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Nutritional Anthropometric Measurements and Indices of Adults in Delhi: Selected Centiles and Age Changes

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KEY WORDS Height. Weight. Arm Girth. Selected Centiles. Delhi. Men. Women. Age Changes.

ABSTRACT Mean values, standard deviations and selected centiles of standardised measurements of height, weight and upper arm girth of 1692 men and 362 women aged 20-59 years and working in different government offices in Delhi and New Delhi are presented. Data on monthly income and size of the family of the subjects are also given. Mean height of men and women were 166.1 SD 5.8 cm. and 153.6 SD 5.4 cm. respectively. Selected centiles of body weight at different heights are also presented separately for men and women. The values of lower centiles of arm girth were higher in men while those of higher centiles such as 75th, 90th and 95th centiles of arm girth were higher in women. Arm girth showed high positive correlation with body weight and still higher correlation with height: weight ratio in men as well as women. Arm girth, therefore, may be considered as a very simple and important nutrition index.

Age changes in height, weight and arm girth are also reported separtely for men and women. Body weight and arm girth tended to increase with increase in age upto about 50 years in men as well as women. After about 50 years the mean values of height, weight and arm girth in men started decreasing. In all the age groups the mean valanes of height and weight of men as well as women of the present study are lower than those of their British counterparts reported by Rosenbaum et al. (1985). Anthrompometric ratios/indices and surface area are also studied. Mean values of height: weight ratio were higher in men upto about 30 years but after 30 years the mean values of this ratio were higher in women in all the age groups. Body mass index tended to increase with increase in age in both the sexes, and in all the age groups the mean values of BMI of women were higher than those of men. In all the age groups the mean values of arm girth: height index and $3\sqrt{}$weight/height index were also greater in women than men. $3\sqrt{}$weight/height can be used as an important index of underweight and obesity.

Height, weight and upper arm girth are very simple and important nutritional anthropometric measurements. But recent data of even these body measurements of adults (men as well as women) in India are scanty. Data on nutritional anthropometric ratios/indices such as height weight ratio, body mass index, Ponderal index and age independent height weight index of adults are also extremely scanty.

Information on age changes in body weight, arm girth and nutritional anthropometric indices of adults are also extremely meagre. The object of the present study, therefore is:

1. to present the mean values, standard deviations and selected centiles of height, weight and upper arm girth of adults (men and women) residing in Delhi;
2. to report the mean values and selected centiles of body weight at different heights of men and women; and
3. to report the means, SDs and selected centiles of surface area, height weight ratio, arm girth: stature index, body mass index, Ponderal index and $3\sqrt{}$ weight/height index of men and women.

Values of correlation coefficients between height and weight; arm girth and weight and between arm girth and height: weight ratio are

also presented. Age changes in body measurements and anthropometric ratios/indices are also reported.

MATERIAL AND METHODS

One thousand six hundred ninety two men and three hundred sixty two women, randomly selected from various government offices in Delhi and New Delhi formed the objects of the present study. They were employed as clerks or assistants and their ages ranged from 20 to 59 years. The distribution of men and women and their mean ages in different age groups are presented in table 1.

Health History: Health history was asked from each subject and only those subjects were included in the present study who were apparently healthy and did not have any complaint of serious illness during the past three months prior to their physical examination for body measurements. Subjects with any physical deformity were not included in the present study.

Income and Family Members: Information on total family income per month and total number of members of the family was also obtained from each subject. Mean values and selected centiles of total family income per month and total family members of the subjects of the present study are presented in tables 2 and 3 respectively. Female employees had more family income (Table 2) and male employees had more family members in their families (Table 3).

Table 1: Distribution of men and women and their mean ages in different age groups

Age group (years)	Men			Women		
	Age (years)			Age (years)		
	n	Mean	SD	n	Mean	SD
20.0 - 24.9	152	22.02	1.92	57	22.53	1.35
25.0 - 29.9	199	27.01	1.33	89	26.49	1.40
30.0 - 34.9	194	32.01	1.38	66	31.94	1.38
35.0 - 39.9	200	36.95	1.46	40	36.93	1.51
40.0 - 44.9	171	42.12	1.45	50	42.02	1.30
45.0 - 49.9	358	47.15	1.40	41	46.56	1.32
50.0 - 54.9	254	51.75	1.46	13	51.15	1.21
55.0 - 59.9	164	56.52	1.28	6	56.67	1.97
20.0 - 59.9	1692	40.67	10.84	362	33.80	9.18

Table 2: Selected centiles of total family income (in Rupees) per month of male and female employees of government offices in Delhi

Sex	Mean	Centiles						
		5th	10th	25th	50th	75th	90th	95th
Men (n = 1692)	1,191	500	550	760	1,000	1,500	2,000	2,350
Women (n = 362)	2,117	1,000	1,200	1,500	1,900	2,500	3,457	4,000

Table 3: Selected centiles of number of family members of of male and female employees of government offices in Delhi

Sex	Mean	Centiles						
		5th	10th	25th	50th	75th	90th	95th
Men (n = 1692)	5.3	2	3	4	5	6	8	9
Women (n = 362)	4.4	2	3	3	4	5	7	8

Anthropometric Measurements: Standardised measurements of height, weight and upper arm girth were obtained of each subject and standard techniques were employed for taking the measurements. Height was measured to the nearest 0.1 cm with anthropometer and body weight with minimal clothing was measured to the nearest 0.05 kg. with 'Prince' lever actuated balance. Due allowance was made for clothing of each subject before recording the body weight. Arm girth of the left arm was measured to the nearest 0.1 cm with flexible steel tape at a level midway between the tip of the acromion process of scapula and olecranon process of the ulna while the arm was hanging down freely. The tape just touched the perimeter of the upper arm and did not press or deform its contours (Committee on Nutritional Anthropometry 1956; Singh, 1966, 1967, 1968 b). All the data were collected during 1983 - 84. As the height measurements obtained in the evening are lower than the measurements of the same subjects obtained in the morning (Majumdar 1958; Singh 1968) all the anthropometric measurements were made in the forenoon as far as possible.

Surface area of the body was calculated for each subject by using the following formulae:

$$\text{Surface area } (m^2) \text{ for men} = \frac{\text{Weight (kg)}^{0.425} \times \text{Height (cm)}^{0.725} \times 74.66}{10{,}000}$$

(vide Banerjee and Sen, 1955)

$$\text{Surface area } (m^2) \text{ for women} = \frac{\text{Weight (kg)}^{0.425} \times \text{Height (cm)}^{0.725} \times 78.28}{10{,}000}$$

(vide Banerjee et al, 1958)

RESULTS AND DISCUSSION

Mean values, SDs and selected centiles of height, weight, body surface area and height: weight ratio/indices of men and women aged 20 - 59 years are presented in table 4. Values of means as well as centiles of height, weight and surface area of men were higher than those of women. But height : weight ratio showed a different trend. While the mean values and 50th centile values of height: weight ratio of men were more or less identical with the corresponding values of women, the values below the 50th centile were lower in women and above the 50th centile, the values were higher of women than those of men (Table 4). The mean values and the values of different centiless of body mass index and $3\sqrt{}$ weight/height were lower in men than those of women (Table 4).

Selected centiles of body weight of men and women of different heights are presented in table 5. As expected, the values of all the centiles of body weight of men as well as women increased with increase in height (Table 5).

The mean values, SDs and selected centiles of arm girth of men and women are presented in table 6. Arm girth also showed similar trend like that of height: weight ratio. While mean values of arm girth of men and women were identical, the values of lower centiles of arm girth were higher in men and those of higher centiles such as 75th, 90th and 95th centiles were higher in women. SD of arm girth was also higher in women than in men (Table 6). These results indicate greater variation of arm girth in women.

Correlations

In men as well as women, positive correlations were obtained between height and weight (Table 7). This observation is in keeping with the observation that height and weight, in general, are related to each other.

Very high positive correlations were obtained between arm girth and body weight and still higher values of correlation coefficient 'r' were obtained between arm girth and height: weight ratio in men as well as women. The values of correlation coefficient 'r' between arm girth on the one hand and height: weight ratio on the other were 0.85 in men as well as women (Table 7). These findings support the earlier findigs of Singh (1968b, 1970, 1975, 1979, 1990a, 1991b).

Height: weight ratio is a very simple nutrition index. Very high positive correlation between

Table 4: Means, SDs and selected centiles of height, weight, body surface area and height weight ratio indices of men and women

Sex and Measurement/Index	*Mean*	*SD*	*Centiles*						
			5th	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*
Men (n = 1692)									
Height (cm)	166.1	5.8	156.4	158.6	162.3	165.9	169.7	173.5	176.0
Weight (kg)	59.6	10.1	45.2	47.6	52.3	58.2	65.8	73.5	78.1
Surface area $(m)^2$	1.72	0.15	1.50	1.55	1.61	1.71	1.81	1.92	1.98
Height-Weight ratio Weight (kg)/Height (m)	35.8	5.7	27.8	29.1	31.4	35.1	39.4	43.8	46.3
Body mass index (Weight (kg)/Height $(m)^2$	21.6	3.4	16.9	17.6	18.9	21.1	23.8	26.2	27.6
$3\sqrt{}$ Weight (kg)/Height (m)	2.3	0.1	2.2	2.2	2.3	2.3	2.4	2.5	2.6
Women (n = 362)									
Height (cm)	153.6	5.4	144.9	146.5	149.8	153.5	157.0	160.7	162.4
Weight (kg)	54.7	9.9	39.5	42.4	47.3	53.9	60.8	68.2	71.3
Surface area $(m)^2$	1.64	0.14	1.41	1.46	1.55	1.64	1.74	1.83	1.88
Height-Weight ratio Weight (kg)/Height (m)	35.6	6.2	28.1	30.9	35.0	39.7	44.2	46.9	
Body mass index (Weight (kg)/Height $(m)^2$	23.2	4.1	17.5	18.3	19.9	22.9	25.8	28.5	30.4
$3\sqrt{}$ Weight (kg)/Height (m)	2.5	0.2	2.2	2.3	2.3	2.5	2.6	2.7	2.7

Table 5: Selected centiles of body weight (kg) of men and women in successive height groups

Sex and Height group (cm)	*Centiles*						
	5th	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*
Men							
150.0 - 154.9	38.4	40.8	45.3	51.3	56.3	62.7	63.5
155.0 - 159.9	42.3	44.5	47.7	53.6	59.9	67.9	72.5
160.0 - 164.9	44.2	46.3	50.2	55.8	61.7	68.7	73.3
165.0 - 169.9	47.1	49.2	53.2	59.2	66.9	73.5	77.3
170.0 - 174.9	49.2	52.0	55.8	62.6	71.0	78.1	82.3
175.0 - 179.9	53.1	54.0	58.1	64.3	74.5	83.0	85.5
180.0 - 184.9	44.7	54.5	58.5	67.0	73.3	79.0	90.5
Women							
140.0 - 144.9	31.3	34.9	40.2	47.3	57.4	68.0	76.4
145.0 - 149.9	37.2	38.8	44.6	51.0	57.3	63.5	66.1
150.0 - 154.9	41.4	42.7	47.2	54.5	62.4	68.9	71.7
155.0 - 159.9	42.6	44.7	48.8	54.4	60.0	69.1	73.4
160.0 - 164.9	47.8	48.7	51.6	58.0	68.0	74.6	76.2

Table 6: Mean, SD and selected centiles of arm girth (cm) of men and women

Sex	*Mean*	*SD*	*Centiles*						
			5th	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*
Men (n = 1692)	25.4	2.5	21.5	22.2	23.5	25.3	27.0	28.8	29.8
Women (n = 362)	25.4	3.2	20.8	21.4	23.0	25.0	27.5	29.8	31.2

Table 7: Values of correlation coefficient 'r' between height and weight; arm girth and weight and between arm girth and height : weight ratio of men and women aged 20-59 years

Sex	*Height: Weight*	*Arm girth: Weight*	*Arm girth and Height Weight ratio*
Men			
(n= 1692)	0.37	0.82	0.85
Women			
(n= 362)	0.29	0.82	0.85

arm girth on the one hand and height: weight ratio on the other indicates that arm girth which is a very simple and easily practicable anthropometric measurement may be used as a simple and important nutrition index.

Age Changes in Body Measurements

The values of mean and SD of height and weight of men and women in every 5 yearly age group of 20.0 - 24.9, 30.0 - 34.9 .....55.0 - 59.9 years are presented in table 8. In males the mean values of height were more or less constant upto about 50 years age group. After about 50 years the mean values of height in men tended to decrease with increase in age. Mean values of stature of women were also more or less constant upto about 50 years in the present study (Table 8).

Body weight in men increased with increase in age upto about 50 years after which it tended to decrease with increase in age (Table 8). In women also, the body weight tended to increase upto about 50 years. This increase in body weight upto about 50 years in men and women may probably be due to lower physical activity and consequently additional deposition of fat with increase in age. Decrease of body weight after about 50 years in men and women (Fig. 1) may probably be due to the onset of senescene after that age.

Mean values and SDs of height and weight of British men and women of different age groups reported by Rosenbaum et al. (1985) are also presented in table 8 for comparison. In all the age groups, the mean values of height and weight of men and women of present study were lower than

Table 8: Height and Weight of Delhi adults (present study) and British adults (Rosenbaum et al., 1985) in different age groups

Sex and age group (years)	*Height (cm)*				*Body Weight (kg)*			
	Delhi adults		*British adults*		*Delhi adults*		*British adults*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Men								
20.0 - 24.9	166.6	6.5	176.0	7.3	54.4	7.9	71.4	10.7
25.0 - 29.9	166.1	6.5	175.3	6.9	55.9	8.7	73.0	10.6
30.0 - 34.9	166.4	5.7	174.9	7.1	58.7	10.3	74.9	11.3
35.0 - 39.9	166.5	5.5	174.5	6.4	60.4	9.7	75.7	11.9
40.0 - 44.9	166.2	5.7	173.6	6.4	61.0	10.4	76.4	11.8
45.0 - 49.9	166.4	5.5	173.6	6.7	62.0	10.2	77.4	11.9
50.0 - 54.9	165.4	5.4	172.6	6.5	61.4	11.0	75.2	10.9
55.0 - 59.9	164.7	6.3	171.1	6.6	59.0	9.2	73.8	11.8
Women								
20.0 - 24.9	153.4	4.9	161.5	6.4	48.0	6.7	59.2	9.5
25.0 - 29.9	153.8	5.6	161.8	6.1	51.2	8.7	59.9	10.2
30.0 - 34.9	154.4	5.5	161.9	6.0	55.3	7.8	61.2	10.2
35.0 - 39.9	152.8	5.1	161.3	6.3	56.5	9.6	62.2	11.4
40.0 - 44.9	153.1	6.3	161.1	5.8	61.5	11.1	63.9	12.1
45.0 - 49.9	153.3	5.2	160.7	6.0	58.2	10.3	64.3	11.5
50.0 - 54.9*	153.0	3.9	159.7	6.2	61.4	8.5	64.6	12.6
55.0 - 59.9*	152.9	3.3	159.5	5.8	56.0	4.3	64.7	11.2

*Results of height and weight of Delhi women in these age groups must be interpreted with caution because of too small number of subjects in these age groups

those of their British counterparts. This difference in the mean values may be due to difference in genetic/ethnic as well as nutritional factors.

The mean values and SDs of arm girth measurements of men and women of different age groups are presented in table 9. In both the sexes, the mean values of arm girth increased with increase in age upto about 50 years. After 50 years, the mean values of arm girth in men started decreasing with increase in age and this decrease may be due to onset of senescence in men, after the age of about 50 years.

On closer observation of the mean values of arm girth of men and women (Table 9) it was interesting to observe that upto about 30 years, men had higher mean values of arm girth but after 30 years the women had higher mean values of arm girth than those of men in all the age groups (Fig. 2). These observations indicate that women put on more fat than men after the age of about 30 years.

Age Changes in Anthropometric Indices/Ratios

1. *Body Mass Index* (BMI) (weight (kg)/height (m).[2] The mean values and SDs of BMI of men and women of different age groups are presented in table 10. Body mass index of men as well as women tend to increase with increase in age. But it is interesting to note that in all the age groups the mean values of BMI of women are higher than those of men.

Rosenbaum et al. (1985) presented mean values and SDs of BMI of British men and women of different age groups. In that study British men show higher mean values of BMI than British women (Table 10, Fig. 3). But in the present study women show greater mean values of BMI than those of men of all the age groups (Fig. 3). Further, Delhi men of present study show lower mean values of BMI than those of British men as well as women (Fig. 3). These observvations clearly indicate the necessity of constructing

Table 9: Mean values and SD of arm girth (cm) of men and women in different age groups

Age group (years)	*Men*		*Women*	
	Mean	*SD*	*Mean*	*SD*
20.0 - 24.9	24.3	2.3	23.0	2.1
25.0 - 29.9	24.7	2.3	24.1	2.7
30.0 - 34.9	25.1	2.6	25.5	2.5
35.0 - 39.9	25.5	2.5	26.4	3.0
40.0 - 44.9	25.7	2.5	27.9	3.5
45.0 - 49.9	26.0	2.5	26.7	2.8
50.0 - 54.9*	25.8	2.6	28.1	3.1
55.0 - 59.9*	25.1	2.4	26.2	2.0

* In these age groups, the number of female subjects was too small. Therefore the results of women of these age groups must be interpreted with caution

Table 10: Means and SDs of body mass index of Delhi adults (Present study) and British adults (Rosenbaum et al., 1985)

Age group (years)	*Body mass index (Weight (kg)/Height (m)^2*							
	Men				*Women*			
	Delhi men		*British men*		*Delhi women*		*British women*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
20.0 - 24.9	19.6	2.4	23.0	3.0	20.4	2.5	22.7	3.5
25.0 - 29.9	20.2	2.3	23.8	8.0	21.6	3.3	22.9	3.7
30.0 - 34.9	21.2	3.4	24.5	3.3	23.2	3.4	23.4	3.7
35.0 - 39.9	21.8	3.3	24.7	3.5	24.2	3.8	23.9	4.1
40.0 - 44.9	22.1	3.5	25.3	3.5	26.2	4.5	24.6	4.1
45.0 - 49.9	22.4	3.4	25.7	3.4	24.8	4.5	24.9	4.1
50.0 - 54.9	23.4	3.7	25.2	3.1	26.2*	3.3	25.2	4.6
55.0 - 59.9	21.7	3.2	25.2	3.4	23.9*	1.2	25.4	4.2

* The number of Delhi women in these age groups was too small. Therefore the results of Delhi women in these age groups must be interpreted with caution

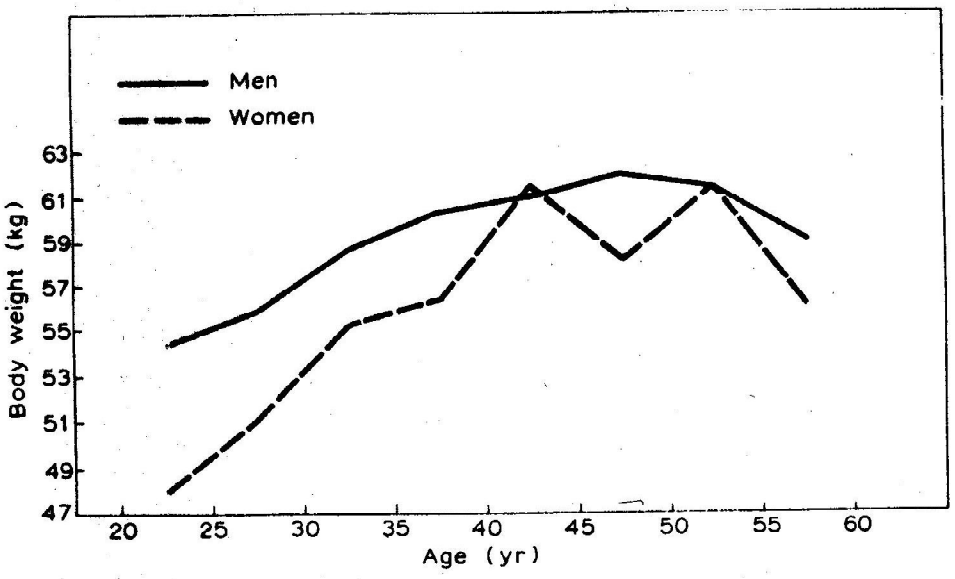

Fig. 1. Body weight of men and women in different age groups

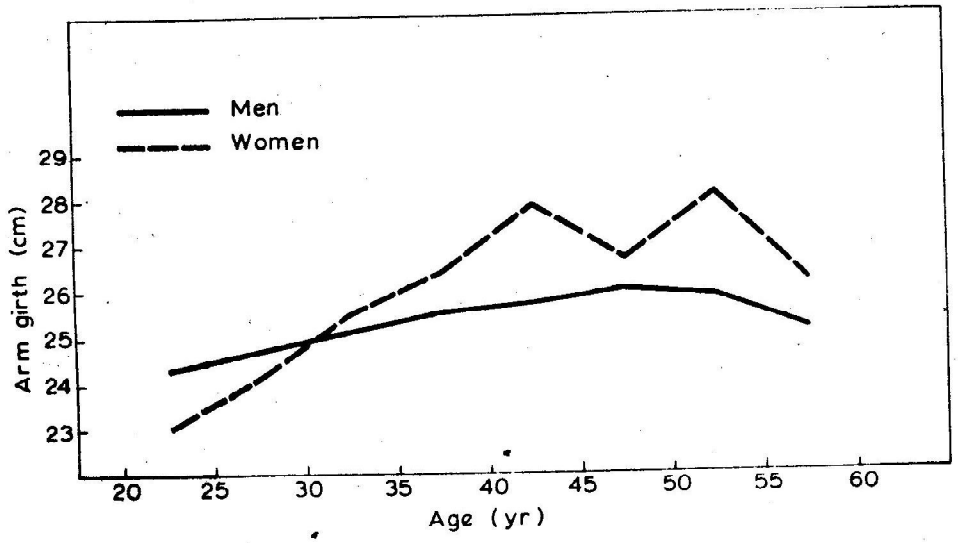

Fig. 2. Arm girth of men and women in different age groups

regional standards. Selected centiles of BMI of men and women of different age groups of the present study, therefore, are presented in table 11.

Body mass index is an important index for detecting cases of under weight and over weight or obestity (Knight, 1984). Therefore men and women having their BMI less than 5th centile may be considered under weight and those having their BMI more than 95th centile value of their particular age group and sex (Table 11) may be considered over weight or obese.

2. *Height: Weight Ratio* [Body weight (kg)/ Height (m)]. In both the sexes the mean values of height : weight ratio or weight per unit height increased with increase in age upto about 50 years. (table 12, Fig. 4). But an interesting sex difference was observed in this ratio. While the mean values of this ratio were higher in men upto about 30 years, the mean values of this ratio in the age groups of 30.0 to about 50 years were higher in women. These observations indicate that after

Table 11: Selected centiles of body mass index of men and women of different age groups

Sex and age group (years)	*Centiles*						
	5th	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*
Men							
20.0 - 24.9	16.4	17.1	18.1	19.2	20.6	22.6	24.0
25.0 - 29.9	16.6	17.2	18.3	19.7	22.2	24.1	25.7
30.0 - 34.9	16.7	17.1	18.5	20.6	23.3	25.9	27.7
35.0 - 39.9	17.1	17.8	19.3	21.4	24.0	26.6	27.6
40.0 - 44.9	17.2	17.5	19.5	21.4	24.5	26.9	28.5
45.0 - 49.9	17.4	18.4	19.8	22.4	24.5	26.9	28.8
50.0 - 54.9	16.8	17.6	19.8	22.3	24.9	27.2	29.2
Women							
20.0 - 24.9	16.5	17.6	18.7	19.9	20.0	24.2	25.2
25.0 - 29.9	17.1	17.9	19.4	20.8	23.2	27.1	28.4
30.0 - 34.9	18.2	19.1	20.1	23.5	25.6	27.6	29.1
35.0 - 39.9	17.5	18.9	21.4	24.4	26.2	28.1	32.2
40.0 - 44.9	17.4	20.5	23.4	25.9	30.0	32.3	34.4
45.0 - 49.9	17.3	17.7	21.3	24.3	27.8	30.9	32.7

Table 12: Means and SDs of height: weight ratio, arm girth: height index, Ponderal index and 3 √ Weight/Height index of men and women of different age groups

Sex and age group (years)	*Height: Weight ratio*		*Arm girth: Height Index*		*Ponderal Index*		*3√Weight (kg)/Height (m)*	
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
Men								
20.0 - 24.9	32.6	4.2	14.6	1.4	44.1	1.8	2.3	0.1
25.0 - 29.9	33.6	4.7	14.9	1.4	43.6	2.1	2.3	0.1
30.0 - 34.9	35.3	5.8	15.1	1.6	43.1	2.3	2.3	0.1
35.0 - 39.9	36.2	5.5	15.3	1.5	42.7	2.2	2.4	0.1
40.0 - 44.9	36.7	5.9	15.5	1.5	42.5	2.3	2.4	0.1
45.0 - 49.9	37.2	5.8	15.6	1.5	42.2	2.2	2.4	0.1
50.0 - 54.9	37.0	6.3	15.6	1.6	42.2	2.4	2.4	0.1
55.0 - 59.9	35.8	5.2	15.3	1.5	42.5	2.2	2.4	0.1
Women								
20.0 - 24.9	31.3	4.0	15.0	1.3	42.4	1.7	2.4	0.1
25.0 - 29.9	33.3	5.2	16.0	1.8	41.6	2.1	2.4	0.1
30.0 - 34.9	35.8	5.2	16.0	1.9	40.7	2.2	2.5	0.1
35.0 - 39.9	36.9	5.9	17.3	2.0	40.1	2.3	2.5	0.1
40.0 - 44.9	40.1	6.9	18.2	2.4	39.1	2.4	2.6	0.2
45.0 - 49.9	38.0	6.7	17.4	2.1	39.8	2.7	2.5	0.2
50.0* - 54.9*	40.1	5.2	18.4	2.1	38.9	1.7	2.6	0.1
55.0* - 59.9*	36.6	2.2	17.	1.1	40.0	0.6	2.5	

* Result in these age groups of women to be interpreted with caution because of too small number of subjects in these age groups

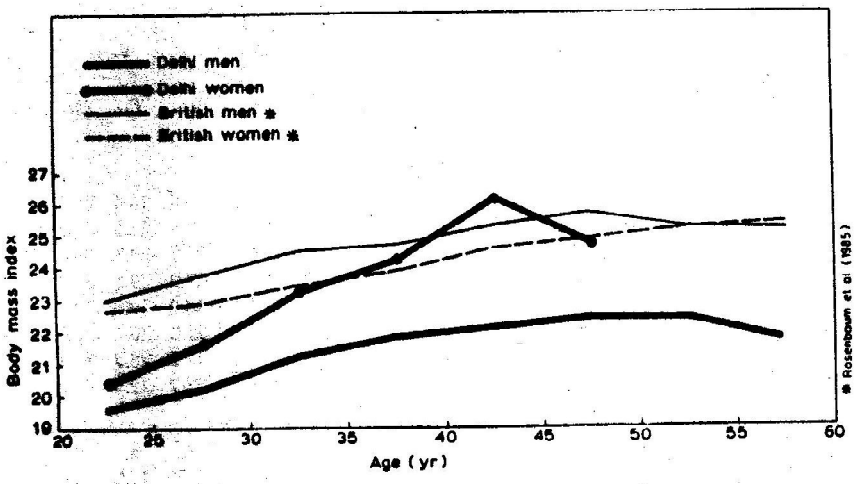

Fig. 3. Body mass index of Delhi adults (Present Study) and British adults (Rosenbaum et al., 1985)

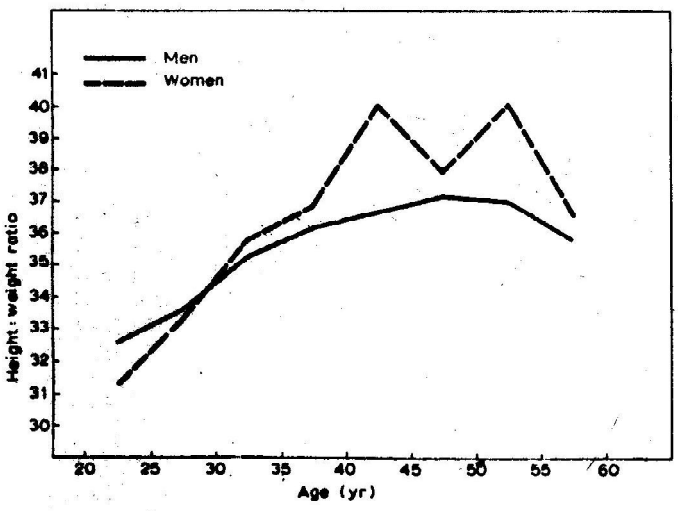

Fig. 4. Height Weight ratio of men and women in different age groups

about 30 years of age women tend to have higher mean values of weight per unit height than men, and this may probably be due to putting on of more fat by women than men in these age groups.

After 50 year of age, the mean values of height:weight ratio decreased in men (Table 12). This may be due to onset of senescence in men after about the age of fifty.

3. *Arm Girth: Height Ratio* [Arm girth (cm)/ Height (m)]. The mean values of arm girth: height ratio continuously increased upto about 50 years in men as well as women (Table 12). But it was interesting to note that at every age group the mean values of this ratio were greater of women than those of men. (Fig. 5).

4. *Ponderal Index* [Height (cm)/$3\sqrt{}$Weight (kg)]. The mean values as well as the values of different centiles of ponderal index tended to decrease with increase in age in both the sexees (Tables 12 and 14), and the magnitude of decrease in different age groups was relatively more in women than in men (Tables 12, 14 and Fig. 6). In every age group men showed higher values of means as well as centiles than those of women.

5. *$3\sqrt{}$Weight (Kg./Height (m).* The mean values of this index ranged from 2.3 to 2.4 in men and form 2.4 to 2.6 in women (Table 12). Values of standard devication of this index were 0.1 in all the age groups of men but in women the values of standard deviation ranged from 0.1 to 0.2. Moreover in all the age groups the mean values of this index were greater in women than in men (Table 12, Fig. 6). This observation of consistently higher mean values of this index in women as compared to those of men may be due to greater deposition of body fat in women than men.

Singh (1991a) reported that the mean and median values of $3\sqrt{}$weight/height of college girls were constant and identical in all the 4 age groups of 17 to 20 years. In another communication, (Singh, 1991 b) he reported that the median values of $3\sqrt{}$weight/height were constant and identical in all the nine age groups of 9-17 years old boys and girls of public schools, central

Table 13: Selected centiles of height: Weight ratio of men and women of different age groups

Sex and age group (years)	*Height: Weight ratio (Weight (kg)/Height (m)*						
	Centiles						
	5th	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*
Men							
20.0 - 24.9	26.8	28.4	29.9	31.9	34.1	37.4	41.2
25.0 - 29.9	27.2	28.1	30.6	32.8	36.2	41.4	43.4
30.0 - 34.9	27.7	28.3	30.7	34.3	38.8	43.2	47.1
35.0 - 39.9	27.9	29.5	32.2	35.8	39.9	44.3	45.6
40.0 - 44.9	28.0	29.6	32.1	35.7	41.0	44.7	47.2
45.0 - 49.9	29.0	30.2	32.9	36.9	40.9	45.6	47.6
50.0 - 54.9	27.6	28.9	32.7	36.4	41.3	45.2	48.2
55.0 - 59.9	27.7	29.8	31.8	35.4	39.2	43.4	44.9
Women							
20.0 - 24.9	24.3	26.3	28.3	30.8	33.3	37.5	39.0
25.0 - 29.9	25.6	27.2	29.6	32.4	35.4	42.8	44.1
30.0 - 34.9	28.8	29.4	31.7	36.1	39.6	41.7	45.0
35.0 - 39.9	27.0	29.9	33.1	37.0	39.9	42.8	47.3
40.0 - 44.9	25.8	30.3	36.2	40.5	44.6	48.7	53.1
45.0 - 49.9	26.6	27.5	32.8	38.1	43.0	46.8	49.5

Table 14: Selected centiles of Ponderal index of men and women of different age groups

Sex and age group (years)	*Ponderal index (Height (cm)/ 3 $\sqrt{}$ Weight (kg)*						
	Centiles						
	5th	*10th*	*25th*	*50th*	*75th*	*90th*	*95th*
Men							
20.0 - 24.9	40.9	41.8	43.1	44.2	45.3	46.3	46.7
25.0 - 29.9	40.3	40.9	42.2	43.7	45.0	46.2	46.8
30.0 - 34.9	39.1	39.9	41.3	43.2	44.7	46.1	46.6
35.0 - 39.9	39.2	39.7	40.9	42.7	44.3	45.6	46.0
40.0 - 44.9	38.8	39.4	40.6	42.5	44.1	45.6	46.0
45.0 - 49.9	38.7	39.7	40.8	42.1	43.9	45.0	45.8
50.0 - 54.9	38.3	39.2	40.4	42.1	43.7	45.0	46.3
55.0 - 59.9	39.2	39.7	40.9	42.4	44.0	45.2	45.9
Women							
20.0 - 24.9	39.5	40.4	41.0	42.4	43.5	44.4	45.7
25.0 - 29.9	38.1	38.6	40.3	41.9	42.8	44.5	45.0
30.0 - 34.9	37.4	37.9	39.0	40.4	42.6	43.9	44.1
35.0 - 39.9	36.2	37.5	38.5	39.8	41.5	43.9	44.5
40.0 - 44.9	35.6	36.0	37.4	38.8	40.7	42.4	43.9
45.0 - 49.9	35.9	36.3	38.0	39.4	41.4	44.3	44.9

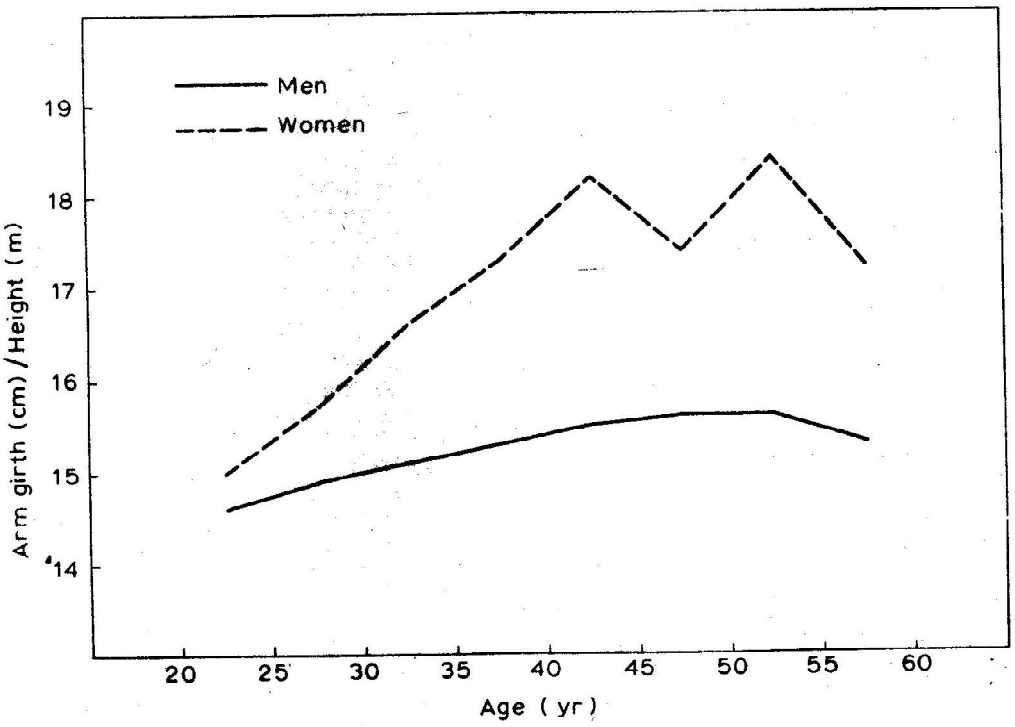

Fig. 5. Arm girth/height index of men and women in different age groups

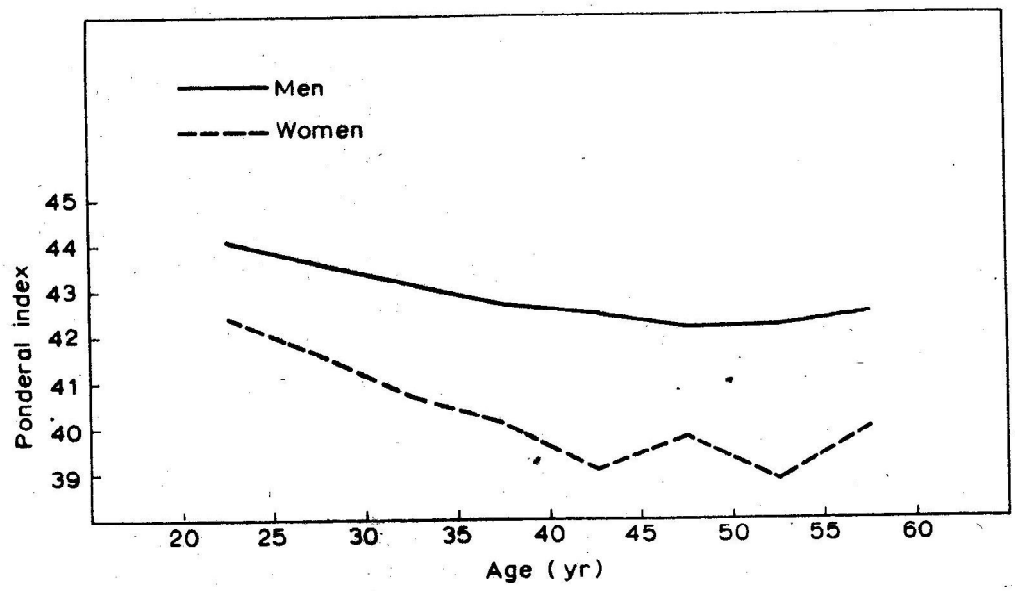

Fig. 6. Ponderal index of men and women in different age groups

Table 15: Selected centiles of 3 √ Weight (kg)/height (m) of men and women of different age groups

Sex and Age group (years)	3 √ Weight (kg)/Height (m) Centiles						
	5th	10th	25th	50th	75th	90th	95th
Men							
20.0 - 24.9	2.1	2.2	2.2	2.3	2.3	2.4	2.4
25.0 - 29.9	2.1	2.2	2.2	2.3	2.4	2.4	2.5
30.0 - 34.9	2.1	2.2	2.2	2.3	2.4	2.5	2.6
35.0 - 39.9	2.2	2.2	2.3	2.3	2.4	2.5	2.6
40.0 - 44.9	2.2	2.2	2.3	2.4	2.5	2.5	2.6
45.0 - 49.9	2.2	2.2	2.3	2.4	2.5	2.5	2.6
50.0 - 54.9	2.2	2.2	2.3	2.4	2.5	2.6	2.6
55.0 - 59.9	2.2	2.2	2.3	2.4	2.4	2.5	2.5
Women							
20.0 - 24.9	2.2	2.3	2.3	2.4	2.4	2.5	2.5
25.0 - 29.9	2.2	2.2	2.3	2.4	2.5	2.6	2.6
30.0 - 34.9	2.3	2.3	2.3	2.5	2.6	2.6	2.7
35.0 - 39.9	2.2	2.3	2.4	2.5	2.6	2.7	2.8
40.0 - 44.9	2.3	2.4	2.5	2.6	2.7	2.8	2.8
45.0 - 49.9	2.2	2.3	2.4	2.5	2.6	2.8	2.8

schools and government schools in Delhi. This index, which is age independent index during adolescence, is not that age independent in adults. But still this index is comparatively more age independent in adults than other nutritional anthropometric indices such as height: weight ratio; arm girth; height index and body mass index (Tables 10 and 12). This index, therefore, can be more effective than even the body mass index for detecting the cases of under weight and obesity. Selected centiles of this nutrition index (3√weight/height) are therefore presented in table 15. Men and women having the value of 3√weight/height less than 5th centile may be considered under weight and those having the values more than 95th centile of this index of their particular age group and sex (Table 15) may be considered over weight or obese.3√*weight/height*, therefore, may be considered as an important index of nutrition and obesity.

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