



## Stature Estimation from Finger Length by Regression Equation

Gupta K<sup>1</sup>, Thalaur S<sup>2</sup>, Singh R<sup>3</sup>, Barwa J<sup>4</sup>, Das S<sup>5</sup>

<sup>1,2</sup> MBBS Students, Himalayan Institute of Medical Sciences, Jolly Grant, Doiwala, Dehradun, Uttarakhand – 248016

<sup>3</sup> Assistant Professor, Department of Forensic Medicine & Toxicology, All India Institute of Medical Sciences, Bathinda, Punjab-151001

<sup>4</sup> Associate Professor, Department of Forensic Medicine & Toxicology, All India Institute of Medical Sciences, Bathinda, Punjab-151001

<sup>5</sup> Professor & Head Forensic Medicine and Toxicology Department, Himalayan Institute of Medical Sciences, Jolly Grant, Doiwala, Dehradun, Uttarakhand – 248016

### ABSTRACT:

**Background:** Estimation of stature from mutilated body parts, as in mass disasters and in many heinous crimes, has always intrigued the Forensic Pathologist and investigating agencies. Every part of human being grows in correlation to each other. Many authors have conducted various studies to find the correlation amongst various body parts and found positive correlation. The present study has correlated the length of all fingers with the stature of the individual.

**Methodology:** The study was carried out on 150 healthy voluntary subjects (75 male and 75 female) of age 18-25 years. Instruments like Stadiometer and Vernier caliper was used for height and finger length measurements respectively.

**Result:** Mean values of stature and finger length were larger in males as compared to females. Positive and strong correlation was found between stature and right index finger length in females and left middle finger length in males whereas right and left middle finger length in total subjects showed statistically significant correlation (P-value < 0.05).

**Conclusion:** The findings of the study can be useful only when an intact finger is examined. As very less information is available related to correlation between finger length and stature of individual, there is need of more research from different geographical locations.

**KEY WORDS:** Finger length, Mutilated body parts, Stature.

### INTRODUCTION

Identification of a person is an important and tricky task for Forensic pathologist by using parameters like stature or height of individual in medico-legal cases. Stature of a person varies from race to race, population to population or even with age, sex and nutrition.<sup>1</sup>

It is easier to predict the stature of an individual when whole skeleton is brought for identification in comparison to cases where only parts of the body or fragmented remains are examined.<sup>2</sup>

Many authors have conducted studies to estimate the stature by using various independent variables like Middle finger,<sup>3</sup> length of the hand and the length of the phalanges,<sup>4-6</sup> Arm span<sup>7</sup>, foot length<sup>8</sup>, upper limb length<sup>9</sup>, hand and hand print dimensions.<sup>10</sup> Very few studies have been conducted on length of all fingers for predicting the stature of individual based on the principle of correlation.

### AIM AND OBJECTIVES

**Aim:** To estimate the stature of individual by using finger length after applying the linear regression equation.

#### Objective:

1. To find correlation between finger length and stature.
2. To derive regression equation for predicting the stature by using finger length.



**MATERIAL AND METHOD**

The current observational cross sectional study was carried out on 150 healthy and voluntary subjects out of which 75 were males and 75 were females of age group range 18-25 years. Subjects with congenitally malformed limbs, developmental defects, missing legs, skeletal abnormalities of spine like scoliosis, kyphosis, lordosis, etc. were excluded.

For measuring the height of an individual, the subject was made to stand barefoot in erect upright position against the wall with both feet kept close and back of the head, shoulders, buttocks and heels touching the wall. For measuring the finger length, the vernier calliper was placed horizontally along the ventral surface of hand; fixed part of the outer jaw was kept on the proximal crease of one finger and the mobile part was kept on the tip of that finger. The same procedure was applied for all fingers. All the measurements were entered in Excel sheet as data and by using the SPSS software, correlation and regression equation were derived for predicting the stature.

**RESULT**

In total subjects, mean value of right middle finger length is more than the left middle finger length followed by right ring and then left ring length. Highest correlation is observed by the middle finger length ( both right and left ) with height while least correlation is observed in left little finger length with height in total subjects. Among the male subjects, highest mean value of right middle finger length is observed followed by left middle finger length, having a highest positive correlation between left middle finger length followed by right ring finger length with height. In female subjects, mean value of right middle finger length is higher than left middle finger length with positive correlation observed between right index finger length with height and weak positive correlation observed between left thumb with height. All the correlation were found to be statistically significant ( < 0.05 ) at 95 confidence interval. This shows that the finger lengths are positively correlated with height and stature can be predicted by linear regression equation. [Table No. 1, 2 & 3]

**Table No. 1.** Pearson’s correlation with height and regression equation in total subjects

S.no	Parameter (Total)	Mean	S.D	Correlation with Height	significance	Regression Equation Y = a + bx
1.	RT	6.4941	0.53575	0.718	0.000	80.876 + (13.266)(6.4941)
2.	RI	7.0963	0.47147	0.701	0.000	62.565 + (14.721)(7.0963)
3.	RM	7.8596	0.53024	0.762	0.000	55.246 + (14.222)(7.8596)
4.	RR	7.2936	0.51167	0.754	0.000	60.619 + (14.590)(7.2936)
5.	RL	5.9508	0.47911	0.725	0.000	77.903 + (14.977)(5.9508)
6.	LT	6.4382	0.58208	0.727	0.000	87.409 + (12.367)(6.4382)
7.	LI	7.1230	0.50558	0.717	0.000	67.046 + (14.037)(7.1230)
8.	LM	7.8400	0.54936	0.762	0.000	59.353 + (13.734)(7.8400)
9.	LR	7.2683	0.53306	0.733	0.000	68.112 + (13.609)(7.2683)
10.	LL	5.8883	0.51201	0.696	0.000	87.819 + (13.452)(5.8883)



**Table No. 2.** Pearson’s correlation with height and regression equation in male subjects

S.NO.	Parameter (Male)	Mean	S.D	Correlation with Height	significance	Regression Equation $Y = a + bx$
1.	RT	6.8956	0.38619	0.273	0.009	$143.52 + (4.510)(6.8956)$
2.	RI	7.3795	0.39266	0.327	0.002	$135.418 + (5.312)(7.3795)$
3.	RM	8.2292	0.36223	0.404	0.000	$116.091 + (7.112)(8.2292)$
4.	RR	7.6561	0.35877	0.447	0.000	$113.821 + (7.941)(7.6561)$
5.	RL	6.2602	0.39152	0.364	0.001	$137.573 + (5.918)(6.2602)$
6.	LT	6.8794	0.39736	0.296	0.005	$141.938 + (4.750)(6.8794)$
7.	LI	7.4555	0.37856	0.317	0.003	$134.834 + (5.336)(7.4555)$
8.	LM	8.2271	0.37818	0.461	0.000	$110.760 + (7.762)(8.2271)$
9.	LR	7.6321	0.38494	0.347	0.001	$130.732 + (5.750)(7.6321)$
10.	LL	6.2079	0.44480	0.319	0.003	$146.261 + (4.568)(6.2079)$

**Table No. 3.** Pearson’s correlation with height and regression equation in female subjects

S.NO	Parameter (Female)	Mean	S.D	Correlation with Height	significance	Regression Equation $Y = a + bx$
1.	RT	6.0925	0.31934	0.405	0.000	$110.600 + (8.016)(6.0925)$
2.	RI	6.8132	0.36182	0.618	0.00	$85.839 + (10.803)(6.8132)$
3.	RM	7.4900	0.39747	0.569	0.000	$91.535 + (9.066)(7.4900)$
4.	RR	6.9312	0.36357	0.475	0.000	$102.110 + (8.271)(6.9312)$
5.	RL	5.6414	0.33893	0.585	0.000	$97.776 + (10.931)(5.6414)$
6.	LT	5.9970	0.36009	0.394	0.000	$117.874 + (6.931)(5.9970)$
7.	LI	6.7906	0.38381	0.554	0.000	$97.444 + (9.130)(6.7906)$
8.	LM	7.4528	0.40103	0.504	0.000	$100.129 + (7.958)(7.4528)$
9.	LR	6.9046	0.39466	0.536	0.000	$100.101 + (8.594)(6.9046)$
10.	LL	5.5686	0.35056	0.577	0.000	$101.456 + (10.413)(5.5686)$



## DISCUSSION

Our study shows that right index finger is more reliable in females and left middle finger more reliable in males for estimation of stature. Similar results were observed among females in a study conducted by G.M. Raju et al<sup>12</sup> in Devangere district and by Rajesh Vajjnathrao Bardale et al [6] in which there was higher significance of right index finger while among males the finding was found to be inconsistent. Our findings are inconsistent with a study conducted by D. Suseelamma et al<sup>2</sup> who concluded that left thumb length is more reliable for stature estimation and with the study by Pooja Ahuja et al<sup>11</sup> in which left index and the left middle finger length was found reliable in both males as well as females.

Our study shows that, strong correlation between height is observed with the middle finger length in total subjects ( both right and left ), left middle finger length in males and right index finger length in females. This finding is inconsistent with the study conducted among Nepalese medical students by Katwal B et al<sup>15</sup> who observed a strong correlation between right middle finger length and stature in both males and females. However, our findings are partially consistent with the study done by Vishal Koulapur et al<sup>16</sup> which shows good correlation between left middle finger length and stature in both males and females.

High correlation values were observed among males in our study which is inconsistent with the findings observed in tribal district population of India by Rahule AS et al<sup>17</sup> and by the study done by Pramod Kumar GN et al<sup>18</sup>.

## CONCLUSION

By measuring the stature and finger lengths of both males and females, we have observed that as compared to females, males have more height and finger length. The finger lengths are positively correlated with height and using these mean values, a regression equation can be formulated, which can help in estimation of stature. It is observed that among all the fingers, right index finger and left middle finger can be used efficiently for estimation of stature in females and males respectively. Since, the study involves measurement of each finger from proximal crease to its tip, the above results can be useful only when an intact finger is examined. This study was conducted on a limited sample size belonging to a particular geographical location, hence it needs to be further extended to a larger and varied population.

**ETHICAL CLEARANCE :** Taken from Institutional Ethical Committee

**CONFLICT OF INTREST :** Nil

**FUNDING:** Self-funded project

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