Indian Internet Journal of Forensic Medicine & Toxicology
Vol. 9, No. 2, April-June, 2011, 45-48

Original Communication

A Study of Correlation Between Hand Dimensions In Indian Population

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ABSTRACT

Various dimensions of the hand have been used for the determination of sex, and stature of an individual in forensic investigations. However, the data on correlation between the different hand dimensions is very limited. The present research aims at analysing the correlation between the dimensions of hand. The study was conducted on 500 Indian medical students (230 males and 270 females) at Kasturba Medical College, Manipal. A significant correlation is observed between the different dimensions of hand. Besides, medico-legal implications the study will also prove to be of significance in plastic and reconstructive surgery of hand.

Keywords: Forensic anthropology, Identification, Correlation, Hand dimensions.

INTRODUCTION

Anthropometry has enjoyed popularity over the years as a reliable technique to measure human body and its components [1]. The hand dimensions are used successfully for the determination of sex and stature of an individual [2-10]. Besides, hand length has shown a significant correlation with gestational age in fetuses [11].

Human body parts are supposed to be proportionate to each other. However, the information on the correlation between the dimensions of hand is inconclusive. The present investigation is an attempt to find the correlation between the hand dimensions in Indian population using statistical considerations. The study may help in identification and in addition, may have significance in plastic and reconstructive surgery of hand where the available dimensions of hand can be used in post-traumatic reconstruction of the hand.

MATERIAL AND METHODS

The present study is a part of a larger research on the estimation of stature [4,7] and sex [10] from hand dimensions that was conducted on 500 right handed medical students (230 males and 270 females), aged between 20-30 years in the department of Forensic Medicine, Kasturba Medical College, Manipal during 2002 – 2004.

The subjects were asked to place their hands supine on a flat hard horizontal surface with fingers extended and adducted, following which the hand and palm length was measured. Then the subjects were asked to place their hands prone on a flat hard horizontal surface, with thumb in abducted and other fingers extended and adducted, and the hand breadth was measured. Care was taken to see that the forearm was directly in line with the middle finger.

The following measurements were recorded for each hand in centimeters to the nearest millimeter using vernier calipers.

1. Length of the hand (HL): The distance between the mid-point of inter-styloid line (line joining the most distal point on the styloid processes of radius and ulna) to the most anterior projection of the middle finger.
2. Length of the palm (PL): The distance between the mid-point of distal transverse crease of wrist

(extending from ulnar to radial side) to the most proximal flexion crease of the middle finger.

3. Breath of the hand/ palm (HB): The distance between the radial side of the second metacarpophalyngeal joint and the ulnar side of the fifth metacarpophalyngeal joint.

Analysis was done using SPSS (Statistical Package for Social Sciences) computer programme, version 11. For assessing the correlation between hand dimensions, the Pearson's correlation coefficient was calculated. The significance of results was tested using student's "t" test, p- value of less then 0.05 was considered as significant.

RESULTS

Descriptive statistics for hand dimensions in males and females for right and left side are shown in Table 1. Statistically significant differences in hand dimensions are present between males and females. Male dimensions are statistically larger than females ($p<0.001$).

Table 1: Descriptive statistics: Hand length, hand breadth and palm length in males and females

	Male (n=230)			Female (n=270)			t-value
	Range	Mean	S.D.	Range	Mean	S.D.	
RHL	18.0-22.8	19.9	0.9	15.8-20.4	17.9	0.9	25.074*
LHL	17.9-22.6	19.9	0.9	15.4-20.7	17.9	0.9	24.648*
RHB	7.2-9.6	8.1	0.4	6.4-8.2	7.4	0.4	27.347*
LHB	7.0-9.6	8.0	0.4	6.2-8.0	7.3	0.4	28.668*
RPL	9.6-12.9	10.9	0.5	8.0-11.0	9.7	0.5	25.180*
LPL	9.5-12.2	10.9	0.5	8.2-11.1	9.6	0.5	25.665*

S.D. – standard deviation, RHL – right hand length, LHL – left hand length, RHB – right hand breath, LHB – left hand breath, RPL – right palm length, LPL – left palm length, *p < 0.001

Various possible correlations are tested in right and left hands among males and females as shown in Tables 2 and 3. The hand dimensions are significantly correlated to each other in both hands among males and females.

Table 2: Pearson Correlation (r) in hand dimensions among males and females in right hand

	Males (n=230)			Females (n=270)		
Variable	RHL	RHB	RPL	RHL	RHB	RPL
RHL	1.000*	0.702*	0.849*	1.000*	0.548*	0.861*
RHB	0.702*	1.000*	0.590*	0.548*	1.000*	0.474*
RPL	0.849*	0.590*	1.000*	0.861*	0.474*	1.000*

HL – hand length, HB – hand breath, PL – palm length, *p-value < 0.001

Table 3: Pearson Correlation (r) in hand dimensions among males and females in left hand

	Males (n=230)			Females (n=270)		
Variable	RHL	RHB	RPL	RHL	RHB	RPL
RHL	1.000*	0.678*	0.873*	1.000*	0.555 *	0.869*
RHB	0.678*	1.000*	0.563*	0.555 *	1.000*	0.478*
RPL	0.873 *	0.563*	1.000*	0.869*	0.478*	1.000*

HL – hand length, HB – hand breath, PL – palm length, *p-value < 0.001

Highest coefficient of correlation (*r*) was observed between the hand length and the palm length on both sides among males and females.

DISCUSSION

In our study, the hand dimensions in males are found to be statistically larger than females. The results of the present investigation are similar to the earlier observations that female hand dimensions are consistently smaller than those of the males in different human populations [2-11].

Literature on correlation within the hand dimensions is limited. The present research indicates a positive correlation between the hand dimensions. Our findings are consistent with the general perception that various body measurements are well correlated to each other. Among the various measurements, maximum correlation is exhibited between hand length and the palm length among males and females on both right and left sides. To the best of our knowledge no studies have ever reported the correlation between the hand dimensions; hence, degree of correlation in our study could not be compared.

CONCLUSION

DNA analysis provides the most reliable results in the field of identification. But it is not used routinely in forensic investigations in the developing countries as yet owing to its cost-effectiveness, availability of laboratories and techniques, trained manpower and processing time. Hence, techniques in forensic anthropology continue to play a major role in identification of human remains using statistical considerations.

In the present research, the hand dimensions were found to be well correlated to each other. Our study indicates that hand measurements can be reconstructed with reasonable accuracy using statistical considerations, provided a single hand dimension is available.

ACKNOWLEDGEMENTS

The authors are thankful to the students of Manipal University for voluntarily participating in the study.

REFERENCES

1. Iscan MY Anthropometry. In: J. Siegel, P. Saukko, G. Knupfer (Eds.), *Encyclopedia of Forensic Sciences*, Academic Press, London, 2000;pp. 284-290.
2. Abdel-Malek AK, Ahmed AM, el-Sharkawi SA, el-Hamid NA. Prediction of stature from hand measurements. *Forensic Sci Int* 1990; 46:181-187.
3. Bhatnagar DP, Thapar SP, Batish MK. Identification of personal height fromthe somatometry of the hand in Punjabi males. Forensic Sci Int 1984; 24:137-141.
4. Rastogi P, Nagesh KR, Yoganarasimha K. Estimation of stature from hand dimensions of north and south Indians. *Leg Med (Tokyo)* 2008; 10:185-189.
5. Krishan K, Sharma **A**. Estimation of stature from dimensions of hands and feet in a North Indian population. *J Forensic Leg Med* 2007;14:327-332.

6. Sanli SG, Kizilkanat ED, Boyan N, Ozsahin ET, Bozkir MG, Soames R et al (2005) Stature estimation based on hand length and foot length. *Clin Anat* 18:589-596.

7. Rastogi P, Kanchan T, Menezes RG, Yoganarasimha K. Middle finger length- a predictor of stature in Indian population. *Med Sci Law* 2009; 49:123-26.

8. Agnihotri AK, Purwar B, Googoolybe K, Agnihotri S, Jeebun N. Prediction of stature from hand dimensions. *J Forensic Leg Med* 2009;14:279–83 .

9. Kanchan T, Rastogi P. Sex determination from hand dimensions of North andSouth. *Indians. J Forensic Sci* 2009; 54: 546-550.

10. Kumar GP, Kumar UK. Estimation of gestational age from hand and foot length. *Med Sci Law* 1994; 34: 48-50.

11. Kanchan T, Kumar GP, Menezes RG. Index and ring finger ratio: a new sex determinant in the South-Indian population. *Forensic Sci Int* 2008; 181: 53.