

Stature estimation from middle finger length in north Karnataka population, India

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Abstract

Background: Aim of the present study is to establish correlation between stature and middle finger length of both the hands in both males and females separately. **Materials and Methods:** In the present study, an attempt is made to correlate stature and middle finger lengths of 150 males and 150 females of north Karnataka population in age ranging from 18 to 30 years. Pearsons correlation coefficient and Regression equation formulas for stature estimation were calculated for all the parameters using SPSS software. **Result:** The co-relation co-efficient between stature and both right and left middle finger length were found to be positive and statistically significant ($P < 0.01$) in both males and female. Right middle finger length ($r = 0.47$ in males $r = 0.58$ in females) was better correlated with stature than the left middle finger length ($r = 0.44$ in males and $r = 0.29$ in females). **Conclusion:** There exists a definite correlation between stature and middle finger length in both males and females included in the study. Regression equations derived can be successfully used to know the stature of an individual from middle finger lengths.

Keywords: stature, correlation, regression equation.

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INTRODUCTION

Identification is an individuals birth right.¹ Stature is one of the basic indicator of the biological profile that can aid in the identification of an individual. It helps distinguish between multiple individuals who have the same ancestry, sex and age and thus provides a circumstantial or presumptive identification of an individual. Personal identification of the deceased person is of prime importance to the investigating officer.² Examination of skeletal remains and mutilated body parts recovered from crime scene has often been used by the forensic anthropologists to extract relevant personal information about the victim.³

There is increase in the number of catastrophic events causing mass death from natural and manmade disasters. Such disasters like flooding, tsunamis, earthquakes, plain crashes, train crashes, terrorist attacks usually requires the identification of victims from fragmentary and dismembered human remains. In such situations the stature prediction occupies relatively a central position in the identification of an individual necessitated by the medical jurisprudence or by the medico-legal experts. Based on the correlation attempts have been made to establish the stature from the dimensions of almost all the body parts/bones⁴. There are only a handful of researches on estimation of stature from middle finger length. In present study, an attempt has been made to estimate stature from middle finger length measurements.

MATERIALS AND METHODS

300 healthy adult students (150 males and 150 females) of medical, dental and other health sciences at Al-Ameen Medical college campus, Bijapur were selected from among those volunteering for the study. Inclusion criteria; Age more than 18 years and less than 30 years. Exclusion criteria; left handed subjects. Subjects with skeletal abnormalities and connective tissue disorders, which may be congenital or acquired.

Stature: Stature was measured using standard Stadiometre. Measurement was taken by making the subject on the resting base of stadiometer, bare footed with shoulder blocked and buttocks touching the stadiometer rod. Palms were turned inward with the fingers pointing vertically downward and the head oriented in eye-ear-eye Plane (Frankfurt Plane). The movable rod of the Stadiometer was brought in contact with vertex in the mid saggital plane.³

Middle Finger length: The subject is asked to place the hand on a flat table and the distance between the proximal phalangeal ridge to the most forward projecting point on the tip of fingers was noted.²

All the measurements are taken before noon to avoid diurnal variation as the stature is maximum in morning and decreases by 1.5-2.0 cms by the end of the day.⁵

Statistical method adopted

All the measurements are analysed by using SPSS software. The results are presented separately for males and females. The data is summarised into Minimum value, Maximum value, Mean, Standard Deviation and Range for height and middle finger length for both the sexes.

To study the relationship of middle finger length with the stature, the Pearson Correlation Coefficient is estimated. Linear regression equations are derived to estimate stature of unknown from middle finger length.

Correlation coefficient: The relationship or association between two variables is called correlation. The extent or degree of relationship between two set of figures is measured in terms of a parameter called Correlation Coefficient. It is mathematically estimated by a formula and is denoted as Pearson’s Correlation ‘r’.

- If r = 0 : there is no correlation * If r = -1 : there is perfect negative correlation
- If r = +1 : there is perfect positive correlation * If r = 0-0.1 : trivial correlation
- If r = 0.1-0.3 : small correlation * If r = 0.3-0.5 : moderate correlation
- If r = 0.5-0.7 : large correlation * If r = 0.7-0.9 : very large correlation
- If r = 0.9-1 : near perfect correlation

Regression

The word regression means prediction. It is a method to estimate or predict the value of unknown variable from the value of known variable. This is possible only when the two variables are linearly correlated. The variable to be estimated is called dependant variable and the variable which is known is called independent variable. The mathematical equation from which dependant variable can be calculated is called regression equation.

RESULT

Table 1: Table showing distribution of height (cms) among study population

	Mean	SD	Minimum	Maximum
Males	168.3	6.32	157	187
Females	156.41	5.92	144	170

Table 2: Mean, Standard Deviation, Regression Coefficient and Significance value for Middle finger length among study population

		Mean	SD	r	P
Males	Right middle finger	83.65	8.32	0.47	0.001
	Left middle finger	82.83	7.25	0.44	0.001
Females	Right middle finger	72.72	5.44	0.58	0.001
	Left middle finger	72.27	5.44	0.29	0.001

Table 3: Regression Equations for calculating Stature from middle finger lengths of individuals included in the study

		Height (in cms) =
Males	Right middle finger length(RMF)	137.9+0.36 (RMF)
	Left middle finger length(LMF)	136+0.38 (LMF)
Females	Right middle finger length(RMF)	81.7++1.02 (RMF)
	Left middle finger length(LMF)	140.8+0.21 (LMF)

From the above data collected, results were prepared. Regression equation, Pearson’s correlation coefficient and other statistical values were calculated using MS Excel program and SPSS software. Table 1 shows distribution of height among males and females included in the study population. Mean height among males was 168.3 ± 6.32 cms. and 156.41 ± 5.92 cms in females. Table 2 shows

mean, standard deviation, correlation coefficient (r) and significance of correlation (p) of Middle finger lengths among the study population. The mean middle finger length in males was 83.65 ± 8.32 cms. on right hand and 82.83 ± 7.25 cms. on left hand. In females, the mean middle finger length was 72.72 ± 5.44 cms. on right hand and 72.27 ± 5.44 cms. on left hand. It was again observed

that in both males and females the right middle finger length ($r = 0.47$ in males $r = 0.58$ in females) was better correlated with stature than the left middle finger length ($r=0.44$ in males and $r = 0.29$ in females). Table 3 shows linear regression equation for calculating stature of unknown individual using middle finger lengths.

DISCUSSION

The estimation of stature is considered as one of the important parameters in identification of a person. The body parts show biological correlation with stature. This fact has been utilized by many workers to use body parts for estimation of stature. In the present study, it was found out that there exists a positive and significant correlation between stature and middle finger length of both the hands in both males and females. Right middle finger showed better correlation than the left middle finger. Right middle finger of female population showed highest correlation among all the parameters ($r = 0.58$). Shivkumar AH *et al* also conducted a study on stature estimation from middle finger length in South Indian population and concluded that there exists a strong and positive correlation between stature and middle finger length.² In another study carried out by Varghese AJ *et al* in Mysore region of Karnataka, found significant correlation between stature and middle finger length of both hand in males and females.⁶ Tyagi *et al*⁷ derived significant correlation between finger length and stature and recommended use of regression equation for stature estimation. Jasuja OP *et al*³ established significant correlation between stature and phalangeal lengths and concluded that the stature can be estimated from actual as well as print measurements. Krishna K *et al*⁴ after conducting a study in North Indian population, stature can be predicted with reasonable accuracy from both index and ring finger. These types of studies are of anthropological importance as it helps to know the difference between different population groups. There are no sufficient data on stature estimation from fragmented body parts. More ever even less data is available on stature estimation from middle finger length. Thus in the present study an attempt has been made to establish correlation between stature and middle finger length and derive regression equation which can be vital tool to estimate stature in North Karnataka population.

CONCLUSION

The relationship that exists between stature and different body parts of an individual has been of great interest to the forensic and medico legal experts.

The present study has established definite correlation between stature and middle finger length in both males and females included in the study.

Regression equations for each of parameter were derived as:

For Males:

- Stature = $0.36 \times$ Right middle finger length + 137.9
- Stature = $0.38 \times$ left middle finger length + 136

For Females:

- Stature = $1.02 \times$ Right middle finger length + 81.7
- Stature = $0.21 \times$ Left middle finger length + 140.8

The above equations can be used to know the height of an individual and thus helps to determine the identity of an unknown. The anthropometric measurements differ in different sex and ethnic groups which are determined by genetic and environmental factors suggesting the need for different normograms for various populations. These types of studies are of anthropological importance as it helps to know the difference between different population groups. If the study is repeated on the same population group after several years, it will help to identify the micro evolutionary changes. It also helps in forensic analysis in establishing the identity of the person in question, where stature is one of the primary characteristics of identification.

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