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Original Research Article

Estimation of Stature from Foot Print Length Among Students and Staff of a Tertiary Medical Institution Between Age Group of 21 to 30 Years.

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Article Info

Abstract

Identity means the determination of the individuality of a person. Identification of a person is one of the most important issues for a forensic expert in solving many medico-legal cases. The present studies was under taken to estimate the stature from foot print length and to evolve regression equation for the same in both the gender. 100 healthy subjects (50 males and 50 females) of age group 21-30 years, who are resident of north Karnataka, were included in the study. The foot print lengths of both the feet of the participants were taken. The readings were subjected to statistical evaluation and regression formulae were established for stature estimation from foot print lengths in males and females.

1. Introduction

Identification is the determination of the individuality of a person based on many characteristic features, viz name, age, sex, religion, race, anthropometry, Fingerprints, foot prints, DNA typing, congenital or acquired malformations, etc. Of these features sex, age and stature are considered as primary characteristics of identification, while others are secondary.[1]

Identification is more important medico-legally in both civil and criminal cases, i.e. civil cases like marriage, divorce, inheritance, paternity disputes, business contracts and criminal cases like assault, murder, sexual offences etc. It is more challenging to a forensic expert in situations of mass disasters like railway or aircraft accidents, bomb explosions, tsunami etc, where only the parts of the body especially the peripheries like hand and foot are available.[1]

In the present study an attempt has been made to derive regression formulae which will be used to calculate the stature from foot print length in both the sexes among the population of north Karnataka.

Aims and Objectives
1. To estimate the stature from percutaneous measurement of maximum foot length in both the feet among the study population.
2. To evolve regression equation for stature estimation from above dimensions in both the gender.
3. To assess the bisexual and bilateral difference form foot print length.

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2. Materials and Methods
Sources of data:

The study was carried out involving 100 subjects comprising of both students and staff of S. Nijalingappa Medical College of age group between 21–30 years. The subjects of this age group were selected as the maximum height of a person is attained after the age of puberty, to be more precise at the age 21 years.[2] The upper limit is taken as 30 years since growth regression starts thereafter.[3]

Sampling method: Simple random sampling.

Sample size: 100 healthy subjects (50 males and 50 females) involving students and staff of S. Nijalingappa Medical College and HSK hospital were included. Out of these 100-study population 10 from each age group from 21 - 30 years were considered having 5 males and 5 females in each subgroup randomly.

Method of collection of data:

General physical examination of the selected subjects was done to know their general health status and to rule out the above said deformities in the subjects. The aims and objectives of the intended study were explained to the subjects in their vernacular language and an informed consent is obtained. The details of the participants are entered in the proforma and the following parameters were recorded.

Recording of the height:

All the readings are taken at the same time of the day to minimize the diurnal variation. The height of each subject has been recorded by asking the subject to stand erect with barefoot on the base of the standard stadiometer in a Frankfurt plane. The subjects are asked to stand erect without support with the arms by the side of the body. The horizontal plate being attached to the vertical wooden scale of two meters' height and the reading is taken from the base of the stadiometer to the vertex of the head in centimeters to the nearest millimeter.

Foot print length:

The participants are asked to wash and dry their feet to remove the dirt. A plain glass plate of about 24 X 24 inches is selected and is uniformly smeared with a thin layer of black printer's ink using a roller. The subject is then made to place their right foot on the smeared glass plate. Asked the person to stand on one leg so that adequate weight of the body is transferred on to that leg and the footprint is transferred on A4 size white paper placed on an even hard surface. The same procedure is repeated for the left footprint. The length of the foot print is measured from pterion to acropodian of either the first or second toes whichever is longer. The reading is taken in centimeters corresponding to the nearest millimeter. The length of foot print readings is measured twice and by two different observers to minimize inter and intra observers' error.

The final readings are entered in master chart and subjected to statistical evaluation using SPSS (Statistical Programme for Social Sciences) software version17 and the results were analyzed. The above study was approved by the ethical committee of the college and the university.

3. Results

In the present study focus has been made on the estimation of stature from foot length and foot print lengths by forming regression equations. A total of 100 (50 males and 50 females) healthy individuals between age group of 21-30 years were considered. The foot prints of each individual were taken separately for both right and left foot. Linear regression equations were formed separately for each age group, gender and for total population.

Distribution of Participants by Stature:

It is evident that the stature in males is ranging from 156 –186 cms with the mean of 169.42 cms and standard deviation of 7.215 cms. Similarly, the stature in females is ranging from 143 – 174 cms with the mean of 159.28 cms and standard deviation of 6.449 cms. It is observed that males have greater mean value of stature as compared to females.

Distribution of Participants by Foot Print Length in Males:

In males, the right foot print length is ranges from 20.5 – 26.2 cms with the mean of 24.120 cms and standard deviation of 1.3583 cms. The left foot print length is ranged from 20.5 – 26.5 cms with the mean of 24.164 cms and standard deviation of 1.3286 cms. It is observed that the mean value of foot print length is more on left side as compared to right; however, the difference is too small and is statistically insignificant. (p = 0.443)

Foot Print Length in Females:

In females, the right foot print length is ranged from 20.5 – 24.7 cms with the mean of 22.482 cms and standard deviation of 1.0022 cms. The left foot print length is ranged from 20.1 – 25.0

cms with a mean of 22.558 cms and standard deviation of1.0258 cms. It is observed that the mean value of foot print length is more on left side when compared with right; however, the difference between two is statistically insignificant. (p = 0.68)

Estimation of Stature by Using Foot Print Length in Males:

Table no. 01: The linear regression equations were derived for males for stature estimation from right and left foot print length.

Side	Regression equation	SE	r	r^2
Right	S = 84.51+3.52XRFPL	5.45	0.66	0.43
Left	S = 72.11+4.02XLFPL	4.89	0.74	0.55

SE- Standard error, **r**- Coefficient correlation, **r^2**: Predictive value.

As per **table no 01,** In males, foot print length shows high positive correlation value of coefficient(r) which suggest a direct correlation between stature and foot print length. The equation derived for total males can be used within the predictive range (r^2) of 0.43 for right and 0.55 for left foot print lengths. However, the independent linear regression equations of relevant age group can be used for better results if the age of the person is known.

Estimation of Stature by Using Foot Print Length in Females

Table no 02: Linear regression equations were derived for total females for estimation of stature from right and left foot print lengths.

Side	Regression equation	SE	r	r^2
Right	S = 64.89+4.19XRFPL	4.93	0.65	0.42
Left	S = 67.08+4.08XLFPL	4.95	0.65	0.42

SE- Standard error, **r**- Coefficient correlation, **r^2**: Predictive value.

As per **table no 02**, In females, foot print length shows high positive correlation coefficient (r) which suggests a direct relation between stature and foot print length. The equation derived for total females can be used within the predictive range (r^2) of value 0.42 for both right and left foot print lengths. However, if the age of the person is known, then better result can be obtained by using the independent linear regression equations.

4. Discussion

Stature:

In our study, stature in males as shown in table 4 is ranging from 156 − 186cms with the

mean of 169.42 + 7.215cms. Similarly, stature in females is ranging from143 − 174 cms with the mean of 159.28 + 6.449cms. It is observed that males have taller stature as compared to females. The fact that males are constitutionally taller than females as the age of puberty being 2-3 years later in them as compared to females gives the additional time for growth. This explains that formula for one sex cannot be applied for other sex. It is evident that, our study is in correlation with all the studies.

Foot Print Length

Foot Print Length in Males:

In the present study, the right foot print length is ranging from 20.5 − 26.2 cms with a mean of 24.120 + 1.3583cms and the left footprint length is ranging from 20.5 − 26.5 cms with a mean of 24.164 + 1.3286cms. It is observed that the foot print length is more on left side when compared to right in 54%cases, left smaller than right in 32% of cases and both equal in 14% of. However, the cumulative mean of foot print length of both sides did not show a statistical difference. (p = 0.443)

Foot Print Length in Females

In females, the right foot print length is ranging from 20.5 − 24.7 cms with the mean of 22.482 + 1.0022 cms. The left foot print length is ranging from 20.1 − 25.0 cms with the mean of 22.558 + 1.0258 cms. It is observed that the foot print length is more on left side when compared to right in 48% cases, left smaller than right in 34% of cases and both equal in 18% of cases as in table 12. However, the cumulative mean of foot print length of both sides did not show a statistical difference. (p = 0.68)

Linear Regression Equations from Foot Print Length for Stature Estimation in Males:

In our study to predict stature from right foot print length among males the formula derived is S = 84.51 + 3.52 X RFPL with R2 value of 0.43 and for left footprint length is S = 72.11 +4.02 X LFPL with R2 value of 0.55 our study is in consistent with study done by other researchers Kewal K (2008)[4] and Raju GM et al (2009)[5]

Linear Regression Equations from Foot Print Length for stature Estimation in Females:

In our study to predict stature from right foot print length among males the formula derived is S =

64.89 + 4.19 X RFPL and for left foot print length is S = 67.08+ 4.08 X LFPL with R2 value of 0.42 for both. (Table 16) However, only one study was found which had done stature estimation by footprint length in females i.e., Vidya CS et al (2011) [6] reporting a R^2 value of 0.70 for both the foot print lengths and is not in correlation with our study. Many factors like race, nutrition, geographical distribution and others play an important role in human growth and development. This may have resulted in differentR2 values for foot length and foot print lengths among different observers.

5. Conclusion

Males have greater mean value for stature as compared to females. Left side foot print lengths are more as compared to right foot print length; however, the difference is marginal and statistically insignificant. (Males, p =0.443 & females' p = 0.68). It is found that there is direct relationship between stature and foot print lengths in both the gender. In males, regression equation for right foot print length is, S = 84.51 + 3.52 XRFPL with R2 value of 0.44 and that for left foot print length is, S = 72.11+4.02 X LFPL with R2 value of 0.55. In females, Regression equation for right foot print length is, S = 64.89 + 4.19X RFPL and for left foot print length is, S = 67.08 + 4.08 X LFPL with R2value of 0.42 for both. In case of males R2 value on left foot length is more than R2 value on right foot length, while in case of females R2 value is found to be equal for both the sides.

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