

Estimation of Stature from Ring Finger Length and Sexual Dimorphism in Adult Chakma Males and Females

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ABSTRACT

Background: Estimation of stature from ring finger length in adult Chakma males and females and also to observe gender difference was the main purpose of this study.

Materials and methods: It was a cross-sectional analytical study conducted over 104 adult healthy Chakma males and females (52 males & 52 females) residents of Chattogram Hill Tracts area from July 2011 to June 2012 in the Department of Anatomy, Chittagong Medical College, Chattogram. Subjects selection was done by convenient sampling technique and stature and ring finger length were measured and data was documented in SPSS version 19.

Results: A highly significant gender difference was found in ring fingers length. Mean Multiplication Factor (M.F) to estimate stature in males was 24.0172 and 24.0350 for right and left ring finger respectively and in female was 24.1770 and 24.1696 for right and left ring finger respectively. A positive correlation was found between stature and right ring finger length 0.511 and left ring finger length 0.560 in Chakma males and stature and right ring finger length 0.574 and left ring finger length 0.601 in Chakma females respectively.

Conclusion: This study found multiplication factors for right and left ring finger length to estimate stature in a correct way and found a linear correlation between stature and ring fingers length and also there was significant gender difference present between ring fingers length in adult Chakma males and females.

Key words: Stature; Ring finger length; Co-relation coefficient; Gender difference; Chakma population.

Introduction

Anthropometry is an early tool of physical anthropology where sizes and proportions of the human body are measured and relation with stature also observed. Estimation of stature from the dimensions of different body parts is being used for many years in the field of anthropometry. Stature of an individual is necessary in medico-legal autopsies, in forensic examinations, mutilated, decomposed and amputated body fragments found due to natural disasters like earthquakes, tsunamies, cyclones, floods and manmade disasters like terror attacks, bomb blasts, mass accidents, wars, plane crashes etc¹. There is a constant relationship between the height of the person and with body segments². Morphological characteristics among the individuals are different in different ages, ethnicities, genders, religions, geographical status, nutritional factors. So, that identification process is more complicated and subjective³. Anthropometry helps in reconstruction of the biological profile

of the deceased such as age, sex ethnicity and stature. Among these 'big fours' of forensic anthropology, estimation of stature is considered as one of the main parameter of personnel identification in forensic examinations⁴. Relationship between the dimensions of individual body segments and the height has been of interest to artists, anthropologists and scientists for many years. The anthropologists have done many studies on different populations to identify the body segments relation with the stature. Inter-racial and inter-geographical differences present in data of correlation of stature with body appendages & length of long bones; what may be true for one race or one region may not be true for the other⁵. Height is one of the factors in description of impressiveness of an individual and it varies with race, age, sex, heredity, climate and nutritional status. Telekka (1950) expressed the opinion that each racial group needs a separate formula for estimation of stature⁶. As per physical anthropologist, long bones of the limbs are best to estimate the height of a deceased⁷. Correlation between height and upper limb segment length can be used medicolegally to determine the stature, sex, race, age. Stature estimation from finger length was attempted by some researchers which were reported by the published work of Raju GM et al, Bardale et al, Hasan KR et al, Sen J et al, Acharya J et al, Katwal B et al^{8-12,3}. Jasuja and G. Singh in their published work in 2004 and they also attempted of stature estimation from hand and phalalange length¹³. Anthropometric study of finger length of both hand of Chakma population will add an additional parameter in personal identification. The Chakma also known as 'Changhma' are a community that inhabits the Chattogram

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Hill Tracts of Bangladesh, the north-east India and rakhine state of Myanmar. Among Chakma tribal group, anthropometric study for stature estimation from ring finger length was very rarely seen. It was seen that normally due to some degenerative changes in joints and cartilages after 50 years the stature is being reduced and growth of the child occur upto 20 to 25 years⁶. So, in between 25 to 45 years actual height of the person is remain unchanged. So, An attempt had been taken in the present study to make correlation of stature with the ring finger length and also to see the gender difference among chakma males & females in ring finger length within these age group for antropometric knowledge.

Materials and methods

Total 104 Chakma adult Buddhist in the age between 25 to 45 years were undergo direct physical measurement. Among them 52 males & 52 females. The subjects were chosen by convenient sampling technique from Rangamati & Khagrachari district of greater hill tracts area of Chattogram and analysis was done in the Department of Anatomy of Chittagong Medical College. To eliminate the discrepancies of diurnal variation the measurements and the photographs were taken in day time between 9 a.m. to 4 p.m¹⁴.

Procedure for Measurement of Stature (Height of the Body in A Standing Position :-

The subject stood on bare-footed with feet together on a level concrete floor, with his/her upper backs, buttocks and heels touching the wall. The participant's head in the Frankfort plane. The arms were hung freely by the sides with the palm facing the thighs. After asking the subject to take a deep breath and holding it, a measuring scale was placed against the head and wall to determine maximum height on the wall and this was marked. The subject was then told to breath and to step away from the wall. The height was then measured from the floor to the mark on the wall with steel tape which represents stature in centimeters to the nearest 0.1 centimeters. The average of the two measurement was considered for the height of that person¹⁵.

Procedure for Measuring the Length of Ring Finger :-

The subject was asked to place his / her hand on a table with the fingers together and thumb abducted and the hand and fingers as straight as possible. Measurement of length of ring finger was taken from the tip of the finger to the middle point of proximal / basal crease of the ring finger with the help of sliding caliper¹⁶.

Measurement of Ring Finger Length Using Sliding Caliper :-

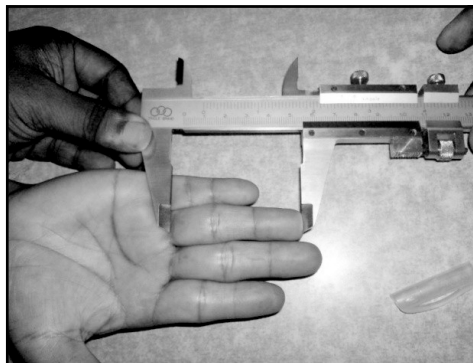


Figure 1 : Measurement of ring finger length.

Formula for Measurement of any Length by Sliding Caliper:-

$$\text{Length} = \text{Reading of the main scale} + \text{Vernier coincidence} \times \text{Vernier constant} - (\pm \text{Mechanical error})^{17,18}$$

Procedure of Calculation of Multiplication Factor :-

Multiplication factor was obtained by dividing the stature with the respective upper limb variable (Length of ring finger). Then the mean multiplication factor was calculated.

$$\text{Multiplication factor} = \text{stature} \div \text{upper limb variable (Length of ring finger)}^{15}$$

Software SPSS version 19 was used for analysis of data. Their mean, minimum, maximum, standard deviation, mean multiplication factor were calculated. Frequency distribution and regression analysis were done. Measured and estimated statures by using multiplication factor were tested by paired sample t-test. Gender differences in each variable were tested by using independent sample t-test. The Pearson correlation coefficient (r), probability (p) value was calculated. The significance level was set at p < 0.05.

Results

In the present study, descriptive statistics and Multiplication Factor (MF) to estimate stature of Chakma adult males and females was shown in Table I. A highly significant positive (p<0.001) correlation between ring finger length with stature found in males and females shown in table II. In Table III showed that there was no significant difference present in measured and estimated stature in males and females respectively.

Table I : Descriptive statistics and Multiplication Factor (MF) in males (n=52) and females (n=52).

Variables		Minimum(cm)	Maximum(cm)	Meant±SD	M.F.
Stature	Male	150.85	189.05	162.5327± 6.85381	
	Female	137.90	165.95	150.7500±5.82519	
Right ring finger	Male	5.92	8.01	6.7828±0.41233	24.0127
	Female	5.18	7.31	6.2584±0.45843	24.1770
Left ring finger	Male	5.82	8.10	6.7790±0.43155	24.0350
	Female	5.30	7.39	6.2575±0.44779	24.1696

Table II : Pearson correlation coefficient (R) of variables measurements with stature and p value – males & females.

Variable		Right side			Left side		
		r	r ²	p value	r	r ²	p value
Ring finger length	Males	0.511	0.262	p=0.000	0.560	0.314	p=0.000
	Females	0.574	0.330	p=0.000	0.601	0.361	p=0.000

Table III : Comparison between the measured stature and the stature estimated from different physically measured variables-males & females.

	Measurement from which the stature estimated	Measured stature (cm)	Estimated stature (cm)		p value
		Mean ± SD	Range	Mean ± SD	
Male	Right ring finger length	162.53 ± 6.85	142.18 – 192.38	162.90 ± 9.90	0.760
	Left ring finger length		139.76 – 194.56	162.93 ± 10.37	0.739
Female	Right ring finger length	150.75 ± 5.82	125.24 – 176.73	151.30 ± 11.08	0.660
	Left ring finger length		128.10 – 178.49	151.24 ± 10.82	0.685

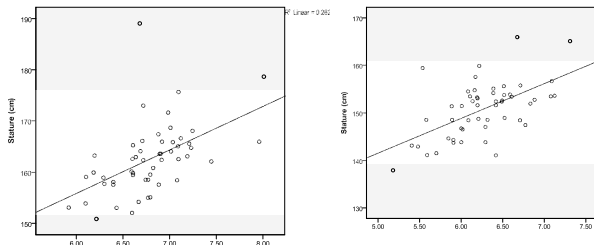


Figure 2 : Scatter diagram with regression analysis showing significant positive correlation ($r=0.511$, $p<0.001$) between the stature and length of right ring finger of the Chakma adult males ($n=52$) and ($r=0.574$, $p<0.001$) between the stature and length of right ring finger of the Chakma adult females ($n=52$).

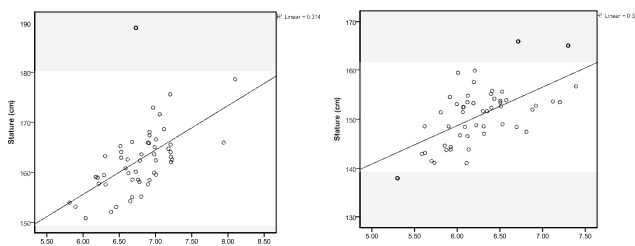


Figure 3 : Scatter diagram with regression analysis showing significant positive correlation ($r=0.560$, $p<0.001$) between the stature and length of left ring finger of the Chakma adult males ($n=52$) and ($r=0.60$, $p<0.001$) between the stature and length of left ring finger of the Chakma adult females ($n=52$).

Discussion

The mean length of right ring finger in male was $6.7828(\pm 0.41233)$ cm, in female was $6.2584(\pm 0.45843)$ cm, left ring finger in male was $6.7790(\pm 0.43155)$ cm, in female was $6.2575(\pm 0.44779)$ cm. Larger ring finger length was found in similar study done by Acharya et al. in Nepalese population (Left ring finger in male was 7.43 ± 0.45 cm and in female was 6.97 ± 0.38 cm)³. Pramod Kumar study of Mysore district population of India (right ring finger length in males $9.3720(\pm 0.6639)$ cm, in females $8.7490(\pm 0.6222)$ cm; left ring finger length in males $9.3250(\pm 0.6333)$ cm, in females $8.6840(\pm 0.5839)$ cm)¹⁹.

Multiplication factor for estimation of stature for right and left ring finger for both male and female was different and specific for that finger and tribe and we have seen that with the multiplication factor we can determine almost accurately the stature of that person. Pearson correlation coefficient (r) in male was 0.511 for right ring finger and 0.560 for left ring finger and in female was 0.574 for right ring finger and 0.601 for left ring finger and all showed p value for correlation was <0.001 . So, highest correlation with stature found in left ring finger in both male and female. Our study also showed coefficient of determination (r^2) in case of male was for right ring finger 0.262 and for left ring finger 0.314. Coefficient of determination (r^2) in case of females was for right ring finger 0.330 and for left ring finger 0.361. Other

researchers also found significant ($p<0.01$) positive correlation between stature and ring finger length. Pearson correlation coefficient (r) in study by Pooja Ahuja et al of Gujarat population of India, in males, right ring finger 0.577 and left ring finger 0.563 and in females, right ring finger 0.566 and left ring finger 0.582². Pramod Kumar study on peoples of Mysore district, India, in males, right ring finger 0.350 and left ring finger 0.315 and in females, right ring finger 0.383 and left ring finger 0.434¹⁹, Rajesh et al study on Maharashtra population, India, right ring finger 0.546 and left ring finger 0.572, in female 0.594 for both right and left ring finger⁹. Gender difference in ring finger length in our study also showed highly significant ($p<0.001$) and male ring finger length was longer than female ring finger length. Rajesh et al found significant difference ($p<0.001$) exists between male and female index and ring finger length⁹. So, from above discussion it have been seen that some study was done about correlation with stature with ring finger length and develop multiplication factor and our study also effective to identify the Chakma adult people.

Conclusion

Highly significant positive correlation was established between stature and right and left ring finger length in adult Chakma tribal population. Regression analysis was done and found very effective in stature estimation was seen in this study. The multiplication factor showed the accuracy in determining the height of the person and the highly significant gender difference was also seen in our study. So, our study will be helpful in personal identification of the Chakma population.

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Disclosure

All the authors declared no competing interests.

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