Mal J Nutr 14 (1): 91 - 99, 2008

Nutritional Status of Adult Men from the Oraon Tribe in Ranchi District of Jharkhand, India

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ABSTRACT

A cross-sectional study was undertaken to investigate anthropometric characteristics and nutritional status among adult male (18 years and above) Oraons (n = 290), a tribe in the Ranchi District of the state of Jharkhand in India. The anthropometric characteristics (stature, body weight and mid upper arm circumference or MUAC) were categorised into three age-groups (18-39 years, 40-59 years and 60 years and above). This particular investigation recorded a low (18.48Kg / m^2) body mass index (BMI) and a high frequency of under-nutrition (53.10% chronic energy deficiency or CED) among the adult Oraons. BMI and CED of the adult Oraons were also compared with some populations of eastern India. It is noted that 38.28% of adult Oraons suffer from under-nutrition when the nutritional status of their population is evaluated by the standard cut-off points of MUAC. Pearson correlations of BMI and MUAC with age exhibited significantly ($p < 0.001$) negative correlations among the Oraons. Correlations between BMI and MUAC in their population showed a high significance ($p < 0.0001$). Significant age-related variations (tested by one-way ANOVA) in anthropometric parameters were observed in the Oroan population. Linear regression analyses revealed more or less significant negative impacts of age on BMI and MUAC in the population.

INTRODUCTION

This paper reports a bio-anthropological investigation undertaken on adult male Oraons, a tribe in Ranchi District of the state of Jharkhand in eastern India. An anthropometric assessment of health and nutritional status of the community with respect to body mass index (BMI) and mid upper arm circumference (MUAC) records the state of health of the population that lives under poor economic conditions. Age-trend of anthropometric characteristics in the population was also examined.

It has long been well established that the use of anthropometry is a resourceful indicator of nutritional and health status of adults (WHO, 1995). Although nutritional status in adults can be evaluated in many ways, the BMI is most widely used because its use is inexpensive, non-invasive and suitable for large-scale surveys (Lee & Nieman, 2007; Pirlich & Lochs, 2001). BMI

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is generally considered a good indicator of not only the nutritional status but also the socio-economic condition of a population, especially the adult population of developing countries (Khongsdier, 2002, Adak *et al.,* 2006).

Several studies elsewhere have investigated the anthropometric characteristics and nutritional status of the adults of different ethnic groups (Corish & Kennedy, 2003, Davidson & Getz, 2004, Santos *et al.*, 2004, McLorg, 2005; Kikafunda & Lukwago, 2005). Information is scarce on the anthropometric and nutritional status of various tribal populations of Eastern India (Bose *et al.*, 2005; 2006a; 2006b). It has been recently suggested (Datta Banik, 2007; Datta Banik & Sain, 2007, Datta Banik, Bose & Bisai, 2005; 2007a; 2007b; Bose *et al.*, 2005, 2006c; 2006d) that there is an urgent need to evaluate the nutritional status of various tribes of India.

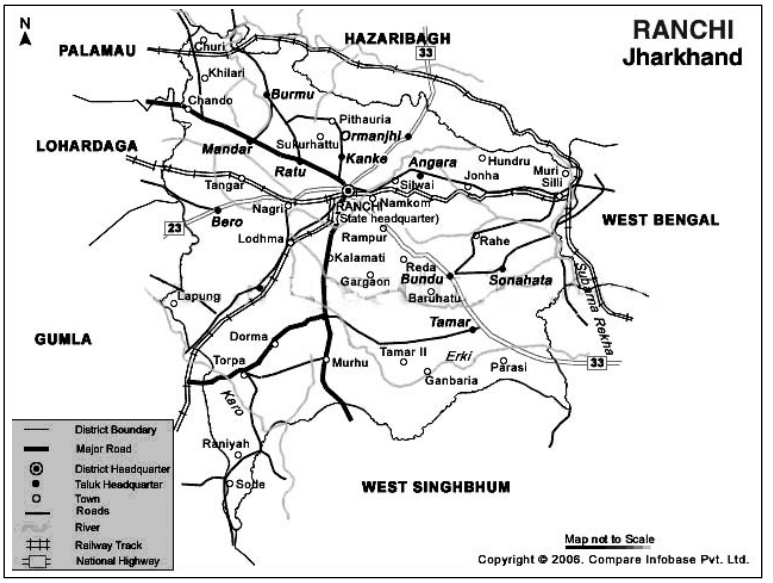
The Scheduled Tribes constitute around 30.25% of the total population of the state of Jharkhand (Mittal & Srivastava; 2006, Topal & Samal, 2001; Mandal, Mukherjee & Data, 2002). There are about 30 major tribal communities in the state with the predominant tribal groups being the Santals, Oraons, Mundas, Hos, Loharas, Kharwars, Kharias and the Bhumijs. The Oraons are the second largest tribal community, next to the Santals in the state of Jharkhand with a total population of about 10 million, of which 7 million are settled in Ranchi district. They are also found in relatively smaller numbers in other parts of India. According to the census (Govt of India, 2001), about 58.43% of the Oraons follow some religious traits of the Hindus, 21.05% are Christians and 20.52% belong to other religions.

The Oraons speak *Kurukh*, which belongs to the sub-groups of the Dravidian language family. They also speak Hindi. The Oraons have several exogamous totemic clans and they use their clan names as surnames (viz. Kujur, Tirke, Ekka etc.). Land is their main economic resource. They are settled cultivators. But during lean seasons they depend on forest produce. A number of Oraons work as wage labourers and industrial workers and some of them are employed in government and private organizations. The Oraons have their own religion, folk songs and folk tales.

MATERIALS AND METHODS

Several studies have focused on age-related variations in anthropometric characteristics and nutritional status of adult men and women of different ethnic groups of both tribal and non-tribal populations (Bose & Chakraborty, 2005; Bose *et al.*, 2006a). In view of this, the objective of the present study was to report nutritional status based on BMI, of the adult (aged 18 years and above) male Oraons in the district of Ranchi in the state of Jharkhand, India. This cross-sectional study focuses on anthropometric variations and also evaluates nutritional status of the adult male Oraons in Ranchi district of Jharkhand, India. The subjects of the study were selected through a purposive village level survey among the adults.

The present cross-sectional study among the adult (aged 18 years and above) Oraon (sample size of n = 290) males was conducted during July 2007. Anthropometric data were collected from five villages, viz Amanburu, Ulidih, Nahelgara, Nawadi (Bundu) and Manjhituli in and around Bundu, which is about 45 kilometers south from the city of Ranchi, the provincial capital of the state of Jharkhand. All available adult individuals belonging to this ethnic group in these villages and having no apparent acute disease or disorder were considered for this survey.



This map has been downloaded from :
http://www.mapsofindia.com/maps/jharkhand/districts/ranchi.htm. Dated 22.02.2008

All anthropometric measurements of lightly clothed subjects were taken by the trained investigator (SDB) using standard techniques of Lee & Nieman (2007). Stature or height (cm) is the vertical distance from floor to vertex of the head. The subject stands bare-footed while the head is held with the Frankfurt plane.

Height and weight were taken to the nearest 0.1 cm and 0.5 kg, using standard Martin's anthropometer and weighing scale (Libra, New Delhi, India), respectively. Technical errors of measurements (TEM) were within acceptable limits. Derived anthropometric indices and ratios were worked out using the following standard equations and classifications following international standards (WHO, 1995).

Abbreviations of the anthropometric measurements, indices and ratios used are as follows:

BMI (Kg / m^2) = Body Mass Index = Weight (kg) / height (m^2)

The classification of BMI provides a useful support for the analysis of height and weight data from chronically under-nourished adult populations (WHO, 1995). MUAC (cm) = Mid-Upper Arm Circumference

Changes in mid-arm circumference (MUAC) tend to parallel changes in muscle mass and hence are particularly useful in the diagnosis of protein energy malnutrition or starvation (Harries *et al.*, 1984). MUAC measurement was made using a flexible, non - stretch tape. The subject stood erect and sideways to the measurer (Lee & Nieman, 2007) with the head held by the Frankfurt plane, arms relaxed and legs apart. The measurement was taken at the midpoint of the upper right arm between the acromion process and the tip of the olecranon. After locating the mid-point, the right arm was relaxed so that it was hanging loosely by the side, with the palms facing inwards. The tape was wrapped gently but firmly around

the arm at the mid-point. Measurement was taken to the nearest 0.1 cm. Cut-off values of MUAC were used based on the classifications of Pitanga & Lessa(2005) and Lee & Nieman (2007).

Students' *t*-test was performed to test for differences in mean anthropometric characteristics between the two different samples. One-way analysis of variance - Scheffe's procedure (Mascie-Taylor, 1994a; 1994b) was used to test for age-group differences in mean anthropometric characteristics. Pearson correlation coefficients (r) and linear regression analyses were used to study the inter-relationship between age and anthropometric characteristics. In linear regression analyses, age was used as a continuous independent variable. All statistical analyses were done using the SPSS Statistical Package. Statistical significance was set at $p < 0.05$.

Ethical approval was obtained from Vidyasagar University Ethics Committee before commencement of the study. Informed consent was also obtained from local community leaders and each participant.

RESULTS AND DISCUSSION

The mean (± standard errors) age of the adult male Oraons (37.43 years ± 0.81) indicate a young adult population. The group statistics (mean ± standard errors) with range (minimum and maximum values) of anthropometric measurements and derived index (BMI) are presented in Table 1. The mean Body Mass Index (BMI) of the Oraons (18.48 kg / m^2 ± 0.12) marginally equals to the WHO (1995) recommended value of CED Grade - I thinness (18.49 kg / m^2).

Prevalence of Chronic Energy Deficiency (CED) and nutritional status of the adult male Oraons (n = 290) are presented in Table 2. The high frequency (53.10%) of CED (BMId" 18.49kg / m^2) among the Oraons indicates that the adult male population is suffering from severe under-nutrition.

Comparing the prevalence of under-nutrition based on BMI of adult males of three other populations [Telagas (Datta Banik 2007), Datta Banik & Sain 2007; Saraks (Datta Banik *et al.*, 2007b), and Dhimals - (Datta Banik *et al.*, 2005; 2007a) of eastern India] with the Oraons of the present study, reveal that nutritionally, the Oraons are worse off, with the highest percentage (53.10%) having chronic energy deficiency (Table 3).

Assessment of nutritional status based on the cut-off points of MUAC also indicates that a high proportion (38.28%) of the adult Oraons suffer from under-nutrition (Table 4).

Age difference in mean anthropometric characteristics is observed in the results given in Table 6. Significant age-group differences in all anthropometric characteristics, except stature ($F = 2.495$, $p < 0.084$) are observed among the adult male Oraons (n=290) viz. body weight ($F = 7.54$, $p<0.001$); BMI ($F = 5.843$, $p<0.001$); MUAC ($F = 4.986$, $p < 0.001$).

The results of Pearson correlation of variables show a negative correlation in anthropometric parameters with age, which conforms to the results given in Table 5, which indicate a gradual decline in mean values of the variables with advancement in age. Correlation of anthropometric parameters with age appears to be significant in cases of BMI ($r = -0.174$, $p < 0.001$), MUAC ($r = -0.162$, $p < 0.001$) among the Oraons. Correlation of BMI with MUAC ($r = 0.554$) displays high significance ($p < 0.0001$) in the adults.

Impact of age on anthropometric characteristics is examined through linear regression analysis, considering age as the

Table 1. Descriptive statistics of anthropometric measurements, derived indices and ratios among adult male Oraons (n = 290) of Ranchi District, Jharkhand

SL.NO.	*Variables*		*Oraon (n=290)*
1	Age(Years)	Range	18 - 75
		Mean ± se	37.43 ± 0.81
2	Stature(cm)	Range	138.50 - 179.50
		Mean ± se	160.65 ± 0.35
3	Body wt.(kg)	Range	31.0 - 72.0
		Mean ± se	47.79 ± 0.38
4	BMI(Kg/m^2)	Range	12.95 - 24.90
		Mean ± se	18.48 ± 0.12
5	MUAC(cm)	Range	23.20 - 44.40
		Mean ± se	23.50 ± 0.17

Table 2. Frequency of nutritional status based on body mass index (BMI) (WHO,1995) among adult male Oraons of Ranchi District, Jharkhand

BMI Range(Kg/m^2)	*Nutritional status*	*Oraon (n=290)*
<16.0	Grade III thinness (CED III)	19 (6.55%)
16.0-16.99	Grade II thinness (CED II)	42 (14.42%)
17.0-18.49	Grade I thinness (CED I)	93 (32.07%)
Total (16.0-18.49)	Undernutrition	154 (53.10%)
18.50-24.99	Normal	135 (46.90%)
25.00-29.99	Overweight	0.00 (0.00%)

Table 3. A comparison of BMI and under-nutrition in some populations of Eastern India

Variable	*Telaga (T)(n=102)*	*Sarak (S)(n = 158)*	*Dhimal (D)(n=159)*	*Oraon (O)^(n = 290)*
Mean BMI (kg/m^2)	20.30(0.36)	20.27(0.24)	19.5 (0.16)	18.48(0.12)
UNDERNUTRITION (%)BMI < 18.49	27.45	27.85	27.00	53.10

Standard errors are presented in parentheses.
^ Present study.

T = TELAGA (Datta Banik 2007; Datta Banik & Sain, 2007)
S = SARAK (Datta Banik *et al.,* 2007b)
D = DHIMAL (Datta Banik *et al*., 2005; 2007a)
O = ORAON (Present Study)

Table 4 Assessment of nutritional status based on MUAC among adult male Oraons

Cut off points of MUAC (cm)	*Nutritional status*	*Oraons (n=290)*
≥23.0	Normal	179(61.72%)
<23.0	Under-nutrition	111(38.28%)

Adult male Oraon (n) = 290

Table 5. Age-related variations in anthropometric characteristics of the adult male Oraons (n = 290) of Ranchi District, Jharkhand.

Variables	*Age-groups (years)*			*F*	*Significance(p<)*
	18-39	40-59	60+		
N	174	87	29		
	Mean ± SE	Mean ± SE	Mean ± SE		
Mean age	28.14 ± 0.50	46.82 ± 0.58	65.00 ± 0.80	614.20	0.000
Stature	160.93 ± 0.44	160.86 ± 0.63	158.32 ± 1.19	2.495	0.084
Body wt.	48.44 ± 0.49	47.93 ± 0.72	43.48 ± 0.82	7.54	0.001
BMI	18.66 ± 0.14	18.49 ± 0.23	17.34 ± 0.25	5.843	0.001
MUAC	23.75 ± 0.20	23.50 ± 0.34	22.00 ± 0.33	4.986	0.001

Table 6. Correlation of anthropometric characteristics among adult male Oraons of Ranchi District, Jharkhand.

Variables	*Correlations with*	*Oraons (n=290)*	
		r	*Significance (p<)*
AGE	BMI	-0.174	0.001
	MUAC	-0.162	0.001
BMI	MUAC	0.554	0.0001

Table 7. Simple linear regression of anthropometric characteristics with age among adult male Oraons of Ranchi District, Jharkhand.

Dependent Variables	*Population*	*B*	*SeB*	*Beta*	*t*	*Sig*	*R*	*R^2*	*AdjustedR^2*
BMI	Oraons (n=290)	-2.47	0.008	-0.174	-3.00	0.003	0.174	0.030	0.027
MUAC	Oraons (n=290)	-3.29	0.012	-0.162	-2.781	0.006	0.162	0.26	0.023

B refers to regression coefficient. SeB refers to standard error of B. Beta refers to estimated regression coefficient.

independent variable and other anthropometric parameters, viz. BMI and MUAC were taken separately as the dependent variables. Significant impact of age is recorded on BMI (t =-3.00, p< 0.001); MUAC (t = -2.781, p<0.001) among the Oraons (Table 7). These studies show negative impact of age on most of the anthropometric parameter. These results further confirm the negative correlation with age in the case of most of the variables (Table 6). Hence, it is evident that as they grow older, the Oraons become nutritionally worse off.

CONCLUSION

This study is a preliminary record of information of anthropometric characteristics and nutritional status of the adult male Oraons, a tribe in Ranchi district of Jharkhand. The results show that a significant section of the population is suffering from under-nutrition. Immediate consideration for adequate food and nutrient supplementation is essential for the Oraons. Results of the negative age-trend of anthropometric markers are further verified and validated by the results of the significant negative correlations with age as estimated by correlation analysis and negative impact of age on anthropometric variables in regression analyses. Significant decline of health and nutritional state with age, as measured and appraised by anthropometric parameters, is therefore observed in the Oraons.

It may be mentioned that nutritional status of a population has a complex link with dietary habits as well as the ecology and environment. Further research should be undertaken to investigate the influence of dietary patterns and environment on health and nutrition of the adult populations in this part of the world. Moreover, studies related to inter-tribal differences in these components are also important. The present investigation did not deal with these factors as they were beyond the scope of the study. This is a clear limitation of the present study. However, it is essential that future research on tribal populations will include these parameters while investigating their nutritional status.

REFERENCES

Adak D, Gautam RK, Bharati S, Gharami AK, Pal M & Bharati P (2006). Body Mass Index and chronic energy deficiency of adult males of Central Indian Populations. *Human Biology* 78 (2) : 161-178.

Bose K (1996). Generalised obesity and regional adiposity in adult white and migrant Muslim males from Pakistan in Peterborough. *J Roy Soc Pro Health* 116: 161-167.

Bose K., Ghosh A, Roy S & Gangopadhyay S (2005). The relationship of age, body mass index and waist circumference with blood pressure in Bengalee Hindu male jute mill workers of Belur, West Bengal, India. *Anthropol Anz* 63(2) : 205-12.

Bose K & Chakraborty F (2005). Anthropometric characteristics and nutritional status based on body mass index of adult Bathudis: a tribal population of Keonjhar District, Orissa, India. *Asia Pac J Clin Nutr* 14: 80–82.

Bose K, Banerjee S, Bisai S, Mukhopadhyay A & Bhadra M (2006a). Anthropometric profile and chronic energy deficiency among adult Santal tribals of Jhargram, West Bengal, India: comparison with other tribal populations of Eastern India. *Ecol Food Nutr* 45: 1-11.

Bose K, Chakraborty F, Bisai S, Khatun A & Bauri, H (2006b). Body Mass Index and nutritional status of adult Savar tribals of Keonjhar District, Orissa, India. *Asia Pac J Pub Health.* 18 (3) : 3 – 7.

Bose K, Ganguly S, Mamtaz H, Mukhopadhyay A & Bhadra M (2006c). High prevalence of undernutrition among adult Kora Mudi tribals of Bankura District, West Bengal, India. *Anthropol Sci* 114 : 65 – 8.

Bose K, Bisai S & Chakraborty F (2006d). Age variations in anthropometric and body composition characteristics and under-weight among male Bathudis: a tribal population of Keonjhar District, Orissa, India *Coll. Antropol* 30 (4) : 771-775.

Chumlea WC, Rhyne RL, Garry PJ & Hunt WC (1989). Changes in anthropometric indices of body composition with age in a healthy elderly population. *American Journal of Human Biology* 1: 457 – 462.

Corish CA & Kennedy NP (2003). Anthropometric measurements from a cross-sectional survey of Irish free-living elderly subjects with smoothed centile curves. *British Journal of Nutrition 89*: 137-145.

Datta Banik S (2007). Age-sex and diurnal variation of blood pressure in different nutritional states among the adult Telegas of Kharagpur in West Bengal, India. *Collegium Antropologicum* 31(3) : 717-722.

Datta Banik S, Bose K & Bisai S (2005). Anthropometric and physiometric assessment of adult Dhimals of Naxalbari, West Bengal. *Indian Journal of Biological Sciences* 11: 26-39.

Datta Banik S & Sain BK (2007). A study on age-related changes and diurnal variation of blood pressure among the Telegas of Kharagpur, West Bengal, India. *Man and Life* 33 (3-4): 53-60.

Datta Banik S, Bose K, Bisai S, Bhattacharya M, Das S, Jana A & Purkait P (2007a). Chronic energy deficiency among the Adult Dhimals of Naxalbari, West Bengal – comparison with other tribes of Eastern India. *Food and Nutrition Bulletin* 28(3) : 348 – 352.

Datta Banik S, Barman RK, Maity S, Sukul T & Roy V (2007b). Ethnic variation In anthropometric characteristics and body composition – a comparative study among adult male Oraons and Saraks of Ranchi District Jharkhand India. *Anthropologie* (Comunicated)

Davidson J & Getz M (2004). Nutritional risk and body composition in free-living elderly participating in congregate meal-site programs. *Journal of Nutrition and Elderly 24* : 53-68.

Government of India (2001). Census of India. Office of the Registrar General and Census Commissioner, India.

Harries AD, Jones LA, Heatley RV, Newcombe RG & Rhodes J (1984). Precision of anthropometric measure-ments: the value of mid-arm circum-ference. *Clin Nutr* 2: 193-196.

Khongsdier R (2002). Body mass index and morbidity in adult males of the War Khasi in Northeast India. Eur *J Clin Nutr* 56: 484–489.

Kikafunda JK. & Lukwago FB (2005). Nutritional status and functional ability of the elderly aged 60 to 90 years in the Mpigi district of central Uganda. *Nutrition* 21: 59-66.

Lee RD & Nieman DC (2007). Nutritional Assessment. McGraw Hill, New York

Mandal H, Mukherjee S, Datta A (2002). India – An Illustrated Atlas of Tribal World. Anthropological Survey of India, Kolkata.

Mascie-Taylor CGN (1994a). Statistical issues in anthropometry. In: *Anthropometry: the Individual and the Population.* Cambridge. Ulijaszek SJ, Mascie-Taylor CGN (eds.). Cambridge University Press, pp 56 –77.

Mascie-Taylor CGN (1994b). Analyzing cross-sectional anthropometric data. *Eur J Clin Nutr* 48: S190-S202.

McLorg PA (2005). Anthropometric patterns in middle-aged and older rural Yucatec Maya women. *Annals of Human Biology* 32: 487 – 497.

Mittal PC & Srivastava S (2006). Diet, nutritional status and food related traditions of Oraon tribes of New Mal (West Bengal), India. *Rural and Remote Health* 6 : 385.

Pirlich M & Lochs H (2001). Nutrition in the elderly. *Best Prac Res Clin Gastroenterology* 15 : 869.

Pitanga FJG & Lessa I. (2005). Anthropometric indexes of obesity as an instrument of screening for high coronary risk in adults in the city of Salvador – Bahia. *Arquivos Brasileiros de Cardiologia* 85 (1).

Santos JL, Albala C, Lera L, Garcia C, Arroyo P, Perez-Bravo F, Angel B & Pelaez M (2004). Anthropometric measurements in the elderly population of Santiago, Chile. *Nutrition* 20: 452-457.

Topal YS & Samal PK (2001). Causes for variation in social and economic conditions among tribes of Indian Central Himalaya: a comparative study. *Man in India* 81: 87-88.

World Health Organization (WHO) (1995). Physical status: The use and interpretation of anthropometry. Report of a WHO Expert Committee. WHO Technical Report Series 854. World Health Organization. Geneva.