

Study of Static Anthropometric Measurements and Body Somatotypes of Women

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Abstract- The present investigation entitled “Study Static Anthropometric Measurements of and Body Somatotypes of Women” was undertaken by conducting survey among 200 selected women from Parbhani city. The data regarding anthropometric measurements, body mass index, were assessed by using questionnaire, scientific equipment and observations. Statistical analysis such as standard deviation, analysis of variance and correlation co-efficient test was applied to find out the difference between selected parameters of women with different body types and correlation between selected independent and dependent variables. Findings of the study indicated that there was wide variation in static anthropometric measurements of selected women except for palm length. Major group of selected women was mesomorphic in body type having medium hand grip strength. Thus it can be said that to remain healthy and more productive it is better to maintain ectomorphic body somatotype.

Index Terms- Women, Static Anthropometry, Somatotype

I. INTRODUCTION

The human physique is a continuously distributed characteristic. The history of classification and analysis of human physique can be traced back to the very ancient times when the people with strong bodies with great ability to fight, hunt and organize must have achieved distinction and got noticed by the society kings. Hippocrates a great Greek philosopher and physician of the fifth century BC described two different types of bodies; thin and lean persons with long extremities and short persons with thick and massive bodies. Since ages various efforts have been made to categorize the human body on the basis of physical structure. Physique is closely linked to body type. It is something that person is born with and develops naturally. It is determined genetically and therefore has little control over it. Body shape, composition and musculature can be improved but one cannot make drastic changes. (Bhasin and sweta, 2007). Independent of body size, a somatotype is a convenient shorthand descriptor of overall physique in terms of body shape and composition. It reflects an overall outlook of the body and conveys a meaning of the totality of morphological features of the human body. A three-exact decimal score of component of somatotype refers to endomorphy representing relative fatness mesomorphy representing relative muscularity and ectomorphy representing relative linearity. Somatotype has often been used to study morphometric variations in human body. (Tetri et al,

2011). Anthropometry is the single most universally applicable, inexpensive and non invasive method available to assess the size proportion and composition of the human body. Static anthropometry refers to the body measurements in stationary and natural position (Sing and Kukarni, 1999)

II. EXPERIMENTAL PROCEDURE

The present study was conducted in selected colonies of Parbhani city of Marathwada region of Maharashtra State in 2014. The sample of study comprised randomly selected 200 women without any physical deformities. The questionnaire was developed to collect the information on selected variables related to study. Information was collected through personal interview and observation method. Selected static anthropometric measurements of women were recorded by use of anthropometer and flexible measuring tape. Portable weighing machine was used to record body weight of selected women. Body types were classified on the basis of Body Mass Index of women.

Assessment of Body Mass Index and Body types

BMI is the ratio of body weight (kg) to height (meter)². It is known as quetelet’s index. Body Mass Index of selected women was calculated by using formula (Garrow, 1981)

$$BMI (kg / m^2) = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

On the basis of assessed BMI score the body types were categorized as per the guidelines of WHO (2006). In view of the present study the body types were categorized as Ectomorph, Mesomorph and Endomorph as shown below

Classification of body types:

BMI (kg/m ²)	WHO Classification	Operational classification of body types
≤16.0-18.0	Underweight	Ectomorph
18.5-24.9	Normal	
25-29.9	Over weight	Mesomorph
≥30-40	Obesity	Endomorph

Physical fitness level was assessed on the basis of Vo₂ max of the selected women and the grip strength was determined with the help of grip dynamometer A hand grip dynamometer was

used to measure the hand grip strength of right hand of selected women.

III. RESULTS AND DISCUSSION

General information of selected women

General information of selected women is presented in table 1. It is understood from the table that majority of the selected women were in the age group of 35 to 45 years (46.5%) followed by the age group of 25-35 years (37.5%). Lower percentage of women was between the age of 45 and 55 years (16%). Among the selected women 48.5 per cent of women were school educated followed by college educated (31%) and non literate (20.5%). Majority of the selected women were housewives (79%). Lower percentages of selected women were in the occupation of service (17%) and business (4%). Approximately equal percentage of selected women were having monthly family income between Rs. 10,000 and Rs. 15,000 (37.5%) and Rs.15,001 and Rs. 20,000 (40%). Only 22.5 per cent of selected women had monthly family income more than Rs. 20,000.

Static linear anthropometric measurements and body weight of selected women in standing position

Static linear anthropometric measurements in standing position and body weight of selected women are given in table 2. It is evidenced from the table that normal standing height of women was 152.92 cm in the range of 138 -167.5 cm. The mean eye height was recorded as 141.49 cm in the range of 126-154.5 cm. The mean values for the mid shoulder height, waist height and elbow height of selected women recorded were 127.36 cm, 92.97 cm and 97.77 cm respectively in the corresponding ranges of 114-141.6 cm, 70-102 cm and 84-111 cm. Average full hand length and palm length of selected women was noted as 72.89 cm and 17.12 cm respectively in the corresponding ranges from 64 to 87 cm and 14 to 19 cm. Mean body weight of the selected women was 50.65kg in the range between 33 and 69 kg. Finding on normal standing height and eye height of selected women in this study are in line with the study carried out by Fluegel et al (1986) among East German adults.

On the whole 25 to 30 cm range was observed in minimum and maximum measurements of all linear static measurements except for palm length of selected women. The variation between minimum and maximum measurement of palm length was very less (5 cm).

Body circumference measurements of selected women

Body circumference measurements of selected women are noted in table 3. It is evidenced from the table that the mean body circumference measurements of abdomen, arm, chest, waist and hip were 100.34 cm, 27.16 cm, 88.03 cm, 80.93 cm and 93.66 cm respectively. The ranges reported for abdominal, arm, chest, waist and hip circumference were 79-120 cm, 22-41 cm, 71-101 cm, 61-108 cm and 77-116 cm respectively.

Thus a wide variation of 30 to 40 cm in lower and upper limit was noticed for abdominal circumference, arm circumference, chest circumference, waist circumference and hip circumference measurements of selected women.

Body types, Physical fitness level and grip strength of selected women

Body types were classified on the basis of Body Mass Index of women. Physical fitness level was assessed on the basis of VO_2 max of the selected women and the grip strength was determined with the help of grip dynamometer and presented in table 4. It was observed from the table that majority of the selected women (57.5%) were mesomorph followed by ectomorph in body type (27.5%). Only 15 per cent of the selected women had endomorphic body type.

On the whole it was observed that majority of the selected women were mesomorphic in body type. These findings are in line with the findings indicated by wilsmore (1987) that mesomorphy was dominant somatotype component among female hockey players. Readings of the VO_2 max indicated that maximum percentages of the selected women (37.5%) were having good physical fitness level followed by high average physical fitness level (34%). The percentage of the selected women having low average physical fitness level (26.5%) was less. Meager percentage of selected women (2%) had very good level of physical fitness level.

It was further noted that majority of the selected women (75%) were having medium grip strength. The percentage of women having high grip strength of 23-26 kg (15.5%) and low grip strength of 15 to 18 kg (9.5%) was low.

Thus it can be concluded that majority of the selected women were mesomorphic in body somatotype having good physical fitness level and medium grip strength.

Correlation between selected independent and dependent variables

Correlation of body somatotype, grip strength and VO_2 max with selected independent variables of selected women is reported in table 5. It was revealed from the readings that the age of selected women was negatively correlated with VO_2 max ($r=-0.97^{**}$) of women indicating that with an increase in the age of women VO_2 max was decreased. The body weight of women was found to be positively correlated with body somatotype ($r=0.71^{**}$) and grip strength ($r=0.60^{**}$) of selected women. This indicated that with increase in body weight the women were moving towards mesomorphic and endomorphic in body type and had more grip strength. Body height ($r=0.40^*$) and education ($r=0.50^{**}$) of selected women were positively correlated with VO_2 max of women, which indicated that taller and highly educated women had good VO_2 max level. The fact may be attributed to that due to education women become health conscious and maintain good health condition.

It was concluded that the age was negatively correlated with VO_2 max had positive correlation with body somatotype and grip strength. Whereas body weight, body height and education had correlation with body somatotype, grip strength and VO_2 max of selected women.

IV. CONCLUSION

On the whole findings of the study indicated that majority of the selected women were in the age group of 35- 45 years, school educated , not holding any job and having family income between Rs.15,000 and Rs. 20,000 per month.

Average normal standing height of selected women was noted as 152.92 cm and eye height was 141.49 cm. A wide range of 25 to 30 cm was observed in minimum and maximum measurements of all linear static measurements except for palm length of selected women. The variation between minimum and maximum measurement of palm length was very less (5 cm). Mean body circumference measurements of selected women ranged between 80 to 100 cm. with wide variation of 30 to 40 cm in lower and upper limit for abdominal circumference, arm circumference, chest circumference, waist circumference and hip circumference measurements of selected women.

Majority of the selected women (57.5%) were mesomorphic in body type. Higher percent of the selected women were having good physical fitness level and majority of them (75%) had medium grip strength of 19-22 kg. It was observed that the age, body weight, body height and education of selected women had correlation with body somatotype, grip strength and VO_2 max.

Table 1 General information of selected women

Attributes	Frequency	Percentage
Age (yrs)		
25-35	75	37.5
35-45	93	46.5
45-55	32	16
Education		
Non literate	41	20.5
School educated	97	48.5
College educated	62	31
Occupation		
House wife	158	79
Service	34	17
Business	08	4
Monthly Income (Rs)		
10000-15000	75	37.5
15001-20000	80	40
20001 and above	45	22.5

Table 2 Static linear anthropometric measurements and body weight of selected women in standing position

Anthropometric variables	Measurements (cm)		
	Mean \pm S.D.	Minimum	Maximum
Normal standing height	152.92 \pm 7.26	138	167.5
Eye height	141.49 \pm 6.37	126	154.5
Waist height	92.97 \pm 6.31	70	102

Mid shoulder height	127.36 \pm 6.45	114	141.6
Elbow height	97.77 \pm 5.12	84	111
Full hand length	72.89 \pm 5.26	64	87
Palm length	17.12 \pm 1.13	14	19
Body weight (Kg)	50.65 \pm 7.72	33	69

Table 3 Body circumference measurements of selected women

Body circumference	Measurements (cm)		
	Mean \pm S.D.	Minimum	Maximum
Abdominal	100.34 \pm 10.08	79	120
Arm	27.16 \pm 4.25	22	41
Chest	88.03 \pm 7.95	71	101
Waist	80.93 \pm 11.32	61	108
Hip	93.66 \pm 9.94	77	116

Table 4 Body somatotypes, physical fitness level and grip strength of selected women

Attributes	Classification	Frequency and percentage
Body somatotype	BMI(kg/m²)	
Ectomorph	< 20	55(27.5)
Mesomorph	20-25	115(57.5)
Endomorph	>25	30(15)
Physical fitness level	Vo₂max(ml/kg/min)	
Poor	up to 15	--
Low average	16-25	53(26.5)
High average	26-30	68(34)
Good	31-40	75(37.5)
Very good	41-45	4(2)
Grip strength	(Kg)	
Low	15-18	19(9.5)
Medium	19-22	150(75)
High	23-26	31(15.5)

Figures in Parentheses indicate percentages

Table 5 Correlation of body somato type, grip strength and Vo₂max with selected independent variables of selected women

Dependent Variables Independent Variables	Correlation coefficient(r)		
	Body somatotype	Grip strength	Vo ₂ max
Age	0.08NS	0.04 NS	-0.97**
Weight	0.71**	0.60**	0.10 NS
Height	0.00 NS	0.01 NS	0.40*
Education	-0.18 NS	-0.12 NS	0.50**
Occupation	-0.14 NS	-0.11 NS	-0.08 NS

*Significant at 5 % level **Significant at 1% level NS Non significant

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