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Hand, foot and its relationship to stature of adult population: An anthropological study

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Abstract

Aims & Objectives: To assess the hand length, foot length and stature of the individual. To correlate the hand length, foot length and the stature. To predict the stature of an individual by hand length, foot length using regression analysis.

Concussion: The present study has shown the usefulness of hand length & foot length measurement in the estimation of stature amongst medical students age b/w 17-27 years belonging to Different regions of Rajasthan.

Keywords: Anthropometry, Vertex, radial & ulnar tuberosity, Frankfurt's plane

1. Introduction

Anthropometry is a systematized measuring tool that expresses dimension of the human body and skeleton. Height estimation by measurement of various long bones has been attempted by several workers with variable degree of success. Each worker has derived his own formula for calculating the stature from long bones. However, foot measurement has not frequently been used for this.

2. Aims and Objectives

- To assess the hand length, foot length and stature of the individual.
- To correlate the hand length, foot length and the stature.
- To predict the stature of an individual by hand length, foot length using regression analysis.
- To review the findings of study in height of available literature.
- Recommendation if any.

3. Materials and Methods

200 objects (100 males and 100 females) in the age group of 17-21 years. The study was conducted on the medical students of Jhalawar Medical College, Jhalawar (Rajasthan).

Data Collected

- Stature: (Standing height of an individual's).
- Hand length (B/w midpoint interstyloid line to tip of middle finger)

Methodology: By Regression Equation

Apparatus used in this study

1. Stature Meter.
2. Spreading Caliper (Blunt Ended)
3. Vernier Calliper

4. Inclusion Criteria

- Similar socio-economic status.
- Age group of students ranged from 17 to 27 years
- Measurements were taken at fixed time b/w 2 to 5 p.m. to eliminate the discrepancies due to diurnal variation.

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5. Exclusion

- Age above 27 and below 17 year excluded
- Time other than b/w 2 to 5 p.m. excluded

Measurement of Stature



Fig 1: Stature is measures of vertical distance from vertex to floor

Vertex: It is the highest point on the head in mid saggital plane, when the head is held erectly or in Frankfurt’s plane. Height was measured from vertex to floor by stadiometer (wall fixing type) with subject standing barefooted, erect on an even floor, in the Frankfurt’s plane.

Subject’s head was positioned parallel to the floor with heels together and weight evenly distributed between both feet. The distance was measured from the highest point on the subject’s head to ground with the head piece of contacting the scalp.

Frankfurt’s Plane: The plane determined by the lowest points on the infra orbital margins and the tragion (the notch immediately above the tragus of the ear). This corresponds

almost exactly to the plane of visual axis, which is obtained when the individual is looking straight ahead of him.

Measurement of hand and foot length

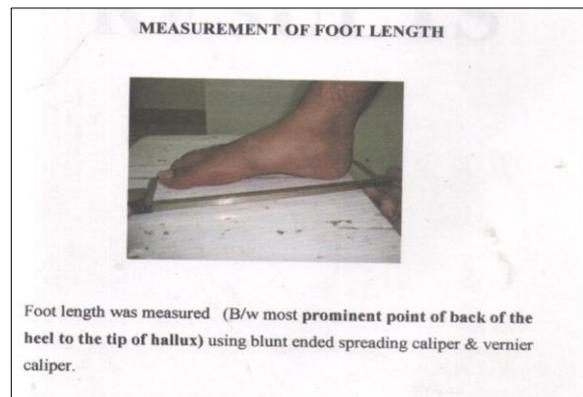
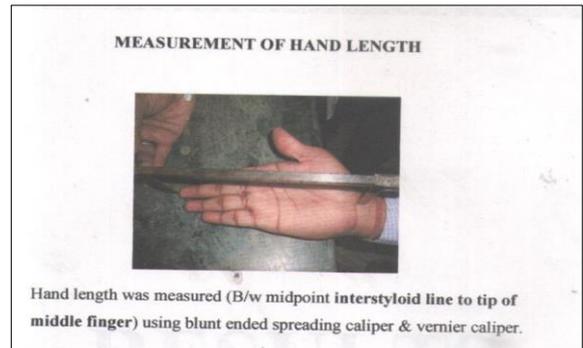


Fig 2

6. Results

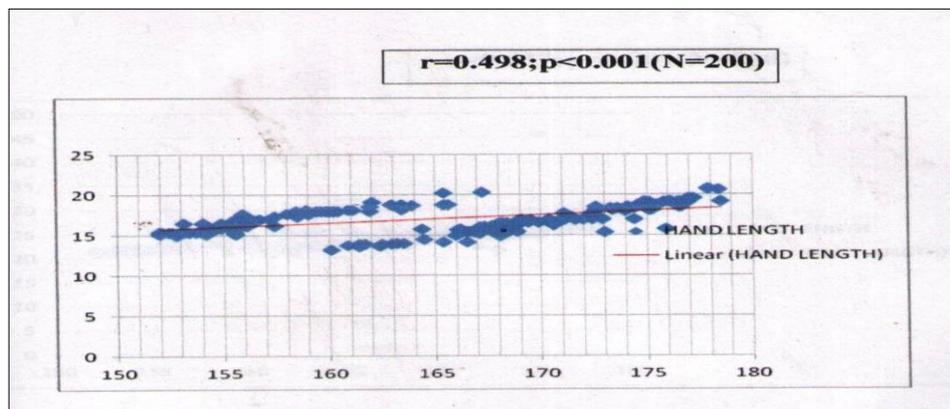
Person correlation of hand length, foot length and body height.

Table 1: Person correlation of body height (cm)

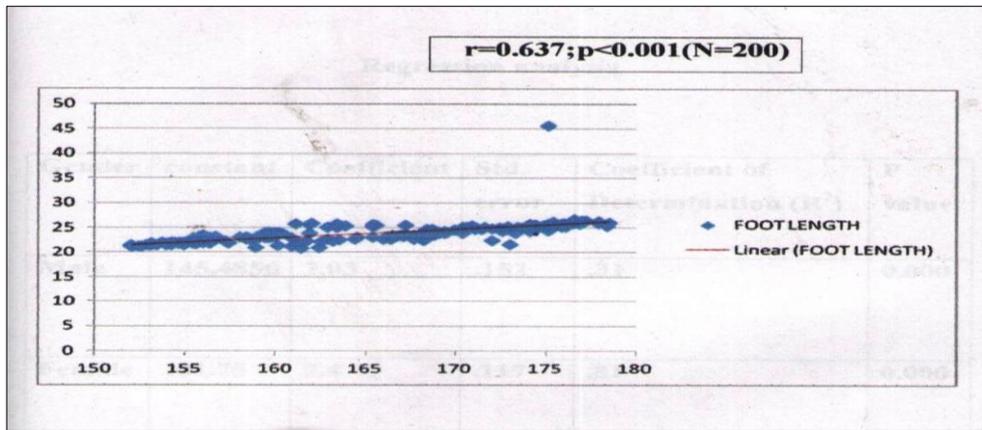
	Male (n=100)	Female (n=100)	P value	All cases
Hand Length (cm)	.941	.946	0.000	.498
Foot Length (cm)	.5642	.9023	0.000	.637

The Correlations of hand length and height in cm was observed to be statistically significant with respective to gender. When both male and female are observed together (n=200), the degree of relationship between body height and hand length is significant.

The Correlations of food length and height in cm was observed to statistically significant with respective to gender. When both male and female are observed together (n=200), the degree of relationship between body height and foot length is significant.



Graph 1: Pearson correlation between hand length and body height



Graph 2: Pearson correlation between foot length and body height

Regression analysis for prediction of total height with covariate foot length with respective gender.

Table 2: Regression Analysis

Gender	Constant	Coefficient	Std. error	Coefficient of Determination (R ²)	P value
Male	145.4856	1.03	.152	.31	0.000
Female	101.75	2.4	.117	.81	0.000

Regression analysis for prediction of total height with covariate Hand length with respective gender.

Table 3: Regression Analysis

Gender	Constant	Coefficient	Std. error	Coefficient of Determination (R ²)	P value
Male	129.71	2.41	.0874	.88	0.000
Female	110.57	2.75	.095	.89	0.000

Correlation Coefficient and Regression analysis for all cases. prediction of total height for Hand length and foot length in

Table 4

	All cases	
	Coefficient of Correction (r)	Coefficient of Determination (R ²)
Hand Length (cm)	.498	.24
Foot Length (cm)	.637	.40

The regression analysis was carried out to find the strength of relationship of hand length with body height. The relationship between hand length and body length is positive and for every unit increase in hand length there is significant (2.41 in male & 2.75 in female) increase in body height.

The regression analysis was carried out to find the strength of relationship of foot length with body height. The relationship between foot length with body height. The relationship between foot length and body height is positive and for every unit increase in hand length there is significant (1.03 in male & 2.41 in female) increase in body height. Correlation Coefficient and Regression analysis for prediction of total height for Hand length and foot length in all cases.

The regression analysis was carried out to find the strength of relationship of hand length with body height. The relationship between hand length and body length is positive and for every unit increase in hand length there is significant

(2.41 in male & 2.75 in female) increase in body height.

7. Discussion

Chikhalkar b.g. Derived a regression equation b/w hand length & height, their correlation coefficient b/w hand length & height was +0.5902. Aged b/w 19-23 year with 300 subjects where hand length measurements were taken from mid-point below radial & ulnar tuberosity to tip of middle finger.

The study comprised of 150 subjects studying in various colleges of Delhi B/w 18-22 year of age. Their correlation coefficient b/w hand length & height was +0.7.

Isurani hayperuma was conducted on 258 medical students Galle, Sri Lanka. The age of subjects ranged from 20-23 years, hand length was measured b/w distal wrist crease & distal end of most anterior projecting point, i.e. tip of middle finger. Their correlation coefficient b/w hand length & height was +0.58 in male, & +0.59 in Female.

Table 5: Comparison of similar previous studies with present study.

Workers	Chikhalkar b.g.	Isurani Hayperuma	Present Study
Age of the study Group in years	19-23 years	20-23 years	17-25 years
Mean hand length (cm)	18.938	19.01 (Male) 17.62 (Female)	16.95 (Male) 16.97 (Female)
Mean Total Height (cm)	167.265	170.14 (Male) 157.55 (Female)	170.69 (Male) 157.25 (Female)
Correlation Coefficient	+0.5902	+0.58 (Male) +0.59 (Female)	+0.947 (Male) +0.946 (Female) +0.498(combined)

Chikhalkar b.g. Derived a regression equation b/w foot length & height. Their correlation coefficient b/w foot length & height was +0.6102. Aged b/w 19-23 year with 300 subjects where foot length measurements were taken from tip of toe to heel on the medical side.

Patel S.M. Shah was conducted on 502 medical students

Galle, Shri Lanka. The age of subjects ranged from 17-22 years, foot length was measured as a direct distance from most prominent point of back of heel to tip of hallux or to the tip of second toe.

Their correlation coefficient b/w foot length & height was +0.65 in male & +0.80 in female.

Table 6: Comparison of similar previous studies with present study.

Workers	Chikhalkar b.g.	Patel S.M.	Present Study
Age of the study Group in years	19-23 years	20-23 years	17-25 years
Mean hand length (cm)	24.008	24.44 (Male) 22.34 (Female)	24.41 (Male) 22.77 (Female)
Mean Total Height (cm)	167.265	170.96 (Male) 156.14 (Female)	170.692 (Male) 157.25 (Female)
Correlation Coefficient	+0.6102	+0.65 (Male) +0.80 (Female)	+0.564 (Male) +0.902 (Female) +0.637(combined)

8. Conclusion

With respect to age, sex and racial groups, dimensions and body proportions are widely variable. The present study has shown the usefulness of hand length & foot length measurement in the estimation of stature amongst medical students age b/w 17-27 years belonging to Different regions of Rajasthan. Regression formulae for stature estimation from hand length, & foot length measurement were derived in both males and females.

Correlation coefficient of

Hand length & height +0.947 in males and +0.946 in females

Foot length & height +0.564 in males and +0.902 in females If either of the measurement (hand length, & foot length or total height) is known, the other can be calculated. This fact will be of practical use in medico legal investigations and in anthropometry.

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