

Original Research Article

To derive a regression formula between hand length and height of an individual.

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Abstract:

Background & Method: The aim of this study is to derive a regression formula between hand length and height of an individual. Bertillon system is based on the principle that after the age of 21 years, the dimensions of the skeleton remain unchanged and also that the ratio in size of different parts to one another varies considerably in different individuals.

Result: The reliability of estimation of stature from foot length was determined with the help of Standard Error of Estimation (SEE). The SEE predicts the deviations of estimated stature from the actual stature.

Estimation of height from foot length of female subjects exhibits lower values of Standard Error of Estimation than from foot length of male subjects. It means the reliability of stature from foot length of female subjects is more than male subjects.

Conclusion: These types of studies are of medico legal importance, as the first step in forensic analysis in establishing the identity of the person in question, where stature is one of the primary characteristics of identification. These studies are also of anthropological importance as it helps to know the differences between different population groups.

Keywords: regression, hand, length and height.

Study Designed: Observational Study.

1. Introduction

Personal identification is the determination of individuality of a person. The exact fixation of personality of an individual can be done on the basis of certain physical characteristics. Identification may be complete (absolute) or incomplete (partial). Complete identification means absolute fixation of individuality of a person[1]. Partial identification implies ascertainment of only some facts about the identity of the person while others still remains unknown. Age, sex and stature are the primary characteristics of identification[2]. Identification is necessary in living persons, recently dead persons, decomposed bodies, mutilated bodies and skeleton. It is necessary in both criminal and civil cases[3].

Physical anthropology has an early beginning in India. The credit of making systematic study of the racial elements in Indian populations goes to Guha BS, who collected the anthropometric data on scientific basis and also helped in establishing the study of Physical

anthropology in general in India. In 1946, he succeeded in establishing the Anthropological Survey of India and built laboratories for anthropometry and other branches of Physical anthropology[4].

In the meantime a number of Indian anthropologists returned to India after getting training abroad especially, in Germany[5]. They did anthropological studies in different parts of the country. They also produced a number of students who have distinguished themselves in various branches[6].

2. Material & Method

The study population comprised of 30 male and 30 female subjects. The study population was divided into three sub-groups. Each subgroup having 20 subjects included both sexes. The subjects were within the age group of 21 to 30 years. As stature attains its maximum at around 21 years of age and senility related changes of stature starts appearing after 30 years.

Bertillon system is based on the principle that after the age of 21 years, the dimensions of the skeleton remain unchanged and also that the ratio in size of different parts to one another varies considerably in different individuals. As such, this is applicable only to adults.

In the study population, the subjects included are irrespective of caste, religion, dietary habits and socioeconomic status. The subjects born only in north India were included.

INCLUSION CRITERION

1. The age of study population was within the range of 21-30 years.
2. In the study population only healthy individual was considered.
3. Subjects born in North India were studied.

EXCLUSION CRITERION

1. The age of study population below 21 years and above 30 years.
2. An individual having congenital skeletal deformity.
3. An individual having skeletal deformity due to trauma and orthopedic surgeries.

The measurement taking includes height in centimeters, foot length and hand length in centimeters to the nearest millimeters. The procedure, aims and objectives of the study was explained to each subject. A written consent was taken from each subject.

3. Results

Table no. 1: Regression equation for prediction of stature by RFL, LFL, RHL and LHL for both sexes in all age groups.

Variables	Sex	Regression equation	SEE	t-test	P value
RFL	Male	78.131+3.487 RFL	3.9517	6.709	<0.001**
	Female	74.596+3.538 RFL	3.3309	6.411	<0.001**
LFL	Male	78.110+3.472 LFL	3.9925	6.569	<0.001**
	Female	86.974+3.020 LFL	3.4830	7.934	<0.001**
RHL	Male	82.082+4.575 RHL	4.0567	6.991	<0.001**
	Female	68.842+5.146 RHL	2.9632	6.905	<0.001**
LHL	Male	76.342+4.877 LHL	3.8737	6.681	<0.001**
	Female	66.621+5.270 LHL	2.8636	6.904	<0.001**

Table no. 2: Regression equation for prediction of stature from average FL & HL for both sexes in all age groups.

Variables	Sex	Regression equation	SEE	t-test	P value
FL	Male	76.586+3.539 FL	3.9381	6.509	<0.001**
	Female	78.642+3.369 FL	3.3663	6.941	<0.001**
HL	Male	75.847+4.906 HL	3.8906	6.547	<0.001**
	Female	65.612+5.329 HL	2.8632	6.728	<0.001**

The reliability of estimation of stature from foot length was determined with the help of Standard Error of Estimation (SEE). The SEE predicts the deviations of estimated stature from the actual stature.

Estimation of height from foot length of female subjects exhibits lower values of Standard Error of Estimation than from foot length of male subjects. It means the reliability of stature from foot length of female subjects is more than male subjects.

Sexual differences in the studied parameters were assessed with the help of “t” test. Higher values of “t” test shows the more reliable index for estimation of height.

Table no. 3: Regression equation for prediction of stature from average FL & HL for whole study population.

Variables	Regression equation	SEE	R	t-test	P value
FL	64.329+3.994 FL	3.7194	0.831	10.535	<0.001**
HL	55.713+5.940 HL	3.5462	0.848	8.982	<0.001**

In males -Stature= 76.586+3.539× foot length and Stature=75.847+4.906× hand length.

In females-Stature=78.642+3.369× foot length and Stature=65.612+5.329× hand length.

When sex is unknown

Stature=64.329+3.994× foot length and Stature=55.713+5.94 hand length. The study thus has forensic and anthropological applications.

4. Discussion

The correlation coefficient (r) for correlation between foot length and stature in females of different study groups ranged from 0.467- 0.708 which indicates moderate to very large correlation.

In the present study the correlation between foot length and stature in females (0.681) suggests large correlation. The coefficient of determination (R^2) was lowest in Gujjars which was 0.252 and the highest was seen in Northwest Indians which was 0.50, suggesting that 25.2% and 50% of the variation in stature can be explained by foot length for Gujjars and Northwest Indians respectively. In present study the value of R^2 implies that 46.4% of the variation in stature can be attributed to foot length in females[7].

The regression equation has a constant and a multiplication factor. The foot length is multiplied with the multiplication factor and the added to the constant to get the stature[7]. In the present study the regression equation for females the constant is 78.64 and the multiplication factor is 3.369 which means for every 1 cm increase in foot length the stature increases by 3.369 cm[9].

5. Conclusion

The anthropometric measurements differ in different sex and ethnic groups which are determined by genetic and environmental factors suggesting the need for different normograms for each endogamous group.

These types of studies are of medico legal importance, as the first step in forensic analysis in establishing the identity of the person in question, where stature is one of the primary characteristics of identification. These studies are also of anthropological importance as it helps to know the differences between different population groups.

6. References

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