DOI: 10.7860/JCDR/2022/51181.15863

Original Article

Forensic Section

Relationship between Stature and Hand Parameters in Adults- An Autopsy Study

BINCY BABU[1], KRISHNAN BALENDRAN[2], CS SREEDEVI[3]

ABSTRACT

Introduction: Estimation of stature is important in the process of identifying unknown and co-mingled human remains in mass casualties and natural disasters. Forensic experts are asked by the investigating officer to help to identify the person from dismembered parts of the body and skeletal remains. Estimation of stature is based on a principle that every body part bears more or less a constant relationship with height of an individual. Literature have documented that the hand parameters can be successfully used for stature estimation.

Aim: To determine the relevance of hand parameters in the estimation of stature and also to derive a regression formula for stature from the hand parameters.

Materials and Methods: This cross-sectional study was conducted in the Department of Forensic Medicine, Government TD Medical College, Alappuzha, Kerala, India, from June 2017 to June 2018. A total of 210 postmortem cases aged above 20 years were included in present study for the comparison of stature, hand length and hand breadth based on age were measured using standard methodology. Average of measurements of right and left hands were taken. Descriptive statistics were used to summarise height, hand breadth and hand length. Categorical and continuous variables were expressed as mean±SD. Correlation was done using Analysis of Variance (ANOVA) and t-test and predictive equations obtained using Karl Pearson's correlation coefficient.

Results: A total of 210 included 157 males and 53 females, and maximum subjects (78,37.1%) belonged to the age group 41-60 years. Hand length and hand breadth showed significant correlation with stature in both males and females with a significant p-value <0.01. Statistically significant age-related difference between the age groups 21-40 years, age 41-60 years was noted in stature, average hand length and hand breadth. The study variables like stature, hand length and hand breadth showed statistically significant higher values for males than females. It was observed that though both hand parameters showed positive correlation with stature, hand length was more predictive in both sexes. Regression equations for estimation of stature from hand length and breadth were derived for males, females and also for the total population irrespective of the gender in cases when only hand length or hand breadth is available and also when both hand length and breadth are available.

Conclusion: From the data obtained it can be concluded that estimation of stature can be done with reasonable accuracy using hand parameters with hand length showing greater correlation with stature than hand breadth in both sexes. Though statistically significant, the correlation coefficient for females was considerably less using both hand parameters.

Keywords: Anthropometry, Height, Linear regression equations

INTRODUCTION

Identification is the determination of the individuality of a person based on physical characteristics [1]. The process of identification generally begins with formulation of a biological profile (osteobiography); specifically, estimation of sex, age, ethnicity and stature [2]. Establishment of identity is necessary in the living persons, recently dead unidentified persons, decomposed bodies, mutilated bodies, burnt bodies and also in skeletal remains. When intact bodies are to be examined, stature estimation does not pose any problem. The estimation of stature, when mutilated and amputated limbs or body parts are found, using available parts is crucial for creating a biological profile during the process of personal identification. Stature is determined by a combination of genetic and environmental factors [3].

Dimensional relationship between body segments and the whole body has always been the focus of scientists, anatomists and anthropologists [4]. Hand and foot dimensions used for stature estimation help to formulate a biological profile in the process of personal identification [5]. Hand dimensions like breadth, length, wrist length, length of forearm, arm, foot dimensions, length of long bones have all been used to successfully predict the stature. Several authors have offered regression equations for stature based on the length of long bones [6-9]. It is well known that the formulae that apply to one population may not always give accurate results for other populations [10]. Even within our vast homeland of India, there are many different ethnic groups and they are having their own variations [11]. Literature search revealed that studies regarding estimation of height with hand parameters are largely lacking in Kerala and there was a felt need for identifying baseline parameters.

Hence, present study was conducted to study the relation between stature and hand parameters namely hand length and hand breadth of a person and also to derive a regression formula for estimating the stature from hand length and hand breadth of a person.

MATERIALS AND METHODS

A cross-sectional study was conducted at the Department of Forensic Medicine, Government TD Medical College, Alappuzha, Kerala, India, for a period of 13 months from June 2017 to June 2018. The study was conducted after getting clearance from the Institutional Ethics Committee of the Institution (EC 45/2016 dated 29.11.2016).

Inclusion criteria: The cases of both male and female sex with age above 20 years whose bodies were brought for medicolegal autopsy to the Department were included in the study.

Exclusion criteria: The cases with any injury, disease or anomaly that affects hand dimensions or stature were excluded from the study. Decomposed, charred or mutilated dead bodies were also excluded from the study.

Sample size calculation: According to study conducted by Kavyashree AN et al.,considering the correlation between stature and right hand breadth as 0.256% at 95% confidence interval with 80% power, the sample size is calculated using the standard formula for one sample correlation as [7]:

$$N=[\{Z_{1-\alpha/2}+Z_{1-\beta}\}^2\times4/\{\ln(1+r/1-r)\}^2]+3$$

$Z_{1-\alpha/2}$=two tailed probability for 95% confidence interval=1.96

$Z_{1-\beta}$=two tailed probability for 80% power=0.84

r=correlation between stature and right hand breadth=0.26

$N=[\{1.96+0.84\}^2\times4/\{\ln(1+0.256/1-0.256)\}^2]+3$, N=117.5

Thus, the total sample size required for the study was 118. Since more samples were available than the calculated sample size convenient sampling was done including all available samples to increase the power of the study.

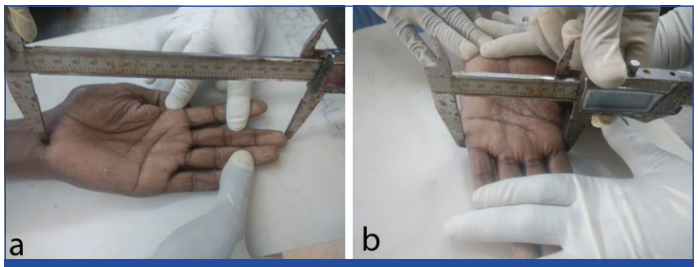
A total of 210 subjects were divided into three age groups

- Group 1: 21-40 years,
- Group 2: 41-60 years
- Group 3: more than 60 years

Procedures

Stature: The body was placed in supine position on a flat, hard surfaced autopsy table. Head was fixed so that frankfurt plane [12] remains parallel to the autopsy table. Stature (total body length) was measured between the vertex of the head and the heel using measuring tape fixed on a wooden rod [13].

Hand length and hand breadth: The hand measurements were taken after breaking rigor mortis. The hand was kept straight and flat with fingers extended, adducted and thumb extended on autopsy table. Hand length and breadth was measured from the palmar aspect of the hand. Hand length was taken as a straight distance between the midpoint of distal transverse crease of wrist joint and the tip of the middle finger. Hand breadth was measured with thumb abducted as a straight distance between most laterally placed point on the head of the 2nd metacarpal to the most medially placed point on head of the 5th metacarpal. Hand length and hand breadth were measured with manual sliding calliper [Table/Fig-1a,b]. The average of measurements of right and left hands was taken. Regression equations were derived to correlate the stature and both hand parameters in both sexes and also irrespective of the gender [13].



[Table/Fig-1]: a) Diagram showing measurement of hand length; b) Diagram showing measurement of hand breadth.

STATISTICAL ANALYSIS

Descriptive statistics were used to summarise height, hand breadth and hand length. Categorical and continuous variables were expressed as mean±SD. Comparison of stature amongst age groups was done using Analysis of Variance (ANOVA). Comparison of Average Stature, hand length and breadth based on sex was done using t-test. Karl Pearson's correlation was used to find out the relationship of height with hand length and hand breadth. Simple and multiple linear regression equations were derived to predict height using hand length and breadth. The p-value <0.05 was considered the threshold for statistical significance. Statistical analysis were performed by using Statistical Package for the Social Sciences (SPSS) version 20.0.

RESULTS

A total of 210 samples were studied which included 157 (74.8%) males and 53 (25.2%) females. Among a total of 210 study subjects, there were 67 (31.9%) in Group 1; 78 (37.1%) in Group 2 and 65 (31%) in Group 3 (highest age being 87 years). Mean stature of the study samples was 164.4±5.6 cm and range of 145-175 cm. Mean of average of hand lengths of right and left hands of the study samples was 16.3±0.8 cm and range of 14.5-19.3 cm. Mean of average hand breadths of right and left hands was measured in 6.4±0.7 cm and range of 5-8.5 cm.

The stature, average hand length and breadth of the various groups based on age were calculated [TableFig-2] and a comparison was done amongst the age groups. As stature was compared among the age groups [Table/Fig-3], it was noted that Group 2 showed statistically significant difference in stature with p-value <0.01.

The stature, average hand length and breadth based on sex were calculated and a comparison was done between the two groups (males and females) and comparison was statistically significant between males and females for all the three parameters (p-value <0.01) [Table/Fig-4]. Stature was correlated with hand length and hand breadth [TableFig-5] and showed positive correlation coefficient. Thus, it can be opined that when the hand length and hand breadth increases, stature will also increase.

In order to predict the stature of a person using his/her hand length, simple linear regression analysis was carried out [Table/Fig-6]. Stature of the person was taken as dependent variable and hand length and hand breadth were taken as independent variables. The

Groups		Mean (cm)	Standard deviation (cm)	Median (cm)	Minimum (cm)	Maximum (cm)
Group 1	Stature	166.3	5.4	168	155	175
	Average hand length	16.6	0.9	16.5	15	19.3
	Average hand breadth	6.6	0.7	6.5	5	8.5
Group 2	Stature	164.4	4.5	165	153	172
	Average hand length	16.3	0.6	16.1	15	18
	Average hand breadth	6.4	0.5	6.5	5	8
Group 3	Stature	162.4	6.3	164	145	173
	Average hand length	16.1	0.7	16	14.5	17.5
	Average hand breadth	6.2	0.6	6	5	7.3

[Table/Fig-2]: Descriptive statistics showing stature, average hand length and breadth based on age.

Groups	Mean (cm)	Standard deviation (cm)	Number	F*	Significance	Scheffe multiple comparisons		
						Pair	F	p-value
Group 1	166.3	5.4	67	8.72	p<0.01	Group 1 and 2	2.2	0.114
Group 2	164.4	4.5	78			Group 1 and 3	8.7	<0.01
Group 3	162.4	6.3	65			Group 2 and 3	2.5	0.082

[Table/Fig-3]: Comparison of stature based on age.
*F: Fisher value- ANOVA

Parameter	Sex	Minimum (cm)	Maximum (cm)	Median (cm)	Mean (cm)	Standard deviation (cm)	N	t-test	p-value
Hand length	Male	15	19.3	16.5	16.5	0.7	157	7.43	p<0.01
	Female	14.5	17	16	15.7	0.5	53		
Hand breadth	Male	5	8.5	6.5	6.5	0.6	157	6.11	p<0.01
	Female	5	7.3	6	6	0.6	53		
Stature	Male	154	175	167	166.3	4.3	157	10.64	p<0.01
	Female	145	169	159	158.7	5	53		

[Table/Fig-4]: Descriptive statistics and comparison of average stature, hand length and breadth based on sex.

Parameters	Stature (Male)		Stature (Female)		Total	
	r-value	p-value	r-value	p-value	r-value	p-value
Average hand length	0.782	p<0.01	0.620	p<0.01	0.797	p<0.01
Average hand breadth	0.735	p<0.01	0.559	p<0.01	0.739	p<0.01

[Table/Fig-5]: Correlation of stature with hand length and hand breadth.
(r-value- Pearson's correlation coefficient)

Parameter	Sex	Constant	B*	p-value	Prediction equation for stature	$R^{2\dagger}$
Hand length	Male	87.67	4.77	<0.01	87.67+ (4.77×hand length).	0.612
	Female	69.03	5.71	<0.01	69.03+ (5.71×hand length).	0.384
	Total	68.23	5.90	<0.01	68.23+(5.9×hand length).	0.635
Hand breadth	Male	132.43	5.18	<0.01	132.43+(5.18×hand breadth).	0.540
	Female	129.46	4.91	<0.01	129.46+(4.91×hand breadth).	0.312
	Total	123.98	6.32	<0.01	123.98+(6.32×hand breadth).	0.547

[Table/Fig-6]: Prediction of stature using either hand length or hand breadth.
*B: Multiplication factor; †R^2: Correlation coefficient; ‡: Multiple regression analysis

B factor is the value by which the dependent variable increases for every 1 cm increase of independent variable. The R^2 values suggest the percentage factor by which the dependent variable can be explained by the independent variable.

An attempt was also made to predict stature using both independent variables considered together [Table/Fig-7]. The R^2 of the regression analysis for male, females and whole population is 0.644, 0.459 and 0.667, respectively. It means that 64%, 46% and 67% of variations in the stature can be explained in the respective populations (male, females and whole population) if both hand length and hand breadth are available.

Gender	Constant	B‡		Prediction equation for stature	$R^{2\S}$
		Length	Breadth		
Male	98.08	3.29*	2.13*	98.08+(3.29×hand length)+(2.13×hand breadth).	0.644
Female	76.72	4.15*	2.83†	76.72+(4.15×hand length)+(2.83×hand breadth).	0.459
Total	80.09	4.20*	2.49**	80.09+(4.20×hand length)+(2.49×hand breadth).	0.667

[Table/Fig-7]: Prediction of stature using both hand length and breadth.
*: Significant at 0.01 level; †:-Significant at 0.05 level; ‡B: multiplication factor; §R^2: Correlation coefficient; (Multiple regression analysis)

DISCUSSION

In the present study, statistically significant age related difference was noted in stature, average hand length and hand breadth with p-value <0.01. The mean values of average hand length, hand breadth and stature showed statistically significant higher values for males than females. Hand length and breadth showed statistically significant positive correlation (p-value <0.01) with stature in both sexes. It was observed that stature of a person can be estimated more accurately when both hand length and breadth are available, than when only one parameter is available. Regression equations (Multiple regression analysis) estimation of stature were derived for males, females and also for the total population irrespective of the gender in cases when only hand length or hand breadth is available and also when both hand length and breadth are available.

Available literature was studied and a comparison was done of mean stature, hand length and hand breadth derived in the present study with other studies [Table/Fig-8] [6-8,14-21].

Stature: The mean stature of the males in the study population of the present study was found to be 166.3+4.3 cm. This is in close proximity with the mean stature value of 165.57 cm obtained for male population in the study done by Varu PR et al., [6]. Studies conducted by Kavyashree AN et al., Tandon R et al., and Wakode NS et al., showed mean stature of male population as 171.73, 172.7, 171.4 cm which were higher values than the present study [7,8,19]. The mean of stature for the female population in the present study was 158.7±5 cm. Similar values of 158 and 158.9 cm were found in the studies of Sunil et al., and Patel RN et al., [14,15]. The studies done by Tandon R et al., and Wakode NS et al., showed almost near values like 157.6 and 157.19 cm respectively as mean stature of females [8,19]. The mean values of stature for males and females were lower in the study done by Geetha GN and Swathi SA, and were 157.95 and 148.7cm respectively [20].

Hand length and breadth: In this study, the mean hand length of male study population was 16.5±0.7 cm and female population was 15.7±0.5 cm which was not comparable to values obtained in most other studies. The mean hand breadth of the male samples was 6.5±0.6 cm in the present study. The mean hand breadth in other studies was higher as shown in [Table/Fig-8]. The mean hand breadth for females of the present study was 6±0.6 cm. Values in other studies were much higher than that of the present study [Table/Fig-8]. Studies conducted by Pal A et al., does not depict any significance in the difference in the length of right and left hand in either sex (p-value=0.03) [22].

In this study, the mean values of stature, average hand length and breadth showed statistically significant difference in males and females. In a study conducted in Kashmir by Khan MA et al., it was observed that in males the length parameters show greater correlation than the breadth parameters [9]. The present study has found out that there exists a statistically significant and positive correlation between stature and hand parameters like hand length and hand breadth. Hand length showed more correlation with stature than hand breadth. The correlation coefficient was 0.612 for hand length in males while it was 0.384 for females and 0.540 for hand breadth in males whereas it was 0.312 for females in the present study.

Khan MA et al., observed that the correlation between stature and measured parameters was as follows: right hand length (0.626) in males and left hand length (0.695) in females and left hand breadth (0.046) in males and right hand breadth (0.386) in females [9]. All the parameters exhibit statistically significant positive correlation with hand length being more predictive than hand breadth. Varu PR et al., noted a positive correlation with r^2=0.905 in males and 0.889 in females between height and hand length [6]. Kavyashree AN et al., observed that bilateral variation was significant for the measurements of hand length whereas bilateral variation was insignificant for hand breadth measurements [7]. It was also observed that positive correlation existed between stature vs right hand length (0.412), left

Study done by	Place	Sample size	Sex	Mean height (in cm)	SD	Mean hand length (in cm)	SD	Mean hand breadth (in cm)	SD
Sunil et al., (2005) [14]	Delhi	150	M	169	7.8	19.6	1.3	--	--
			F	158	5.8	18.2	1	--	--
Patel RN et al., (2014), [15]	Gujarat	200	M	169.6	3.97	18.41	1.04	--	--
			F	158.9	4.29	17.55	1.10	--	--
Choudhary S et al., (2014) [16]	Jammu	100	M	169.76	6.23	--	--	--	--
			F	155.21	5.32	--	--	--	--
Moorthy TN and Zulkifly NRB, (2014) [17]	Malaysia	200	M	168.7	0.6	18.6	0.9	7.9	0.4
			F	156.3	0.6	17	0.9	7.0	0.5
Dey S and Kapoor AK (2015) [18]	Rajasthan	147	M	--	--	19.23	1.2	8.3	0.40
			F	--	--	17.37	1.09	7.57	0.35
Wakode NS et al., (2015) [19]	Maharashtra	200	M	171.4	5.79	18.34	0.9	--	--
			F	157.6	5.37	16.7	0.77	--	--
Varu PR et al., (2015) [6]	Gujarat	200	M	165.57	6.59	17.98	0.95	8.26	0.53
			F	151.02	5.69	16.65	0.84	7.27	0.33
Kavyashree AN et al., (2015) [7]	Karnataka	304	M	171.73	6.82	18.81	1.12	8.24	0.38
			F	159.25	6.21	17.17	0.93	7.24	0.46
Geetha GN and Swathi SA, (2015) [20]	Kasargode, Kerala	200	M	157.95	6.42	18.2	1.08	8.34	0.5
			F	148.7	7.57	16.9	0.8	7.5	0.4
Tandon R et al., (2016) [8]	Uttar Pradesh	497	M	172.7	6.1	19.36	1.09	8.31	0.41
			F	157.19	6.2	17.33	0.99	7.24	0.45
Subashri A and Thenmozhi MS (2016) [21]	Tamil Nadu	100	M	163	5.1	--	--	--	--
			F	160	5.8	--	--	--	--
Present study (2021)	Alappuzha, Kerala	210	M	166.3	4.3	16.5	0.7	6.5	0.6
			F	158.7	5	15.7	0.5	6	0.6

[Table/Fig-8]: Comparison of mean stature, hand length and hand breadth derived in the present study with other studies [6-8,14-21].

hand length (0.397) right hand breadth (0.095) left hand breadth (0.127) with hand length being more predictive. Chandra A et al., in his study for stature prediction based on hand anthropometry in male industrial workers of the Haryana state showed values of correlation coefficient less than that of the present study for. (0.598 for hand length and 0.460 for hand breadth) [23].

Linear regression equations were derived for estimation of stature from hand length and hand breadth in the present study and was compared with data obtained from other studies [Table/Fig-9] [6-8,14,17,20,24].

Authors and year of study	Place	Sample size	Sex	Estimation of stature from hand length	Estimation of stature from hand breadth
Sunil et al., (2005) [14]	Delhi	150	M	86.93+4.25HL	--
			F	77.42+4.56HL	--
Moorthy TN and Zulkifly NRB, (2014) [17]	Malaysia	200	M	--	123.72+5.69HB
			F	--	136.81+2.78HB
Varu PR et al., (2015) [6]	Gujarat	200	M	85.517+4.45HL	110.301+6.688 HB
			F	86.430+3.88HL	91.585+8.174 HB
Kavyashree AN et al., (2015) [7]	Karnataka	304	M	124.18+2.52HL	151.18+2.54 HB
			F	112.49+2.72HL	150.12+1.27 HB
Geetha GN and Swathi SA, (2015) [20]	Kasargode, Kerala	200	M	--	117.798+0.481HB
			F	--	140.696+0.104 HB
Tandon R et al., (2016) [8]	Uttar Pradesh	497	M	111.5+3.16HL	124.54+5.79HB
			F	96.46+3.504HL	105.5+7.125HB
Supare M et al., (2015) [24]	Maharashtra	400	M	68.69+5.52HL	--
			F	65.22+5.46HL	--
Present study (2021)	Alappuzha, Kerala	210	M	87.67+4.77HL	132.43+5.18HB
			F	69.03+5.71HL	129.46+4.91 HB

[Table/Fig-9]: Regression formula for stature from hand length and hand breadth derived in the present study and in other studies [6-8,14,17,20,24].

In a study conducted in Nigeria comparing hand and foot parameters with stature in ethnic groups it was observed that though hand and foot parameters could be used to estimate stature accurately, none of them was more reliable than the other. It was also noted that the formula obtained for these parameters were population and ethnic specific [25]. Parameters like finger length, considering all digits were used to predict stature in children [26]. Thus, more variables can be used to increase the predictive value of the formulated regression models.

Limitation(s)

Regression equations become more accurate when multiple variables can be used. This study, though conducted in a small population, shall act as the stepping stone for multicentric studies to be conducted in the State of Kerala using more predictive variables like arm length, finger length, wrist circumference to increase the accuracy of prediction. Regression equations obtained for general population can be used in cases when, only mutilated remains of hand are available and there occurs a difficult identification of sex.

CONCLUSION(S)

The data obtained from this autopsy-based study presented that estimation of stature can be done with reasonable accuracy using hand parameters. It was observed hand length showed greater correlation with stature than hand breadth in both sexes. The correlation coefficient for females was considerably less using both hand parameters but was statistically significant. This could be due to hormonal or nutritional factors and needs to be further studied for a definite reason. Stature estimation was more precise when both parameters were used together in the regression model. A regression equation for stature prediction when sex was unknown was also derived and showed high correlation. It is needed to conduct more studies among people of different regions, sex and ethnicity and to derive regression equations for a particular population.

REFERENCES

[1] Narayan Reddy K. The Essentials of Forensic Medicine and Toxicology. 33rd ed. New Delhi: Jaypee Brothers; 2014:57.
[2] Franklin D. Forensic age estimation in human skeletal remains: Current concepts and future directions. Legal Medicine. 2010;12(1):01-07.
[3] Ahmed AA. Estimation of stature from the upper limb measurements of Sudanese adults. Forensic science international. 2013;228(1-3):178.e1-7.
[4] Mukherjee J. Textbook of Forensic Medicine and Toxicology. 2nd ed. New Delhi: Arnold Associates; 1994:128-129.
[5] Uhrová P, Beňuš R, Masnicová S, Obertová Z, Kramárová D, Kyselicová K, et al. Estimation of stature using hand and foot dimensions in Slovak adults. Legal Medicine. 2015;17(2):92-97.
[6] Varu PR, Manvar PJ, Mangal HM, Kyada HC, Vadgama DK, Bhuva SD. Determination of stature from hand dimensions. J Med Res. 2015;1(3):104-07.
[7] Kavyashree AN, Bindurani MK, Asha KR. Determination of stature from hand dimensions in Indian population. Journal of International Medicine and Dentistry. 2015;2(3):209-14.
[8] Tandon R, Yunus SM, Faruqi NA, Asghar A. Measurements of hand and foot–A predictor of stature in adult human population of Uttar Pradesh. International Journal of Anatomy, Radiology and Surgery. 2016;5(1):12-15.
[9] Khan MA, Bashir SI, Khan MA, Shahdad S. Determination of stature from measurements of hand length and hand breadth; an anthropometric study of Kashmiri population. Int J Anat Res. 2017;5(2.3):3968-75.
[10] Duyar I, Pelin C. Body height estimation based on tibia length in different stature groups. American Journal of Physical Anthropology: The Official Publication of the American Association of Physical Anthropologists. 2003;122(1):23-27.
[11] Chikhalkar BG, Mangaonkar AA, Nanandkar SD, Peddawad RG. Estimation of stature from measurements of long bones, hand and foot dimensions. J Indian Acad Forensic Med. 2010;32(4):329-23.
[12] Venes D. Cyclopedic medical dictionary 21st ed. Philadelphia FA Davis Company; 2005:906.
[13] Pearson K. IV. Mathematical contributions to the theory of evolution.—V. On the reconstruction of the stature of prehistoric races. Philosophical Transactions of the Royal Society of London. Series A, Containing Papers of a Mathematical or Physical Character. 1899;(192):169-244.
[14] Sunil, Dikshit PC, Aggrawal A, Rani M. Estimation of stature from hand length. J Ind Acad Forensic Med. 2005;27(4):219-21.
[15] Patel RN, Parekh U, Patel P. A study of estimation of stature from hand length in Gujarat. NHL Journal of Medical Sciences. 2014;3(2):32-35.
[16] Choudhary S, Singh H, Gupta N. Estimation of stature from combined length of forearm and hand in Jammu region of India. Int J Basic Applied Sci. 2014;3(1):08-10.
[17] Moorthy TN, Zulkifly NRB. Regression analysis for stature determination from hand anthropometry of Malaysian Malays for forensic investigation. Sri Lanka Journal of Forensic Medicine, Science & Law. 2015;5(2):08-15.
[18] Dey S, Kapoor AK. Hand length and hand breadth: A study of correlation statistics among human population. International Journal of Science and Research. 2015;4(4):148-50.
[19] Wakode NS, Wakode SL, Ksheersagar DD, Tajane VD, Jachak AN. Prediction of stature based on measurement of hand length in Maharashtra region. Indian Journal of Clinical Anatomy and Physiology. 2015;2(3):131-35.
[20] Geetha GN, Swathi SA. Estimation of stature from hand and foot measurements in a rare tribe of Kerala state in India. J Clin Diagn Res. 2015;9(10):HC01-04.
[21] Subashri A, Thenmozhi MS. Estimation of stature using hand length in south Indian Region. Int J Pharm Sci Rev Res. 2016;40(1):52-54.
[22] Pal A, Aggarwal P, Bharati S, Panda M, Datta I, Roy P. Anthropometric measurements of the hand length and their correlation with the stature in Eastern Indian population. NJMR. 2014;4(4):303-05.
[23] Chandra A, Chandna P, Deswal S, Mishra RK, Kumar R. Stature prediction model based on hand anthropometry. Int J Med Health Biomed Bioeng Pharma Eng. 2015;9(2):201-07.
[24] Supare M, Pandit S, Bagul A. Estimation of stature from hand length and hand breadth in medical students of Maharashtra, India. Int J Health Allied Sci. 2015;4(3):154-59.
[25] Igbigbi PS, Ominde BS, Adibeli CF. Anthropometric dimensions of hand and foot as predictors of stature: A study of two ethnic groups in Nigeria. Alexandria Journal of Medicine. 2018;54(4):611-17.
[26] Rhiu I, Kim W. Estimation of stature from finger and phalange lengths in a Korean adolescent. J Physiol Anthropol. 2019;38(1):01-08.

PARTICULARS OF CONTRIBUTORS:
1. Assistant Surgeon, Department of Health Service, Family Health Centre, Peruvanthanam, Kerala, India.
2. Assistant Professor, Department of Forensic Medicine, Government TD Medical College, Alappuzha, Kerala, India.
3. Professor, Department of Forensic Medicine, Government Medical College, Thrissur, Kerala, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Krishnan Balendran,
MWRA-53A, Mundakkal West, Kollam, Kerala, India.
E-mail: krishnanbalendran@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Aug 09, 2021
- Manual Googling: Nov 05, 2021
- iThenticate Software: Dec 09, 2021 (20%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Jul 02, 2021**
Date of Peer Review: **Sep 15, 2021**
Date of Acceptance: **Nov 12, 2021**
Date of Publishing: **Jan 01, 2022**