

Anthropometric Identification of North Indian Population by Measuring Finger Lengths

Mudasir Ahmad Khan¹, Aijaz Ahmad Patloo², Mohd. Arif Makdoomi³,

¹Demonstrator, Department of Anatomy, Government Medical College- Srinagar, India.

²Medical Officer. Qadeem Masjid Lane, House No.76, Lal bazaar Srinagar, J&K, India.

³Demonstrator in the department of Anatomy, Government Medical College, Srinagar, India.

*Corresponding author

Dr. Mudasir Ahmad Khan

Article History

Received: 08.09.2017

Accepted: 15.09.2017

Published: 30.09.2017

DOI:

10.21276/sjams.2017.5.9.23



Abstract: Estimation of stature is based on a principle that every body part bears more or less a constant relationship with height of an individual. Various studies in the past have utilized various body parts such as upper and lower extremities including hand and foot dimensions for the estimation of stature. Our study was intended to find out the correlation between height and finger length. To find out correlation and formulate a linear regression equation in order to find out height from finger length. The present study was conducted on a sample of 200 medical students (100 males and 100 females) within the age group of 20-30 years, studying in Government Medical College-Jammu. Only those students were taken who belong to J&K state and have no obvious deformity that can affect the measurements. Measurements were analyzed statistically to establish the relationship between finger length and stature. The study shows that the finger lengths bears a statistically significant $p < 0.001$ correlation with stature and can be an important tool for stature estimation. Linear regression equations were formulated to derive the stature from finger length in both males and females. The mean stature and finger length of male were more than female with statistical significance. Stature can be accurately estimated from finger length using simple regression equation separately for males and females.

Keywords: Finger length, Correlation, Identification, North Indian, Regression

INTRODUCTION

Personal identification is one of the main tasks of forensic research. Stature, age, sex, and ancestry helps in narrowing down the pool of the possible victim matches in the investigation process and thus provide useful clues to the investigating agency in establishing the identification of the individuals. The relationship between different body dimensions can be utilized to solve crimes in the absence of complete evidence. This relationship can help a forensic scientist to calculate stature from mutilated and dismembered body parts in forensic examinations. Anthropometric techniques have been used for stature and bone length estimation from unknown body parts and skeletal remains by anthropologists, medical scientists, and anatomists for over a hundred years [1-3].

Stature is indeed a very important indicator of growth and development and is used in the clinical setting for nutrition and health research. Together with bodyweight, stature is an important parameter used to calculate basal energy expenditure, body mass index,

basal metabolic rate, body composition, vital capacity and estimations of nutrient requirements[4-7].

Prediction of the dimensions of different body segments is useful in many areas of modern science. Body proportions and the dimensions of different body segments, including the vertebral column, long bones of the limbs and the bones of the hand and foot have been used for stature estimation. However, the long bones of the limbs have been the most widely studied [8-10].

Till date, most of the workers on stature estimation have used the length of bones such as femur, tibia, humerus, radius, etc. Very little data is available on previous work done for calculation of height from finger length especially in the J&K state of North India. Hence this study intends to fill this lacuna. This study looks into the possibility of estimation of stature from the length of finger.

MATERIALS AND METHODS

Source of Data

The present study was conducted on a sample of 200 medical students (100 males and 100 females) within the age group of 18-25 years from Government Medical College, Jammu and Indira Gandhi Dental College, Jammu.

Inclusion Criteria

Apparently healthy, asymptomatic males and females of age group 18-25 years.

Exclusion Criteria

- Males and Females with physical deformities and systemic illness affecting stature and hand measurements were excluded from the study.
- Age groups below 18 years and above 25 years were excluded from the study.

Methods of Collection of Data

The study was conducted in a separate post-graduate room. The objectives and methods of the study were explained to the sample population and informed consent was obtained, by taking their signatures on the consent form. All measurements were taken at a fixed time of day to eliminate diurnal variation.

- Six anthropometric measurements i.e., Stature, Thumb Length, Index Finger Length, Middle Finger Length, Ring Finger Length and Little Finger Length were measured. The measurements of both left and right side were measured separately, for each individual.
- All the measurements were recorded with full concentration and perfection.

Instruments Used

Following instruments were used:

- **Sliding Caliper**

It was used for finger length measurements. It consists of a long straight bar, a long arm fixed to one end and a sliding sleeve with long arm parallel to first one.

- **Stadiometer**

- It was used to measure vertical height of the subjects. It consists of platform on which the subject stands a long vertical bar which was scaled in millimeters and an adjustable horizontal bar for measuring the highest point of the subject.

Landmarks and Techniques involved in taking anthropometric measurements:

- **Stature**

It is the vertical distance between the highest point on the vertex and platform of stadiometer. The subject was made to stand erect, bare foot on a level platform against the stadiometer bar with his/her back and hips touching the bar, the feet were close to each other and the heels touching the bar, arms hanging by the side. The head of the subject was resting without any strain in the eye-ear plane or Frankfurt's plane i.e., trigone and the infraorbital margin of both the sides lie in the same plane.

- **Finger Length**

It is the distance between middle of metacarpophalangeal crease (proximal flexion crease) of the middle finger and the extreme projecting point on the tip of middle finger.

RESULTS

Table-1: Showing distribution of stature (in cm) among study population.

	Males	Females	Total
Number	100	100	200
Mean	172.77	157.92	165.35
Std. Error of Mean	0.638	0.549	0.673
Std. Deviation	6.384	5.495	9.524
Minimum	157.50	147.00	147.00
Maximum	188.50	175.00	188.50

Table-2: Showing correlation between the statures with various parameters studied in Males.

Parameter	RIGHT HAND		LEFT HAND	
	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)
Thumb Length	0.421	0.000*	0.478	0.000*
Index Finger Length	0.555	0.000*	0.600	0.000*
Middle Finger Length	0.611	0.000*	0.611	0.000*
Ring Finger Length	0.588	0.000*	0.571	0.000*
Little Finger Length	0.561	0.000*	0.454	0.000*

*. Correlation is significant at the 0.01 level (2-tailed)

Table-3: Showing correlation between the stature with various parameters studied in Females.

Parameter	RIGHT HAND		LEFT HAND	
	Pearson Correlation	Sig. (2-tailed)	Pearson Correlation	Sig. (2-tailed)
Thumb Length	0.454	0.000*	0.434	0.000*
Index Finger Length	0.554	0.000*	0.547	0.000*
Middle Finger Length	0.501	0.000*	0.515	0.000*
Ring Finger Length	0.520	0.000*	0.540	0.000*
Little Finger Length	0.544	0.000*	0.550	0.000*

*. Correlation is significant at the 0.01 level (2-tailed)

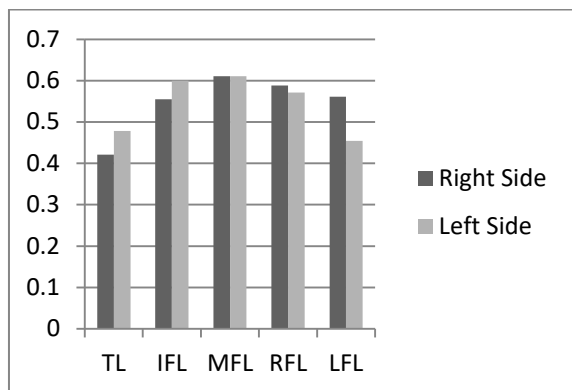


Fig-1: Showing Pearson's correlation in males.

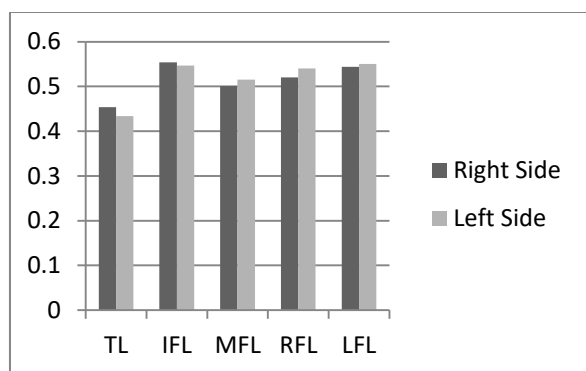


Fig-2: Showing Pearson's correlation in females.

Table-4: Showing Linear regression equation for various parameters studied in Males.

Linear Regression Equations in Males of Right and Left side		Coefficient of Determination (r ²)
Stature = Constant + Regression Coefficient (Dimension) ± Standard Error of Estimate		
Stature = 127.45 + 7.01(Right Thumb Length) ± 5.82		0.177
Stature = 115.45 + 7.77(Right Index Finger Length) ± 5.33		0.308
Stature = 105.64 + 8.26(Right Middle Finger Length) ± 5.08		0.373
Stature = 107.14 + 8.69(Right Ring Finger Length) ± 5.19		0.345
Stature = 113.71 + 9.55(Right Little Finger Length) ± 5.31		0.314
Stature = 117.85 + 8.60(Left Thumb Length) ± 5.63		0.229
Stature = 104.53 + 9.31(Left Index Finger Length) ± 5.12		0.361
Stature = 104.22 + 8.45(Left Middle Finger Length) ± 5.07		0.374
Stature = 108.56 + 8.52(Left Ring Finger Length) ± 5.26		0.325
Stature = 134.41 + 6.19(Left Little Finger Length) ± 5.71		0.206

Table-5: Showing Linear regression equation for various parameters studied in Females.

Linear Regression Equations in Females of Right and Left side	
Stature = Constant + Regression Coefficient (Dimension) ± Standard Error of Estimate	Coefficient of Determination (r²)
Stature = 113.06+7.47(Right Thumb Length) ± 4.91	0.206
Stature = 101.34+8.17(Right Index Finger Length) ± 4.59	0.307
Stature = 107.83+6.58(Right Middle Finger Length) ± 4.77	0.251
Stature = 106.98+7.25(Right Ring Finger Length) ± 4.71	0.270
Stature = 110.63+8.27(Right Little Finger Length) ± 4.63	0.296
Stature = 118.40+6.68(Left Thumb Length) ± 4.97	0.188
Stature = 102.34+8.10(Left Index Finger Length) ± 4.62	0.299
Stature = 105.27+6.95(Left Middle Finger Length) ± 4.73	0.266
Stature = 106.31+7.38(Left Ring Finger Length) ± 4.64	0.291
Stature = 110.73+8.28(Left Little Finger Length) ± 4.61	0.303

Table-6: Measurements of stature and finger length of right and left side in males (n=100).

S.No.	RT	RI	RM	RR	RL	LT	LI	LM	LR	LL	Stature	Sex
1	6.3	6.9	7.8	7.3	6.1	6.3	7.1	7.8	7.4	6.0	176	M
2	6.5	7.4	8.0	7.5	6.1	6.2	7.3	8.0	7.6	6.1	170	M
3	6.1	7.2	8.1	7.2	5.9	5.8	7.2	8.0	7.0	5.6	174.9	M
4	6.2	6.8	7.7	7.4	6.0	6.0	7.1	7.7	7.4	6.1	170	M
5	6.0	7.4	8.2	7.6	6.2	6.1	7.5	8.4	7.8	6.3	167.5	M
6	6.1	6.9	7.5	7.0	5.8	6.0	6.9	7.5	6.9	5.9	170.5	M
7	6.6	7.3	8.2	7.5	6.1	6.6	7.3	8.2	7.4	6.1	173	M
8	6.5	7.2	7.9	7.5	6.0	6.4	7.1	7.8	7.2	6.0	180	M
9	6.3	7.2	8.3	7.7	6.3	6.4	7.2	8.3	7.9	6.5	173	M
10	6.2	7.3	8.0	7.3	6.2	6.3	7.3	8.0	7.4	6.1	174	M
11	6.4	7.3	8.3	7.9	6.0	6.4	7.4	8.4	7.6	5.9	171.5	M
12	6.6	7.4	7.8	7.4	6.1	6.5	7.4	8.0	7.5	6.2	173	M
13	7.4	7.6	8.8	8.3	6.7	7.0	7.7	8.8	8.2	6.8	175.5	M
14	6.7	7.6	8.7	7.9	6.2	6.6	7.5	8.5	7.9	6.2	176	M
15	7.1	7.7	8.3	7.9	6.5	7.0	7.7	8.4	8.0	6.7	165	M
16	5.7	6.3	7.5	7.0	5.3	5.5	6.2	7.5	7.1	5.4	164.5	M
17	6.6	7.6	8.6	7.7	6.4	6.5	7.5	8.5	7.6	6.2	170	M
18	5.1	7.4	7.9	7.3	6.2	6.0	7.4	7.9	7.4	6.2	175	M
19	6.0	6.5	6.9	6.6	5.5	5.8	6.4	7.0	6.6	5.6	161	M
20	6.7	7.0	7.9	7.5	6.0	6.5	6.9	7.8	7.6	6.1	175	M
21	6.2	7.3	8.1	7.2	5.8	6.1	7.3	8.0	7.3	6.0	172	M
22	6.5	7.5	8.3	7.7	6.3	6.5	7.4	8.2	7.7	6.3	165	M
23	7.1	7.6	8.5	7.8	6.3	7.0	7.6	8.4	7.8	6.3	169	M
24	6.1	7.0	8.0	7.5	6.0	5.9	7.1	8.0	7.4	6.1	163	M
25	6.4	8.0	8.9	7.9	6.1	6.5	7.9	8.8	7.9	6.2	182	M
26	6.9	7.7	8.2	7.5	6.5	6.9	7.6	8.0	7.4	6.3	166	M
27	7.0	7.9	8.9	8.2	6.7	6.7	7.9	8.7	8.2	6.6	177.5	M
28	6.6	7.5	8.1	7.6	6.2	6.6	7.5	8.0	7.5	6.1	169	M
29	6.4	6.9	7.7	7.3	5.8	6.3	6.9	7.8	7.3	5.8	163	M
30	6.5	8.1	8.6	8.1	6.6	6.5	7.9	8.6	8.2	6.6	174.5	M
31	6.1	6.5	7.3	7.0	5.7	5.9	6.6	7.3	7.1	5.7	164	M
32	7.4	8.4	9.0	8.2	6.8	7.3	8.3	9.0	8.2	6.8	183	M
33	6.7	7.2	7.9	7.4	5.9	6.5	7.1	7.7	7.4	5.8	172	M
34	6.5	7.6	8.2	7.7	6.3	6.5	7.5	8.2	7.8	6.3	177	M
35	6.7	8.5	9.2	8.3	7.0	6.6	8.2	9.2	8.3	7.0	181	M
36	6.3	7.1	8.0	7.2	6.0	6.2	7.1	8.0	7.2	5.9	171	M
37	6.2	7.4	7.9	7.3	6.2	6.1	7.1	7.7	7.3	6.1	165.5	M
38	6.7	7.8	8.5	8.0	6.7	6.7	7.6	8.5	7.9	6.5	167.5	M

39	6.1	6.7	7.6	6.8	5.6	6.0	6.7	7.5	6.8	5.5	168	M
40	6.1	6.5	7.2	6.6	5.5	6.1	6.5	7.2	6.6	5.5	172	M
41	6.3	7.2	8.1	7.7	6.1	6.1	7.0	8.0	7.5	6.0	171	M
42	6.2	7.5	8.2	7.6	5.9	6.1	7.4	8.1	7.5	5.8	168	M
43	6.6	7.4	8.4	8.0	6.6	6.5	7.4	8.4	7.9	6.5	185	M
44	6.8	7.6	8.7	7.9	6.4	6.4	7.6	8.7	7.9	6.5	172	M
45	6.5	7.5	8.1	7.4	6.3	6.3	7.3	8.1	7.3	6.2	182	M
46	6.1	6.7	7.4	6.9	5.5	6.0	6.7	7.5	7.0	5.7	169	M
47	6.7	7.2	8.0	7.5	6.3	6.4	7.4	8.2	7.5	6.3	178	M
48	6.1	6.7	7.5	6.9	6.0	6.1	6.9	7.6	7.0	6.0	172	M
49	6.7	7.3	7.7	7.2	5.9	6.5	7.0	7.7	7.2	6.0	165	M
50	6.2	7.5	8.4	7.7	6.0	6.5	7.5	8.7	7.7	5.8	175	M
51	6.2	6.7	7.4	6.7	5.1	6.2	6.6	7.4	6.6	5.0	157.5	M
52	6.0	6.7	7.4	6.7	5.5	5.7	6.7	7.4	6.7	5.4	163	M
53	6.6	7.8	8.3	7.4	6.1	6.5	7.6	8.2	7.4	6.1	174	M
54	6.4	7.8	8.4	7.5	6.3	6.5	7.7	8.2	7.5	6.4	172	M
55	6.5	7.3	7.8	7.3	5.8	6.4	7.2	7.8	7.2	5.8	165	M
56	7.1	7.8	8.9	8.4	6.7	7.1	7.8	8.9	8.4	6.7	188.5	M
57	5.8	7.1	7.7	7.3	5.9	5.8	7.1	7.7	7.3	5.8	170	M
58	6.7	7.6	7.9	7.2	6.1	6.6	7.3	7.8	7.1	6.0	171.5	M
59	6.5	7.4	7.9	7.3	5.9	6.4	7.4	8.0	7.4	6.0	178	M
60	7.2	8.2	9.2	8.2	6.7	7.0	8.2	9.1	8.2	6.7	181	M
61	6.3	7.0	7.9	7.7	6.1	6.3	7.0	7.9	7.7	6.1	173	M
62	5.9	6.6	7.3	6.9	6.1	5.8	6.6	7.4	6.8	6.1	161	M
63	6.4	6.9	7.6	7.2	6.0	6.5	7.0	7.6	7.3	5.9	171	M
64	6.0	7.6	8.2	7.5	6.1	6.1	7.4	8.2	7.6	6.2	181	M
65	6.3	7.0	7.7	7.0	5.7	6.4	7.0	7.6	7.0	5.7	176	M
66	6.9	7.9	8.6	7.7	6.5	6.8	7.9	8.6	7.6	6.5	179	M
67	6.6	7.8	8.8	8.2	6.6	6.5	7.8	8.7	8.1	6.6	185	M
68	6.9	7.4	7.7	7.4	6.5	6.8	7.4	7.7	7.3	6.4	174	M
69	6.8	7.2	8.1	7.8	6.5	6.6	7.1	8.1	7.7	6.4	173	M
70	6.4	7.5	8.2	7.9	6.5	6.4	7.5	8.2	7.9	6.5	167	M
71	7.1	8.3	8.9	8.5	7.0	7.1	8.0	8.6	8.4	6.9	184	M
72	7.1	7.9	8.4	7.5	6.1	7.0	7.7	8.4	7.5	6.1	177	M
73	6.0	7.0	7.5	7.0	6.2	6.0	6.8	7.6	7.1	6.1	159	M
74	6.8	7.5	8.3	7.9	6.7	6.7	7.0	8.2	8.0	6.6	175	M
75	6.5	7.8	8.9	8.5	6.9	6.6	7.7	8.9	8.3	6.9	175	M
76	6.6	7.5	8.5	8.0	6.3	6.5	7.5	8.5	8.0	6.6	179	M
77	6.2	7.3	8.1	7.2	5.8	6.1	7.3	8.0	7.3	8.0	172	M
78	6.2	7.4	7.9	7.3	6.2	6.1	7.1	7.7	7.3	6.1	165.5	M
79	6.7	8.5	9.2	8.3	7.0	6.6	8.2	9.2	8.3	7.0	181	M
80	6.5	7.6	8.2	7.7	6.3	6.5	7.5	8.2	7.8	6.3	177	M
81	6.7	7.2	7.9	7.4	5.9	6.5	7.1	7.7	7.4	5.8	172	M
82	7.4	8.4	9.0	8.2	6.8	7.3	8.3	9.0	8.2	6.8	183	M
83	6.5	8.1	8.6	8.1	6.6	6.5	7.9	8.6	8.2	6.6	174.5	M
84	6.4	6.9	7.7	7.3	5.8	6.3	6.9	7.8	7.3	5.8	163	M
85	6.6	7.5	8.1	7.6	6.2	6.6	7.5	8.0	7.5	6.1	169	M
86	7.0	7.9	8.0	8.2	6.7	6.7	7.9	8.7	8.2	6.6	177.5	M
87	6.6	7.4	8.4	8.0	6.6	6.5	7.4	8.4	7.9	6.5	185	M
88	6.2	7.3	8.0	7.3	6.2	6.3	7.3	8.0	7.4	6.1	174	M
89	6.4	7.3	8.3	7.9	6.0	6.4	7.4	8.4	7.6	5.9	171.5	M
90	6.1	7.2	8.1	7.2	5.9	5.8	7.2	8.0	7.0	5.6	174.9	M
91	6.2	6.8	7.7	7.4	6.0	6.0	7.1	7.7	7.4	6.1	170	M
92	6.3	6.9	7.8	7.3	6.1	6.3	7.1	7.8	7.4	6.0	176	M
93	6.1	7.2	8.1	7.2	5.9	5.8	7.2	8.0	7.0	5.6	174.9	M
94	6.2	6.8	7.7	7.4	6.0	6.0	7.1	7.7	7.4	6.1	170	M

95	6.6	7.6	8.6	7.7	6.4	6.5	7.5	8.5	7.6	6.2	170	M
96	5.9	7.4	7.9	7.3	6.2	6.0	7.4	7.9	7.4	8.2	175	M
97	6.5	7.5	8.3	7.7	6.3	6.5	7.4	8.2	7.7	6.3	165	M
98	6.2	7.5	8.2	7.6	5.9	6.1	7.4	8.1	7.5	5.8	168	M
99	6.6	7.4	8.4	8.0	6.6	6.5	7.4	8.4	7.9	6.5	185	M
100	6.5	7.2	7.9	7.5	6.0	6.4	7.1	7.8	7.2	6.0	180	M

Table-7: Measurements of stature and finger length of right and left side in females (n=100).

S.No.	RT	RI	RM	RR	RL	LT	LI	LM	LR	LL	Stature	Sex
1	5.7	6.6	7.4	6.8	5.3	5.7	6.7	7.4	6.6	5.5	152.5	F
2	6.2	7.3	8.1	7.3	6.0	6.1	7.4	8.1	7.2	6.1	161.5	F
3	6.3	7.1	8.0	7.5	6.1	6.5	7.2	8.0	7.6	6.2	166	F
4	5.7	6.5	7.3	6.9	5.5	5.4	6.6	7.3	6.7	5.4	153	F
5	6.4	6.8	7.5	7.2	5.9	6.0	6.6	7.5	7.0	5.7	161	F
6	6.2	6.9	7.6	7.3	6.0	5.7	7.2	7.6	7.4	6.3	161.5	F
7	6.1	7.3	7.9	7.6	6.2	5.9	7.0	7.9	7.3	6.0	163.5	F
8	5.7	7.1	7.4	7.3	6.0	5.8	7.0	7.6	7.4	6.0	152	F
9	6.3	6.6	7.4	6.6	5.3	6.0	6.8	7.3	6.6	5.3	155.5	F
10	6.1	7.0	7.7	7.3	5.6	6.0	7.0	7.7	7.0	5.2	157	F
11	5.9	7.0	7.5	7.0	5.9	5.6	7.0	7.4	6.9	5.8	158.5	F
12	5.7	6.9	7.4	6.9	5.7	5.5	6.9	7.3	6.9	5.7	159	F
13	5.7	6.5	7.4	6.9	5.9	5.6	6.7	7.4	7.0	5.9	157	F
14	6.0	7.0	7.9	7.4	5.9	6.2	7.1	7.9	7.3	6.0	157.5	F
15	5.3	6.7	7.3	6.9	5.7	5.1	6.6	7.4	6.9	5.6	157	F
16	5.9	7.2	7.9	7.4	6.1	6.0	7.2	7.8	7.5	6.2	167.5	F
17	5.9	6.7	7.7	6.8	5.9	5.8	6.6	7.7	6.8	5.8	156	F
18	5.4	6.5	7.1	6.7	5.3	5.3	6.4	7.1	6.7	5.4	153	F
19	5.7	6.7	7.4	7.0	5.9	5.7	6.7	7.3	7.1	5.9	147	F
20	6.3	7.3	8.1	7.7	6.5	6.2	7.2	8.0	7.4	6.3	156	F
21	6.7	8.2	9.0	8.5	6.5	6.5	8.2	9.1	8.5	6.6	168	F
22	6.5	7.5	7.9	7.5	5.7	6.5	7.4	7.9	7.5	5.8	162	F
23	6.1	6.9	8.0	7.3	5.7	5.9	6.9	7.8	7.4	5.7	157	F
24	6.0	6.7	6.9	6.7	5.6	6.0	6.6	6.7	6.7	5.7	162	F
25	6.3	6.5	7.1	6.7	5.7	6.0	6.5	7.1	6.7	5.5	152.5	F
26	6.5	7.2	8.0	7.2	5.9	6.4	7.2	8.1	7.2	5.9	155.5	F
27	6.4	7.3	8.1	7.5	6.2	6.3	7.2	8.2	7.6	6.2	167	F
28	5.8	7.1	7.6	7.0	5.5	5.7	7.0	7.6	7.1	5.4	160	F
29	5.6	6.7	7.5	6.8	5.8	5.6	6.6	7.4	6.7	5.8	156	F
30	6.6	7.3	8.1	7.5	6.3	6.6	7.2	8.1	7.5	6.3	170	F
31	6.3	7.1	7.7	7.2	6.1	6.2	7.0	7.6	7.2	6.1	156	F
32	5.6	6.6	7.2	6.4	5.4	5.5	6.6	7.1	6.3	5.3	157	F
33	6.0	7.0	7.7	7.1	5.7	5.9	6.9	7.7	7.1	5.5	160	F
34	6.6	7.5	8.2	7.5	6.4	6.6	7.4	8.1	7.5	6.4	165.5	F
35	5.8	7.1	7.8	6.9	6.1	5.8	7.0	7.5	7.0	6.1	155	F
36	6.2	7.2	7.9	7.3	5.5	5.9	6.9	7.7	7.2	5.6	154	F
37	6.4	7.3	8.1	7.4	5.7	6.4	7.3	8.0	7.3	5.7	156	F
38	6.2	6.9	7.9	7.2	6.0	6.4	7.0	7.5	6.9	6.0	153	F
39	6.3	7.5	7.9	7.3	5.8	6.3	7.4	7.9	7.3	5.8	158	F
40	5.4	6.5	7.4	6.7	5.5	5.5	6.5	7.1	6.5	5.3	152.5	F
41	6.1	6.7	7.2	6.7	5.2	6.1	6.5	7.3	6.7	5.3	148	F
42	6.2	6.7	7.4	6.9	5.5	6.1	6.5	7.4	6.8	5.5	153	F
43	5.7	7.1	7.7	6.9	5.6	5.7	7.0	7.6	6.9	5.5	160	F
44	6.2	6.9	7.5	6.7	5.5	6.0	6.9	7.4	6.7	5.5	154	F
45	6.3	7.3	8.0	7.4	6.0	6.3	7.2	8.0	7.3	6.1	165	F
46	5.9	6.9	7.7	6.9	5.6	5.8	6.9	7.7	7.0	5.7	147	F

47	6.0	6.7	7.6	6.7	5.7	5.7	6.6	7.7	6.7	5.6	156.5	F
48	5.6	6.7	7.3	6.5	5.2	5.5	6.6	7.2	6.6	5.2	160	F
49	6.1	6.5	7.1	6.7	5.3	6.0	6.5	7.2	6.7	5.3	154	F
50	5.9	6.3	7.2	6.5	5.1	5.8	6.3	7.2	6.5	5.2	157	F
51	5.9	7.0	7.6	7.0	5.9	5.9	6.9	7.6	7.1	5.8	164.5	F
52	5.8	7.0	7.6	7.2	5.7	5.7	6.9	7.7	7.3	5.7	153	F
53	5.6	6.6	7.3	6.4	4.9	5.4	6.5	7.2	6.4	4.8	155.5	F
54	6.4	7.2	8.0	7.5	6.1	6.4	7.1	8.0	7.5	6.0	161.5	F
55	5.7	7.0	7.5	7.0	5.7	5.6	6.7	7.7	7.0	5.7	160.5	F
56	6.1	6.5	6.7	6.2	5.2	6.0	6.4	6.8	6.3	5.2	151.5	F
57	5.9	6.6	7.4	6.7	5.3	5.9	6.5	7.3	6.7	5.2	150	F
58	5.5	7.1	7.6	6.7	5.5	5.5	6.9	7.4	6.5	5.4	154	F
59	5.9	7.0	7.5	6.9	5.3	5.5	6.7	7.6	6.9	5.3	159	F
60	6.1	7.1	8.1	7.5	6.1	6.0	7.0	8.0	7.3	6.1	168	F
61	6.0	7.0	7.6	6.9	6.0	5.9	6.8	7.5	6.9	5.8	159	F
62	6.4	7.0	7.9	7.4	5.8	6.1	7.0	7.9	7.5	5.8	159	F
63	5.8	6.2	7.0	6.6	5.2	5.5	6.2	7.0	6.5	5.3	154	F
64	5.3	6.7	7.4	6.7	6.0	5.3	6.5	7.3	6.6	5.9	155	F
65	5.9	6.5	7.2	6.8	5.1	5.9	6.7	7.2	6.7	5.4	155	F
66	6.2	7.2	7.9	7.3	5.5	5.9	6.9	7.7	7.2	5.6	154.5	F
67	5.6	6.6	7.4	6.8	5.6	5.5	6.5	7.3	6.7	5.5	161.5	F
68	6.3	7.3	8.0	7.3	5.8	6.2	7.2	7.9	7.2	5.8	162.5	F
69	5.8	7.0	7.8	7.2	6.0	5.9	7.1	7.8	7.3	5.9	154.5	F
70	5.9	6.7	7.5	7.1	5.8	5.8	6.5	7.2	7.0	5.7	163	F
71	5.9	6.5	7.5	6.6	5.5	5.8	6.4	7.5	6.6	5.5	156.5	F
72	6.1	6.7	7.2	6.7	5.5	6.0	6.6	7.3	6.7	5.4	157	F
73	5.6	6.0	6.6	6.3	4.9	5.5	6.0	6.6	6.2	4.8	150	F
74	5.7	6.4	6.8	6.4	5.3	5.6	6.3	6.9	6.3	5.2	157	F
75	5.9	6.2	6.9	6.7	5.3	5.8	6.3	6.9	6.6	5.3	160	F
76	6.3	7.3	8.3	7.6	6.1	6.3	7.2	8.1	7.6	6.0	171.5	F
77	6.3	7.4	8.4	7.3	6.0	6.3	7.3	8.1	7.3	6.0	163	F
78	6.8	8.0	8.5	7.7	6.5	6.6	7.9	8.4	7.6	6.4	175	F
79	6.5	7.5	8.1	7.5	6.3	6.5	7.5	8.1	7.5	6.3	168	F
80	5.9	7.2	7.9	7.3	6.0	5.7	7.2	7.9	7.2	5.9	163	F
81	5.8	6.7	7.2	6.6	5.2	5.2	6.4	7.1	6.4	5.4	152	F
82	5.3	6.7	7.3	6.9	5.7	5.1	6.6	7.4	6.9	5.6	157	F
83	5.9	7.2	7.9	7.4	6.1	6.0	7.2	7.8	7.5	6.2	167.5	F
84	6.4	7.3	8.1	7.4	5.7	6.4	7.3	8.0	7.3	5.7	156	F
85	6.2	6.9	7.9	7.2	6.0	6.4	7.0	7.5	6.9	6.0	153	F
86	6.3	7.5	7.9	7.3	5.8	6.3	7.4	7.9	7.3	5.8	158	F
87	6.0	7.0	7.7	7.1	5.7	5.9	6.9	7.7	7.1	5.5	151.5	F
88	6.6	7.5	8.2	7.5	6.4	6.6	7.4	8.1	7.5	6.4	165.5	F
89	5.4	6.5	7.4	6.7	5.5	5.5	6.5	7.1	6.5	5.3	152.5	F
90	5.7	7.0	7.5	7.0	5.7	5.6	6.7	7.7	7.0	5.7	160.5	F
91	6.1	6.5	6.7	6.2	5.2	6.0	6.4	6.8	6.3	5.2	161.5	F
92	6.4	7.2	8.0	7.5	6.1	6.4	7.1	8.0	7.5	6.0	150	F
93	5.9	6.6	7.4	6.7	5.3	5.9	6.5	7.3	6.7	5.2	152.5	F
94	5.7	6.6	7.4	6.8	5.3	5.7	6.7	7.4	6.6	5.5	156	F
95	5.6	6.7	7.5	6.8	5.8	5.6	6.6	7.4	6.7	5.8	153	F
96	6.2	6.7	7.4	6.9	5.5	6.1	6.5	7.4	6.8	5.5	160	F
97	5.7	7.1	7.7	6.9	5.6	5.7	7.0	7.6	6.9	5.5	154	F
98	6.2	6.9	7.5	6.7	5.5	6.0	6.9	7.4	6.7	5.5	160.5	F
99	5.7	7.0	7.5	7.0	5.7	5.6	6.7	7.7	7.0	5.7	151.5	F
100	6.1	6.5	6.7	6.2	5.2	6.0	6.4	6.8	6.3	5.2	160	F

DISCUSSION

Estimation of the stature of an individual is an important aspect of forensic examinations and anthropological studies. Stature provides important evidence in the forensic investigation process to the establishment of personal identification. Anthropologists have always been of particular interest to assess the stature of an individual from different dimensions of the body and bones. However, different parts of the body and stature differ between human populations [11,12]. From an Indian perspective, the problem of stature estimation has been studied by Krishan [13], who predicted stature from cephalo-facial dimensions in the North Indian population, Rastogi *et al.*[14] estimated stature from hand anthropometry of North and South Indians, Chikhalkar *et al.*[15] estimated stature from long bones, hand and foot dimensions and Rani *et al.*[16] predicted stature from foot dimensions.

In our study it was seen that in males it was middle finger length of both right and left hand side which was having more correlation with stature and hence the best finger for the determination of stature. Where as in case of females it was index finger length of right side and little finger length of left side which were having comparatively more correlation and hence a better option for the determination of stature.

Tyagi *et al.* studied the subjects from Delhi and found positive correlation between stature and finger lengths and have suggested that index finger was best for the prediction of stature in both males and females [17]. Jasuja *et al.* had studied the hand and four phalange lengths in 60 subjects belonging to Jat Sikhs community. The researchers had observed correlation coefficient that ranged from 0.215 to 0.681 and concluded that stature could be estimated from studied parameters.

CONCLUSION

The present study was taken up with the aim of finding out the correlation between finger lengths with stature and also to derive linear regression equation for the estimation of stature from these dimensions that directly helps in the identification of an individual. It was also concluded that in case of males the middle finger length of both right and left hand side is the best for the calculation of stature and in case of females the index finger of right side and little finger of left side is the best to calculate the stature.

REFERENCES

1. Beddoe J. On the stature of the older races of England, as estimated from the long bones. The Journal of the Anthropological Institute of Great Britain and Ireland. 1888 Jan 1; 17:201-9.

2. Pearson K. Mathematical contribution to the theory of evaluation V. On the reconstruction of the stature of prehistoric races. Philos Trans R Soc Lond 1899; 192:169–244.
3. Kanchan T, Menezes RG, Moudgil R, Kaur R, Kotian MS, Garg RK. Stature estimation from foot dimensions. Forensic Sci Int 2008;179(241):e1–5.
4. Mc-Pherson JR, Lancaster DR, Carroll JC. Stature change with aging in Black Americans. J Gerontol 1978;33(1):20–5.
5. Chumlea WC, Guo S, Wholihan K, Cockram D, Kuczmarski RJ, Johnson CL. Stature prediction equations for elderly non-Hispanic white, non-Hispanic black and Mexican-American persons developed from NHANES III data. J Am Diet Assoc 1998; 98:137–42.
6. Hurley RS, Bartlett BJ, Witt DD, Thomas A, Taylor EZ. Comparative evaluation of body composition in medically stable elderly. J Am Diet Assoc 1997; 97:1105–9.
7. Roubenoff R, Wilson PWF. Advantage of knee height over height as an index of stature in expression of body composition in adults. Am J Clin Nutr 1993; 57:609–13.
8. Smith SL. Stature estimation of 3–10-year-old children from long bone lengths. J Forensic Sci 2007; 52:538–46.
9. Radoinova D, Tenekedjiev K, Yordanov Y. Stature estimation from long bone length in Bulgarians. Homo 2002; 52:221–32.
10. Muñoz JI, Liñares-Iglesias M, Suárez-Peñaranda JM, Mayo M, Miguéns X, Rodríguez-Calvo MS, Concheiro L. Stature estimation from radiographically determined long bone length in a Spanish population sample. Journal of Forensic Science. 2001 Mar 1;46(2):363-6.
11. Raxter MH, Ruff CB, Azab A, Erfan M, Soliman M, El-Sawaf A. Stature estimation in Ancient Egyptians: a new technique based on anatomical reconstruction of stature. Am J Phys Anthropol 2008; 136(2):147–55.
12. Zaher JF, El-Ameen NFM, Seedhom AE. Stature estimation using anthropometric measurements from computed tomography of metacarpal bones among Egyptian population. Egypt J Forensic Sci 2011; 1:103–8.
13. Krishan K. Estimation of stature from cephalo-facial anthropometry in North Indian population. Forensic Sci Int 2008;181 (52):e1–6.
14. Rastogi P, Nagesh KR, Yoganarasimha K. Estimation of stature from hand dimensions of North and South Indians. Leg Med 2008; 10:185–9.
15. Chikhalkar BG, Mangaonkar AA, Nanandkar SD, Peddawat RG. Estimation of stature from measurements of long bones, hand and foot

- dimensions. J Indian Acad Forensic Med 2009; 32 (4):329–31.
16. Rani M, Tyagi AK, Ranga VK, Rani Y, Murari A. Stature estimates from foot dimensions. J Punjab Acad Forensic Med Toxicol 2011;11(1):26–30
17. Jasuja OP. Calculation of stature from foot and shoe impressions. Punjabi University, Patiala. 1987.