

A Study of Correlation between Middle Finger Length and Height in a Tribal District Population of India

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Abstract

Background: Determination of stature is an important parameter of personal identification of an individual. Moreover, there can be anthropometric variations in different geographical areas. The present study was planned to evaluate the correlation between middle finger length and stature of a tribal district population of India so that a formula can be derived for estimation of height for this tribal district population. **Materials and Methods:** A total of 100 subjects, 23 male and 77 female were included in the study. Middle finger length was measured using sliding caliper from the most proximal flexion crease till the projecting point on the tip of the finger. The stature was measured from vertex to floor where both feet were kept parallel to each other. Regression equations obtained from the data using SPSS software. **Results:** The mean observed stature of males was 169.97 cm and mean of the middle finger length was 7.92 cm. Pearson correlation coefficient 0.457 in male was highly significant. In females observed mean stature was 154.20 cm and mean finger length was 7.30. Calculated Pearson correlation coefficient 0.636 in females was also highly significant. The predictive stature observed in male was 169.97 cm with 2.61 as standard deviation while it was 154.20 cm in females with 4.55 as standard deviation. **Conclusion:** In the studied population middle finger length and stature among males and females have good correlation. The obtained regression equations can be used for estimation of stature of this regional population.

Keywords: Anthropometry, Middle finger, Stature

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Introduction

Anthropometry is a science which deals with methods and techniques of measurement of living as well as skeletons of individuals.¹ The evidence of use of this branch of science in the field of legal medicine is available since 19th century when a French police expert Mr. Alphonse Bertillon defined the system of criminal identification of individuals based on anthropometric measurements.² Since then anthropometric measurements are extensively used in the field of forensic and legal medicine. Estimation of stature is very important and main component of anthropological research which is necessary for identification and used by medico-legal experts, forensic examiners and anatomist.³ If whole body is available then

estimation of stature is easy but it is very difficult in case of only few parts of the body or some skeletal remains are available.⁴ Prediction or reconstruction of stature of an individual from the skeletal remains or mutilated, amputated limbs or some parts of body have special significance in individual identification since remains are not uncommon in the events of the murders, accidents or natural disasters, wars and body fragments found in forest and mutilated by animals.^{5,6}

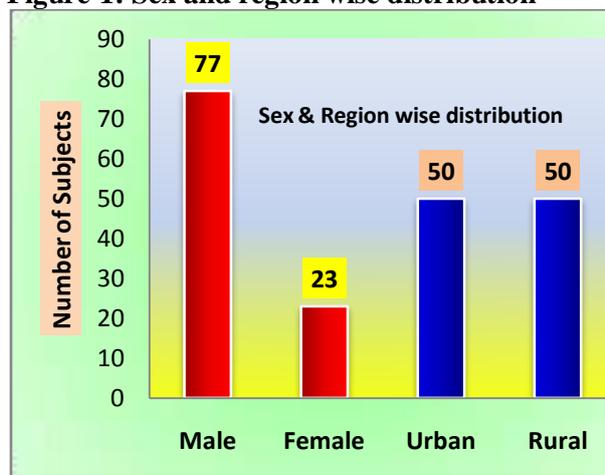
Most of the workers used intact long limb bones like femur, tibia, humerus and radius for estimation of stature which is natural heights of a person in an upright position and various methods, formulae and regression equations are devised for various population groups.^{2,7,8} But very little work is done towards correlation of height and various finger lengths like

Macdonnel who compared the stature with the length of the middle finger of English criminals⁹ and Tyagi et al⁵ who found accurate or near accurate correlation between stature and finger lengths in Delhi region of India.⁵ Each race and population of geographical areas needs specific formulae as it is because many factors like race, ethnicity, nutritional factors, and environmental status play important role in the development and growth of human beings.^{10,11} Present study was planned with the intention to find out correlation if any between middle finger length and stature of the population of a tribal district of Andhra Pradesh India which will be helpful medico-legally.

Materials and Methods

A total of 100 right handed subjects including 23 male and 77 female from both the urban and rural region after taking informed consent were included in the study (Figure- 1). All the subjects were in between the age group of 16 to 50 years (Table-1) and they and their family origin belongs to various regions of Adilabad- a tribal district of Andhra Pradesh India.¹² Included subjects represented all the major categories like General Category, Other Backwards Class (OBC), Muslims, Schedule Cast and Schedule Tribes (Table- 2). Subjects with acquired or congenital skeletal deformities were not enrolled for the study.

Figure-1: Sex and region wise distribution



Middle finger length was measured by sliding caliper. The subjects kept their right hand on a flat table. One end of the sliding caliper kept on

the most proximal flexion crease of middle finger and another end on the extreme projecting point on the tip of the finger thus middle finger length was measured. For measurement of stature, the subjects were asked to stand erect, bare foot, feet were kept parallel to each other, palms of hand turn inward and fingers pointing downwards against a wall and heels, buttocks and back touched the wall. The stature was measured as vertical distance from the vertex to the floor.^{8,13} The data was tabulated and linear regression analysis was done using SPSS software.

Table- 1: Age wise distribution

Age Group	No. of Subjects
16 Years (Y)	1 (1%)
18 – 20 Y	23 (23%)
21 – 25 Y	30 (30%)
26 – 30 Y	31 (31%)
31 – 35 Y	6 (6%)
36 – 40 Y	6 (6%)
41 – 45 Y	2 (2%)
46 – 50 Y	1 (1%)
Total	100 (100%)

Table- 2: Category wise distribution

Social Category	No. of Subjects
Backward Class	49 (49%)
Schedule Cast	26 (26%)
Muslims	13 (13%)
General Category	7 (7%)
Schedule Tribes	5 (5%)
Total	100 (100%)

Results

Height of most of the males 65(84.42%) was in between the range of 161 cm to 175 cm with majority 30(38.96%) of subjects were in the range of 166 cm to 170 cm while in case of females majority 10(43.48%) of height was in between the range of 156 cm to 160 cm (Table-3).

The mean stature of males was 169.97 cm with standard deviation of 5.71. The minimum and

maximum stature was 157 cm and 192 cm respectively. Among males, mean of the middle finger length was 7.92 cm and 0.42 as standard deviation. Using linear regression analysis a constant (120.74) and Pearson correlation coefficient (0.457) were obtained for the middle finger. The regression coefficient shows significant ($p < 0.01$) correlation between middle finger length and the height.

In females observed mean stature was 154.20 cm with a standard deviation of 7.15. Minimum height was 139 cm while the maximum stature was 167 cm. Their mean finger length was 7.30 while minimum was 6 cm and maximum 8.40 cm. The Pearson correlation coefficient was 0.636 and the constant was 93.56. Regression coefficient indicates significant correlation between middle finger of females and their heights (Table- 4).

The predictive value for stature observed in male was 169.97 cm with 2.61 as standard deviation while it was 154.20 cm in females with 4.55 as standard deviation (Table- 5).

A regression equation can be formulated using the values obtained by linear regression analysis

Table- 3: Range of heights

Height in cm	No. of Subjects		
	Male	Female	Total
139	0	2	2
145 – 150	0	5	5
151 – 150	0	3	3
156 – 160	2	10	12
161 – 165	15	2	17
166 – 170	30	1	31
171 – 175	20	0	20
176 – 180	6	0	6
181 – 185	3	0	3
186 – 195	1	0	1
Total	77	23	100

and the stature can be estimated using that standard equation^{14,15} which is: ($S = \text{Constant} + \text{Regression coefficient} \times \text{MFL}$) Where $S =$ Stature, and $\text{MFL} =$ Middle Finger Length. Thus the obtained equation for males is; ($S = 120.74 + 0.457 \times \text{MFL}$) While for females it is; ($S = 93.56 + 0.636 \times \text{MFL}$).

Table- 4: Descriptive statistics

Sex		Minimum	Maximum	Mean	SD	Constant	r	p value
Male N=77	Stature	157	192	169.97	5.71	120.74	0.457	<0.01*
	Finger	7.1	9.5	7.92	0.42			
Female N=23	Stature	139.0	167.0	154.20	7.15	93.56	0.636	<0.01*
	Finger	6.00	8.40	7.30	0.55			

SD = Standard Deviation, r = Correlation coefficient, *=Significant

Table- 5: Predictive stature

Sex	Values	Minimum	Maximum	Mean	SD
Male N=77	Predictive Value	164.85	179.76	169.97	2.61
Female N=23	Predictive Value	143.43	163.37	154.20	4.55

Discussion

In the present study we found good correlation between right middle finger length and stature in males and females but the correlation coefficient is higher in females than male as we found it 0.457 in males and 0.636 in females suggestive of better correlation in females than males. Mean predictive stature of males is 167.97 while

it is 154.20 in females. Obtained regression equations for males-

$S = 120.74 + 0.457 \times \text{MFL}$ and for females-

$S = 93.56 + 0.636 \times \text{MFL}$ can be used for estimation of stature in males and females respectively. Shivakumar AH et al¹⁶ also found good correlation and statistically highly significant correlation coefficient between right middle finger length and stature among males of south Indian population of Karnataka region

of south India. But the regression equation obtained in the present study is different from their study (Table- 6). They opined that right middle finger length can be used to estimate stature among males of that region. Shivkumar AH et al¹³ in another study of females in the same region found significant but different correlation coefficient (6.9) and the different regression equation than the males.

Verghese AJ et al⁸ in Mysore and surrounding regions of Karnataka, south India found significant correlation between middle finger length of both the hands and stature in males and females and recommended that those equations should be used for estimation of stature in their region of south India. Krishan K et al¹⁷ concluded that Index finger length and Ring finger length has statistically significant correlation with stature of adolescent population of North India and opined that the living stature can be predicted with a reasonable accuracy from both the fingers. Tyagi AK et al⁵ also found significant correlation between finger length and stature and they also suggested use of regression equation for stature estimation. Shintaku and Furuya¹⁸ in 1990 observed good

correlation of middle finger length and stature among Japanese females, the range of correlation of proximal phalange and stature in that group was from 0.521 to 0.696.

Rastogi P et al¹⁹ found good correlation (Table-6) between stature and middle finger length and significant differences in mean stature of both males and females in north and south Indian population but they have not observed any differences in male to male and female to female stature. They suggested that same formula cannot be applied in both the sexes for estimation of stature. They opined that persons of same race but different geographical areas like north or south Indian don't have much influence on body proportion and does not need different formulas for stature estimation. Moreover, dominant hands also do not have effect on stature estimation.

Srinivas PP et al²⁰ also showed similar view of non significant differences in same race when they compared north and south Indians during their study of correlation between palm and stature. We contradict with the findings of both the studies as our regression equations are different from their indicating geographical variations in stature.

Table- 6: Regression equations for various regions

Authors	Region	Sex	Middle Finger	Regression Equation
Present Study	Tribal district of north Andhra Pradesh	Male	Right	$S=120.74+0.457 X RMFL$
		Female	Right	$S=93.56+0.636 X RMFL$
Shivkumar AH ¹⁵	Karnataka	Male	Right	$S=152.02+1.47 X RMFL$
Shivkumar AH ¹²	Karnataka	Female	Both	$S=90.54+6.9 X MFL$
Verghese AJ ⁸	Mysore Karnataka	Male	Right	$S=120.20+4.95 X RMFL$
			Left	$S=117.11+5.27 X LMFL$
		Female	Right	$S=117.55+4.26 X RMFL$
			Left	$S=115.77+4.43 X LMFL$
Rastogi P et al	North Indians	Male	Right	$S=117.20+6.82 X RMFL$
		Female	Right	$S=99.54+8.044 X RMFL$
	South Indian	Male	Right	$S=95.90+9.517 X RMFL$
		Female	Right	$S=110.93+6.52 X RMFL$

Conclusion

Middle finger length and stature among males and females have good correlation in this tribal district of Andhra Pradesh. They have mean

middle finger length of 7.92 cm in males and 7.30 cm in females while they have mean heights of 169.97 cm and 154.20 cm in males and females respectively. The obtained regression equations $S = 120.74 + 0.457 X MFL$ for male and $S = 93.56 + 0.636 X MFL$ for

females can be used for estimation of stature of males and females of this tribal district population respectively.

Acknowledgement

We are thankful to all the volunteers who participated in the study.

Source(s) of support: Nil

Conflict of Interest: None declared

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