Sexual Dimorphism and Age Variations in Anthropometry, Body Composition and Nutritional Status among Kora Mudi Tribals of Bankura District, West Bengal, India

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INTRODUCTION

According to the 2001 census, India has more than 84 million tribals who constitute 8.2% of the total population (Mittal and Srivastava, 2006). India probably has the largest number of tribal communities in the world (Topal and Samal, 2001). The vast majority of the tribal population reside in rural areas of the country. Koras are one such tribe whose mother tongue is Kora, an Austro-Asiatic language. They are inhabitants of three eastern provinces of India: West Bengal, Orissa and Bihar. The majority of the Koras in West Bengal are found in the districts of Bardhaman, Puruliya, Medinipur, Birbhum, Bankura and Hugli. Kora seems to be a generic name signifying the occupation of earth digging. They have four endogamous groups, viz. Mudi Kora, Kurmi Kora, Nagbanshi Kora, Dhangar or Orang Kora (Mandal et al., 2002). Information on Kora Mudis is extremely scanty and there is no published data dealing with age variations in their anthropometric and body composition characteristics (Bose et al., 2006a).

Hitherto, majority of the studies on age and sex variations in anthropometry and body composition from India (Ghosh et al., 2001; Bose and Das Chaudhuri 2003) have been restricted to non-tribal populations. Therefore, there exits virtually no data on sexual dimorphism in age variations in body composition among Indian tribes. In view of this, the objective of the present study was to investigate sexual dimorphism in age variations in anthropometry, body composition and undernutrition among Kora Mudis, a tribal population of Bankura District, West Bengal, India. We could not locate any previous study that has dealt with these objectives in this ethnic group (Bose et al., 2006a).

METHODS

This cross-sectional study was conducted in 2004. The data were collected from two villages, Phulberia and Siromonipur, in Bankura District of West Bengal. These villages are located approximately 20 km from Bankura town (the district capital of Bankura District) and 160 km from Kolkata (the state capital of West Bengal). The residents of all houses in the two villages were contacted and a total of 500 adult ($18.0 < age \leq 65.0$ years) subjects (250 men and 250 women) were included in the study. The response rates were 72% and 86%, 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.

Information on ethnicity, age, occupation and educational status were obtained from all subjects with the help of a questionnaire. All anthropometric measurements were made by trained investigators (SG and HM) using the standard techniques (Lohman et al., 1988). Height, weight and mid upper arm circumference (MUAC) were recorded to the nearest 0.1cm, 0.5kg, and 0.1 cm, respectively. Biceps (BSF), triceps (TSF), subscapular (SUBSF) and suprailiac (SUPSF) skinfolds were measured to the nearest 0.2 mm. Sum of skinfolds (SUMSF) was also computed. Technical errors of measurements (TEM) were computed and they were found to be within acceptable limits (Ulijaszek and Kerr, 1999). Body mass index (BMI) was computed using the standard equation:

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

Nutritional status was evaluated using internationally accepted World Health Organization (1995) BMI guidelines for adults. The following cut-off points were used:

Undernutrition (Chronic energy deficiency): $BMI < 18.5$

Normal: $18.5 \leq BMI < 25.0$

Overweight: $25.0 \leq BMI < 30.0$

Obese: $BMI \geq 30.0$.

Percent body fat (PBF) was calculated using Siri's equation (1956):

PBF = (4.95/density – 4.50) x 100.

Density was derived following Durnin & Womersley's (1974) age and sex-specific equations using the SUMSF.

Fat mass (FM) and fat mass index (FMI) were computed using following standard equations.

FM (kg) = (PBF/100) x Weight (kg)

FMI (kg/m^2) = FM (kg) / height^2 (m^2)

Total body water (TBW) was computed using Hume-Weyers (1971) sex-specific formulae:

For men TBW = (0.194786 x Ht) + (0.296785 x BW) – 14.012934

For women TBW = (0.34454 x Ht) + (0.183809 x BW) – 35.270121

Where Ht in cm, and the BW in kg.

Mid-upper arm muscle area (MUAMA) and mid-upper arm fat area (MUAFA) were calculated using the standard equations of Gibson (1990):

$$\text{MUAMA} = \frac{(\text{MUAC} - (\pi \times \text{TSF})^2}{4\pi}$$

$$\text{MUAFA} = \frac{\text{TSF} \times \text{MUAC}}{2} - \frac{\pi \times (\text{TSF})^2}{4}$$

where TSF and MUAC are triceps skinfold and mid-upper arm circumference, respectively.

To study age-group differences in anthropometric and body composition measures as well as in the frequency of undernutrition, all subjects were classified into one of the following five age group categories as recommended earlier (Durnin and Womersley, 1974):

Age group I (GI): < 20 years

Age group II (GII): 20 - 29 years

Age group III (GIII): 30 - 39 years

Age group IV (GIV): 40 - 49 years

Age group V (GV): ≥ 50 years

The distributions of most of the variables were not significantly skewed and thus parametric statistics were applied. Students t-test was used to compute sex differences in anthropometric and body composition variables. Age group variations in these measures were undertaken using ONEWAY analyses (Scheffes procedure). Pearson correlation coefficients (r) were used to study the interrelationship of age with these variables. Testing for heterogeneity of the correlation coefficients between the sexes were undertaken following the method described in Sokal and Rohlf (1986). Regression analyses with age as a continuous independent variable were utilized to test for the impact of age on these variables. All statistical analyses were undertaken using the Statistical Package for Social Science (SPSS) Version 11.0 program. Statistical significance was set at $p < 0.05$.

Permission and ethical approval was obtained from local community leaders as well as relevant authorities before commencement of the study.

RESULTS

The mean ages of both sexes (men: 32.7 years, SD = 11.3; women: 31.7, SD = 10.6) were similar. Table 1 presents the sex differences in anthropometry and body composition of the subjects. Men had significantly greater mean height, weight, MUAC, BMI and MUAMA. Women had significantly greater mean BSF, TSF, SUBSF, SUPSF, PBF, FM, FMI and MUAFA.

Table 2 presents age group variations in anthropometric and body composition variables in men. There existed significant age variations in mean weight, BMI, MUAC, TBW and MUAMA.

Table 3 presents age group variations in anthropometric and body composition variables in women. There existed significant age varia-tions in means of all variables except MUAC and MUAMA.

Pearson correlation coefficients (r) of age with anthropometry and body composition measures revealed interesting results (results not shown) in both sexes. Among women age was significantly ($p < 0.01$) negatively correlated with

Table 1: Sex difference in anthropometry and body composition of adult Kora-Mudis of Bankura, West Bengal, India.

Variables	*Males (n = 250)*		*Females (n = 250)*		*t*
	Mean	*SD*	*Mean*	*SD*	
Height (cm)	158.94	6.21	147.60	5.62	21.39**
Weight (kg)	47.35	6.39	39.98	5.40	13.92**
MUAC(cm)	22.55	1.95	21.86	1.94	3.95**
BSF (mm)	3.22	1.18	4.19	1.74	-7.24**
TSF (mm)	4.86	1.87	7.43	2.76	-12.18**
SUBSF(mm)	7.02	2.20	8.61	3.03	-6.68**
SUPSF(mm)	6.24	2.72	7.59	3.02	-5.29**
SUMSF(mm)	21.34	6.99	27.81	9.67	-8.58**
BMI (kg/m^2)	18.69	1.84	18.33	2.06	2.08*
PBF (%)	8.78	3.95	19.29	4.65	-27.24**
FM (kg)	4.28	2.33	7.87	2.74	-15.76**
FMI (kg/m^2)	1.68	0.88	3.60	1.19	-20.45**
TBW (kg)	31.00	2.87	22.93	2.61	32.85**
MUAFA (mm^2)	532.16	223.98	777.07	325.78	-9.80**
MUAMA (mm^2)	3541.51	656.57	3053.40	538.03	9.09**

* $p < 0.05$

** $p < 0.001$

Table 2: Age variations in anthropometric and body composition measures among Kora Mudi men.

Variables	*G I (n = 42)*	*G II (n = 68)*	*G III (n = 69)*	*G IV (n = 46)*	*G V (n = 25)*	*F*
Height	157.6 (6.1)	159.7 (7.3)	159.6 (6.3)	158.4 (5.0)	158.1 (4.2)	1.179
Weight	45.7 (6.0)	49.3 (6.5)	48.0 (6.3)	46.2 (6.1)	45.0 (6.1)	3.774**
MUAC	22.1 (2.4)	23.0 (2.0)	22.9 (1.8)	22.4 (1.7)	21.7 (1.6)	3.306**
BSF	3.6 (1.2)	3.3 (1.3)	3.1 (1.2)	2.9 (0.8)	3.2 (1.4)	2.215
TSF	5.3 (1.8)	5.0 (2.1)	4.9 (1.8)	4.2 (1.3)	4.8 (2.2)	2.075
SUBSF	6.7 (2.3)	7.1 (1.9)	7.5 (2.5)	6.6 (1.9)	6.6 (2.2)	1.798
SUPSF	6.1 (2.4)	6.3 (2.5)	6.6 (2.9)	5.5 (1.8)	6.8 (4.2)	1.476
SUMSF	21.7 (6.7)	21.7 (6.8)	22.2 (7.6)	19.2 (5.0)	21.5 (9.1	1.421
BMI	18.4 (1.7)	19.3 (1.8)	18.8 (1.9)	18.4 (1.7)	17.9 (1.9)	3.549**
PBF	9.1 (3.6)	9.1 (3.8)	9.3 (4.2)	7.9 (3.3)	8.5 (5.0)	1.655
FM	4.2 (2.0)	4.6 (2.3)	4.6 (2.5)	3.6 (1.9)	4.1 (2.9)	1.610
FMI	1.7 (0.8)	1.8 (0.8)	1.8 (0.9)	1.4 (0.7)	1.6 (1.1)	1.606
TBW	30.2 (2.8)	31.7 (3.1)	31.3 (2.8)	30.6 (2.6)	30.2 (2.4)	2.941*
MUAFA	559.5 (198.4)	557.1 (260.8)	545.8 (218.1)	460.2 166.0)	512.8 (251.0)	1.684
MUAMA	3354.2 (936.1)	3663.8 (612.9)	3639.4 (590.7)	3547.4 (520.7)	3242.4 (452.6)	3.238*

* $p < 0.05$,
**$p < 0.01$.
Standard deviations are presented in parentheses.

Table 3: Age variations in anthropometric and body composition measures among Kora Mudi women.

Variables	*G I (n = 57)*	*G II (n = 47)*	*G III (n = 78)*	*G IV (n = 56)*	*G V (n = 12)*	*F*
Height	147.3 (5.3)	147.0 (4.9)	149.3 (5.6)	146.8 (5.4)	144.3 (8.1)	3.298**
Weight	40.8 (5.7)	40.9 (5.4)	40.2 (5.3)	38.9 (5.0)	36.4 (4.2)	2.668*
MUAC	21.9 (2.1)	22.1 (1.4)	22.0 (1.9)	21.6 (2.1)	20.9 (1.5)	1.336
BSF	5.0 (1.7)	4.3 (1.7)	4.1 (1.9)	3.7 (1.2)	3.3 (1.0)	5.357**
TSF	9.1 (2.8)	7.4 (2.4)	7.0 (2.7)	6.7 (2.4)	5.5 (2.1)	8.634**
SUBSF	9.9 (3.3)	8.5 (2.4)	8.4 (3.1)	8.0 (2.7)	6.8 (2.7)	4.507**
SUPSF	9.7 (3.1)	7.1 (2.2)	7.0 (3.1)	6.9 (2.6)	6.8 (3.0)	9.252**
SUMSF	33.6 (9.9)	27.3 (7.8)	26.6 (9.1)	25.2 (8.1)	22.4 (8.0)	8.237**
BMI	18.7 (1.9)	18.9 (2.1)	18.0 (2.2)	18.0 (2.1)	17.5 (1.5)	2.705*
PBF	22.1 (4.1)	19.2 (3.9)	18.6 (4.7)	18.0 (4.4)	16.3 (4.7)	8.952**
FM	9.2 (2.8)	8.0 (2.3)	7.7 (2.9)	7.1 (2.4)	6.0 (2.1)	6.274**
FMI	4.2 (1.1)	3.7 (1.0)	3.4 (1.3)	3.3 (1.1)	2.9 (1.0)	6.382**
TBW	23.0 (2.7)	22.9 (2.4)	23.5 (2.5)	22.4 (2.4)	21.1 (3.4)	3.046*
MUAFA	935.3 (338.6)	779.1 (276.5)	749.3 (343.1)	699.8 (283.7)	558.1 (234.2)	6.113**
MUAMA	2911.2 (630.9)	3136.4 (391.1)	3128.4 (481.1)	3050.6 (629.4)	2929.1 (307.3)	1.838

* $p < 0.05$,
**$p < 0.01$.
Standard deviations are presented in parentheses.

BMI, PBF, FM, FMI and MUAFA. In men, although the correlations of were negative, none of them were significant. Moreover, significant ($p < 0.05$) sex heterogeneity existed between the correlation coefficients of age with PBF, FM, FMI and MUAFA.

Table 4 presents the results of regression analyses of sex (sex coded as: men = 1, women = 2) with anthropometry and body composition measures among Kora Mudis. Sex had significant impact on all measures. For weight, BMI, MUAC, TBW and MUAMA this impact was negative which implied that men had significantly greater mean values of these variables. For all other variables, women had significantly greater mean values.

Tables 5 and 6 present the results of regression analyses of age with anthropometric and body composition measures, in men and women, respectively. In men (Table 5), age had significant negative impact on BSF ($t = -2.310$, $p < 0.01$) only. However, in women (Table 6), age had significant negative impact on most of the variables.

Table 4: Regression analyses of sex with anthropometry and body composition measures among Kora Mudis.

Variable	*B*	*seB*	*Beta*	*Adj.R2*	*T*
Height	-11.334	0.530	-0.692	0.478	- 21.39**
Weight	-7.364	0.529	-0.529	0.279	- 13.92**
MUAC	-0.687	0.174	-0.174	-0.028	- 3.95**
BSF	0.964	0.133	0.308	0.093	7.24**
TSF	2.569	0.211	0.479	0.228	12.18**
SUBSF	1.582	0.237	0.287	0.080	6.68**
SUPSF	1.359	0.257	0.230	0.051	5.29**
SUMSF	6.474	0.755	0.359	0.127	8.58**
BMI	-0.364	0.175	-0.093	0.007	- 2.08*
PBF	10.505	0.386	0.774	0.598	27.24**
FM	3.586	0.228	0.577	0.332	15.76**
FMI	1.915	0.094	0.676	0.455	20.45**
TBW	-8.064	0.246	-0.827	0.684	- 32.85**
MUAFA	244.905	25.004	0.402	0.160	9.79**
MUAMA	-488.107	53.686	-0.377	0.141	- 9.09**

* $p < 0.05$, **$p < 0.001$.
Sex coded as: Male = 1, Female = 2.

Table 5: Regression analyses of age with anthropometry and body composition measures among Kora Mudi men.

Variable	*B*	*seB*	*Beta*	*Adj.R2*	*T*
Height	-0.0086	0.035	0.016	-0.004	0.245
Weight	-0.0418	0.036	-0.740	0.001	- 1.166
MUAC	-0.0097	0.011	-0.056	-0.001	- 0.883
BSF	-0.0152	0.007	-0.145	0.017	- 2.310*
TSF	-0.0193	0.010	-0.116	0.010	- 1.843
SUBSF	-0.0066	0.012	-0.034	-0.003	- 0.531
SUPSF	-0.0016	0.015	0.007	-0.004	0.107
SUMSF	-0.0394	0.039	-0.064	0.000	- 1.004
BMI	-0.0183	0.010	-0.112	0.009	- 1.777
PBF	-0.0318	0.022	-0.091	0.004	- 1.436
FM	-0.0161	0.013	-0.078	0.002	- 1.233
FMI	-0.0069	0.005	-0.088	0.004	- 1.390
TBW	-0.0107	0.016	-0.042	-0.002	- 0.666
MUAMA	-1.7440	3.696	-0.030	-0.003	- 0.472
MUAFA	-2.1380	1.254	-0.108	0.008	- 1.705

* $p < 0.01$.

Table 6: Regression analyses of age with anthropometry and body composition measures among Kora Mudi women.

Variable	*B*	*seB*	*Beta*	*Adj.R2*	*T*
Height	-0.0299	0.034	-0.056	-0.001	- 0.883
Weight	-0.1020	0.032	-0.198	0.035	- 3.185*
MUAC	-0.0210	0.012	-0.114	0.009	- 1.808
BSF	-0.0488	0.010	-0.295	0.083	- 4.854**
TSF	-0.0876	0.016	-0.330	0.106	- 5.513**
SUBSF	-0.0689	0.018	-0.239	0.053	- 3.882**
SUPSF	-0.0819	0.017	-0.285	0.078	- 4.686**
SUMSF	-0.2860	0.055	-0.311	0.093	- 5.162**
BMI	-0.0381	0.012	-0.194	0.034	- 3.121*
PBF	-0.1480	0.026	-0.335	0.109	- 5.602**
FM	-0.0785	0.016	-0.302	0.087	- 4.982**
FMI	-0.0339	0.007	-0.300	0.086	- 4.946**
TBW	-0.0290	0.016	-0.117	0.010	- 1.851
MUAMA	1.8840	3.244	0.037	-0.003	0.581
MUAFA	-9.0120	1.880	-0.291	0.081	- 4.793**

* $p < 0.01$, **$p < 0.001$.

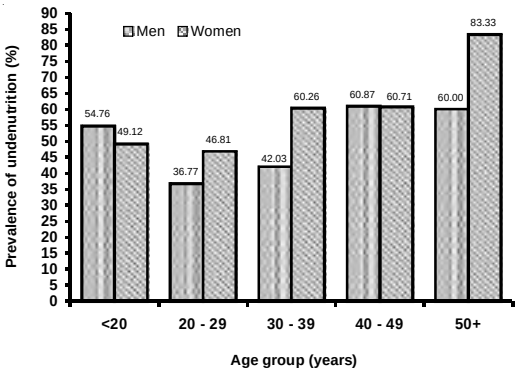

Fig. 1. Prevalence of chronic energy deficiency (CED) of Kora Mudis by age and sex.

The frequencies of undernutrition (chronic energy deficiency or CED) in the five age group categories are presented in Figure 1. It can be seen that most of the age groups, the frequency of undernutrition was higher among women. The frequency of undernutrition increased with increasing age in both sexes. The highest rates were observed in GV (m = 60.0 %, w = 83.33 %).

DISCUSSION

Anthropometry has also been extremely useful in identifying age variations in body size and composition (Bose and Das Chaudhuri, 2003; Bose, 2002; McLorg, 2005). Anthropometric measurements provide an indirect assessment of body composition and are easy and economical to undertake making them ideally suited for field surveys (Bose and Das Chaudhuri, 2003; Bose, 2002). Many studies worldwide (Shimokata et al., 1989; Miccozi and Harris, 1990) have already reported on the effects of age on anthropometry and body composition from different parts of the world. However, only a few studies from India (Ghosh et al., 2001; Bose and Das Chaudhuri 2003) have dealt with age changes in anthropometric and body composition characteristics. Moreover, to date, very little is known about sexual dimorphism in age variations in anthropometric and body composition characteristics among any tribal population of India. The present study provides unique data on age and sex differences in anthropometric and body composition profile and nutritional status of adult Kora Mudis, a tribal population of West Bengal, Eastern India.

The results of the present study indicated that there existed significant sex and age differences in means of several variables. It is noteworthy to point out that although BMI, which is a measure of overall adiposity, was significantly higher among men, the means for all other measures of adiposity, i.e., BSF, TSF, SUBSF, SUPSF, SUMSF, PBF, FM, FMI, PBF and MUAFA were significantly higher among women. The means for non-fat variables, TBW and MUAMA, were significantly higher among men. This implied that there existed significant sexual dimorphism in fat versus non-fat components of body composition.

The present investigation revealed that there existed significant age variations in both sexes, although the variations were more pronounced in women. Similar findings have been reported in earlier studies conducted among non-tribal populations worldwide (Ghosh et al., 2001; Bose and Das Chaudhuri 2003; Bose, 2002; McLorg, 2005, Shimokata et al., 1989; Miccozi and Harris, 1990; Pirlich and Lochs, 2001; Suzana et al., 2002; Chilima and Ismail, 1998; Pieterse et al., 1998; Zverev and Chisi, 2004).

The results also demonstrated that in women, age was significantly negatively related with BMI (overall adiposity) as well as all other measures of fat, i.e., PBF, FM, FMI and MUAFA. This indicated that there was a strong tendency in loss of adiposity in women that was not observed in men. Moreover, significant ($p < 0.05$) sex heterogeneity existed between the correlation coefficients of age with PBF, FM, FMI and MUAFA. This was suggestive of a significant sexual dimorphism in age variations in these variables.

Regression analyses further vindicated the significant negative age association with these measures of adiposity among women. Age had significant negative impact on these measures. In fact the percent of variation explained by age was rather high for PBF (10.9%), FM (8.7%), FMI (8.6%) and MUAFA (8.1%). This significant loss of adiposity could have severe health implications.

It has been documented that undernutrition is more common in elderly persons than in younger adults (Pirlich and Lochs, 2001). Older people, especially those residing in rural areas, are at a greater risk of undernutrition (Suzana et al., 2002). High prevalence of undernutrition among Kora Mudis, particularly among older individuals, is the striking feature of this study. Using WHO classification (1995) of nutritional status accord-

ing to BMI values, the frequency of undernutrition was very high, particularly in GIV and GV. This clearly indicated that the rate of undernutrition increased consistently with increasing age. These rates of undernutrition were much higher than those reported among other rural populations in developing countries (Chilima and Ismail, 1998; Pieterse et al., 1998; Zverev and Chisi, 2004) including India (Bose and Das Chaudhuri, 2003). These results indicated that undernutrition is a serious problem among Kora Mudis and this problem gets accentuated with age.

In conclusion, the two key points of this study were:

1) Among Kora Mudi tribal women, age was significantly negatively related with adiposity measures.
2) Undernutrition (BMI < 18.5 kg/m^2) was a serious problem among this group, especially among the older individuals.

Both the abovementioned points could have serious health implications. In addition, it should be noted that prevention of undernutrition, especially among older individuals of this ethnic group, is of paramount importance from health promotion point of view. Thus, the roles of nutritional screening and assessment are important. It is well documented that undernutrition in elderly people is a consequence of somatic, psychic or social problems (Pirlich and Lochs, 2001), the interrelations between these factors should be further investigated among this ethnic group. Moreover, older Kora Mudis need to be incorporated into nutrition and health programmes and policies. Since the nutritional status of this population is very poor, recognition of social and health factors associated with the poor nutrition status will allow appropriate intervention to enhance the quality of the life, parti-cularly among older females. Lastly, the interaction between adiposity loss and undernutrition of female Kora Mudis needs to be investigated further. Recent studies have highlighted the need for undertaking such investigations among other tribes of India (Bose and Chakraborty, 2005; Bose et al., 2006b, c, d).

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KEYWORDS India; tribe; Kora Mudis; sexual dimorphism; anthropometry; body composition; nutritional status.

ABSTRACT The present study was undertaken to investigate age and sex variations in anthropometry, body composition and nutritional status among Kora Mudis, a tribal population of Bankura District, West Bengal, India. A total of 500 (250 males and 250 females) adult ($18.0 < age \leq 65.0$ years) Kora Mudis of two villages of Bankura District (approximately 160 km from Kolkata), namely Phulberia and Siromonipur were studied. Anthropometric measurements included height, weight, mid upper arm circumference (MUAC), biceps (BSF), triceps (TSF), subscapular (SUBSF) and suprailiac (SUPSF) skinfolds. Body mass index (BMI) and several body composition measures including percent body fat (PBF), fat mass (FM), fat mass index (FMI), mid upper arm fat area (MUAFA), mid upper arm muscle area (MUAMA) and total body water (TBW) were derived. BMI was used as a measure of nutritional status. Undernutrition was evaluated as BMI < 18.5 kg/m^2. Men had significantly greater mean height, weight, MUAC, BMI, TBW and MUAMA compared to women. On the other had, women had significantly greater mean BSF, TSF, SUBSF, SUPSF, PBF, FM, FMI and MUAFA. Among men, there existed significant age variations in mean weight, BMI, MUAC, TBW and MUAMA, whilst among women there existed significant age variations in means of all variables except MUAC and MUAMA. Age was significantly ($p < 0.01$) negatively correlated with BMI ($r = -0.194$), FM ($r = -0.302$), FMI ($r = -0.300$), PBF ($r = -0.335$) and MUAFA ($r = -0.291$) in women. In men, age was not significantly correlated with any variable. Significant heterogeneity ($p < 0.05$) in Pearson correlation coefficients (r) between the sexes was observed for PBF, FM, FMI and MUAFA. Regression analyses of sex (sex coded as: men = 1, women = 2) with anthropometry and body composition measures revealed that sex had significant impact on all measures. Furthermore, regression analyses of age with anthropometric and body composition measures demonstrated that in men age had significant negative impact on BSF ($t = -2.310$, $p < 0.01$) only. However, in women, age had significant negative impact on most of the variables. Moreover, there was an increasing trend in the frequency of undernutrition with increasing age. The highest rates were observed among individuals aged ≥ 50 years (m = 60.0 %, w = 83.33 %). In conclusion, this study provided evidence that there existed significant age and sex variations in anthropometry and body composition among adult Kora Mudis. The frequency of undernutrition was much higher among older subjects. Appropriate nutritional intervention programs are needed for implementation in this ethnic group.

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