

Morphometric Study of Estimation of Stature from Index Finger Length in Indian Population.

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ABSTRACT

Background: Estimation of stature is basic and major section of Anthropological research which is necessary for unmistakable conformation and is used by medico- legal experts, forensic examiners and Anatomists. **Methods:** In the present, morphometric, cross sectional study of the measurement of stature from index finger length among the population of India is done. This study consist of 400 subject among them 200 are males and 200 females between the age group of 17-25 year. The subjects are students of Teerthanker Mahaveer Medical College and Research centre. The data was statistically analysed by calculating mean and standard deviation as well as standard error. Regression formula was also derived by calculating the stature and the index and ring finger length. **Result:** The high value of the regression coefficient shows that the index finger length may clearly predict the body height in both sexes. It is a good predictor for estimation of the height of the males and females subjects. Regression equations are- For male:- $Y=124.26+6.41(RIFL)$, For female:- $Y=110.16+5.82(RIFL)$. **Conclusion:** The finding of the present study shows that the index finger length can be used successfully to predict the height of the human being. Medico-legally it is a considerable parameter which determines the height of subject which is a major step in recognition of a deceased subject.

Keywords: Index finger, Morphometry, Stature.

INTRODUCTION

Estimation of stature of an individual by certain factor is the branch of science called Anthropology (Human science). Anthropology is a Greek word and Anthropos means 'Human being' and logos mean 'knowledge'.^[1]

"Height is one of the critical parameter of either absolute or incomplete identification of individuals. It gives a part of an individual Pgyiongnomy and one piece of information that may end up being a fundamental aid in individual inadequate reorganization conformation".

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Estimation of stature is basic and major section of Anthropological research which is necessary for unmistakable conformation and is used by medico-legal experts, forensic examiners and Anatomists. Estimation of stature is straight forward, if whole body is available but it is of a great degree

troublesome in cases of only few segments of the body or if some skeleton remains are obtainable. Prediction or reconstructions of height of a person from the skeletal remains like mutilated, amputated extremity or some sections of the body have uncommon significance in individual recognition.^[2] It is fact particularly important for Anatomists to know that trunks and extremities demonstrate consistent ratios among themselves. This relationship is marvelously significant, anthropologically to discover cultural differences and medico legally, when a little part of the body are available. In various conditions as medico legal experts, the stature of individual has to be considered by using the regression equation from the accessible skeleton substance in the form of incomplete skeleton or inaccessible long bones or from reconstructed length of long bones from its available fragments for establishing the individuals' individuality. Various workers have considered unmistakable parameter in cadavers but certain components like chronic diseases give flawed results. So the present study is done on living adult person.^[3]

The most important issue present in front of forensic expert is to recognize the identity of a person due to mass disaster like plane crash,

terrorist attack, bomb blast etc. , or any natural disaster like earthquake, sonami etc. During these kind of disaster if any mutilated body part is found then it is very useful for the expert to find the identity of an individual.^[4]

The dimensions on the human body and parts of the body are capable for different purposes like^[5-7]:-

In Scientific investigations:- Educational anthropologists consider the evolutionary significant difference in the body proportions among people whose associates live in different environmental settings. Human population exhibit similar climatic variations pattern to additional large-bodied mammals

In Medical surgical and Dental purposes:- Anthropometry is used in the detection and correlation of bodily defects. It is used in nutritional surveys to classify under nutrition and obesity. Fetal anthropometry is used in the assessment of fetal age and fetal well being. In general, it is used for the cosmetic surveys and estimation general health. It is also used in preparation of prosthesis in surgery and dentistry. In industry

Military section and sports:- Anthropometry is used in the requirements of military personnel. It is also used in monitoring and training of sports persons.

Criminal and other identifications:- Anthropometry is essentially used in personal identification and hence is used to identify the criminals by the measurements of different bodies parts of that person.

The height is one of the essential parameter of either partial or complete identification of the individuals. Various studies have been conducted to measure stature from different body parts and it has been reported that the most significant correlation was found between index finger length with that of stature. Therefore, the main aim of the study is to correlate the height with that of index finger length among the population of India.

MATERIALS AND METHODS

In the present, morphometric, cross sectional study of the measurement of stature from index finger length among the population of India is done. This study consist of 400 subject among them 200 are males and 200 females between the age group of 17-25 year. The subjects are students of Teerthanker Mahaveer Medical College and Research centre.

In the present study, three parameters were measured and these are as follows: -

Height:- Maximum distance from floor with feet axis parallel to the vertex in centimeters with the help of stadiometer, the person should stand erect in Frankfort plane.^[8]

Length of index finger:- Maximum distance from proximal crease to the most distal part of index finger in centimeters on ventral aspect of fully extended palm, by using of the vernier caliper.^[8]

The instrument used in the present study are as follows: -

Vernier caliper:- Vernier caliper is use for measurement of index finger length in centimeters. It has an outer jaw, inner jaw and a body, the outer jaw of vernier caliper is stable or fix, but the inner jaw is movable and it helps in measuring the length of the index finger [Figure 1].

Stadiometer:- Stadiometer is a part of medical apparatus, which is used for the measuring the human height in centimeters. It is usually designed as a ruler and a sliding head piece which is horizontal and accustomed to rest on the head's top. Stadiometers are used in study purpose, routine medical examinations and also for clinical test and experiments.

Inclusion criteria:-

Subjects should be physically healthy person.

Students should be Indian.

Students should be under the range of 17-25 years.

Willing to participate in this study.

Exclusion criteria:-

Physical deformities that can affect body height and index and ring finger length.

Dwarphism, where the skeletal development is unusually stunted.

Age is below 17 years and above 25 years.

Absence of the fingers.

Statistical analysis:-

The data was statistically analysed by calculating mean and standard deviation as well as standard error. Regression formula was also derived by calculating the stature and the index and ring finger length.

Regression formula used was as follows : -

$$Y = a + b (X)$$

Where, Y = height (that has to be measured)

a = intercept

b = slope of regression line.

X = independent variable (index and ring finger length).

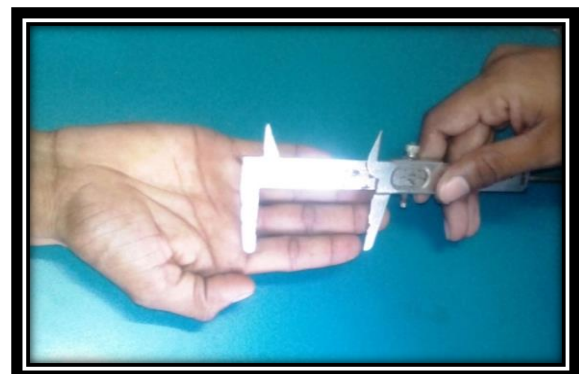


Figure 1: Measuring of Index finger length.

RESULTS

In present study we collected the data of 400 students (200 males and 200 females) from Teerthanker Mahaveer University, Moradabad. Subjects are belonging the India region, which has the age range in between 17-25 years, mean age for the males is 19.225 and mean age for female subjects is 19.115.

The multiple R, R square and their lower confidence interval and upper confidence interval analysis shows high values, the values were represented in the table 1-3 and Figure 2, which reveals that the relationship between height and index finger length in males.

The multiple R, R square and their lower confidence interval and upper confidence interval analysis shows the lower values. The values were presented in the Table 4-6 and Figure 3 and it shows that the relationship between height and index finger length in females.

Table 1: Descriptive statistics for height and index finger of male.

	Male	
	Height	IFL
Maximum	184	8.2
Minimum	155	6
Mean	170.7	7.05
Standard deviation	6.26	0.471
Standard error	0.626	0.047
Variance	39.2	0.22

Table 2: Regression statistics for height and index finger of male.

Number of male subjects (N)	200
Multiple R	0.568
R square	0.323
Slope	6.41
Intercept	124.26
Standard error of estimation	0.39
P value	<0.001

Table 3: The Confidence Interval level for index finger length in males.

Group	Lower limit	Upper limit
0.95	0.419	0.687
0.99	0.366	0.719

DISCUSSION

Present study was directed on the population group where study is concentrating on the college of TMMC and RC Moradabad. Student of different areas of India resides here and regression equation was calculated from variables for estimation of stature from the index finger length in both the sexes. There was a little variation in the records and in this study finger length is found to be a decent parameter for anticipating stature in both the genders.

The high value of the regression coefficient shows that the index finger length may clearly predict the body height in both sexes. These are the good predictor for estimation of the height of the males and females subjects.

The formulae have been obtained by using the statistical equation in both male and female separately, and formula is:-

$$[Y=A+BX]$$

Where; Y= Value of stature

A= Intercept

B= Regression Coefficient.

X= Finger length

Regression formulae for male:-

$$[Y=A+BX]$$

$$Y= 124.26+6.41(\text{RIFL})$$

The regression formulae for female:-

$$[Y=A+BX]$$

$$Y= 110.16+5.82(\text{RIFL})$$

Table 4: Descriptive statistics for height and index finger length of female.

	Female	
	Height	IFL
Maximum	176	7.5
Minimum	147	5.2
Mean	158.58	6.52
Standard deviation	5.58	0.5
Standard error	0.55	0.05
Variance	31.19	0.25

Table 5: Regression statistics for height and index finger length in female.

Number of female subjects (N)	200
Multiple R	0.536
R square	0.287
Slope	5.82
Intercept	110.16
Standard error of estimation	0.428
P value	<0.001

Table 6: Shows the Confidence Interval level for the stature and index finger length in females.

Group	Lower limit	Upper limit
0.95	0.380	0.662
0.99	0.325	0.696

Brown et al. 2002, determination of finger length ratio of Ebira ethnic group of Nigeria was wear and the results were differentiated and distinctive anthropometric measurements in both males and females of adult Ebira individuals. Numerous specialist have attempted these estimations yet the digit ratio values end up being dependably reliable in sex dimorphism and it has been shown that an amazing degree of ordinary male have low digit ratio contrasted with the females. In this study was considered to set up the relationship between the male and females' finger length ratio and to ascertain on the off chance that it has any

association with stature, weight and BMI. The outcome from this study show that there was a relationship somewhere around second and fourth digit ratio in males and females of Ebira ethnic Nationality of Nigeria.^[9]

Estimation of stature from bones particularly long bones is best practices in view of higher connection coefficient and little mistake of appraisal. However

handy challenges emerge in a circumstance where just small dissected body parts are accessible for medicinal examination. Accordingly looking for new parameters, the criminological specialists are investigating diverse body parts to assess the stature, for example, head, face, hands, foot, phalanges and finger length and so on.^[10-15]

Figure 2: Scatter diagram showing the relationship between the stature and index finger length of male.

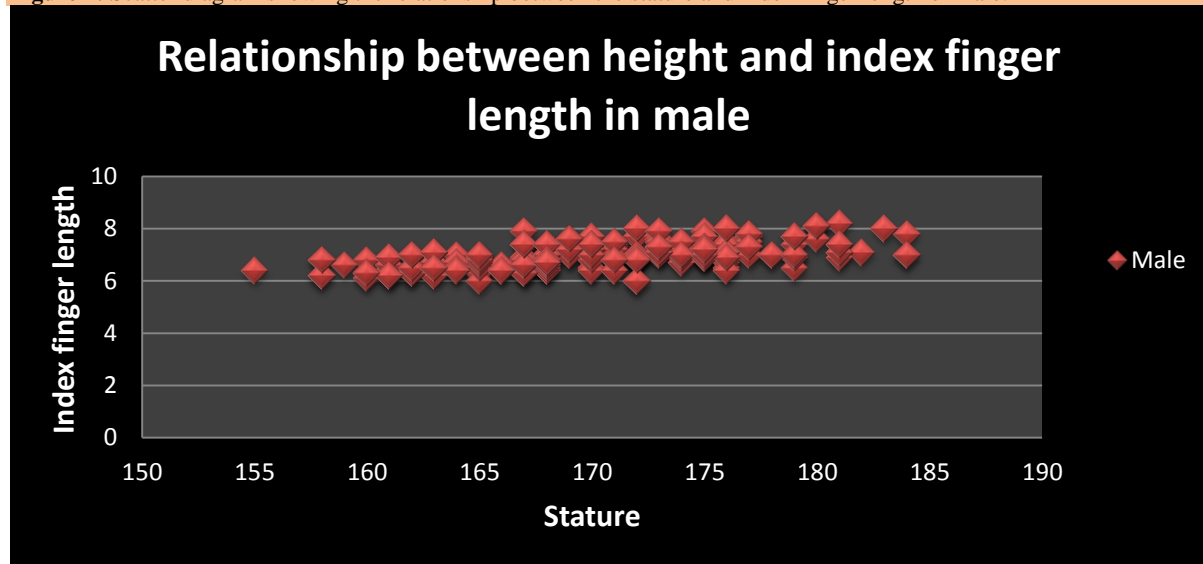
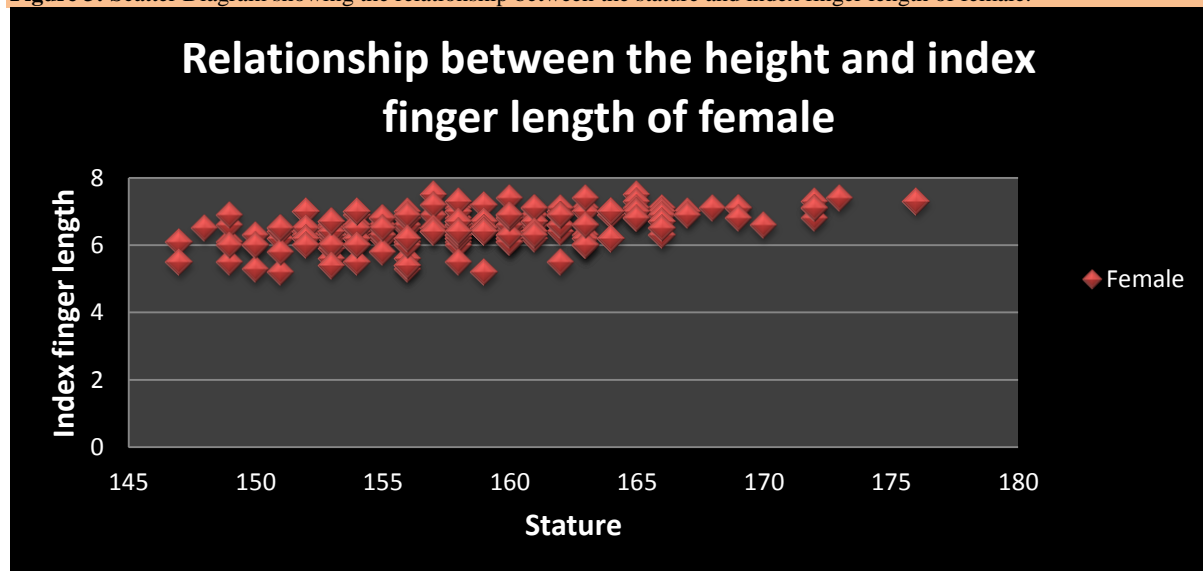


Figure 3: Scatter Diagram showing the relationship between the stature and index finger length of female.



With setting up of DNA profiling procedure as a solid device in recognizable proof, the utility of such customary techniques are presently addressed. However the convenience of such strategies can't be disposed of particularly in circumstances where refined methods are not accessible or where such procedures have confinements. Few studies have exhibited the utility of fingers in estimation of the stature.^[9,11]

Kumar L. et al studied 200 subjects from Uttarakhand, India matured between 21 to 30 years for relationships between's length of thumb and stature and noted positive correlation. The relationship coefficient extended from 0.240 to 0.256.^[16] Krishan et al. assessed stature from pointer and ring finger length in North Indian population and watched that stature can be evaluated from these finger lengths with a sensible

exactness. The connection coefficient extended from 0.671 to 0.748 in males and from 0.367 to 0.531 in females. However this study was led on immature populace with their age range from 14 to 18 years (normal 16 years). Subsequently there is requirement for a study where by the outcomes could be germane to adult population. The consequence of this study is empowering. Measurably critical connection was noted between forefinger length and ring finger length of the hand and tallness. In male the relationship was higher between ring finger and stature ($r=0.54$) while in females the connection was higher between forefinger and stature ($r=0.618$).^[17]

Since the subjects of present study do not have any deformity or obvious medical disorder, they characterize the healthy general population. These subjects were drawn from TMU, Moradabad, who belongs to India and positive relationship occur between height and index finger length. Since, the height differs according to races, and environmental factors, so there is a need to study the population of different areas of world, as this study included Indian Population.

CONCLUSION

Estimation of stature forms an essential parameter to reach to the partial identification of an unidentified body and dismembered remains. The importance of evaluation of height from the different body parts cannot be ignored. The finding of the present study shows that the index finger length can be used successfully to predict the height of the human being. Medico-legally it is a considerable parameter which determining the height of subject is a major step in recognition of a deceased subject when only parts of the body are obtainable. This should persuade others in taking up advanced research in the area. Outcome of this study provides baseline information, concerning some variables of a particular resident though the sample size was medium and convenience sampling had to be applied due to time constraints. In present study we consequent a separate regression equation to estimate the stature from index finger length for Indian population.

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