ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

Original Research Article

ESTIMATION OF STATUTE FROM HAND LENGTH & HAND BREADTH

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Abstract

Introduction: The human hand have been extensively used in research to estimate stature of individuals for identification. Stature is one of the important parameter for identification. Stature estimation is based on a principle that every body part has some constant relationship with height of an individual. The study was done to estimate stature from the hand length and hand breadth. **Study design**: descriptive cross sectional study. **Place of Study:** the study was carried out in Department of Anatomy, Index Medical College, Hospital & Research Centre, Indore. And in Katuri medical college & hospital, Guntur

Material: 510 adult Indian population was collected including both male and females aged between 21 to 60 years from Department of Anatomy, Index Medical College, Hospital & Research Centre, Indore. & Katuri medical college & hospital, Guntur. **Method:** The hands were placed on a scanner connected to a computer through Photoshop software and scanned both hands separately. The image of the hand were saved along with the ruler in the software. Measurements of the hand were done on the scanned pictures after calibrating the scale of the software. Measurement of stature using standiometer

Result: A significant correlation was observed between stature and hand length and hand width. The findings of present study indicate that hand diameters can be used successfully to predict the statute of an individual

Key Words: Stature, anthropometry, hand length and hand width

1. INTRODUCTION

Stature is one of the important parameter for identification. Stature estimation is based on a principle that every body part has some constant relationship with height of an individual [1]. There is an established relationship between stature and various body parts like head, trunk, upper and lower extremities. Estimation of stature of an individual from the skeletal material or from the mutilated or from amputated limbs or from the parts of the limbs

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has obvious significance in the personal identification in the events of murders, accidents or natural calamities [2].

These parameters have been correlated with each other for forensic purposes like determination of the size of an individual from human remains [3]. Sizes of different parts of the hand and its skeleton have been of help in tracing human remains. Some workers have correlated the height of the individual with the size of the hand in small fraction of the population [4-8].

The available literature is inadequate to infer any correlation between the height, and the hand. The degree of access to nutrition and health services may have an effect on the stature of the different ethnic groups around the world, since genetic is a factor in human development [9-12]. Many of them have correlated the dimensions of hand with the stature. This study is designed to measure the hand in adult groups and correlating it with the height of the individual.

Present study was aimed to derive regression formula and multiplication factor to determine stature from Hand dimensions. This study is an effort to improve the Morphometric data in Indian population.

STUDY DESIGN

The present study will be conducted as a cross sectional community based study done over a period of time. All the data needed will be collected in a single visit. The data collected will be analyzed later.

MATERIALS

The study was conducted in Department of Anatomy, Index Medical College, Hospital & Research Centre, Indore & Katuri Medical College & Hospital, Guntur.

SAMPLE: The study was conducted on 510 adult individuals including both male and females aged between 21 to 60 years. All males and females with no history of fracture or malformation were included. Only Indian population was taken. Subjects with history of fracture, Bony deformities & Anomalies that affects hand dimensions or stature were excluded.

2. METHODOLOGY

Stature: It is measured as the vertical distance from the vertex to the floor, where the vertex is the highest point on the head when the head is held in the Frankfurt Horizontal plane. The subject was made to stand barefoot in an erect posture against the wall with both feet kept close together and hands hanging down on the slides. The movable rod of the stadiometer was brought in contact with vertex.

Hand Measurements: The hands were placed on a scanner connected to a computer through Photoshop software and scanned both hands separately. The image of the hand were saved along with the ruler in the software. Measurements of the hand were done on the scanned pictures after calibrating the scale of the software (Image.2 calibration of the scale of the scanner).

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Image.1a

Image.1b

Image.2

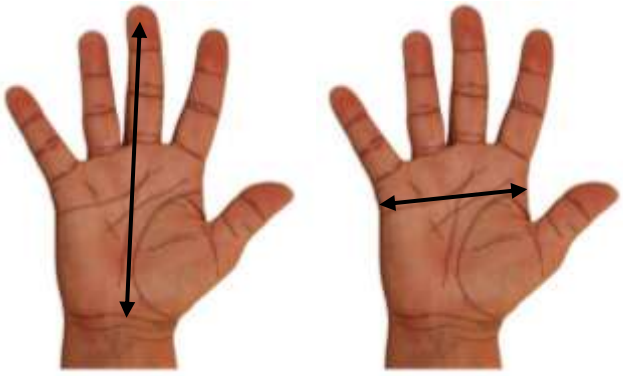

Image.3 & Image. 4

Length of the hand: will be measured from the distal wrist crease to the tip of middle finger
Width of the hand: will be measured from the medial point on the head of fifth metacarpal bone to lateral point of second metacarpal bone
Before proceeding with this methodology we cross checked it with other standard methods.

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The data was collected, tabulated, analysed and subjected to statistical analysis using statistical Package for social Sciences (SPSS) to know the correlation of the stature with hand length and hand width. The reliability of estimation was determined with the help of P value & regression equations individually.

3. Results:

The present study was focus on estimation of stature from hand length and hand breadth of both hands in males and female.

Table.1 Showing Statistical evaluation of Stature with hand length and hand breadth of the present study in male and female separately

	FEMALE					MALE				
	HEIGHT	**LTHL**	**LTHW**	**RTHL**	**RTHW**	**HEIGHT**	**LTHL**	**LTHW**	**RTHL**	**RTHW**
MEAN	159.2	17.3	7.7	17.3	7.7	173.1	19.1	8.8	19.1	8.8
MAXIMUM	179	21	10	21	10	189	21.5	10.5	21.5	10.5
MINIMUM	132	14.5	5	14.5	5	146	16.5	7	16.5	7
STANDARD DEVIATION	7.5	1	0.8	1	0.8	7.4	1.1	0.7	1.1	0.7
CORRELATION COEFFICIENT		0.427	0.254	0.428	0.254		0.654	0.355	0.655	0.355

	COMBINED DATA				
	HEIGHT	**LTHL**	**LTHW**	**RTHL**	**RTHW**
MEAN	165.6	18.1	8.2	18.1	8.2
MAXIMUM	189	21.5	10.5	21.5	10.5
MINIMUM	132	14.5	5	14.5	5
STANDARD DEVIATION	10.2	1.3	0.9	1.3	0.9
CORRELATION COEFFICIENT		0.740	0.577	0.740	0.577

Table.2 Showing Statistical evaluation of Stature with hand length and hand breadth of the present study.

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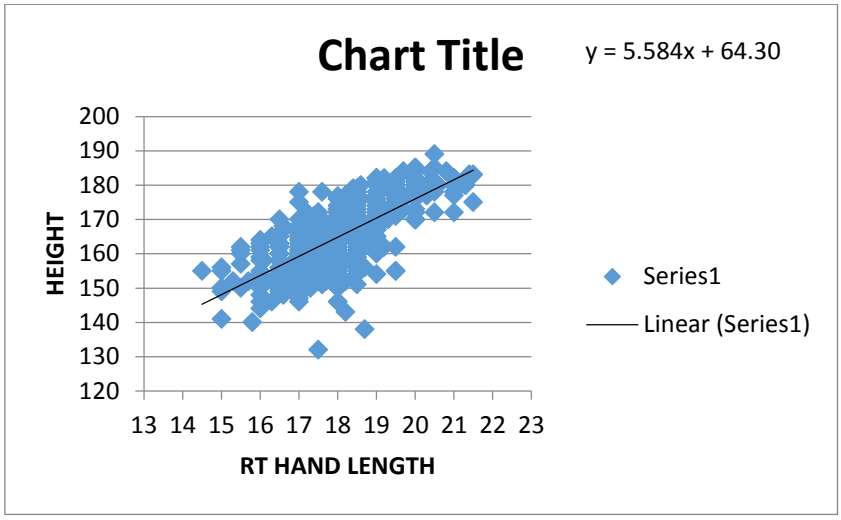
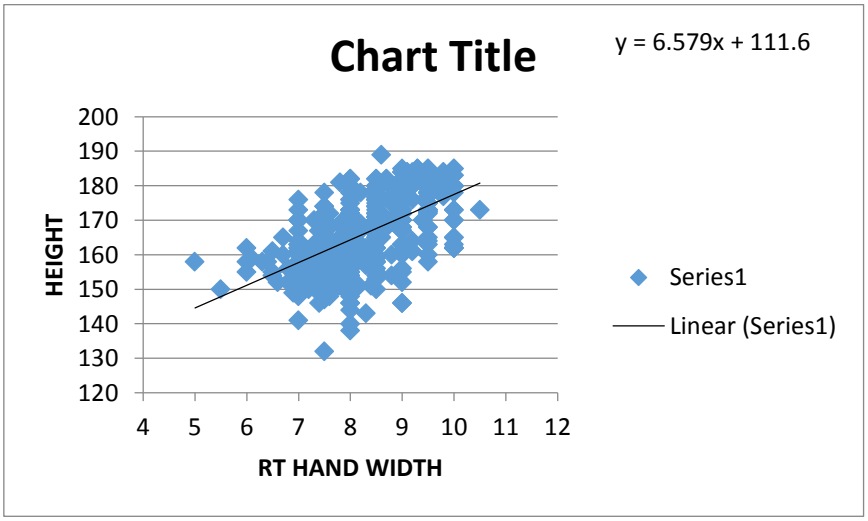
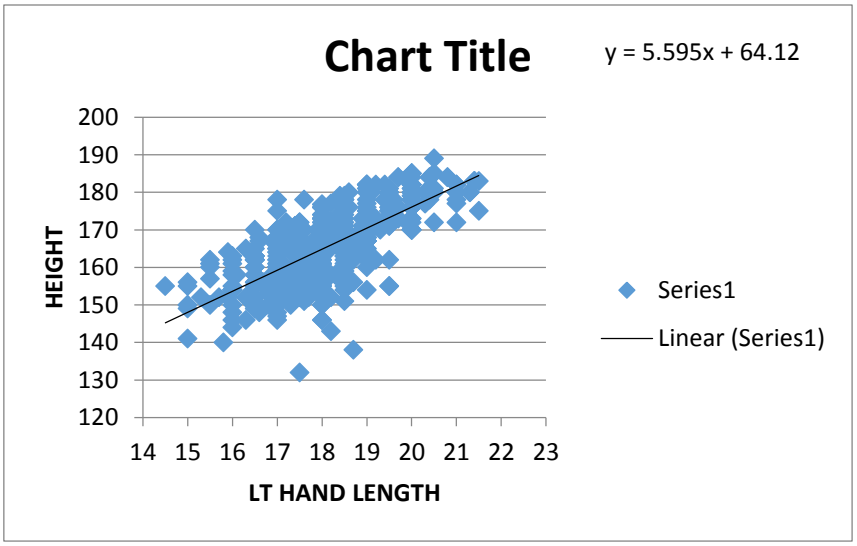


Graph.1 Showing Correlation Between Height & Right Hand Length.



Graph.2 Showing Correlation Between Height & Right Hand Width



Graph.3 Showing Correlation Between Height & Left Hand Length.

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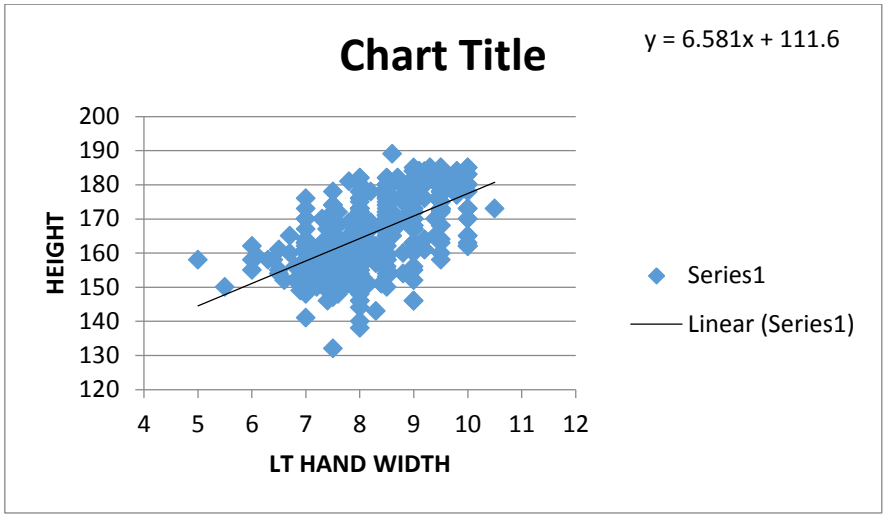
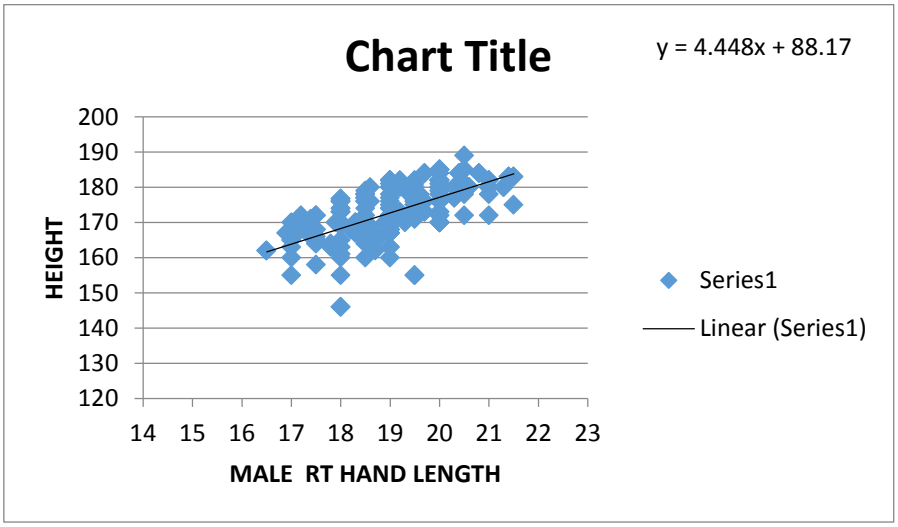
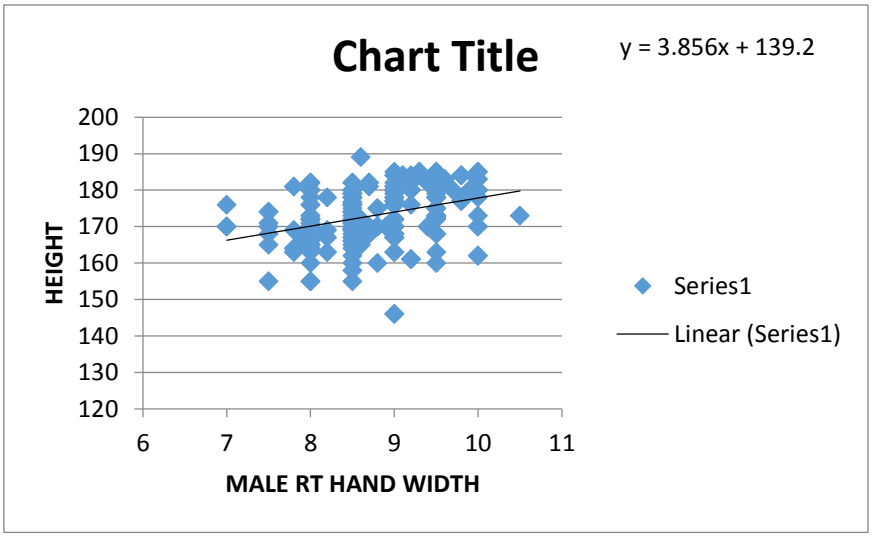


Graph.4 Showing Correlation Between Height & Left Hand Width.



Graph.5 Showing Correlation Between Height & Male Right hand length.



Graph.6 Showing Correlation Between Height & Male Right Hand Width.

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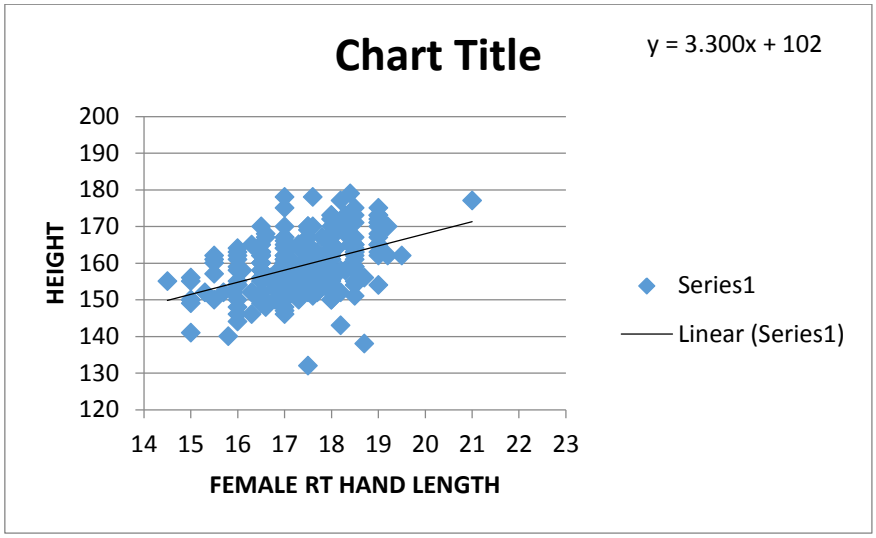
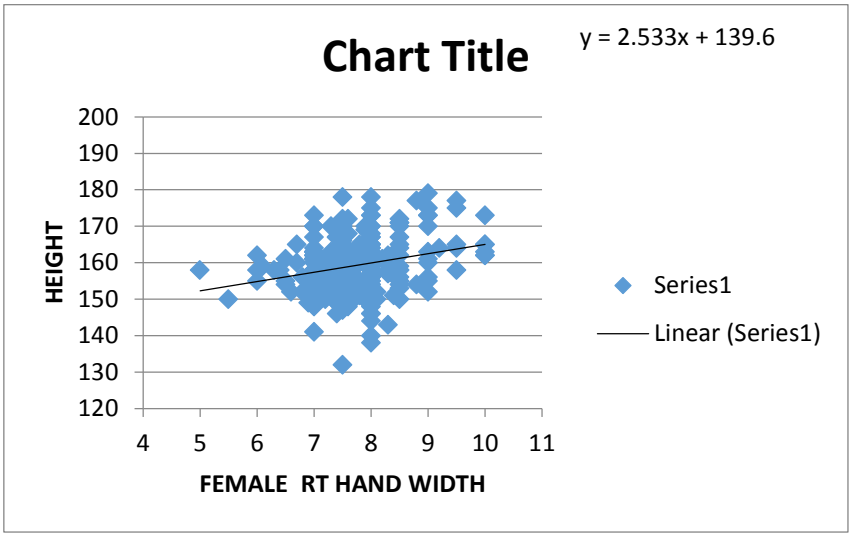
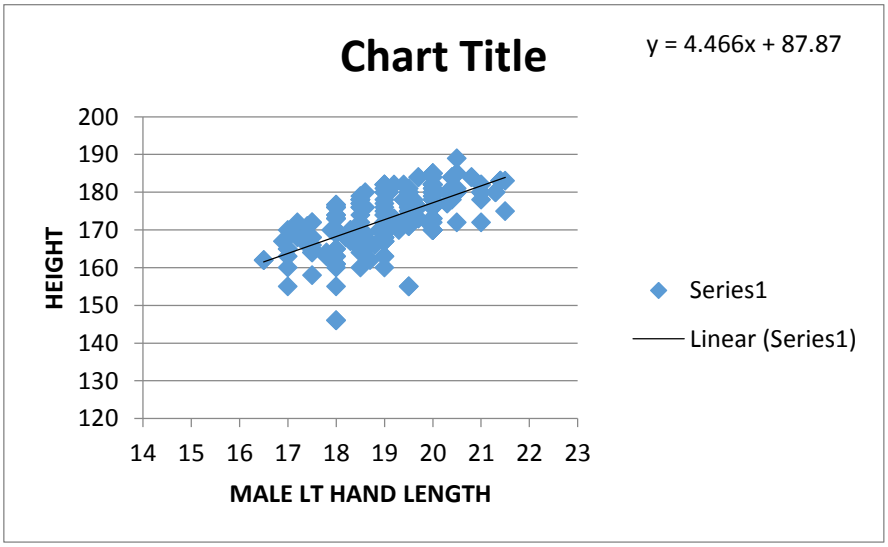


Graph.7 Showing Correlation Between Height & Female Right Hand length.



Graph.8 Showing Correlation Between Height & Female Right Hand width



Graph.9 Showing Correlation Between Height & Male Left Hand length

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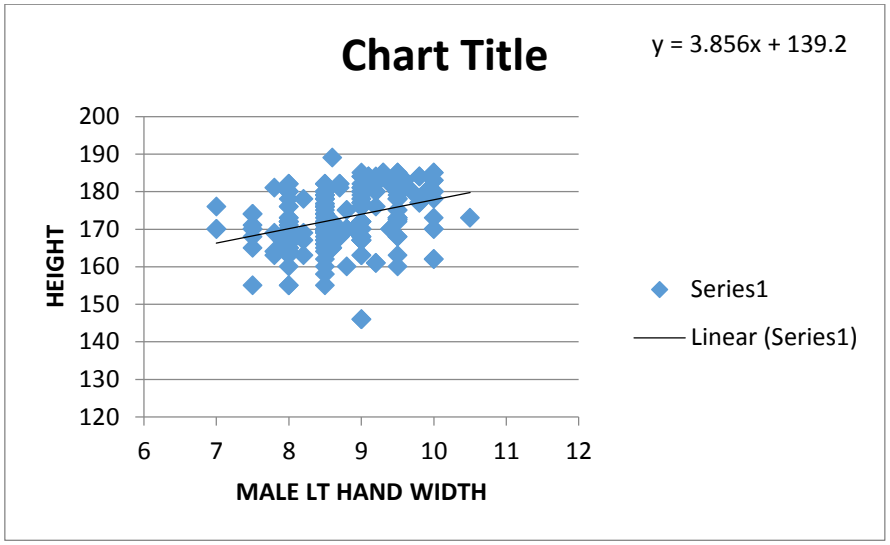
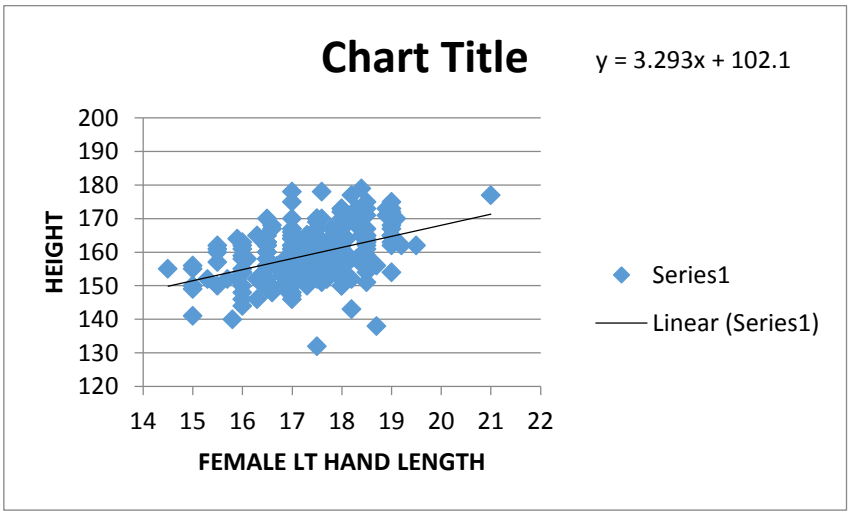
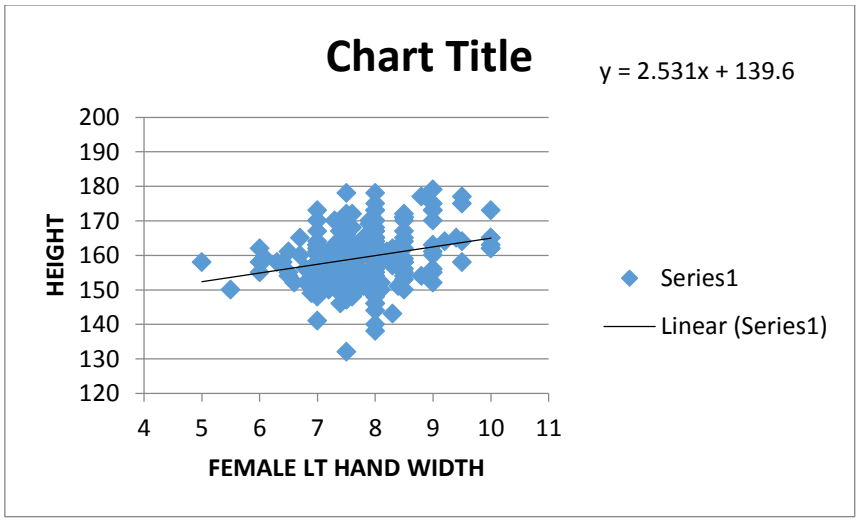


Graph.10 Showing Correlation Between Height & Male Left Hand Width.



Graph.11 Showing Correlation Between Height & Female Left Hand length.



Graph.12 Showing Correlation Between Height & Male Left Hand Width

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In this present study total 510 subjects participated among them 236 were male and 274 were female. The height of the males was in between the range of 146cm to 189cm with mean of 173.1cm. The height of the females was in between the range of 132cm to 179cm with mean of 159.2cm

The length of male right hand ranges from 16.5cm to 21.5cm with mean right hand length is 19.1cm and the length of female right hand ranges from 14.5cm to 21cm with mean right hand length is 17.3cm.

The length of male left hand ranges from 16.5cm to 21.5cm with mean left hand length is 19.1cm and the length of female left hand ranges from 14.5cm to 21cm with mean left hand length is 17.3cm.

The width of male right hand ranges from 7cm to 10.5cm with mean right hand width is 8.8cm and the width of female right hand ranges from 5cm to 10cm with mean right hand width is 7.7cm.

The width of male left hand ranges from 7cm to 10.5cm with mean left hand width is 8.8cm and the width of female left hand ranges from 5cm to 10cm with mean left hand width is 7.7cm.

Among males,the mean of stature is 173.1cm and mean of the hand length is 19.1cm with 1.1 as standard deviation and mean of the hand width is 8.8cm with 0.7cm as standard deviation

Among females,the mean of stature is 159.2cm and mean of the hand length is 17.3cm with 1 as standard deviation and mean of the hand width is 7.7cm with 0.8cm as standard deviation

The data obtained during this study was analyzed and formulated equations to find out stature from hand length and hand breadth measurements.

The correlation coefficient values obtained after statistical evaluation are highly significant for both hand length and hand width for stature.

When the subjects are divided according to the gender Male participants are showing higher correlation coefficient values for both hand length and hand width.

Statistical evaluation of male participants shows the correlation coefficient value for stature and hand length is 0.654 for left hand and 0.655 for right hand the difference is statistically insignificant.

Statistical evaluation of female participants shows the correlation coefficient value for stature and hand length is 0.427 for left hand and 0.428 for right hand the difference is statistically insignificant.

Statistical evaluation of male participants shows the correlation coefficient value for stature and hand width is 0.355 for left hand and 0.355 for right hand no difference statistically.

Statistical evaluation of female participants shows the correlation coefficient value for stature and hand width is 0.254 for left hand and 0.254 for right hand no difference statistically.

When both male and female participants are combined and taken as a single group the values obtained after statistical evaluation were showing stronger correlation than the statistical values obtained by gender differentiation with values 0.740 for both right and left hands, 0.577 for both right and left hands.

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Significance: regression formula for estimating the stature from the hand length and hand breadth can be made. Linear regression equation derived from hand length and hand breadth for estimation of stature showed a statistically significant ($p<0.001$) relationship in both the genders.

4. Discussions:

The present study show that the measurements of the hand length and hand breadth show statistically significant positive correlation with stature of the individual. Linear regression equation derived from hand length and hand breadth for estimation of stature showed a statistically significant ($p<0.001$) relationship in both the genders. Geetha et al studied the estimation of stature from hand and foot measurements. In males the values of the hand length is 0.479 and hand breath is 0.388 and in females the hand length is 0.949 and hand breadth is 0.470. In this males showed higher mean values in all parameters studies than among females the difference being statistically highly significant. Reekee patel et al with 200 subjects were studied for estimation of stature from hand length in both sexes. It showed that mean value of hand length in males were larger than that of females with statistically significant difference. The correlation coefficient for stature estimation from hand length in male subjects is 0.951 that for female subjects is 0.943 and that for combined male and female is 0.834. Suseelama et al studied the height and length of the hand were significantly more in males compared to females. There was no bilateral variation of right and left hands. Shivkumar et al observed that the measurements have a positive as well as statistically significant correlation with the stature. Jyothi et al studied the estimation of hand length and phalangeal length and found that some multiplication factors which will be helpful for estimation of stature for hand length and phalangeal length in both male and female of north India. Rahule et al studied the height and middle finger length and obtained the correlation coefficient of about 0.457. The regression coefficient shows significant correlation between middle finger length and height. Shende et al studied the hand length and hand breadth and observed the correlation coefficient ranges from 0.337 to 0.472 in north Indian males and 0.426 to 0.754 in north Indian females. Similarly in south Indian males it ranges from 0.32 to 0.81 and 0.04 0.537 in south Indian females. Hand length thus shows better correlation coefficient than hand breadth. Sasi kumar et al studied 150 healthy subjects and obtained that mean height for male is higher as compared to females. There is a positive correlation between the stature and middle finger length and derived a simple linear regression equation for estimation finger length provides an accurate and reliable means in reconstructing the stature of an unknown individual. Senthil et al studied the stature estimation from length of fingers in Gujarathi population and found that in both sexes, all the ten fingers are statistically significant and with high degree of correlation.

The observations of the present suggest that these parameters can be utilized to formulate equations to predict stature.

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5. Conclusion:

In this present study all the parameters of hand length and hand breadth are showing positive correlation with stature. Statistical evaluation of the parameters compared from left side to right side showing very minimal differences between them which is statistically insignificant. These measurements may helpful for those who work in this area especially in the various medical disciplines like Forensic experts, surgeons and anthropologists.

Acknowledgments
Authors would like to thank Department of anatomy, Index Medical College, Hospital & Research Centre, Indore (MP), Katuri Medical College and Hospital, Guntur and to all the volunteers who participated in the study
Sincere gratitude to Dr.. V. Chakradhar and Ravi kiran for their help in statistical analysis
Funding: no funding sources
Conflict of interest: Nil

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