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Anthropometric characteristics of adult Bengalee slum dwellers of Midnapore town, Paschim Medinipore, West Bengal, India

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Abstract

A cross sectional study of 1000 Bengalee adults slum dwellers (male=494, female=506) aged 18-81 years of Midnapore town, Paschim Medinipore, West Bengal, India was undertaken to study anthropometric characteristics as well as their age and sex differences in anthropometric variables. The age range of this study was 18 to 81 years. Subjects were classified into five age groups, each with a width of 10 years. The groups were 18-29.9 (males=238, females=186), 30-39.9 (males=105, females=119), 40-49.9 (males=61, females=98), 50-59.9(males=46, females=55), and >60 (males=44, females=48) years. Ten anthropometric variables and BMI (kg/m^2) have been used in the present report. The sex differences of all the anthropometric variables except waist circumference of slum dwellers are statistically significant at the 0.05 level. The mean differences between age groups of males of HT,WT and HT of females are statistically significant at the level 0.05 but WT of females are not statistically significant ($F=1.89$, $P<0.05$).

Keywords: Age and sex differences, anthropometry, body mass index, slum dwellers.

Introduction

According to the 2011 census, India has 1210569573 slum populations, out of them West Bengal has 91276115 and Paschim Medinipore has 5913457 slum populations. Slum is a region of a city marked by poverty and inferior living conditions. Information on anthropometric characteristics, socio economic conditions and nutritional status of Slum and other populations were studied in different countries all over World.

Anthropometry, as a scientific discipline, however, began with Johan Friedrich Blumenbach (1752-1840) (Singh and Bhasin, 2004). Anthropometric measurements such as weight, skinfolds thickness, arm and hip circumferences are commonly used to assess the nutritional status of children and adults. The use of anthropometry as an indicator of nutritional and health status of adults has now been well established (WHO, 1995). Anthropometry is the single most portable, universally applicable, inexpensive and non invasive method available to assess the size, proportions and composition of the human body (WHO, 1995). It is the means of

quantifying variations in body size, shape and composition. It has been recognised one of the most fundamental practical techniques of the human biological studies, since almost every biological function in some way or other related to one or other aspects of the physical dimensions of the body (Weiner and Lourie, 1981). Body mass index (BMI) is a measure of overall adiposity (Bose and Mascie-Taylor, 1998; Kopelman, 2000). Several recent investigations have studied the anthropometric characteristics among adults of different populations along with different tribes (Chakraborty, 2009; Bose et al., 2006; Bisai et al., 2008; Chakraborty and Bose, 2005; Ebada, 2009).

In view of this, the present investigation was undertaken to study the age and sex variations in anthropometric variables among adult Bengalee slum dwellers of Midnapore town, Paschim Medinipore, West Bengal, India.

Materials and methods

The study was conducted in an urban slums situated in several wards of Midnapore town. Midnapore is approximately 130 kms from Kolkata, the provincial capital of West Bengal, India.

One thousand (n=1000) adult slum dwellers lived in Midnapore town (males, 494 and females, 506) participated in this study. The age range of this study was 18 to 81 years. Subjects were classified into five age groups, each with a width of 10 years. The groups were 18-29.9 (males = 238, females = 186), 30-39.9 (males = 105, females = 119), 40-49.9 (males = 61, females = 98), 50-59.9 (males = 46, females = 55), and >60 (males = 44, females = 48) years. Overall response rate was found to be around 80%. The municipal authorities and local community leaders were informed before commencement of the study. Informed consent was also obtained from each participant.

A total of ten anthropometric variables included height, weight and circumferences like mid-upper arm, chest, waist and hip; along with, skinfold thickness of biceps, triceps, sub-scapular and suprailiac measurements and body mass index (BMI) were made in the present report. Instruments were standardized before the commencement of data collection. All the anthropometric measurements were taken internationally accepted standard protocol (Lohman et al., 1988) and body mass index (BMI) was computed using the standard equation: BMI (kg/m ^{2}) = Weight (kg) / height (m^2). Height was recorded to the nearest 0.1cm. Weight of lightly-clothed subjects were recorded to the nearest 0.5 kg. All the skinfold measurement was recorded to the nearest 0.2 mm using Holtain skinfold caliper.

At the preliminary stage of the present interpretation, intra-observer technical errors of measurements (TEM) were calculated based on replicate measurements on 30 random selected subjects. All statistical analyses were computed using the SPSS Package (SPSS 16) on a computer.

Abbreviation

Height (HT), Weight (WT), Mid Upper Arm Circumference (MUAC), Chest Circumference (CC), Waist Circumference (WC), Hip Circumference (HC), Triceps skinfolds (TSF), Biceps skinfolds (BSF), Subscapular skinfolds (SUBSF), Suprailiac skinfolds (SUPSF).

Results and discussion

Table 1 presented Overall mean, standard deviation (SD) and t-values of anthropometric variables of slum dwellers. The mean age of the males was low (34.75 years, SD 14.72), compared with females (37.05 years, SD 14.24) having a statistically significant (t=

Table 1. Overall mean, standard deviation (SD) and t-values of anthropometric variables of slum dwellers.

VARIABLES	Males		Females		
	Mean	SD	Mean	SD	t- value
AGE (years)	34.75	14.72	37.05	14.24	2.51*
HT (cm)	160.65	7.88	148.64	6.37	26.49*
WT (kg)	55.37	10.22	48.46	10.00	10.80*
BMI (kg/m^2)	21.45	3.67	21.93	4.35	1.89**
Circumferences (cm)					
MUAC (cm)	23.91	2.92	22.88	3.11	5.37*
CC (cm)	83.03	7.62	81.96	9.72	1.96*
WC (cm)	76.61	9.91	77.15	12.35	0.76**
HC (cm)	84.15	7.47	86.05	9.27	3.58*
Skin folds (mm)					
TSF (mm)	7.44	3.59	12.63	5.23	18.37*
BSF (mm)	4.99	2.83	7.12	3.60	10.43*
SUBSF (mm)	12.08	5.34	14.94	6.85	7.38*
SUPSF (mm)	10.58	5.22	14.04	6.64	9.17*
*-significant at 0.05 level; **- not significant at 0.05 level					

Table 2. Mean (SD) values of anthropometric variables according to age Groups Males.

VARIABLES	18-29.9	30-39.9	40-49.9	50-59.9	≥ 60	F
HT (cm)	161.95 (7.24)	161.49 (9.36)	159.30 (6.05)	156.41 (7.25)	157.94 (7.98)	7.37*
WT (kg)	55.23 (9.38)	57.80 (11.73)	54.85 (10.44)	53.63 (10.43)	52.80 (9.45)	2.60*
CIRCUMFERENCES (cm)						
MUAC (cm)	24.03 (2.73)	24.14 (3.12)	24.07 (3.05)	23.09 (2.87)	23.30 (3.21)	1.69**
CC (cm)	82.23 (7.02)	84.74 (8.23)	83.17 (8.44)	82.65 (8.24)	83.49 (6.96)	2.07**
WC (cm)	74.44 (8.42)	78.40 (10.21)	78.66 (10.28)	78.71 (12.19)	79.02 (11.43)	5.73*
HC (cm)	83.52 (6.35)	85.77 (8.03)	84.54 (8.13)	84.20 (8.84)	83.10 (8.02)	1.93**
SKINFOLDS (mm)						
TSF (mm)	6.98 (3.06)	7.73 (3.71)	8.07 (5.02)	8.26 (4.05)	7.47 (2.75)	2.22**
BSF (mm)	4.66 (2.09)	5.29 (2.90)	5.60 (4.93)	5.42 (2.70)	4.70 (2.12)	2.22**
SUBSF (mm)	11.44 (4.82)	13.28 (5.74)	12.78 (5.82)	12.30 (6.65)	11.47 (4.37)	2.63*
SUPSF (mm)	9.81 (5.01)	11.54 (5.03)	11.18 (5.34)	11.02 (5.90)	11.13 (5.46)	2.61*
*-significant at 0.05 level; **- not significant at 0.05 level						

Table 3. Mean (SD) values of anthropometric variables according to age Groups Females

VARIABLES	18-29.9	30-39.9	40-49.9	50-59.9	≥ 60	F
HT (cm)	149.24 (7.01)	149.42 (5.38)	149.00 (5.68)	146.43 (5.59)	146.15 (7.21)	4.55*
WT (kg)	47.34 (9.64)	49.69 (10.71)	49.51 (9.57)	49.38 (7.79)	46.52 (12.06)	1.89**
CIRCUMFERENCES (cm)						
MUAC (cm)	22.45 (3.09)	23.25 (3.21)	23.34 (2.86)	22.96 (2.35)	22.65 (3.94)	1.97**
CC (cm)	80.66 (8.57)	82.71 (10.71)	83.10 (8.94)	83.82 (9.87)	80.66 (12.03)	2.08**
WC (cm)	74.70 (11.06)	77.07 (13.11)	78.58 (12.14)	81.04 (12.86)	79.44 (13.44)	4.03*
HC (cm)	83.78 (8.34)	86.55 (9.65)	88.22 (9.25)	88.00 (8.65)	87.05 (10.79)	5.17*
SKINFOLDS (mm)						
TSF (mm)	12.37 (5.59)	13.16 (5.04)	13.08 (5.26)	12.81 (4.53)	11.21 (4.73)	1.51**
BSF (mm)	6.83 (3.79)	7.32 (3.87)	7.54 (3.22)	7.47 (2.72)	6.51 (3.58)	1.21**
SUBSF (mm)	14.27 (6.94)	15.20 (7.29)	15.02 (5.93)	16.90 (6.87)	14.50 (6.88)	1.68**
SUPSF (mm)	13.40 (6.90)	14.56 (7.39)	14.63 (5.83)	15.37 (5.82)	12.47 (5.74)	2.05**
*-significant at 0.05 level; **- not significant at 0.05 level						

2.50, p<0.05). The mean height of the males was high (160.65 cm, SD 7.88), compared with females (148.64, SD 6.37) having a statistically significant (t=26.49, p<0.05). The mean weight of the males was high (55.37 kg, SD 10.22), compared with females (48.46 kg, SD 10.00) having a statistically significant (t=10.80, p<0.05). The mean BMI (kg/m^2) of the males was low (21.45 kg/m^2, SD 3.67), compared with females (21.93 kg/m^2, SD 4.35) having not statistically significant (t = 1.89, p<0.05).

The mean (SD) of MUAC of males was high (23.91cm, SD 2.92) compared with females (22.88 cm, SD 3.11) having a statistically significant (t = 5.37, p<0.05). The mean (SD) of CC of males was high (83.03 cm, SD 7.62) compared with females (81.96 cm, SD 9.72) having a statistically significant (t= 1.96, p<0.05). The mean (SD) of WC of males was low (76.61 cm, SD 9.11) compared with females (77.15cm, SD 12.35) having not statistically significant (t = 0.76, p<0.05). The mean (SD) of HC of males was low (84.15 cm, SD 7.47) compared with females (86.05 cm, SD 9.27) having a statistically significant (t = 3.58, p<0.05).

The mean (SD) of TSF of males was low (7.44 mm, SD 3.59) compared with females (12.63, SD 5.23) having a statistically significant (t = 18.37, p<0.05). The mean (SD) of BSF of males was low (4.99 mm, SD 2.83) compared with females (7.12, SD 3.60) having a statistically significant (t=10.43, p<0.05). The mean (SD) of SUBSF of males was low (12.08 mm, SD 5.34) compared with females (14.94, SD 6.85) having a statistically significant (t= 7.38, p<0.05). The mean (SD) of SUPSF of males was low (10.58 mm, SD 5.22) compared with females (14.04, SD 6.64) having a statistically significant (t = 9.17, p<0.05).

Table 2 shows mean (SD) values of anthropometric variables according to age groups of males. The mean (SD) height of males, decreased significantly from 161.95 (7.24) cm the lowest age group (18-29.9 years) to 156.41 (7.25) cm the next age group (50-59.9 years), and then increased 157.94 (7.98) cm the eldest age group (>60 years). The mean (SD) WT of males increased from 55.23 (9.38) kg in the age group 18-29.9 to 57.80 (11.73) kg in the age group 30-39.9, then it started decreasing and ended up to 52.80 (9.45) kg in the eldest age group. The mean differences of HT, WT between age groups of males are statistically significant at the level 0.05.

The mean MUAC of males, slightly increased from 24.03 (2.73) cm the lowest age group (18-29.9 years) to 24.14 (3.12) cm the next age group (30-39.9 years), and then decreased the next age groups, lastly it is increased 23.30(3.21) cm the eldest age group (>60 years). The mean (SD) CC of males, slightly increased from 82.23 (7.02) cm the lowest age group (18-29.9 years) to 84.74 (8.23) cm the next age group (30-39.9 years), and then decreased the next age groups, lastly it is increased 83.49(6.96) cm the eldest age group (>60 years). The mean (SD) WC of males increased from 74.44 (8.42) cm in the lowest age group (18-29.9 years) upto 79.02 (11.43) cm in the eldest age group (>60 years). The mean (SD) HC of males increased from 83.52 (6.53) cm in the age group 18-29.9 to 85.77 (8.03) cm in the age group (30-39.9 years), then it started decreasing and ended up to 83.10 (8.02) cm in the eldest age group. The mean differences of WC between age groups of males are statistically significant at the level 0.05 but the mean differences of MUAC, CC and HC between age groups of males are not statistically significant at the level 0.05.

The mean (SD) TSF of males, increased from 6.98(3.06) mm the lowest age group (18-29.9 years) upto 8.26 (4.05) mm the next age group (50-59.9 years), and then decreased 7.47 (2.75) mm the eldest age group (>60 years). The mean (SD) BSF of males, increased from 4.66 (2.09) mm the lowest age group (18-29.9 years) to 5.60 (4.93) mm the next age group (40-49.9 years), and then decreased 4.70 (2.12) mm from the next age group to the eldest age group (>60 years). The mean (SD) SUBSF of males, increased from 11.44 (4.82) mm the lowest age group (18-29.9 years) to 13.28 (5.74) mm the next age group (30-39.9 years), and then decreased 11.47 (4.37) mm from the next age groups to the eldest age group (>60 years). The mean (SD) SUPSF of males, increased from 9.81 (5.01) mm the lowest age group (18-29.9 years) to 11.54 (5.03) mm the next age group (30-39.9 years), and then decreased next age groups and then it is increased 11.13 (5.46) mm the eldest age group (>60 years). The mean differences of SUBSF and SUPSF between age groups of males are statistically significant at the level 0.05 but the mean differences of TSF, BSF between age groups of males are not statistically significant at the level 0.05.

Table 3 shows mean (SD) values of anthropometric variables according to age groups of females. The mean (SD) height of females, increased significantly from 149.24 (7.01) cm the lowest age group (18-29.9 years) to 149.42 (5.28) cm the next age group (30-39.9 years), and decreased 146.15 (7.21) cm in the next age groups upto the eldest age group (>60 years). The mean (SD) WT of females increased from 47.34 (9.64) kg in the age group 18-29.9 years to 49.69 (10.71) kg in the age group 30-39.9 years, then it started decreasing and ended upto 46.52 (12.06) kg in the eldest age group. The mean differences of HT between age groups of females are statistically significant at the level 0.05 but the

mean differences of WT between age groups of females are not statistically significant at the level 0.05.

The mean MUAC of females, increased from 22.45 (3.09) cm the lowest age group (18-29.9 years) to 23.34 (2.86) cm the next age group (40-49.9 years), and then decreased 22.65 (3.94) cm the next age groups to the eldest age group (>60 years). The mean (SD) CC of females, increased from 80.66(8.57) cm the lowest age group (18-29.9 years) to 83.82 (9.87) cm the next age group (50-59.9 years), and then decreased 80.66 (12.03) cm the eldest age group (>60 years). The mean (SD) WC of females increased from 74.70 (11.06) cm in the lowest age group (18-29.9 years) to 81.04 (12.86) cm in the next age groups (50-59.9 years), then it is decreased 79.44 (13.44)cm in the eldest age group (>60 years). The mean (SD) HC of females increased from 83.76 (8.34) cm in the age group 18-29.9years to 88.22 (9.25) cm in the age group (40-49.9 years), then it started decreasing and ended up to 87.05 (10.79) cm in the eldest age group. The mean differences of WC and HC between age groups of females are statistically significant at the level 0.05 but the mean differences of MUAC and CC between age groups of females are not statistically significant at the level 0.05.

The mean (SD) TSF of females, increased from 12.37(5.59) mm the lowest age group (18-29.9 years) to 13.16(5.04) mm the next age group (30-39.9 years), then decreased 11.21 (4.73) mm upto the eldest age group (>60 years). The mean (SD) BSF of females, increased from 6.83 (3.79) mm the lowest age group (18-29.9 years) to 7.54 (3.32) mm the next age group (40-49.9 years), and then it is decreased 6.51 (3.58) mm upto the eldest age group (>60 years). The mean (SD) SUBSF of females, increased from 14.27 (6.94) mm the lowest age group (18-29.9 years) to 15.20 (7.29) mm the next age group (30-39.9 years), and then decreased 15.02(5.93) mm in the next age group (40-49.9years), then increased 16.90 (6.87) mm in the age group (50-59.9 years), then again decreased 14.50 (6.88) mm the eldest age group (>60 years). The mean (SD) SUPSF of females, increased from 13.40 (6.90) mm the lowest age group (18-29.9 years) to 15.37 (5.82) mm the next age group (50-59.9 years), and then decreased 12.47 (5.74) mm the eldest age group (>60 years). The mean differences of TSF, BSF, SUBSF and SUPSF between age groups of females are not statistically significant at the level 0.05.

The mean height of the present study of males was higher than those reported recent studies of slum dwellers of Midnapore and Kora Mudis of Bankura District (Bose et al., 2006) but slightly lower than those reported recent studies of adult Nigerians, slum dwellers of Kolkata and Kora Mudis of Paschim Medinipur (Chakraborty et al., 2009; Bisai et al., 2008). The mean height of the present study of females was higher than those reported recent studies of slum dwellers of Midnapore and Kora Mudis of Bankura District (Bose et al., 2007; Bose et al., 2006) but slightly lower than those reported recent studies of adult Nigerians and Kora Mudis of Paschim Medinipur (Bisai et al., 2008; (Ebada, 2009).

The mean weight of the present study of males was higher than those reported recent studies of slum dwellers of Midnapore, Kora Mudis of Bankura District, Kora Mudis of Paschim Medinipur and slum dwellers of Kolkata (Bose et al., 2006; Bisai et al., 2008; Chakraborty et al., 2006) but slightly lower than adult Nigerians (Ebada, 2009). The mean weight of the present study of females was higher than those reported recent studies of slum dwellers of Midnapore, Kora Mudis of Bankura District and Kora Mudis of Paschim Medinipur (Bose et al., 2006; Bisai et al., 2008;

Chakraborty et al., 2006) but slightly lower than adult Nigerians (Ebada, 2009).

The mean BMI of the present study of males was higher than those reported recent studies (Bose et al., 2006; Chakraborty et al., 2009) but slightly lower than those reported recent studies. The mean BMI of females of present study higher than those reported recent studies (Bose et al., 2006; Bose et al., 2007) but slightly lower than those reported recent studies.

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