

## Study of Correlation between Human Height and Foot Length in North-East Karnataka Population (Gulbarga and Bidar)

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### Abstract

Even though the forensic value of correlation coefficient between foot length and height has been studied, there is lack of studies regarding this subject. Interrelations among different body measurements may be used to estimate one from another in case of missing body parts. The present study was carried out to establish correlation between individual's height and mean foot length. It was conducted on students of age group 14 to 24 years. *Aim:* To analyze the correlation between foot length and height in population of North-East Karnataka region. *Methods:* In the present study, 150 subjects were divided into two groups according to age and each subject was assessed. *Results:* Average of mean foot length in male and females

- a. In Age group 14 to 18 years is 25.51 cm and 23.2 cm respectively
- b. In Age group 19 to 24 years is 25.63 cm and 23.4 cm respectively

Correlation coefficient between height length and foot length also shows significant association for the age group of 14 to 24 years and sex.

**Keywords:** Height; Foot Length; Age.

### Introduction

Growth – the vital process is measured by measuring the height of a person, which itself is a sum of the length of certain bones and appendages of the body which represent certain relationship with form of proportions to the total stature. This relationship is very useful anthropologically to find racial differences and medico-legally, when only parts of the deceased body are available. Hence it can be of great anthropological and forensic value and indeed would help many of the Anthropological and Forensic experts.

Height depends on many factors and of those, few factors like genetics, gender, geographical, eating habits and socioeconomic factors are most important

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and worth to mention. Estimation of height from foot length has been attempted by several people with variable degree of success. The present study is done in the population of North Karnataka region to find the correlation between height and foot length.

Rutishauer, for the first time showed in children that the reliability of prediction of height from simple measurements like foot length was as high as long bones [1].

Ashizawa studied the correlation between foot length and body size [2].

Musgrave and Harneja calculated height from various metacarpals amongst British adults and found significant degrees of association in both sexes (Male  $r = 0.58$  to  $0.67$  and female  $r = 0.49$  to  $0.71$ ) [3].

Patel S.M. found mean height was 170.96 cm in males and 156.14 cm in females in age group of 17 to 24 years [4].

Qamra et al., derived regression equation between foot length and height in North-West India population, there correlation coefficient between foot length and height was  $+0.69$  in male and  $+0.70$  in female [5].

## Materials and Methods

The measurements of 150 individuals residing in North-East Karnataka (Gulbarga and Bidar) were studied in Department of Anatomy, Bidar Institute of Medical Sciences (BRIMS), Bidar. The subjects were divided as per their age and sex.

Group-1 included subjects of age group 14 to 18 years in which there were 40 males and 40 females.

Group-2 included subjects of age group 19 to 24 years in which there were 35 males and 35 females.

All the subjects were examined as under;

### Height

Height was measured by Stadiometer. The subjects were made to stand against the wall and height was measured. The measurements were taken by the same person and at a fixed time to avoid personal error and eliminate diurnal variation in methodology.

### Foot Length

Nails were trimmed and measurement of foot length were taken on a paper in standing position. Outline of the foot was marked by proximal and distal point and measurements were taken between two points.

- \* Proximal Point – point of maximum curvature on the outline heel
- \* Distal Point – point of maximum curvature on the outline great toe

### Measurement of Foot

The subjects were explained about the procedure, long sized paper was spread on a bench. Subjects were made to stand on the paper in erect but relax position. Proximal point was marked for the heel with sharp tip of the pencil holding at right angle to the heel. Distal point was marked for the great toe only



Fig. 1:

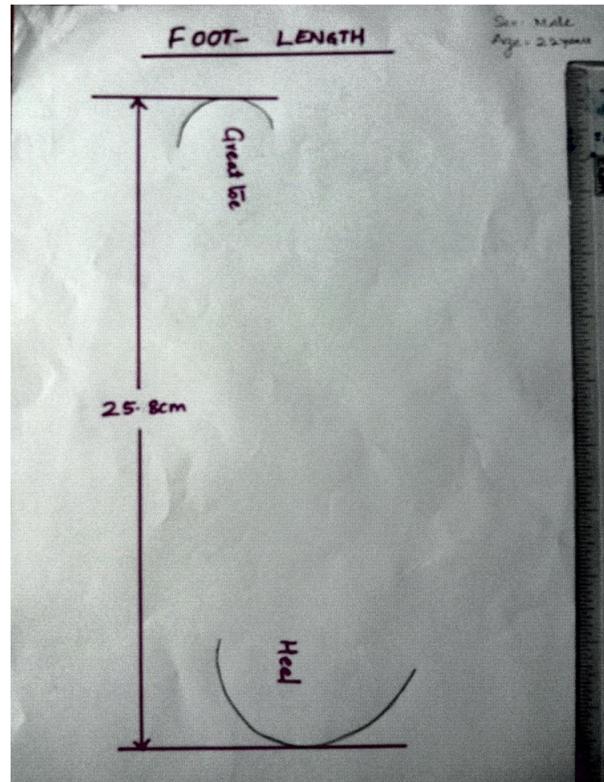


Fig. 2:

holding pencil at right angle to the great toe. Mid point of the curve was taken as distal point. Distance between two points was measured with a ruler and same procedure was followed in all subjects. When analysed statistically, difference between two groups was considered to be significant when  $P < 0.005$ .

## Result and Discussion

The present study shows that mean height in age group of 14 to 18 years in male was 163.95 cm and in females was 150.6 cm. Mean height of age group 19 to 24 years in male was 168.74 cm and in females was 152.7 cm.

In the study done by Patel S. M. it was found that the mean height was 170.96 cm in male and 156.14 cm in females of age group 17 to 22 years. Our study reveals that the mean length of foot in age group 14 to 18 years in male was 25.51 cm and in female was 23.20 cm. Mean length of foot in age group of 19 to 24 years in male was 25.63 and in females was 23.4 cm. Patel S. M. found that the mean foot length was 22.44 cm in males and 22.34 cm in females in age group of 17 to 22 years.

The correlation coefficient between height and length of foot also shows significant association for all age groups and sex in my study.

Jitendra P. Patel et al., found regression equation for male and female as under;

*Age Group 14 to 19 years:*

Height = 77.03 + (3.582) FL for males

Height = 55.35 + (4.59) FL for females

*Age Group 20 to 25 years:*

Height = 79.14 + (3.504) FL for males

Height = 33.18 + (5.480) FL for females

**Table 1:** height v/s rfl and lfl of girls

| Age groups (In years) | No.of girls (n) | Actual Ht. Mean±SD | RFL Mean±SD | LFL Mean±SD | Correlation value (r)     | Reg. coefficient b-value | Reg.equation                                    |
|-----------------------|-----------------|--------------------|-------------|-------------|---------------------------|--------------------------|---|
| 14-18                 | 40              | 150.6±6.02         | 23.15±1.21  | 23.26±1.27  | +0.69<br>+0.714<br>+0.99  | 3.43                     | Height = 71.3 +3.43RFL                          |
| 19-24                 | 35              | 152.77±5.45        | 23.6±1.14   | 23.1±1.143  | +0.368<br>+0.71<br>+0.989 | 1.75                     | Height = 72.3 +3.37LFL<br>Height = 113 +1.75RFL |
|                       |                 |                    |             |             |                           | 1.58                     | Height = 116 +1.58LFL                           |

RFL = Right Foot Length, LFL = Left Foot Length, Ht = Height

**Table 2:** Height v/s rfl and lfl of boys

| No.of boys (n) | Actual Ht. Mean±SD | RFL Mean±SD | LFL Mean±SD | Correlation value (r)     | Reg. coefficient b-value | Reg.equation                                   |
|----------------|--------------------|-------------|-------------|---------------------------|--------------------------|--|
| 40             | 163.95±7.547       | 25.38±1.47  | 25.64±1.61  | +0.583<br>+0.547<br>+0.89 | 2.99                     | Height = 88.1 +2.99RFL                         |
| 35             | 168.74±7.45        | 25.56±1.09  | 25.70±1.14  | +0.75<br>+0.729<br>+0.989 | 5.12                     | Height = 98.4 +2.56LFL<br>Height = 38 +5.12RFL |
|                |                    |             |             |                           | 4.76                     | Height = 46.5 +4.76LFL                         |

RFL = Right Foot Length, LFL = Left Foot Length, Ht = Height

**Conclusion**

The data obtained was tabulated and analyzed statistically to derive the regression equation as under

**In Age Group 14 to 18 years in male:**

Height = 88.1 + 2.99 RFL

Height = 98.4 + 2.56 LFL

**In Age Group 14 to 18 years in female:**

Height = 71.3 + 3.43 RFL

Height = 72.3 + 3.37 LFL

**In Age Group 19 to 24 years in male:**

Height = 38 + 5.12 RFL

Height = 46.5 + 4.76 LFL

**In Age Group 19 to 24 years in female:**

Height = 113 + 1.75 RFL

Height = 116 + 1.58 LFL

Thus the formula derived can be used for the population residing in our area. It can be of great forensic and anthropological value for the people of North-east Karnataka region.

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