

# To Determine The Foot Measurement For Stature Estimation

**Dr. Chandrakant M.Kokatanur<sup>1</sup>, Dr. Ajay Y. Pednekar<sup>2</sup>, Dr. Nelson Nishant Kumar Lyngdoh<sup>3</sup>**

*<sup>1</sup>Professor and HOD, <sup>2,3</sup>Associate professor, Dept. of Forensic Medicine & Toxicology Krishna Institute of Medical Sciences, Karad Maharashtra, India*

*Corresponding author: Dr.A.Y. Pednekar Associate Professor Dept. of Forensic Medicine & Toxicology Krishna Institute of Medical Sciences, Karad Maharashtra, India,*

## ABSTRACT

**Aim:** To determine the foot measurement for stature estimation

**Materials and Methods:** The current research was done on a sample of 100 healthy adults ranging in age from 18 to 65 years. Stature is the vertical distance between the vertex's highest point and the stadiometer's platform. Each subject's stature was measured using the standing height technique. Foot length is the direct distance from acropodion to pternion. It was measured using a specially constructed tool that looked like a small osteometric board. It was made out of a horizontal rectangular hardwood platform with a fixed metal scale calibrated from 0 to 30 cm to the closest millimetre.

**Results:** Male adults had an average height of  $166.11 \pm 6.15$  cm, while female adults had an average height of  $156.89 \pm 7.85$  cm. Males had an average RFL of  $24.71 \pm 1.12$  cm, while females had an average RFL of  $22.15 \pm 1.36$  cm. Males had an average LFL of  $25.01 \pm 1.12$  cm, while females had an average LFL of  $22.44 \pm 1.47$  cm. For men, the Pearson correlation coefficients for height, RFL, and LFL were statistically significant, and there was a positive relationship between stature and foot length. Females' height, RFL, and LFL Pearson correlation coefficients were statistically significant, and there was a positive link between stature and foot length.

**Conclusion:** There was a statistically significant positive association between height and foot length for both sexes in this research. An individual's height is one of many distinguishing features, but it is particularly significant since it is innate.

**Keywords:** foot, stature, height, adults

## Introduction

A person's stature is their standing height. A person's height is a crucial indicator of their physical identity. Due to natural disasters like earthquakes, tsunamis, cyclones, and floods and man-made disasters like terror attacks, bomb blasts, mass accidents, wars, plane crashes, etc., establishing an individual's identity from mutilated, decomposed, and amputated body fragments has become an important necessity in recent times. This matters for humanitarian and legal reasons. An

individual's "stature" is a defining characteristic. <sup>1</sup> Artists, biologists, anatomists, anthropologists, and medicolegists have long been interested in the dimensions that exist between the many parts of the body and the total. <sup>2</sup> Skeletal remains found from a crime scene are often examined by forensic anthropologists in order to glean information about the victim. The process of reconstructing a human body's proportions from such skeletal remnants is one example. <sup>3</sup> Personal identification of victims is sometimes necessary

in medico-legal autopsies. During forensic investigations, it is often necessary to estimate the deceased person's height using measurements taken of their limbs and other body parts.<sup>4</sup>

Among the many factors that may be used to determine who someone is, height ranks high since it is an inborn quality. An significant piece of evidence in solving crimes is the perpetrator's footprint, since it may be used to approximate the perpetrator's height.<sup>5,6</sup> In forensics, an individual's height or height estimate is a crucial piece of evidence. In addition, when direct height measurement is not possible as a result of abnormalities like kyphosis, scoliosis, or missing legs, stature estimate plays a vital role.<sup>7,8</sup>

There is a strong biological link between foot length and height, and it has been shown that this measurement may be used to reliably predict an individual's height with the same degree of accuracy as long bone measures.<sup>9-11</sup>

### Materials and Methods

The current research was conducted at the Department of Forensic medicine and toxicology. The institutional ethics and research committee approved the study.

It was done on a sample of 100 healthy adults ranging in age from 18 to 65 years. This age group was chosen because all of the ossification centres in the foot, hand, and long bones fully fuse around the age of 18. Subjects beyond the age of 65 were eliminated because osteoporotic alterations cause considerable declines in height and foot length. All measurements were obtained in a well-lit area. The measurements were acquired using conventional anthropometric devices following the method described in the biological anthropology

handbook.<sup>12</sup> Stature is the vertical distance between the vertex's highest point and the stadiometer's platform. Each subject's stature was measured using the standing height technique. Foot length is the direct distance from acropodian to pternion. It was measured using a specially constructed tool that looked like a small osteometric board. It was made out of a horizontal rectangular hardwood platform with a fixed metal scale calibrated from 0 to 30 cm to the closest millimetre.

### Data examination

The collected data was assembled, and the data was analysed using SPSS Version 25.0. (SPSS Inc., Chicago, Illinois, USA). Statistical significance was defined as a P-value less than 0.05.

### Results

The current research included 55 men and 45 females. The majority of participants were 35-45 years old (36%), followed by 45-55 years old (25%), over 55 years old (19%), 25-35 years old (12%), and under 25 years old (8%). Male adults had an average height of 166.11±6.15 cm, while female adults had an average height of 156.89±7.85 cm. Males had an average RFL of 24.71±1.12 cm, while females had an average RFL of 22.15±1.36 cm. Males had an average LFL of 25.01±1.12 cm, while females had an average LFL of 22.44±1.47 cm. For men, the Pearson correlation coefficients for height, RFL, and LFL were statistically significant, and there was a positive relationship between stature and foot length. Females' height, RFL, and LFL Pearson correlation coefficients were statistically significant, and there was a positive link between stature and foot length.

**Table 1: Sex distribution of the participants**

Sex	Number	Percentage
Male	55	55
Female	45	45

**Table 2 Age of the participants**

Age	Number	Percentage
below 25	8	8
25-35	12	12
35-45	36	36
45-55	25	25
above 55	19	19

**Table 3: RFL and LFL of the Participants**

Variable in cms	Male	Female
Stature	166.11±6.15	156.89±7.85
RFL	24.71±1.12	22.15±1.36
LFL	25.01±1.12	22.44±1.47

**Table 4: Correlation co-efficient of stature, RFL and LFL in males and females**

Variable	RFL in cm	LFL in cm	p-value
Stature in cm (males)	0.68	0.81	<0.01
Stature in cm (females)	0.66	0.71	<0.01

## Discussion

The current research includes 100 individuals, 55% of whom are men and 45% of whom are women. Several studies have been undertaken to determine height based on foot length. The gender distribution in this research is very identical to that of the Jakhar 2010 survey, which had 103 participants (52 (50.48%) men and 51 (49.51%) females from the state of Haryana).<sup>13</sup> The sole difference in the current research is that men outnumber girls by a little margin. Sanli's study sample contained 1000 individuals, with 536 (53.6%) male students and 464 (46.6%) females<sup>14</sup>, while Fawzy<sup>15</sup> had 50 male participants and Agnihotri<sup>16</sup> had 125 male and 125 female participants.

Foot size differences are caused by sociocultural factors. Mongoloids, especially Japanese, have broader feet than Caucasoids and Australoids.<sup>17</sup> It demonstrates the significance of region-specific data.<sup>18</sup> Previously, the length of long bones was employed to estimate height.<sup>19</sup> Raju M (2009) discovered a statistically significant relationship between bare foot length and height (P 0.001).<sup>20</sup> Deopa Deep (2010) discovered a substantial and positive relationship between foot length and height among Uttarakhand residents.<sup>21</sup> Because

ossification and maturation occur sooner in the foot than in the long bones, height from foot measurement might be more precisely calculated, particularly in teenage age, than from long bone measurement.<sup>22,23</sup>

Qamra et al. calculated linear regression models for determining stature from either foot length or foot breadth and found that foot length was more appropriate. He suggested that the only actual association was between foot length and height.<sup>24</sup>

Giles et al. also proposed that foot length has a biological relationship with height, and that height may be calculated from foot length.<sup>25</sup> Singh and Phookan studied the Thai male population of Assam and concluded that foot length is a stronger predictor of height than foot width.<sup>26</sup> Mansur et al. discovered a correlation of height with foot length of +0.688 in male students and +0.587 in female students at Kathmandu University School of Sciences.<sup>18</sup> Mohanty et al. discovered that the correlation coefficient between height and foot length in Odisha was +0.65 in males and +0.80 in females.<sup>27</sup>

## Conclusion

There was a statistically significant positive association between height and foot length for both sexes in this research. An individual's

height is one of many distinguishing features, but it is particularly significant since it is innate. The Forensic expert can estimate height from the provided data since there is a known correlation between height and other body measurements. Numerous studies have been conducted to determine a person's height based on a variety of factors, including arm and forearm length, hand and finger length, the length of long bones, the length of shoes worn, and so on. It is common practise to use linear regression models to estimate a person's height using known anthropometric data. An individual's height may be roughly estimated from an examination of their feet, making this an essential piece of evidence in a forensic inquiry. The height-to-foot-length association is statistically significant and favourable.

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