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Research Article

Estimation of stature from middle fingers length of population in Davangere district

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Abstract

Estimation of stature holds a special place in the field of forensic medicine and forensic anthropology. This study was designed to investigate the ability of estimating stature from middle finger length. The study was carried out by taking the measurement of middle fingers and body height of250 medical students (125 males and 125 females) of 18 to 25 years of age. The study was carried out in department of forensic medicine and toxicology at SSIMS &RC Davangere, Karnataka state, India. Obtained data was analysed statistically to establish the relationship between a person's index finger and stature. From given data mean, SEE, correlation coefficient(r). Regression equation and 'P' values were obtained. A moderate correlation was observed between middle finger length and height of a person which is statistically highly significant. The present study would be useful for anthropologists and forensic experts.

Keywords: Forensic Anthropology; Stature; Finger Length

1. Introduction

The identification of individual and related issues has assumed importance in almost all spheres of life. In certain situations, such as putrefied, mutilated, or extensively charred body, conventional indicators and routine methods of identification fail to yield results. The situation is worsened when only mutilated and fragmentary remains are available for examination which is not uncommon in today's world due to mass disasters both natural and manmade e.g. earth quakes, cyclones, tsunamis, flood, terror attacks, bomb blasts, mass accidents, wars and plan crashes etc. Estimating the stature of a person from such fragmented remains forms an important tool of identification in such circumstances.

Kerley[1] states that every body part bears a more or less constant relationship with stature. Simmons *et al*[2] derived formulae to calculate stature with good results, even when only parts of the bone are available. Bhatnagar *et al*[3] used different hand dimensions to predict the stature of an individual in different populations. It is shown in earlier studies that various hand measurements tend to differ in various ethnic groups[4]. Consequently, the formulae designed to estimate stature from various anatomical dimensions in one population do not apply to another[5,6]. Many studies are done to calculate stature from foot length, limb lengths, long bones, but there are only few studies on hand and finger lengths, so we are taking middle finger length to calculate stature of a person. It will be helpful in conditions in which only hand or part of hand is available for identification of a person.

In present study attempts has been made to estimate the stature from middle finger. India is a vast country with varied geographical conditions and stature varies with race, sex, and geographical locations as quoted above. Therefore, our study examines the relationship of themiddlefinger length with stature in and around Davangere district. This study may prove useful in conditions where only part of hand is brought for post-mortem examination.

2. Material and methods

The present study was carried out in the department of forensic medicine and toxicology at SSIMS & RC Davangere. A total of 250 subjects were included in the study, out of which 125 males and 125 females within age group of 18 to 25 years. The subjects included in study were healthy individuals free from any apparent skeleton deformity.

Anthropometric measurements of the middle fingers were taken independently on left and right side of each individual. Besides the above measurements, stature of each subject was also recorded. All measurements were taken in well lighted room. The measurements were taken by using standard anthropometric instruments in centimeters to the nearest millimeter in following manner.[7]

2.1 Anthropometric Measurement

Index finger length – It is the distance from the tip of middle finger to the proximal crease of the middle finger.

2.1.1 Instrument: Vernier Calliper.

2.1.2 Technique

The measurement was taken in standing position with stabilization of hand on table. The calliper was horizontally placed along the ventral surface of the left hand. The fixed part of the outer jaw of the calliper was applied to the proximal crease of middle finger and the mobile part of the calliper was approximated to the tip of the middle finger and measurement was taken. In the same way measurement of the middle finger of the right hand were taken.

2.2 Statue – It is the vertical distance between the point vertex and the heel touching the floor (ground surface).

2.2.1 Technique

The subject was made to stand in erect posture against the wall with the feet axis parallel or slightly divergent and the head balance on neck and the measurement was taken.

The data was collected, analysed and subjected to statistical analysis using statistical package for social sciences (SPSS) to know the correlation of the stature with the middle finger length. The reliability of estimation of stature from the lengths of middle finger was determined with the help of 'p' value, SEE, r, r Square and regression equations.

3. Results

The present study focused on estimation of stature from the length of the middle finger.

Table 1; Mean, Standard Deviation and "P" value of both right and left middle finger and height in males and females

	Males			Female		
Parameters	**Mean**	**SD**	**P* Value, sig**	**Mean**	**SD**	**P* Value, sig**
RMFL	7.23	0.39	P<0.001 HS	6.68	0.43	P<0.001 HS
LMFL	7.28	0.43	P<0.001 HS	6.72	0.45	P<0.001 HS
Height	171.89	6.66	P<0.001 HS	158.73	5.56	P<0.001 HS

Table 2: Showing Correlation Coefficient and Standard Error of Estimation of right and left middle finger in both males and females

	Males			Females		
Parameter	**SEE**	**R**	**R square**	**SEE**	**R**	**R square**
RMFL	5.8	0.45	0.20	4.7	0.53	0.28
LMFL	6.2	0.3	0.09	4.9	0.46	0.21

Table 3: Regression Equation in both males and females from right and left middle finger

	Males	Females
Parameter	**Regression equation**	**Regression equation**
RMFL	Height=111.52+7.49 (RMFL)	Height=107.80+6.86 (RMFL)
LMFL	Height= 138.44+4.17 (LMFL)	Height = 117.5+5.54 (LMFL)

Regression equation: stature= value of constant (a) + regression coefficient (b) x middle finger length.

Males: $Y_1 = 111.52+7.49$ (RMFL) $Y_2 = 138.44+4.17$(LMFL)

Females: $X_1 = 107.80+6.86$ (RMFL) $X_2 = 117.5+5.54$ (LMFL)

Regression equation with range of height

Males: $Y_3 = 129.84 + 5.81$(RMFL) ± 11.6 $Y_4 = 131.60 + 5.60$(LMFL) $\pm$ 12.4

Females: $X_3 = 111.32 + 7.10$(RMFL) $\pm$ 9.4 $X_4 = 116.90 + 6.22$(LMFL) $\pm$ 9.8

Where Y_1 & Y_2 = Height in males. Y_3 & Y_4 = Average height in males.

X_1 & X_2 = Height in females. X_3 & X_4 = Average height in females.

RMFL = Right middle finger length. LMFL = Left middle finger length.

4. Discussion

The identification of commingled mutilated remain is a challenge to forensic experts and hence, a need of studies on estimation of stature from various body parts in different population groups. Such studies can help in narrowing down the pool of possible victim matches in cases of identification from dismembered remains.

The present study show that estimation of stature from the middle finger is highly significant ($p<0.001$) in both males and females so it can be used for estimation of stature of a person. The values of 'r' Square in males and females with r Square = 0.20 RMF,0.09 of LMF in males being the lowest and r Square = 0.21 LMF, 0.28 for RMF in females being the highest value, depicts that estimation of height from the RMF in females is more significant than in males where LMFL gives better prediction of height estimation, over all in both males and females it is right middle finger length in case of females which is a better predictor of stature estimation. Standard error of estimation SEE = 5.8for RMF, SEE = 6.2 for LMF in males, SEE= 4.7 RMF & SEE = 4.9 LMF in case of females. This indicates RMF in case both males & females is better predictor of height estimation as compared to LMF and is highly significant. Considering all parameter it is females, which shows better prediction of height estimation from middle finger length as compared to males.

A study was done by Krishan *et al*[8] on stature from IFL and RFL which shows larger significance in males than females, with higher significance for IFL than RFL which is contradictory to our study showing higher significance in females.

A study done by Rastogi *et al*[9] on 500 subjects from Manipal North and South Indian population, showed higher significance in males as compared to females.

5. Conclusion

Estimation of stature forms an important parameter to reach to the partial identification of an unidentified body and dismembered remains. The results of the present study indicate that the middle finger length can be efficiently used for estimation of stature. Most authors have underlined the need for population-specific stature estimation formulae. In this study we derived a separate regression equation to estimate stature from middle finger length for Davangere region.

This study revealed that the MFL can be used with high significant values for estimation of stature in South Indian population even if only an amputated hand is found and other body parts are unavailable. The results of this study are however, applicable only when an intact middle finger is examined. Such studies can help in narrowing down the pool of possible victim matches in cases of identification from dismembered remains.

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