# ESTIMATION OF STATURE AMONG TRIBAL FEMALES FROM THE MEASUREMENTS OF FOOT BREADTH IN UDAIPUR DISTRICT OF RAJASTHAN

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#### ABSTRACT

**Background:** Estimation of stature has a very significant role to play in forensic anthropometry for personal identification. Present study is undertaken to derive regression equations for estimation of stature from foot breadth.

Materials and Methods: Present study was carried out on 520 female subjects among the tribal population of Udaipur district. The stature and foot breadth were calculated and the data was analyzed statistically and the regression equations were derived.

**Result:** In females, the Foot Breadth was highly significant of right and left sides(p < 0.05). In females there was a near to mild correlation between foot breadth of right (0.109) and left (0.106) sides with the stature.

**Conclusion:** The present study revealed that there is a positive correlation exists between the stature and foot breadth. Linear regression equations were deduced in females out of which lowest standard error of estimate was experienced in combined foot breadth of females.

KEY WORDS: Stature, Foot breadth, Regression equations.

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### **INTRODUCTION**

Anthropometry is an important tool of physical anthropology for obtaining different measurements like stature on the living as well as dead (skeleton and skeletal remains) of man using scientific method. Estimation of stature has a very significant role to play in forensic anthropometry for personal identification. Even anatomists and anthropologists apart from forensic experts have shown keen interest in estimating the height of an individual by measuring different body parts like foot length, hand length. Important differences between various ethnic groups have been studied in detail by comparing relationship between segments of body and which has been shown to be related to life style and locomotion. Body segments prediction is of utility in many fields of modern science. The relationship among body segments and height is used in assessing growth in normal individuals as well as in people suffering from specific syndromes such as marfan's syndrome. In the events of accidents, murders or natural disasters, stature estimation of a person from the remains of skeleton or mutilated or amputated Charu Taneja, L. K. Jain. ESTIMATION OF STATURE AMONG TRIBAL FEMALES FROM THE MEASUREMENTS OF FOOT BREADTH IN UDAIPUR DISTRICT OF RAJASTHAN.

limbs has a very important role in personal identification. In the absence of complete evidence the relationship between specific dimensions of body and proportions are used to solve crimes. And it has been showed that stature can be estimated from a shoe left at the scene of a criminal offense. Likewise, victim's stature can be estimated when a body part, such as hand or a long bone, is all that corpse [1]. The biological profile of an individual is an inherent traits such as sex, age, ethnicity and stature can be determined with the help of anthropometry [2].Therefore this study was carried out to assess and correlate the foot breadth and the stature to predict the stature of an individual by foot breadth using regression analysis.

#### MATERIALS AND METHODS

The study design of the current study is Cross- sectional descriptive type. In the present study samples were collected from the tribal community in Udaipur district. The study was conducted on a total number of 520 tribals females including Bhil, Meena, Damors, Sahariyas, Gaduliya lohars, Garsias of the Udaipur region. Sliding vernier calipers was used for the measurements of feet. Staturemeter was used for vertical height measurement.

**Inclusion Criteria** Tribal females of age group 18-32 years, and who were born & brought up in the tribal community of the Udaipur region.

**Exclusion Criteria** Females having physical deformity, injury, disease, fracture, amputation or record of any surgical procedures affecting stature and feet were excluded from the study.

The data obtained was subjected to statistical analysis to derive the mean, standard deviation, correlation coefficient, regression coefficient. For testing the level of significance t test was applied. The following dimensions were measured based on the specific anatomical landmarks and the values were measured in millimeters.

**Stature:** It is the vertical distance between the highest point on vertex and the floor. The subject was made to stand barefoot on the foot place of the stature meter in an erect posture with the hands hanging down on the sides with the palm facing the thighs. Subject was asked to

maintain upright posture and the movable piece was kept on the vertex and the height was recorded in millimeter.

**Foot Breadth:** It is the distance from medial placed point on the head of first metatarsal to the most laterally placed point, located on the head of fifth metatarsal, when the foot was fully stretched.

Fig. 1: Showing Measurement of Foot Breadth.



Fig. 2: Showing Sliding Caliper.



 Table 1: Descriptive Statistics of Height & Weight Studied in Females.

COLUMN	SIZE	MEAN	STD DEV	STD. ERROR	RANGE	MAX.	MIN.	MEDIAN
HEIGHT	520	1563.7	84.802	3.719	348	1723	1375	1566
WEIGHT	520	49.074	6.73	0.295	35.11	71.34	36.23	48.485

Table 1 Shows the average stature of females was **1563.7 ± 84.802** mm and ranged between 1375 to 1723 mm.

Table 2: Descriptive Statistics of Right & Left Foot BreadthStudied in Females.

COLUMN	SIZE	MEAN	STD DEV	STD. ERROR	RANGE	MAX.	MIN.	MEDIAN
FEMALE RFB	520	82.356	8.607	0.377	42.82	99.15	56.33	83.155
FEMALE LFB	520	82.615	8.583	0.376	42.04	99.44	57.4	83.3

Table 2 shows Foot Breadth measured approximately 82 mm & ranged between approximately 56.33 to 99.44 mm in Females. Charu Taneja, L. K. Jain. ESTIMATION OF STATURE AMONG TRIBAL FEMALES FROM THE MEASUREMENTS OF FOOT BREADTH IN UDAIPUR DISTRICT OF RAJASTHAN.

**Graph 1** Shows the mean value of Right Foot Breadth and Left Foot Breadth of female was  $82.35 \pm 8.607$  and  $82.61 \pm 8.583$  respectively.



**Table 3:** Paired Samples t-Test & Pearson Correlation showing statistical difference between Right and Left Foot Breadth in Females.

Paired Samples	t	df	Sig.(2-tailed)	Pearson Correlation
Female Right Foot Breadth - Female Left Foot Breadth	6.659	519	0.000**	0.995**

\*\* Statistically Highly Significant at the Level (0.01 & 0.05)

To assess the statistical differences between the observations of right and left Foot Breadth in females, paired sample t test was performed and thus null hypothesis was rejected. Foot Breadth in females was highly significant of right and left sides. There was a high correlation between foot breadth of females as observed in Table -3 Table 4: Correlation between the Stature and Right & Left Foot Length studied in Females.

Parameters	Female Right Foot Length	Female Left Foot Length		
Pearson Correlation	0.037	0.039		
Sig.(2-tailed)	0.396	0.371		

To assess the statistical differences between the observations of right and left foot length in females, Pearson Correlation was performed. There was a low correlation between foot length of females of right and left sides with the stature as observed in Table-4.



HEIGHT = 1475.62+ 1.07 × RFB ± 84.382

Graph 2 Shows Regression Formula. Value of constant is 1475.62, Regression coefficient is 1.07 and standard error is 84.382.There was positive but near to moderate correlation between height and Right Foot Breadth in females.



HEIGHT = 1477.57+ 1.043×LFB ± 84.410

Graph 3 shows Regression Formula. Value of constant is 1477.57, Regression coefficient is 1.043 and standard error is 84.410.There was positive but near to moderate correlation between height and Left Foot Breadth in females

#### DISCUSSION

Krishan K and Sharma A in [3] studied correlation between height and Foot Breadth in Rajputs of Himachal on 60 Jat Sikhs and found correlation coefficient(r) as 0.324 in males where as in females it was 0.323,after that Singh S, Hussain M and Rizvi SJ [4] studied correlation between height and hand Foot Breadth in Volunteers of Aligarh and found correlation coefficient(r) as 0.31 in males where as in females it was 0.36.Coefficients was more positive in both the sexes combined as compared to those of male and female separately.

Foot breadth and stature correlated better in case of females as compared to that of males. Rani M et al [5] studied correlation between height and Foot Breadth in Students of Delhi and found correlation coefficient(r) as 0.345 for right foot and r for left side was 0.413 in males where as in females correlation was 0.345 for right side and 0.358 for left side in females.

The values of correlation coefficients between stature and foot dimensions observed were positive and statistically highly significant. Shende S, Tirpude B and More S [6] studied correlation between height and Foot Breadth in Charu Taneja, L. K. Jain. ESTIMATION OF STATURE AMONG TRIBAL FEMALES FROM THE MEASUREMENTS OF FOOT BREADTH IN UDAIPUR DISTRICT OF RAJASTHAN.

Students of Maharashtra and found correlation coefficient(r) as 0.44 for right foot and r for left side was 0.41 in males where as in females it was 0.29 for right side and 0.32 for left side in females. Foot breadth showed minimum correlation with stature in females.Singh JP et al. [7] studied correlation between height and foot breadth in female volunteers of New Delhi and found correlation coefficient(r) as 0.379.

Correlation coefficients of foot breadth were lower as compared to foot length measurements in females.DR R et al. [8] studied correlation between height and foot breadth in Medical students of Puducherry and found correlation coefficient(r) as 0.431 for right side in males and r for left side was 0.394 where as in females it was 0.464 for right side and 0.473 for left side in females. The correlation coefficients were higher in females than the males. In the present study I noted the correlation between height and foot breadth in female Tribals of Udaipur, for right side it was 0.109 and for left side it was 0.106 and for combined foot breadth r was 0.107. In the present study the stature shows a positive correlation with the foot breadth in females like the above studies. All the human beings on this earth belong to the same species i.e. Homo sapiens. They are not exactly alike in all their measurable traits; even genetically differ in so many respects. All traits tend to undergo change in many degrees from birth to death. In these traits changes in skeletal development depends on geographical regions.

The study is also in accordance with the fact that there are ethnic as well as racial variations in the dimensions of foot. Thus, emphasizing the need to have normal values and range for the dimensions of foot breadth of both the sides (right and left) for different population as well as supporting the statement "There are no mean values, t values, correlation values and regression equations that is linear and multiple regression of the foot that are valid for all population."

#### CONCLUSION

In the present study, following conclusions were derived these were: In the females for right and left foot breadth a positive and near to mild correlation was shown. In my study, in females linear regression equations were also studied,

## Conflicts of Interests: None REFERENCES

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