

Using hand and phalanges length for estimating the height of the kharwar tribe of uttar pradesh, India

Abstract

Personal identification is an integral part of the investigation in cases of mass disasters where disintegrated and amputated body organs are found very frequently. Plastic and latent fingerprints and palm prints are also available very commonly at most of the scene of crime. Estimating height from various parameters based on the above-mentioned evidences becomes one of the most important and essential exercise for personal identification. In present paper, study on height estimation from h and phalanges length among the Kharwar Tribe of Uttar Pradesh, has been reported. Height and phalanges length of all the fingers of both the hands of 112 individuals have been measured. The inked palm prints were also obtained and the same measurements were recorded from it also. There regression equations have been drawn from the data collected. The result of the present study shows that, estimation of body height or stature from its segments especially from phalangeal lengths has important considerations for identifications of human remains recovered from mass disaster.

Keywords: forensics anthropology, personal identification, height, hand length, phalange length, regression equations

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Ajeet Jaiswal

Department of Epidemiology and Public Health, Central University of Tamil Nadu, India

Correspondence: Ajeet Jaiswal, Department of Epidemiology and Public Health, Central University of Tamil Nadu, India, Tel 9791201427, Email rpgjeet@gmail.com

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Introduction

The height prediction occupies relatively key position both in the forensic anthropological examination and in the identification or ID required by them edicaljuri sprudence or by them edico-legal specialists. Assessment of the height of a person from the skeletal material or from the ruined or cut away appendages or parts of appendages has clear importance in the individual identification in the occasions of the killings, mishaps or catastrophic events basically worries with the legal recognizable proof investigation or forensic anthropological analysis. Studies on the assessment of height from the skeletal remaining parts or from the ravaged appendages, the vast majority of the long bones have been accounted for as demonstrated by the published work of Pearson, Trotter and Glesser.¹⁻² The Indian point of view of the issue of height assessment has been concentrated by Athwale.³⁻¹⁷ Various studies have been published on estimating the stature from skeletal remains 10 11. It has withal been designated that anthropometric characteristics vary in different populations due to differences in nutrition levels of physical activity and genetics.¹⁸⁻²¹ However, the standards for skeletal identification vary among different populations and the standard for one population may not be utilized for another. Although there were two major methods to obtained individual stature namely; the anatomical method more commonly referred to as the 'Full Skeleton methods', or anatomical methods involve estimating stature based on the sum of the vertical measurements of all bones that contribute to stature along with a correction factor for soft tissue.^{22,23} The mathematical method requires a single bone or body parts and makes use of regression formulas or multiplication factors to elicit stature estimates based on correlation of individual bone measurements to statures observed in living populations.^{24,25}

Estimation of height from hand, finger and phalanalgeal length has been reported.^{7,8,14,-17,26-31} But, in forensic cases, one finds latent prints including palm and finger prints. In these types of the cases, one does not know which part of the hand will be available for the analysis

and also that part may not behaving sufficient ridge characteristics to establish identity. Many times, impression of any of the phalanges or only outline of the palm may be available. In these cases, only possibility to use that information is to measure the dimensions of the outlines available and estimate the height to which those may be long. To the best of our knowledge, only few studies has been reported from this aspect like Sharma and Kapoor²⁹⁻³¹ the assessment of height is considered as a measure of forensic analysis in forensic anthropology and it is necessary for forensic expert to understand the importance of estimating height from various body parts or region among various population including populations of different tribal communities for individual or personal identification of these susceptible groups. There is highly limited information existing regarding the anthropometric and forensic information of Kharwar tribal community. Consequently, to fill up a portion of this information gap, the current investigation was done to estimate the height of the Kharwar tribe. This information will be useful for personal identification of this tribe. Therefore, in present study, an attempt has been made to estimate the height not only from hand and phalanges length measurements but also from their measurements taken from inked prints including phalanges length.

Methodology (material and methods)

The current investigation depends on different estimations or measurements of height, hand length, individual phalange length of each finger. Subjects that included 60 male and 52 female Kharwar Tribe of district Chandauli, Uttar Pradesh were of the age group ranging from 18 years to 60 years. The Kharwar is one of the Adivasi gatherings of Uttar Pradesh and Bihar. "They are contemporary of Mundari speaking Indian clans". "Racially they have a place with Proto-Australoids" and "phonetically or linguistically to Dravidian bunch". The customary economic activities of the Kharwar have been farming and other working-class work or wage-earning labour. The Kharwar villages are found in comparatively plain zones. They erect their homes with mud, wood, bamboo, and tiles. The conventional

economic or monetary activities of the Kharwar have been farming and other wage-earning labour but generally they have following characteristics: Dark Brown to Black Skin colour, Gray to Brown Hair colour, Medium to flat Nasal form, Medium Face, Medium 4 to 5.6 feet (approximately) Height and are of Normal Health. Care has been taken for the consideration of unrelated subjects as it were. Both the genders were for the most part having right-sided prevalence. Measurement or Estimation of height was taken by a standard Anthro meter and hand lengths, just as phalange length, were taken by a sliding caliper (Una and co., India). Here it merits referencing that the thumb has not been considered in the current study as a result of its variable adaptability when compared with other fingers, which are straight.

Results and discussion

The results of the present study in relation to the estimation of height and the measurements of hand including phalange measurements of Kharwar tribes of district Chandauli, Uttar Pradesh are given in the accompanying Table 2–6. It is apparent from the Table 2 that shows the comparison of Height of the present Study from other Indian studies, that mean height in the males is comparatively higher as compared to that of the other sex i.e., females. A similar type of

response was observed in the research result of^{30–33} Table 3 reflect the comparison of the Length of the Hand i.e., Hand Length of the present study from other Indian studies. The length of the hand was estimated or measured both from hand as well as from the palm prints. Hand length measurements are given in Table 3. As obvious from the table, sexual dimorphism exists in mean hand length and hand length was seen to be higher in males in comparison to the females. There exists no respective contrast in the hand length nor was any measurably huge distinction or statistically significant difference was seen on print length (indirect) from the real hand length (direct). Phalange length measurements are given in the Table 4 & 5. It is obvious from the tables that there exists no genuinely huge contrast or no statistically significant difference versus sex, two-sided bilateral, print (indirect), and real estimations or measurements of the phalanges (direct). It is clear from Table 6 & 7 that every one of the estimations have a positive just as a statistically significant correlation with the height.^{8,31,33} Additionally detailed a genuinely statistically significant correlation between height and hand length.²⁶ Shintaku and Furuya reported for Japanese ladies a relationship of proximal phalange and height going from 0.521 – 0.696. In this way an attempt has been made to develop the regression equations to estimate height to estimate height from the length of the hand and phalangeal.

Table 1 Equipment and measurement used for the study

S.no.	Measurements	Definition	Instrument used	Units
1	Height	It was measured as vertical distance from the vertex to the floor. Measurement was taken by making the subject stand erect on a horizontal resisting plane bare footed with shoulder blocks and buttocks touching the wall. Palms of hand were turned inwards and fingers horizontally pointing downwards. Anthropometer was placed in straight vertical position in front of the subject with head oriented in eye-ear-eye Plane (Frankfurt Plane). The movable rod of the Anthropometer is brought in contact with vertex in the mid saggital plane.	Anthropometry	cm
2	Hand length	It was measured as the straight distance from the metacarpo phalangeal wrist crease to the most forwardly projecting point on the middle finger.	Sliding caliper	cm
3	Phalange length	It was measured as the distance between two phalangeal ridges in case of the first two phalanges and straight distance between most forwarding projecting point on the tip of the finger to the first distal phalangeal crease in case of the third phalange.	Sliding caliper	cm
4	Palm Print	Before taking the inked impressions, hands were thoroughly washed and rubbed clean and dry. Ink was uniformly applied on the hand as well as fingers along with the Bracelet crease. Palm prints were obtained by pressing the fingers as well as palm on the clean sheet of paper. All the measurements mentioned previously were taken on the palm prints by using a transparent scale. All the measurements were recorded in centimetres.	Ink, Ink Pad, Roller, Print Paper	cm

Table 2 Comparison of Height of the Present Study from other Indian Studies

S.no.	Author	Sex	Mean height (cm)	±SD	± SE
1	Baul ³²	-	167	6.11	-
2	Thakur ⁷	-	164.4	6.4	-
3	Jasuja ¹⁰	-	170.1	6.14	-
4	Kler ⁹	-	167.9	5.88	-
5	Vats ³⁰	Male	170.5	7.26	0.964
		Female	164.9	6.94	0.936

Table Continued...

S.no.	Author	Sex	Mean height (cm)	±SD	± SE
6	Jasuja ³³	Male	175.2	5.24	0.957
		Female	159.7	5.17	0.945
7	Maharana ³¹	Male	162.5	6.38	0.896
		Female	150.7	6.22	0.886
8	Present Study	Male	163.9	7.28	0.958
		Female	151.6	6.88	0.938

Table 3 Comparison of the Length of the Hand of the Present Study from other Indian Studies

S.No.	Author	Sex	Measurement	Hand	Mean	± SD	± SE
1	Thakur ⁷	-	Measured	-	19.34	1.72	-
2	Bhatnagar ⁹	-	Measured	Right	19.3	1.34	-
				Left	19.42	1.63	-
3	Vats ³⁰	Male	Measured	Right	19.8	1.95	0.15
				Left	19.38	1.54	0.14
				Right	20.48	1.75	0.15
				Left	20.2	1.63	0.12
	Female	Measured	Right	17.6	1.32	0.14	
			Left	17.48	1.45	0.12	
			Right	18.66	1.66	0.15	
			Left	18.4	1.47	0.17	
4	Jasuja	Male	Measured	Right	19.8	0.73	0.13
				Left	19.79	0.76	0.13
				Right	20.23	0.72	0.13
				Left	20.3	0.69	0.12
	Female	Measured	Right	17.51	0.81	0.14	
			Left	17.47	0.8	0.14	
			Right	17.86	0.85	0.15	
			Left	17.83	0.89	0.16	
5	Maharana ³¹	Male	Measured	Right	19.83	1.8	0.12
				Left	19.7	1.37	0.13
				Right	20.78	1.76	0.12
				Left	20.65	1.45	0.15
	Female	Measured	Right	17.8	1.43	0.13	
			Left	17.45	1.84	0.12	
			Right	18.5	1.46	0.16	
			Left	18.48	1.64	0.14	
6	Present Study	Male	Measured	Right	19.84	0.75	0.14
				Left	19.58	0.78	0.16
				Right	20.88	0.73	0.12
				Left	20.68	0.71	0.13
	Female	Measured	Right	17.9	0.84	0.13	
			Left	17.8	0.83	0.14	
			Right	18.4	0.87	0.15	
			Left	18.25	0.91	0.14	

Table 4 Distribution of Phalange Length among Males of Kharwar tribes of district Chandauli, Uttar Pradesh

S.no.	Finger	Hand	Phalange	Measured/ Print -- mean (cm)	± SD	± SE
1	Index	Right	I	2.368	0.262	0.048
				2.308	0.292	0.063
			II	2.423	0.188	0.034
		III	2.428	0.186	0.033	
		IV	2.42	0.166	0.03	
		V	2.413	0.186	0.032	
	Left	I	2.408	0.26	0.048	
			2.33	0.312	0.066	
			II	2.43	0.202	0.034
		III	2.433	0.198	0.036	
		IV	2.423	0.169	0.029	
		V	2.42	0.168	0.029	
2	Middle	Right	I	2.68	0.268	0.048
				2.39	0.611	0.03
			II	2.868	0.218	0.039
		III	2.868	0.218	0.039	
		IV	2.48	0.166	0.028	
		V	2.498	0.148	0.026	
	Left	I	2.693	0.243	0.044	
			2.36	0.49	0.089	
			II	2.868	0.214	0.039
		III	2.828	0.212	0.038	
		IV	2.488	0.196	0.036	
		V	2.49	0.166	0.03	
3	Ring	Right	I	2.363	0.249	0.046
				2.148	0.386	0.08
			II	2.698	0.209	0.038
		III	2.6	0.22	0.04	
		IV	2.62	0.19	0.034	
		V	2.623	0.191	0.034	
	Left	I	2.333	0.264	0.048	
			2.11	0.443	0.08	
			II	2.68	0.192	0.036
		III	2.603	0.193	0.036	
		IV	2.48	0.16	0.029	
		V	2.488	0.193	0.036	

Table Continued...

S.no.	Finger	Hand	Phalange	Measured/ Print -- mean (cm)	± SD	± SE
4	Little	Right	I	1.888	0.28	0.049
				1.838	0.368	0.066
			II	1.833	0.199	0.036
		Left	I	1.83	0.202	0.036
				2.303	0.168	0.03
			II	2.31	0.166	0.03
	Left	I	I	1.81	0.183	0.031
				1.888	0.28	0.049
			II	1.883	0.18	0.032
		III	I	1.888	0.196	0.036
				2.28	0.139	0.026
			II	2.288	0.131	0.023

Table 5 Distribution of Phalange Length among Females of Kharwar tribes of district Chandauli, Uttar Pradesh

S.No.	Finger	Hand	Phalange	Measured/ Print -- mean	± SD	± SE
1	Index	Right	I	2.063	0.222	0.04
				2.103	0.239	0.043
			II	2.208	0.21	0.038
		Left	I	2.213	0.198	0.036
				2.163	0.163	0.028
			II	2.163	0.148	0.026
	Left	I	I	2.113	0.189	0.034
				2.108	0.282	0.049
			II	2.163	0.226	0.041
		III	I	2.163	0.229	0.041
				2.388	0.218	0.039
			II	2.288	0.162	0.028
2	Middle	Right	I	2.363	0.236	0.043
				2.26	0.364	0.066
			II	2.603	0.206	0.038
		Left	I	2.618	0.202	0.036
				2.24	0.164	0.028
			II	2.263	0.16	0.028
	Left	I	I	2.388	0.218	0.039
				2.213	0.422	0.086
			II	2.6	0.206	0.038
		III	I	2.603	0.206	0.036
				2.168	0.169	0.028
			II	2.268	0.164	0.028

Table Continued...

S.No.	Finger	Hand	Phalange	Measured/ Print -- mean	± SD	± SE
3	Ring	Right	I	2.108	0.229	0.041
				2.083	0.311	0.066
			II	2.26	0.194	0.036
			2.283	0.18	0.032	
		III	2.228	0.168	0.03	
			2.248	0.182	0.031	
		Left	I	2.1	0.283	0.038
				1.993	0.339	0.061
			II	2.308	0.184	0.033
				2.323	0.181	0.033
			III	2.238	0.164	0.028
				2.238	0.162	0.028
4	Little	Right	I	1.618	0.236	0.042
				1.68	0.232	0.042
			II	1.643	0.206	0.038
			1.668	0.198	0.036	
		III	2.033	0.188	0.034	
			2.043	0.198	0.036	
		Left	I	1.663	0.208	0.038
				1.643	0.292	0.063
			II	1.68	0.181	0.033
				1.698	0.189	0.032
			III	2.028	0.168	0.028
				2.043	0.168	0.028

Table 6 Statistical correlation coefficients for length of hand and phalange with height among Kharwar tribes of district Chandauli, Uttar Pradesh

S.no.	Hand	Finger	Phalange	Measured		Print	
				Male	Female	Male	Female
1	Right	-	-	0.752	0.577	0.502	0.529
	Left	-	-	0.597	0.575	0.452	0.557
2	Right	Index	I	0.431	0.429	0.393	0.379
			II	0.753	0.732	0.732	0.722
			III	0.325	0.323	0.319	0.349
		Middle	I	0.743	0.754	0.731	0.715
			II	0.499	0.427	0.505	0.527
			III	0.371	0.302	0.357	0.377
	Ring	I	0.377	0.327	0.377	0.399	
		II	0.423	0.433	0.411	0.407	
		III	0.397	0.39	0.334	0.343	
		Little	I	0.254	0.243	0.302	0.377
			II	0.241	0.279	0.225	0.279
			III	0.207	0.259	0.215	0.297

Table Continued...

S.no.	Hand	Finger	Phalange	Measured		Print	
				Male	Female	Male	Female
	Left	Index	I	0.334	0.393	0.334	0.357
II			0.457	0.474	0.45	0.427	
III			0.417	0.511	0.417	0.335	
		Middle	I	0.71	0.719	0.791	0.719
II			0.522	0.513	0.522	0.593	
III			0.374	0.34	0.317	0.453	
		Ring	I	0.377	0.34	0.497	0.427
II			0.435	0.419	0.441	0.427	
III			0.473	0.454	0.449	0.479	
	Little	I	0.397	0.301	0.307	0.322	
II		0.301	0.37	0.497	0.417		
III		0.394	0.377	0.327	0.337		

Table 7 Regression equations for height estimation from measurements of hand among Kharwar tribes of district Chandauli, Uttar Pradesh

S.No.	Author	Measurement	Regression equations		
1	Thakur ⁷	Hand Length (HL)	Right	$S = 158.91 + 0.440 \times \text{Left HL}$	
			Left	$S = 51.388 + 5.988 \times \text{Right HL}$	
			Mean	$S = 94.208 + 3.788 \times \text{ML}$	
		Hand Breadth (HB)	Right	$S = 113.458 + 6.539 \times \text{Left HB}$	
			Left	$S = 092.308 + 8.908 \times \text{Right HB}$	
			Mean	$S = 078.548 + 10.69 \times \text{MB}$	
2	Bhatnagar et al. ⁹	HandLength(HL)	$Y = 127.97 + 2.06 \times X$		
		Hand Breadth (HB)	$Y = 141.67 + 3.13 \times X$		
3	Jasuja ³³	Right Hand	Measure	Male: $Y = 069.513 + 5.223 \times X \pm 4.033$ Female: $Y = 130.954 + 1.612 \times X \pm 5.061$	
			Print	Male: $Y = 101.991 + 3.767 \times X \pm 4.627$ Female: $Y = 133.961 + 1.473 \times X \pm 5.127$	
		Left Hand	Measure	Male: $Y = 084.742 + 4.491 \times X \pm 4.406$ Female: $Y = 130.035 + 1.660 \times X \pm 5.064$	
			Print	Male: $Y = 104.171 + 3.611 \times X \pm 4.820$ Female: $Y = 131.051 + 1.636 \times X \pm 5.090$	
			Right Hand	Measure	Male: $Y = 079.602 + 5.543 \times X \pm 4.021$ Female: $Y = 127.834 + 1.662 \times X \pm 5.076$
				Print	Male: $Y = 102.692 + 4.067 \times X \pm 4.591$ Female: $Y = 129.381 + 1.533 \times X \pm 5.225$
4	Maharana ³¹	Left Hand	Measure	Male: $Y = 088.682 + 3.992 \times X \pm 4.304$ Female: $Y = 129.045 + 1.830 \times X \pm 5.047$	
			Print	Male: $Y = 105.371 + 3.841 \times X \pm 4.615$ Female: $Y = 132.341 + 1.727 \times X \pm 5.388$	

Table Continued...

S.No.	Author	Measurement	Regression equations	
5	Present Study	Right Hand	Measure	Male:Y= 071.623 + 4.923 × X± 4.523 Female:Y= 131.361 + 1.712 × X± 5.181
			Print	Male:Y= 102.882 + 3.387 × X± 4.427 Female:Y= 132.992 + 1.723 × X± 4.327
		Left Hand	Measure	Male:Y= 086.784 + 4.621 × X± 4.526 Female:Y= 131.024 + 1.830 × X± 5.082
				Print

The regression equations for the assessment of height from the hand estimations have been accounted or reported earlier also. The similar comparative posting of regression equations for assessment of height from various hand estimations in Kharwar tribes of Chandauli, Uttar Pradesh has been given in Table 7& 8. These conditions were tested by putting the real value and tracked down that the error of assessment of height exists within the calculated or estimated range. In the current study, regression equations have been formulated with the standard error fluctuating from 4.427 to 4.950 cms on account of the males and 4.327 to 5.291 on account of females. The standard error difference among print and estimated or measured goes from 0.400 to 1.00cms, which again shows that both the parameters are effective and efficient to demonstrate the estimation. It additionally shows that both of two can be used for height estimation, which is of incredible significance as at the location of event or scene of occurrence just prints might be available. The result from the print

measurements be compared with the result found from suspect’s real measurements or genuine measurements. As references show that almost very little work has been accomplished for estimating of height from phalange length with the exception of few reported by Shintaku and Furuya^{26,29,30,31,33,34} stated estimation of height from fingertip length and fingerprint tip length among criminals Jats people group and Kharwar tribal community separately. While Shintaku and Furuya²⁶ examined proximal phalange in females only,²⁹ Sharma and Kapoor have contemplated distal phalange in males only. In the present study, all the three phalanges of each finger have been studied for height estimation in both the sex. It is apparent from the table that as the range of error of height estimation remains practically something very similar from all the phalanges thusly any phalange might be utilized for this reason. This reality expands the odds to remove more data from even a piece of the print is available at the scene.

Table 8 Regression equations for the estimation height from the measurements of phalange among Kharwar tribes of district Chandauli, Uttar Pradesh

S. No	Finger	Phalange	Measured/print	Regression equation		
				Male	Female	
1	Index	I	Measured	Y=155.439+8.748 × X± 4.83	Y=154.026+2.698 × X± 5.226	
				Y=159.521+6.893 × X± 5.006	Y=152.342+3.493 × X± 5.178	
		Print	Y=153.62+9.326 × X±4.884	Y=152.74+3.371 × X±5.212		
			Y=154.411+8.757 × X± 4.904	Y=144.790+7.055 × X± 5.090		
		II	Measured	Y=130.028+18.812 × X± 4.28	Y=152.07+3.446 × X± 5.22	
				Y=146.380+12.098 × X±4.929	Y=151.725+3.704 × X± 5.196	
	Print	Y=131.77+18.119 × X± 4.364	Y=153.039+3.019 × X± 5.22			
		Y=147.279+11.742 × X± 4.973	Y=153.421+2.916 × X± 5.224			
	III	Measured	Y=155.984+8.164 × X± 5.26	Y=135.169+11.339 × X± 4.98		
			Y=167.453+3.444 × X± 5.433	Y=123.808+16.642 × X± 4.412		
		Print	Y=155.212+8.461 × X± 5.273	Y=134.166+11.858 × X± 4.935		
			Y=177.166+(-.545) × X± 5.464	Y=136.283+10.808 × X± 4.963		
2		Middle	I	Measured	Y=171.902+1.645 × X±5.40	Y=157.909+0.769 × X± 5.259
				Y=177.357+(-.647) × X±5.456	Y=161.598+(-.857) × X± 5.254	
Print	Y=139.904+13.252 × X± 4.089	Y=153.724+2.528 × X± 5.232				
	Y=133.104+15.709 × X± 3.743	Y=158.679+(-.430) × X± 5.266				

Table Continued...

S. No	Finger	Phalange	Measured/print	Regression equation	
				Male	Female
3	Ring	II	Measured	$Y=137.977+13.652 \times X \pm 4.655$	$Y=160.765+(-.423) \times X \pm 5.266$
				$Y=136.521+13.868 \times X \pm 4.67$	$Y=152.365+2.919 \times X \pm 5.23$
		Print	$Y=138.232+13.575 \times X \pm 4.638$	$Y=157.970+0.691 \times X \pm 5.265$	
			$Y=136.521+13.868 \times X \pm 4.67$	$Y=154.495+2.082 \times X \pm 5.249$	
		III	Measured	$Y=134.758+16.318 \times X \pm 4.843$	$Y=136.26+10.402 \times X \pm 5.021$
				$Y=154.804+8.375 \times X \pm 5.257$	$Y=125.668+14.948 \times X \pm 4.729$
	Print	$Y=137.982+15.108 \times X \pm 4.828$	$Y=138.918+9.277 \times X \pm 5.061$		
		$Y=155.593+8.090 \times X \pm 5.190$	$Y=125.172+15.233 \times X \pm 4.696$		
	I	Measured	$Y=170.632+2.42 \times X \pm 5.386$	$Y=155.283+2.120 \times X \pm 5.224$	
			$Y=173.254+1.224 \times X \pm 5.438$	$Y=160.924+(-0.614) \times X \pm 5.263$	
		Print	$Y=154.286+9.104 \times X \pm 4.975$	$Y=154.984+2.239 \times X \pm 5.241$	
			$Y=149.143+11.276 \times X \pm 4.502$	$Y=161.036+(-0.636) \times X \pm 5.265$	
II		Measured	$Y=149.209+10.208 \times X \pm 4.995$	$Y=157.545+0.948 \times X \pm 5.264$	
			$Y=143.848+12.347 \times X \pm 4.958$	$Y=145.205+6.239 \times X \pm 5.140$	
Print	$Y=148.642+10.438 \times X \pm 5.017$	$Y=153.222+2.866 \times X \pm 5.237$			
	$Y=142.456+12.913 \times X \pm 4.921$	$Y=151.427+3.587 \times X \pm 5.224$			
III	Measured	$Y=161.558+5.608 \times X \pm 5.348$	$Y=153.628+2.703 \times X \pm 5.246$		
		$Y=155.021+8.299 \times X \pm 5.209$	$Y=140.362+8.646 \times X \pm 5.095$		
	Print	$Y=164.470+4.470 \times X \pm 5.391$	$Y=143.0+7.50 \times X \pm 5.109$		
		$Y=154.952+8.366 \times X \pm 5.254$	$Y=138.749+9.367 \times X \pm 5.058$		
	I	Measured	$Y=167.609+4.436 \times X \pm 5.245$	$Y=158.087+0.966 \times X \pm 5.2626$	
			$Y=163.497+6.858 \times X \pm 5.143$	$Y=159.660+0.024 \times X \pm 5.267$	
Print	$Y=163.090+6.711 \times X \pm 5.176$	$Y=156.995+1.673 \times X \pm 5.252$			
	$Y=155.907+10.914 \times X \pm 5.118$	$Y=160.09+(-.550) \times X \pm 5.266$			
II	Measured	$Y=164.417+6.215 \times X \pm 5.321$	$Y=148.617+7.074 \times X \pm 5.072$		
		$Y=147.790+14.810 \times X \pm 4.667$	$Y=151.851+4.916 \times X \pm 5.190$		
	Print	$Y=165.034+5.870 \times X \pm 5.341$	$Y=148.815+7.053 \times X \pm 5.058$		
		$Y=145.461+16.064 \times X \pm 4.662$	$Y=149.867+6.224 \times X \pm 5.141$		
	III	Measured	$Y=157.180+8.042 \times X \pm 5.300$	$Y=156.582+1.526 \times X \pm 5.250$	
			$Y=167.595+3.590 \times X \pm 5.440$	$Y=141.090+9.108 \times X \pm 5.062$	
Print	$Y=170.509+2.304 \times X \pm 5.451$	$Y=154.313+2.649 \times X \pm 5.243$			
	$Y=171.472+1.914 \times X \pm 5.457$	$Y=137.337+11.034 \times X \pm 4.962$			

Conclusion

In conclusion, estimation of body height or stature from its segments or dismember parts has important considerations for identifications of human remains recovered from mass disaster. From the present, it was found that no significant difference was observed between hand length and palm print length. The distinction between measured phalangeal length from hand and print likewise isn't critical or not significant. Statistically significant correlation is available between the height and these measurements. The regression equations have been formulated from these measurements and presumed or

concluded that height can be estimated from actual as well as print measurements with a standard error of estimate ranging from 4.327 to 5.291 cm.

Ethics approval and consent to participate

Both oral and written consents were taken from all the respondents as well as their parents and the main authorities of the school, after properly explaining to them the aims and objectives of the study. Proper ethical clearance was also taken, before going for the data collection of the study, by the Doctoral Committee of the Department

of Anthropology of Pondicherry University. All the subject were appraised of and exhaustively oriented to the procedures of the tests. They participated in this research study voluntarily and genially without any compulsion or coercion in the data accumulation. The research schedule was prepared both English as well as in the local language like Hindi, so that there may not be any problem in understanding.

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Conflicts of interest

Author declares there is no conflict of interest.

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