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VARIATION IN ANTHROPOMETRIC CHARACTERISTICS OF BODY COMPOSITION WITH AGING ,AMONG ADULT RURAL POPULATION OF ODISHA, INDIA

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ABSTRACT ■ Nutritional anthropometry is readily used as a simple tool for surveillance tool to attenuate chronic diseases. Anthropometric characteristic of body composition among the rural population of Odisha is an attempt to envisage the baseline data as well as investigate the adult to old age difference body composition status of the population. 263 men and 286 women of variable age groups (40-79 years) from the Ganjam district of Odisha, India were recruited. Anthropometric measurements (height, weight, skinfold measurements) were recorded to calculate the percent body fat, body mass index and body surface area. With increase in age, men showed a reduction in weight, abdominal skin folds, percent body fat as well as BMI, however the decrement was not statistically significant. In case of women however, significant differences in reduction of these parameters between different age groups were observed. Post hoc analysis also revealed insignificant differences in the body composition parameters among men with the studied age groups. However, in women, all the parameters significantly reduced with the increasing age groups. Although, there is a reduction in anthropometric characteristics of body composition among rural men and women studied, the reduction is not significant in men. It is noted that physical activities tend to reduce with age, resulting in less utilization of fat. Also among men, ageing is related to low plasma free testosterone levels, increasing the BMI as well as fat mass and decrease in muscle mass. The result state that rural men, in particular, of Odisha, India exhibit rotundity-oriented susceptible anthropometric characteristics of body composition with increasing age.

Key words: Anthropometry, Adult rural population of India,body composition,aging,nutrition

STATEMENT OF RELEVANCE

The assessment results of body composition with age variability can serve as a tool to evaluate body nutritional status, kinetics and performance analysis, monitor health risks, physical therapy modules, facilitate improvement of health programmes as well as the development of the national anthropometric database.

INTRODUCTION

Anthropometric characteristics elucidate better approach to the knowledge of the growth process and the obvious changes in the body composition with increasing age. Earlier studies have focused on age variations in anthropometric characteristics and nutritional status of the adult population of different ethnic groups (Bose et al. 2006; Wen

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and Kowaleski-Jones, 2012; Das and Roy, 2010). Although it is known that the growth of the human body is fast prominent in the early stages of life, adulthood and geriatric body composition changes are also evident, primarily due to osteological changes, muscular and fat tissue variation (Das and Roy, 2010). As a part of the countrywide anthropometric database for use in various research and application, including health and fitness research, evaluation of body composition, study of nutritional status and disorders, monitor body growth and health risks, postural analysis and skeletal disorders/ deformities, body kinetics and performance analysis, anthropometric characteristics of body composition of the population would be of immense help. Literature indicates that anthropometric dimensions and body composition indicators vary among different population and needs to be quantified as a future surveillance tool to attenuate chronic diseases (Batsis et al. 2009; Corden et al. 2013).

In this context nutritional anthropometry has been readily used as a simple tool to reflect the anthropometric characteristics. Although adult nutritional status are evaluated with various methods, the BMI is one of the widely used inexpensive, non-invasive parameter for large-scale surveys (Bose et al. 2006), for explaining growth and development, especially in the developing countries (Prista et al. 2003). Precisely, various other techniques determining body composition are adapted by various researchers (Parker et al. 2003), however, for field studies, simple and readily available anthropometric measurements serve as a reliable tool for predicting body composition, including percent body fat (%BF) (Wang et al. 1994; Ellis, 2001).

The present study was carried out on a rural population, as part of a large-scale community survey at Ganjam district of Odisha, India (19.5^0 N, 84.5^0 E) with the objective to report the anthropometric characteristics of the residing population. This work reports the extent of age related changes in anthropometric characteristics among the adult rural population based on body mass index, percent body fat and body surface area.

METHODS

The study was a cross-sectional survey, wherein 263 men and 286 women of variable age groups (40-79 years) participated. All the participants were healthy without any physical abnormalities. The study was approved by the Ethical Committee of National Institute of Occupational Health, Ahmedabad, India. Before measurement, the subjects were informed about the purpose of the study and the measurement procedures. Each participant had the opportunity to ask questions before obtaining the written informed consent from the participant. Comprehensive anthropometric measurements were then recorded by trained observers, from which body composition adiposity indicators were computed.

Stature was taken on a flat base with stadiometer attached to the wall. Weight was measured with volunteers with minimal clothing on an electronic balance accurate to 0.1 kg. Four skinfold measurements were taken with skinfold calliper (Holtain Ltd., Crosswell, Crymych, UK) at biceps, triceps, subscapular, and suprailiac regions. The percent body fat, body mass index (BMI) and body surface area (BSA) of the volunteers were calculated from the recorded parameters using standard equations. The SPSS for Windows, Version 16.0. Chicago, SPSS Inc. was used for the analysis of the data.

It is worth mentioning the limitation of

determining body fat from skinfold thicknesses, since two individuals having similar skin fold thickness might differ in their body fat content due to differences in deposit of fat in the abdominal cavity. Therefore, the abdominal skinfold thickness was also measured.

RESULTS

The age-trend distribution of variables among the men and women studied is tabled in Table 1. Univariate analysis revealed that the weight was reduced among the men, although there is no significant difference. Abdominal skin fold, percent body fat also had a decreasing trend among men with exception at the age range of 60-69 years. Body mass index, though within the normal range for the men, also observed to have a decreasing trend among population with increasing age (Bose et al. 2006b).

In case of women, a similar trend was observed; however, all the parameters were elevated in the age range of 50-59 years. A significant difference in the parameters among women were observed between the age groups studied. The age change trend in the anthropometric characteristics and body composition indicators among men and women are shown in Figure 1.

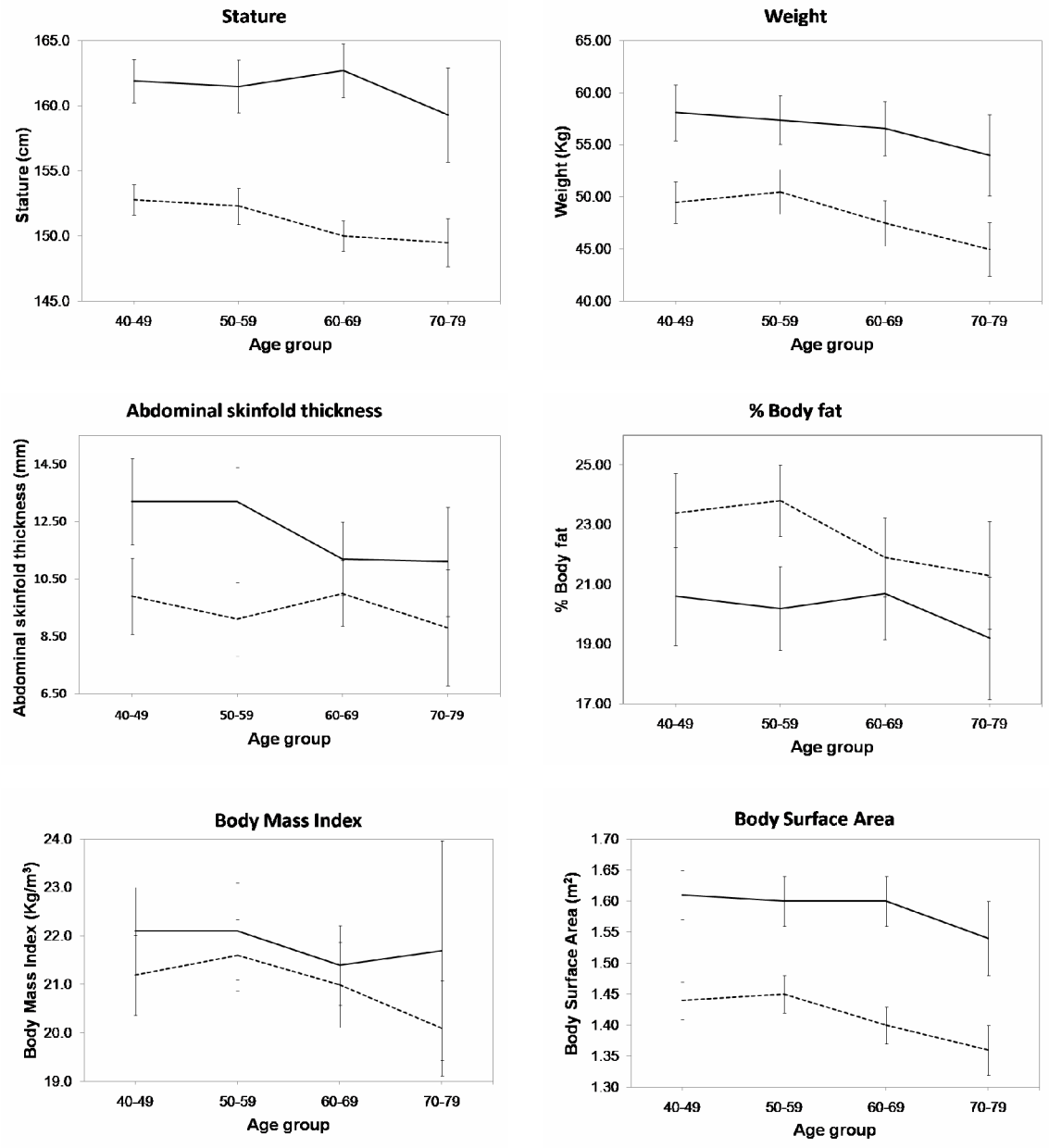
Among men and women in the age range of 40-49 and 50-59, significant reduction in all parameters except BMI was observed. However, in the age range of 60-69 and 70-79, stature, weight and body surface area among women was observed to be

Table 1. Age differences in anthropometric parameters and body composition adiposity indicators among the men and women. N is number of participants measured for the parameters in each age group. Values are mean±standard deviation. Univariate analysis between different age groups are expressed as F-ratio.

	Age range	40-49	50-59	60-69	70-79	$F_{3, 259}$
Men	N	78	84	61	40	
	Age (years)	43.9±3.1	52.8±2.8	62.9±2.6	71.2±1.9	1083.1§
	Stature (cm)	161.9±7.4	161.5±9.4	162.7±7.5	159.3±11.4	1.072
	Weight (kg)	58.1±11.9	57.4±10.8	56.6±10.2	54.0±12.2	1.25
	Abdominal skinfold (mm)	9.9±6.2	9.1±5.0	10.0±4.8	8.8±5.5	0.654
	% BF	20.6±6.8	20.2±5.8	20.7±5.7	19.2±5.9	0.517
	BMI (kg/m^2)	22.1±4.0	22.1±4.6	21.4±3.2	21.7±7.1	0.351
	BSA (m^2)	1.61±0.17	1.60±0.17	1.60±0.16	1.54±0.18	1.653
Women	N	85	86	81	35	
	Age (years)	43.2±2.9	52.7±2.7	62.5±2.5	71.2±2.2	1213.9§
	Stature (cm)	152.8±5.5	152.3±6.6	150.0±5.3	149.5±5.3	5.37§
	Weight (kg)	49.5±9.4	50.5±9.9	47.5±9.9	45.0±7.4	3.283*
	Abdominal skin fold (mm)	13.2±5.8	13.2±5.6	11.2±4.6	11.1±5.3	2.823*
	% BF	23.4±5.8	23.8±5.2	21.9±5.5	21.3±4.7	2.527*
	BMI (kg/m^2)	21.2±3.8	21.6±3.4	21.0±4.0	20.1±2.8	1.371
	BSA (m^2)	1.44±0.13	1.45±0.15	1.40±0.14	1.36±0.12	4.593?

Significant at: * $p<0.05$; . $p<0.01$; § $p<0.001$

significantly lower than men, which reveal that ageing women were more vulnerable as compared to men as far as nutritional status is concerned.



Legend: ——— Men ———— Women

Figure 1. Age changes in the anthropometric characteristics and body composition indicators among men and women.

DISCUSSION

The present study has shown that with increasing age, the anthropometric characteristics of body composition decreases, although not statistically significant in the case of men. However, women tend to have a significant decrease in anthropometric characteristics with increasing age. This is supported by the literature that physical characteristics from the adulthood show declining trend (Das and Roy, 2010).

This may be vulnerable as per as their nutritional status is concerned, as with increasing age, the physical activity would tend to reduce (Blair, 2009), resulting in less utilization of fat than their younger counterparts (Rising et al. 1996). On the contrary, obese population has a higher metabolic rate in absolute terms than the lean individuals implicating that the obese would require more energy for a given activity and therefore, they tend to be more sedentary than lean individuals. Further, ageing is also related to lower testosterone levels in men (Araujo and Wittert, 2011), increasing the BMI as well as fat mass and decreasing in muscle mass (Vermeulen et al. 1999), which can be a cause of adiposity oriented health concern. However, some studies among rural elderly adults of Asian-Indian origin revealed lower body weights and age related body composition as high level of nutritional Although, the present study results are in pattern with the above studies as observed in Figure 1, LSD post hoc analysis revealed no significant difference among men with the studied age groups. However, among women, stature was significantly different with all age ranges. Weight differed significantly among women of 40-49 years and 60-69 and 70-79 years ($p<0.05$). However, only women within 50-59 years had a significant difference in percent body fat with 60-69 and 70-79 years ($p<0.05$). Literature also reveals that in Asian Indians, age incremental abdominal fat increase is common, while the percent body fat increase is less likely (Kesavachandran et al. 2012), associated with possible risk of overweight/obesity related disorders. On the contrary, Das et al. The observed increase in percent body fat among men as well as women with advancing age (Das and Roy, 2010), which is not corroborative with the finding of our study. Abdominal skinfold and BSA were also seen significantly differently between 40-49 years and 60-69 and 70-79 years and also among 50-59 and 60-69 years women ($p<0.05$).

Although, the limitation of the study in its inablity to correlate the anthropometric characteristics with other risk factors and disease prevalence, the positive outcome of the study is the generation of baseline data for further research. It is imperative to state that the rural population, particularly men from Odisha exhibit rotundity-oriented susceptible anthropometric characteristics of body composition with increasing age.

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