

## ORIGINAL RESEARCH

### Assessment of relationship between footprint length and stature

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#### ABSTRACT

**Background:** Identification of a person is of prime and foremost importance in both civil and criminal cases. Investigating officer has to make rapid and accurate assessments in identification of a culprit in criminal cases. The present study was conducted to assess relationship between footprint length and stature.

**Materials & Methods:** 86 adults of both genders were included. The length of the footprint was measured from outer most margin of heel to the tip of extension of the longest toe in the footprint with the help of a scale and it is recorded in centimetres. The height was measured from heel to the horizontal cardboard in centimetres. With this footprint length, height of the subject was calculated with the help of regression formula.

**Results:** Out of 86 patients, males were 50 and females were 36. There was a significant positive correlation between right footprint length with stature ( $r=+0.84$ ) and left footprint length with stature ( $r=0.82$ ). The difference in correlation coefficient is statistically significant ( $p<0.05$ ). There was a significant positive correlation between right and left footprint length with stature ( $r=+0.88$ ). The difference in correlation coefficient is statistically significant ( $p<0.05$ ).

**Conclusion:** A significant correlation of stature with right and left footprint length has been observed.

**Key words:** Foot, stature, Height

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#### INTRODUCTION

Identification of a person is of prime and foremost importance in both civil and criminal cases. Investigating officer has to make rapid and accurate assessments in identification of a culprit in criminal cases. Many factors about the culprit are usually not known while investigating a crime.<sup>1</sup> Therefore, identification of a person has to be established by available information. Though, there are parameters which help in identifying a person, stature of an individual is one of the important parameters, as it is an inherent characteristic. Many studies have been carried out to estimate the stature from different body parts like arm length, forearm length, hand and finger length, length of long bones, foot and shoe lengths etc.<sup>2</sup>

Stature is the height of the person in upright posture. It is an important physical identity. "Stature" is one of the most important elements in the identification of an individual. It is anatomically complex that includes the dimensions of legs, pelvis, vertebral column and skull and contribution of each of these to the total varies in different individuals and also in

different population.<sup>3</sup> Ossification and maturation in the foot occurs earlier than the long bones and therefore, height could be more accurately predicted from foot measurements as compared to that from long bones.<sup>4</sup> There are lot of variations in estimating stature from limb measurements among people of different region & race. Hence there is a need to conduct more studies among people of different regions so that stature estimation becomes more reliable.<sup>5</sup> The present study was conducted to assess relationship between footprint length and stature.

## MATERIALS & METHODS

The present study comprised of 86 adults of both genders. All agreed to participate in the study.

Data such as name, age, gender etc. was recorded. A glass plate of 24×24 inches is cleaned and uniformly smeared with a thin layer of black painters. Subject footprint and stature are taken separately.

The length of the footprint was measured from outer most margin of heel to the tip of extension of the longest toe in the footprint with the help of a scale and it is recorded in centimetres. A thin cardboard was kept horizontally at the vertex of the head. The height was measured from heel to the horizontal cardboard in centimetres. With this footprint length, height of the subject was calculated with the help of regression formula. The calculated height was compared with the actual height of the subject. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

## RESULTS

**Table I Distribution of patients**

Total- 86		
Gender	Males	Females
Number	50	36

Table I shows that out of 86 patients, males were 50 and females were 36.

**Table II Correlation between foot print length and stature in males**

Parameters	Mean	R value
Right foot	25.7	0.84
Actual height	173.2	
Left foot	24.9	0.81
Actual height	173.2	

Table II shows that there was a significant positive correlation between right footprint length with stature ( $r=+0.84$ ) and left footprint length with stature ( $r=0.82$ ). The difference in correlation coefficient is statistically significant ( $p<0.05$ ).

**Table III Correlation between foot print length and stature in females**

Parameters	Mean	R value
Right foot	22.7	0.87
Actual height	163.2	
Left foot	22.4	0.87
Actual height	163.9	

Table III shows that there was a significant positive correlation between right and left footprint length with stature ( $r=+0.88$ ). The difference in correlation coefficient is statistically significant ( $p<0.05$ ).

## DISCUSSION

In most of the countries, a footprint record is maintained for all the air-force flying personnel since feet often resist destruction (often shoe clad) by aircraft accidents, fires etc.<sup>6</sup> Despite of the relationships between different body parameters that have been determined, it has been emphasized that these vary from population to population and ethnic origin to ethnic origin due to differences in effects of hereditary, nutrition, living style, and levels of physical activity.<sup>7</sup> With this present study a good correlation between the foot length and the height of an individual could be established.<sup>8</sup> Many studies have been conducted on the estimation of stature many methods are established in estimating stature from the bones but the one of the easiest and the reliable method is by regression analysis.<sup>9,10</sup> The present study was conducted to assess relationship between footprint length and stature.

We found that out of 86 patients, males were 50 and females were 36. Choudhary et al<sup>11</sup> carried out a study to know the relationship between footprint length and stature and to know if there is any difference in the stature estimated by right and left footprint lengths in both the sexes. Total of 200 students (100 males and 100 females) studying at our institute were included in the study. The length of the footprint and the height of each student are measured. A positive and significant correlation between the stature and right footprint length and left footprint length was observed in both the sexes. Regression equations for stature estimation were formulated using right and left footprint length separately in both the sexes. There is no statistically significant difference in the stature estimated by right and left footprint length in both the sexes.

We found that there was a significant positive correlation between right footprint length with stature ( $r=+0.84$ ) and left footprint length with stature ( $r=0.82$ ). The difference in correlation coefficient is statistically significant ( $p<0.05$ ). Kewal Krishnan et al<sup>12</sup> by estimation of stature from foot print and foot outline dimensions in Gujjars of North India suggests that the correlation of stature with foot length is extremely high suggesting a close relationship with them. Mansur et al<sup>13</sup> observed correlation of height with foot length amongst Kathmandu university school of sciences students.

We observed that there was a significant positive correlation between right and left footprint length with stature ( $r=+0.88$ ). The difference in correlation coefficient is statistically significant ( $p<0.05$ ). Natarajamoorthy Tharmas<sup>14</sup> conducted pilot study deals with developing a regression equation for stature estimation from foot length obtained from foot impressions as well as foot outline of 107 randomly selected Malay subjects using a simple linear regression statistical method. Agnihotri Arun Kumar et al<sup>15</sup> in his study included 125 male and 125 female students for estimation of stature by left foot length. General multiple linear regression model was highly significant and multiple correlation coefficient ( $r$ ) was 0.877.

The limitation the study is small sample size.

## CONCLUSION

Authors found that a significant correlation of stature with right and left foot print length has been observed.

## REFERENCES

1. Patel S. M., Shah, G. V., Patel S.V. Estimation of Height from Measurements of Foot Length in Gujarat Region. *J. Anat. Soc. India* 56 (1) 25-27 2007.
2. Jitender Kumar Jakhar, Vijay Pal, P.K. Paliwal. Estimation of Height from Measurements of Foot Length in Haryana Region. *J Indian Acad Forensic Med*, 32(3).

3. Qamra S, Jit I, Deodhar SD. A model for reconstruction of height from foot measurements in a adult population of Northwest India. *Indian Journal of Medical Research*.1980; 71: 77-83.
4. JaydipSen, TanujKanchan, ShilaGhosh. Sex Estimation from Foot Dimensions in an Indigenous Indian Population 2010:1556.
5. Abraham Philip. Formulae for estimating stature from foot size by regression method. *J Ind Acad For Med*, 1990; 12(2): 57-62.
6. Theodoros BG, Mihas. Correlation of foot length with height in school age children. *J Forensic and Legal Medicine*. 2008; 15(2):89-95.
7. Barnabas Danborno, Abraham Elukpo. Sexual dimorphism in hand and foot length, indices, stature-ratio and relation to height in Nigerians. *The Internet Journal of Forensic Science*, 2008, 3(1):08.
8. Raju M, Vijaynath V, Anitha. Walking bare foot: print shows stature of male individual. *JIAFM*, 2009, 31(4):22.
9. Vidya CS, Shamasundar NM, Manjunatha, Nithin MD. Study of footprints for sex determination in the South Indian population. *Journal of South India Medico legal Association*. 2009; 1(2):49-52.
10. DeopaDeepa. Estimation of stature from foot length in Uttarakhand region. *Indian Journal of Forensic Medicine and Toxicology*, 2010, 4(1):9.
11. Choudhary, Shiv Ranjan Kumar, Anil Shandil, Sanjeev Kumar, Mukesh Prasad. Footprint Length: A Legitimate Indicator for Estimation of Stature. *International Journal of Health and Clinical Research*, 2021;4(22):254-256.
12. KewalKrishan. Anthropometry inForensic Medicine and ForensicScience-'Forensic Anthropometry. *TheInternet Journal of Forensic Science™* ISSN: 1540-2622. 2007; vol 2: no. 1,42-46.
13. Mansur DI, Haque MK, Sharma K, Karki RK, Khanal K, Karna R. Estimation of Stature from Foot Length in Adult Nepalese Population and its Clinical Relevance. *Kathmandu Univ Med J* 2012;37(1):16-9.
14. NatarajamoorthyTharmas et al. A study on foot prints of Malaysian athletes and non-athletes on application of forensic comparison. *Malaysian Journal of Forensic Science*2011;2(1).
15. Agnihotri AK, Puwar B. Estimation of stature by foot length. *J Forens and Legal Med*. 2007; 14(5):279-283. 6.