

Estimation of Correlation between Length of Middle Finger and Stature in Maharashtra Region

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Abstract

Context: Measurement of stature and middle finger lengths are part of studies in anthropology. *Aims:* To evaluate correlation between length of middle fingers and stature of college students in both males and females of medical and paramedical fields of Maharashtra which would be beneficial for Anatomists, Anthropologists, Forensic experts and in ergonomics. *Setting and Design:* Department of Anatomy, Dr Vitthalrao Vikhe Patil Foundation's Medical College, Vilad ghat Ahmednagar, Maharashtra. *Material & Methods:* Measurements were taken for stature and middle finger length of both hands of 150 males and 150 females. *Statistical analysis used:* Pearson correlation coefficient and linear regression analysis. *Results:* For males, Pearson correlation coefficient (r) between stature and right middle finger was 0.598 and between stature and left middle finger was 0.591. For females, Pearson correlation coefficient (r) between stature and right middle finger was 0.569 and between stature and left middle finger was 0.551. P values for both genders were highly significant. *Conclusion:* Stature and middle finger length of both hands were significantly correlated with each other irrespective of gender. These strong correlations were further utilized to derive regression equations.

Keywords: Stature; Middle Finger Length; Correlation; Regression Equation.

Introduction

Basic and major component of anthropological research is the estimation of stature which is useful for identification of an individual and is of immense importance to medicolegal experts, forensic examiners and anatomist [1]. It is quite easy to estimate stature of an individual if whole body is available, but it is too difficult to estimate stature if only few parts of the body or skeletal remains are available [2].

Human beings are considered as bilaterally symmetrical; however there may be an asymmetry in the length of middle finger irrespective of gender or handedness.

Subjects and Methods

The present study was conducted in the department of Anatomy at DVVPF's Medical college and Hospital, Vilad ghat, Ahmednagar,

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Maharashtra after obtaining ethical acceptance. It was carried over 300 students (150 males & 150 females), between 18 to 25 years, of medical & paramedical fields of various regions of Maharashtra. Prior informed consent was taken. It excludes the non-Maharashtrian students, those below 18 years & above 25 years, having congenital/accidental absence/ malformed middle finger. Stature was measured in morning time by measuring tape in cm as distance between vertex to heel in standing posture of subject with bare feet on a horizontal plane and head in Frankfurt plane. (Figure 1) Length of middle fingers of both hands in cm was measured by vernier caliper as distance between proximal crease to tip of middle finger with palm facing upward on a horizontal plane. (Figure 2) Correlation between these parameters were obtained using SPSS software [version 16.0]. Further this strong correlations were used to derive regression equations for estimation of stature for both gender.

Results

Maximum and minimum stature for males was 190cm and 155cm respectively. Mean stature for males was 173.68cm. Maximum and minimum length of right middle finger for males was 9.2cm and 6.6cm respectively. Maximum and minimum length of left middle finger for males was 9.1cm and 6.7cm respectively. Maximum and minimum

stature for females was 179cm and 144cm respectively. Mean stature for females was 157.89cm. Maximum and minimum length of right middle finger for females was 8.2cm and 6.0cm respectively. Maximum and minimum length of left middle finger for females was 8.1cm and 6.0cm respectively. For males, Pearson correlation coefficient (r) between stature and right middle finger was 0.598 and between stature and left middle

finger was 0.591. For females, Pearson correlation coefficient (r) between stature and right middle finger was 0.569 and between stature and left middle finger was 0.551. P value for both genders was < 0.001. Stature and middle finger length of both fingers were significantly correlated with each other irrespective of gender. Regression equations for stature from middle fingers of both hands in males & females were derived. Also regression equations for stature from middle fingers of both hands irrespective of gender were derived.



Fig. 1: Measurement of stature



Fig. 2: Measurement of length of middle finger by vernier calliper

Table 1: Descriptive statistics for stature and middle finger length in males and females

	Males [N=150]			Females [N=150]		
	Stature (cm)	RMFL (cm)	LMFL (cm)	Stature (cm)	RMFL (cm)	LMFL (cm)
Maximum	190	9.2	9.1	179	8.2	8.1
Minimum	155	6.6	6.7	144	6.0	6.0
Mean	173.68	7.964	7.961	157.89	7.199	7.191
Standard deviation	6.625	0.471	0.463	6.200	0.397	0.401
Standard error of mean	0.541	0.038	0.038	0.506	0.032	0.033

RMFL -- Right middle finger length, LMFL -- Left middle finger length

Table 2: Regression statistics for stature, RMFL and LMFL in males

[N=150]

Regression statistics	RMFL	LMFL
Pearson correlation coefficient (r)	0.598	0.591
R square	0.358	0.349
Slope	8.412	8.458
Intercept	106.690	106.343
Standard error of estimation	5.326	5.363
P value	< 0.001	< 0.001

Regression equations for males:

Stature = 106.690 + (8.412 × RMFL)

Stature = 106.343 + (8.458 × LMFL)

Table 3: Regression statistics for stature, RMFL and LMFL in females [N=150]

Regression statistics	RMFL	LMFL
Pearson correlation coefficient (r)	0.569	0.551
R square	0.323	0.304
Slope	8.880	8.521
Intercept	93.969	96.613
Standard error of estimation	5.117	5.191
P value	< 0.001	< 0.001

Regression equations for females:
 Stature = 93.969 + (8.880 x RMFL)
 Stature = 96.613 + (8.521 x LMFL)

Table 4: Regression statistics for stature, RMFL and LMFL in all subjects [N=300]

Regression statistics	RMFL	LMFL
Pearson correlation coefficient (r)	0.790	0.786
R square	0.624	0.618
Slope	13.859	13.811
Intercept	60.718	61.153
Standard error of estimation	6.253	6.298
P value	< 0.001	< 0.001

Regression equations for all subjects:
 Stature = 60.718 + (13.859 x RMFL)
 Stature = 61.153 + (13.811 x LMFL)

Discussion

To estimate stature from middle finger length is of utmost importance in medicolegal cases where only complete hand or middle finger is available. In the events of natural disasters, accidents or murder prediction of stature of an individual from skeletal remains or mutilated, amputated limbs or some parts of body have special significance. Present study revealed significant correlation between length of middle fingers of both hands and stature irrespective of gender.

Stature of an individual depends upon multiple factors like age, race, nutritional factors, genetic make up, environment etc. Kerley is of opinion that every body parts bears a more or less constant relationship with stature [3]. Formulae designed to estimate stature in one population from various anatomical dimensions do not apply to another [4]. Relevant formulae are needed for population of various geographical areas as environmental and nutritional factors play major role in growth of individuals [5].

Some researchers studied about correlation between stature and length of different fingers mainly middle, ring, index and some studied all fingers, out of which few derived regression equation for specific population.

Shivakumar et al. [6] studied 100 male students of South India between 17 to 22 yrs and found statistically highly significant correlation between right middle finger length and stature. They revealed that right middle finger length can be used to predict stature among males of that region. A study by Verghese et al. [7] revealed significant correlation between length of middle finger of both hands and stature in males and females in Mysore and surrounding regions of Karnataka, South India and opined that those equations could be used for estimation of stature in the region of south India. A study of 260 students, 130 males & 130 females of central India by Shroff et al. [8] concluded that middle finger length was positively correlated with both hand length and height of person. Rahule et al. [9] estimated good correlation between right middle finger length and stature of tribal district population of India by studying 100 subjects, 23 male and 77 female and concluded that height of an individual could be predicted by regression equation. A study of 200 subjects between 18 to 25 years by Katwal et al. [10] indicated that middle finger length could be efficiently used for estimation of stature. Rastogi et al. [11] found good correlation between stature and middle finger length while studying North and South Indian population The present study revealed highly significant correlation between length of middle fingers of both hands with stature

Table 5: Regression equations derived by researchers

Researchers	Population	Total	Sample size		Regression equations	
			Males	Females	Males	Females
Present	Maharashtra	300	150	150	S=106.690 + (8.412 x RMFL) S =106.343+ (8.458 x LMFL)	S = 93.969 + (8.880 x RMFL) S = 96.613 + (8.521 x LMFL)
Shivakumar AH ⁶	South India	100	100	NIL	S=152.02+1.47(RMFL)	-----
Verghese AJ ⁷	Mysore, Karnataka	260	130	130	S=120.20+4.95 x RMFL S=117.11+5.27 x LMFL	S=117.55+4.26 x RMFL S=115.77+4.43 x LMFL
Rahule AS ⁹	Tribal Andhra Pradesh, India	100	23	77	S=120.74+0.457 x RMFL	S=93.56+0.636 x RMFL
Katwal B ¹⁰	Nepal	200	100	100	S=131.29+0.442 x RMFL	S=115.65+0.442 x RMFL
Pooja A ¹³	Gujrat	200	100	100	S=99.84+9.11 x RMFL S=122.02+6.34 x LMFL	S=79+10.86 x RMFL S=83.35+10.21 x LMFL

irrespective of gender, thus it was correlated with the above studies by various researchers.

After studying 200 subjects, 100 male and 100 female, Suseelama et al. [12] showed significant relationship between finger lengths and stature and as per their opinion middle finger length would give exact height of an individual among five fingers. In a study by Pooja et al. [13] of 200 subjects between 18 to 25 years of Gujrat, it was concluded that among ten fingers of both right and left hands left index and left middle finger were found to be more reliable for estimation of stature.

After observing the table 5 it could be predicted that regression equations for stature is different for different populations, so the regression equation for a particular population could not be applied for the other populations.

Some researchers studied correlation between length of index finger and stature, some between length of ring finger and stature while others between hand length and stature. A study by Bardale et al. [14] over 195 students and by Raju et al. [15] over 250 students in Davangere district found a significant correlation between both index finger and ring length and stature of male and female subjects. A study of 200 subjects of Uttarakhand by Lalit et al. [16] and of 400 subjects by Ravindra et al. [17] shown highly significant correlation between index finger length and stature of male and female. While Nilofer et al. [18] found strong correlation between stature and hand length. They also provided regression equation for accurate estimation of stature in both gender after a study of 200 subjects of Maharashtra. According to Girish et al. [19] there was weak positive correlation between height and hand length after studying 220 subjects, 132 males and 88 females.

Limitations

The present study was conducted for a limited age group and for a particular population, so it cannot be applied to all. The regression equations could be applied only when complete middle finger is available.

Conclusion

Stature and middle finger length of both hands were significantly correlated with each other irrespective of gender. Regression equations for stature from middle fingers of both hands in males & females were predicted. Also stature could be estimated even if gender is not known as the regression equations were derived for all subjects including both males and females.

Thus the present study is helpful to predict the stature of individuals from middle finger length of either hand irrespective of gender.

Key message

Stature and middle finger lengths of an individual were highly correlated with each other.

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