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Progression of Age and Relative Anthropometric Variables Changes Among Male 'Mundas' Tribe of Paschim Medinipore District, West Bengal, India: A Correlative Study

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ABSTRACT

Background: A cross-sectional study was carried among 226 male 'Mundas', a native tribal population resides at remote villages of Paschim Medinipore District, West Bengal, India to investigate effect of age variations on anthropometric parameters of those backward class population of the society. Methodology: The subjects included for the study were categorized into three age groups: Group I: <30 years, Group II: 30-49 years, Group III: ≥ 50 years. Body height, weight, circumferences and skinfold data were collected following standard anthropometric techniques. Body mass index (BMI), body composition variables and indices were derived using standard equations. Results: Findings revealed significant ($p<0.05$) negative correlations for age dependent variations with most of the anthropometric parameters and body composition variables and indices. Alongside for all these variables, a significant negative impact of age was established following regression study. Frequency of underweight individuals was found more along with increase in age. Conclusion: Among 'Mundas' men negative correlation of age with anthropometric health parameters, body composition variables and indices depends on their economical and educational status as well as nutritional inadequacy.

KEYWORDS 'Mundas', Paschim Medinipore, Age variations, Anthropometry, Body composition

Introduction

Many factors are associated with alteration of human health status that includes a principle factor age associated with many risk factors and consequences e.g. delayed mental health development or psychological problems or depression; anxiety leads to low social support and mortality (**Charlton et al., 2001**). It may also have consequences for the middle aged personnel such as higher rate of hospitalization and higher rate of high-risk behaviours (**Charlton and Donald, 2001**). Several studies have focused on age variations in anthropometric characteristics and nutritional status of among men of different ethnic groups (**Allain et al., 1997; Ngatia et al., 2008**) though very scanty data are available on anthropometric and body composition characteristics and the frequency of underweight of male 'Mundas', a tribal population of Paschim Medinipore district, West Bengal, India. 'Mundas' is the inhabitant tribe of three eastern provinces of India-West Bengal, Bihar and Jharkhand and their mother tongue is Santali language (**Bera, 2008**). Majority of the 'Mundas' are found in four subdivisions of West Bengal, namely, Binpur, Belpahari, Jhargram and Jangal Mahals of Paschim Medinipore district, West Bengal (**Mandal et al., 2002**). Present cross-sectional study was aimed to assess and compare the health status of adult 'Mundas' male with age variations through anthropometric and body composition indicators in Paschim Medinipore District, West Bengal, India.

Materials and Methods

Required study related data were collected from Binpur, Belpahari, Jhargram and Jangalmohal region of Paschim Medinipore District, West Bengal, having a distance of approximately 80 Kms from Midnapore town. Prior permission and ethical approval was obtained from local 'Gram Panchayat' leaders as well as relevant Institutional authorities of 'Medinipore Rehabilitation Centre for Children, Midnapore' and 'Sevayatan

School of Medical Technology, Singur, Hooghly' before commencement of the study. Information on ethnicity, age, occupation and educational status were obtained from all subjects with the help of a pre-standardized model questionnaire.

A total of 226 adult (>18 years) men were included randomly in the study from the residents of the selected localities and the participation rate was 76 %. Majority of the subjects were either illiterate or completed only their primary education and very low-wage earning contractual type labour, belonged to low socio-economic class. Age of subjects was calculated from their EPIC data issued by Election Commission of India and on their personal information. Subjects were grouped into three age groups: **Group I**: <30 years (n=72); **Group II**: 30-49 years (n=104) and **Group III**: ≥50 years (n=50). Anthropometric measurements were recorded by trained investigators of the 'Sevayatan School of Medical Technology' using internationally accepted standard protocol (**World Health Organization, 1995**). Anthropometric variables included height, weight, sitting height (STHT), mid upper arm circumference (MUAC), and biceps (BSF), triceps (TSF), subscapular (SUBSF) and suprailiac (SUPSF) skinfold thicknesses. Technical errors of measurements (TEM) were computed and they were found to be within acceptable limits of 10. Thus, TEM was not incorporated in statistical analyses. Body mass index (BMI) was computed using the following standard equation: BMI = Weight (Kg) / Height (m^2). Underweight was evaluated using internationally accepted World Health Organization BMI guidelines (**World Health Organization, 1995**). Following cut-off points were used: Underweight: BMI<18.5; Normal: BMI = 18.5-24.9; Overweight: BMI ≥25.0. For computation of body composition, Percent body fat (PBF) was calculated using Siri's equation PBF = (4.95/density-4.50) X 100 (**Siri, 1956**). Density was derived following Durnin & Womersley's equation (**Durin and Womersley, 2007**) using the sum of BSF, TSF, SUBSF and SUPSF. Fat mass (FM), fat free mass (FFM), fat mass index (FMI) and fat free mass index (FFMI) were computed using following standard equations:

FM (Kg) = (PBF/100) X Weight (Kg); FFM (Kg) = Weight (Kg)-FM (Kg); FMI (Kg/m^2) = FM (Kg)/$height^2$ (m^2); FFMI (Kg/m^2) = FFM (Kg) / $height^2$ (m^2). Total body water (TBW) was calculated using Humes-Weyers formula TBW = (0.194789 X Height)+(0.296785 X Weight)-14.012934, where height in is cm and weight is in Kg (**Hume and Weyers, 1971**). Skewness was not noticed for the distributions of anthropometric and body composition variables. Oneway ANOVA (Scheffes' Procedure) was performed to test for age group differences in mean anthropometric and body composition characteristics. Pearson correlation coefficients (r) were used to study the association of age with these characteristics. Linear regression analyses were used to study the impact of age on these anthropometric and body composition characteristics. In linear regression analyses, age was used as an independent variable. All statistical analyses were undertaken using the Statistical Package for Social Sciences (SPSS) Package, Ver 11.5. Statistical significance level was set at p<0.05.

RESULTS

The age of the subjects was 38±14.4 years. Age group differences in mean anthropometric and body composition characteristics were presented in the **Table 1**. It represented significant (p<0.05) age group dependent differences in means of most of the variables and indices. Significant age group differences in anthropometric variables i.e. mean height (p<0.05), weight (p<0.001), BMI (p<0.05), STHT (p<0.01), BSF (p<0.01), TSF (p<0.05) and SUBSF (p<0.05) were found. In all instances, Group I had the highest mean while Group III had the lowest mean i.e. a decreasing trend in mean values from Group I to Group III.

For body composition variables and indices, significant age group differences in mean PBF (p<0.01), FFM (p<0.05), FM (p<0.01), FMI (p<0.05) and TBW (p<0.01) was found among Group I to Group III. Group I had the highest mean and Group III had the lowest mean with a trend of decreasing mean from Group I to Group III.

Correlation studies of age with these anthropometric and body composition variables and indices revealed that age was significantly negatively correlated with them. Linear regression analyses were also performed. Age was considered as independent variable. Results revealed that (**Table 2**), for all these variables, age had a significant (p<0.05) negative impact that existed for height (t = -3.197), weight (t = -3.516), BMI (t = -2.000), STHT (t = -5.435), BSF (t = -3.627), TSF (t = -2.708), PBF (t = -3.240), FFM (t = -2.966), FM (t = -3.162), FMI (t = -2.947) and TBW (t = -3.781).

Table 1: Age variations in mean anthropometric characteristics and body composition indices of 'Mundas'.

Anthropological Variables	<30 years (n=72)	30–49 years (n=104)	≥ 50 years (n=50)	F-ratio
Height (cm)	160.2±6.3	159.4±5.8	157.4±7.3	3.694*
Weight (Kg)	48.2±6.2	47.4±6.3	44.2±5.7	6.987**
Body Mass Index (Kg/m^2)	18.7±1.6	18.6±2.2	17.8±1.7	3.503*
Sitting Height (cm)	81.2±3.7	79.9±3.2	77.3±7.3	10.931**
Mid Upper Arm Circumference (cm)	23.8±3.2	23.6±2.3	22.9±2.9	1.907
Skin fold thickness				
Biceps Skinfold (mm)	4.1±1.4	3.5±1.7	3.1±1.5	6.117**
Triceps Skinfold (mm)	6.2±1.8	5.5±2.3	5.2±2.3	3.438*
Sub-scapular Skinfold (mm)	8.4±2.2	7.9±2.9	7.0±2.3	4.455*
Supra-iliac Skinfold (mm)	7.5±2.8	7.4±3.2	6.7±2.7	1.222
Body composition				
Percent Body Fat (%)	11.8±3.4	10.4±4.6	9.0±4.8	6.250**
Fat Free Mass (Kg)	42.5±4.9	42.2±4.3	40.0±4.1	5.151*
Fat Free Mass Index (Kg/m^2)	16.4±1.2	16.6±1.4	16.2±1.3	1.709*
Fat Mass (Kg)	5.8±2.2	5.1±2.3	4.1±2.6	5.899**
Fat Mass Index (Kg/m^2)	2.2±0.8	2.0±1.1	1.7±0.9	5.050*
Total Body Water (Kg)	31.6±2.9	31.1±2.6	29.7±2.8	6.834 **

Data are expressed in Mean ± Standard deviations. *p<0.05, **p<0.005.

Underweight status of 'Mundas' revealed that there was a consistent increasing frequency of underweight (BMI<18.5) from Group I (45.8%) to Group III (64.0%). 'Mundas' men in Group II had intermediate frequency (52.4%) of underweight (**Figure 1**).

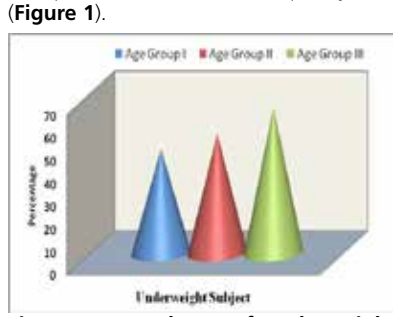

Figure 1: Prevalence of underweight among 'Mundas' with age group variation.

Table 2: Changes in anthropometric and body composition characteristics among 'Mundas' men with age variation studied by linear regression analyses.

Anthropological Variables	Adj. R^2	t
Height	0.039	– 3.192**
Weight	0.048	– 3.513**
BMI	0.013	– 2.000*
STHT	0.112	– 5.435**
Skin fold thickness		
Biceps Skinfold (mm)	0.051	– 3.627**
Triceps Skinfold (mm)	0.027	– 2.708*
Sub-scapular Skinfold (mm)	0.021	– 2.438*
Supra-iliac Skinfold (mm)	0.023	– 2.535*
Body composition		
Percent Body Fat (%)	0.041	– 3.240**
Fat Free Mass (Kg)	0.033	– 2.966**
Fat Free Mass Index (Kg/m^2)	0.034	– 2.146**
Fat Mass (Kg)	0.038	– 3.162**
Fat Mass Index (Kg/m^2)	0.033	- 2.947**
Total Body Water (Kg)	0.056	- 3781**

Discussion

Age dependent changes in body size and composition easily been identified by anthropometric measurements (**McLorg, 2005**). It provides an indirect assessment of body composition (**Bose and Das Chaudhuri, 2003**). The effect of age on anthropometry and body composition has been supported by earlier studies (**Lohman et al., 1988; Chilima and Ismail, 1998; Miccozi and Harris, 1990**). But there is scanty information about relationship between age variations and in anthropometric and body composition characteristics among 'Mundas' West Bengal. So, present study established a significant relationship between age variation and anthropometric and body composition profile of the adult male 'Mundas', the tribal population of Paschim Midnapore, India.

Undernutrition is more common in Indian elderly persons especially residing in rural areas than in younger adults and they are at greater risk of undernutrition has been reported earlier (**Thakur et al., 2013; Vedantam et al., 2015**). High prevalence rate of underweight among older male 'Mundas' is the major features of the present finding. According to BMI values, the prevalence of underweight was 45.7 %, 52.2 % and 63.8% in Group I, Group II and Group III, respectively, which indicated that there is an age dependent increase in the occurrence of underweight. It is much higher than other rural populations in developing countries supported also by earlier findings of others (**Suzana et al., 2002**).

Among 'Mundas' tribal men, anthropometric and body composition variables and body indices is significantly inversely related with age, and Underweight is a serious problem among this group especially among the older individuals, which is further interrelated with physiological, psychological, educational, economical and/or sociological problems (**Allain et al., 1997**; **Natarajan et al., 1993**). So, social and nutritional beneficial along with health programmes and policies should be implanted for this tribe to enhance the quality of their life style.

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