

# Estimation of stature using hand length among the students of Saveetha Dental College

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## ABSTRACT

**Introduction:** Stature calculation is very much necessary for measuring growth factors, lung volumes, muscle strength, glomerular filtration rate of kidneys, and metabolic rate. However, the estimation of stature can be difficult in people with mutilated, deformed, or amputated body parts. **Aim:** This study helps us to estimate the stature using the regression factor obtained using the hand length and handbreadth. **Materials and Methods:** A total of 100 individuals between the ages of 18 and 22 which include 50 males and 50 females were selected and their standing length, hand length and hand breadth were measured. Analysis was made in finding the differences in the stature, hand length, and breadth between the males and females in both their right and left hand. Linear regression equations were made to estimate the stature using hand length and breadth. Multiplication factor is calculated which is the ratio of stature to the hand length and breadth. **Results:** Out of 100 individuals, 50% of them were male and 50% of them were female between the age groups of 18 and 22 years. Stature in males was  $169.5 \pm 9.5$ , and in females, it is  $155 \pm 7.6$ . It is observed that males have greater stature than females. **Conclusion:** In both males and females, hand length showed greater correlation coefficient than handbreadth.

**KEY WORDS:** Hand breadth, Hand length, Stature

## INTRODUCTION

The most important characteristic to study a person is identification. Identification plays an important role in everyday life as it helps to know more about a particular object or a person.<sup>[1,2]</sup> For identification, many parameters have been taken into count. Among them, estimation is the most important. Identification of body parts can help the people of forensic department in identifying the unknown bodies during accidents or natural calamities.<sup>[3,4]</sup> Hence, among the various options, an individual's stature plays a major part. Stature calculation is very much necessary for measuring growth factors, lung volumes, muscle strength, glomerular filtration rate of kidneys, and metabolic rate. However, the estimation of stature can be difficult in people with mutilated, deformed, or amputated body parts.<sup>[5]</sup>

Many previous studies have been reported to have estimated the stature using the hand length and

handbreadth using various formulae.<sup>[6,7]</sup> The answer calculated from the estimated stature in all population was not correct because various other factors such as climate, hereditary, and food habits have an adverse effect on stature.<sup>[8]</sup> This is the reason why there are different measurements in different geographical areas of the world. Therefore, this study helps us to estimate the stature of the students of Saveetha Dental College using the regression factor obtained using the hand length and handbreadth.

## MATERIALS AND METHODS

The present research is a cross-sectional study. A total of 100 individuals which include 50 males and 50 females were selected. All the students were between the ages of 18 and 22 and belong to Saveetha Dental College. The students with characteristic deformities were excluded from the study.

### Standing Length

The stature of the people was measured first. The individuals were asked to stand on their barefoot. They were asked to stand on the base of standard stadiometer with their heels separated such that weight is distributed

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evenly on both the heels on their barefoot. The individuals were made to stand straight such that their whole body lies on the same axis. The headpiece was kept over the individuals head and then the total height of a person in their standing position was measured.

### Hand Length

The individuals were asked to stretch their hand forward. They were asked to place their hand on a flat table and were held firmly. The measurements of the phalanges and the hand were taken using Vernier calipers. The length was measured from the wrist to the tip of the middle finger.

### Handbreadth

The individuals were again made to hold their hand firmly on a flat table and the required measurements were taken using Vernier calipers. The hand is now placed with the fingers together and the thumb stretched out on one side. Using the sliding calipers, the handbreadth is measured from the level of knuckles. The breadth of a hand is defined as the distance between the two phalangeal joints. The measurement was taken for both the right and the left hands.

The measurements obtained after finding the stature, hand length, and handbreadth were statistically analyzed. All these findings were calculated as mean  $\pm$  standard deviation. Analysis was made in finding the differences in the stature, hand length, and breadth between the males and females in both their right and left hand. Linear regression equations were made to estimate the stature using hand length and breadth. Multiplication factor is calculated which is the ratio of stature to the hand length and breadth.

## RESULTS

The results of the study are summarised in Tables 1-4. Out of 100 individuals, 50% of them were male and 50% of them were female between the age groups of 18 and 22 years. Stature in males was  $169.5 \pm 9.5$ , and in females, it is  $155 \pm 7.6$ . It is observed that males have greater stature than females.

In males, the right hand length is  $18.36 \pm 1.13$  cm and the left handbreadth is  $18.32 \pm 1.12$  cm. It is observed that the right hand length is more than the left hand length and it is not statistically significant. In females, the right hand length is  $17.15 \pm 1.05$  cm and the left hand length is  $17.12 \pm 1.04$  cm. It is observed that the right hand length is more than the left hand length and it is not statistically significant.

In males, the right handbreadth is  $7.86 \pm 0.55$  cm and left handbreadth is  $7.85 \pm 0.55$  cm. It is observed that the right handbreadth is more than the left handbreadth and it is not statistically significant. In females, the right handbreadth is  $7.32 \pm 0.53$  cm and the left

**Table 1: Regression of the estimation of height from HL in various age groups (right)**

Age group	Regression equation side	Male	Female
18-19	Right	S=67.62 $\pm$ 5.56 RHL	S=84.79 $\pm$ 4.32 RHL
19-20	Right	S=64.93 $\pm$ 5.74 RHL	S=55.28 $\pm$ 6.04 RHL
20-21	Right	S=82.96 $\pm$ 4.86 RHL	S=74.45 $\pm$ 4.92 RHL
21-22	Right	S=48.87 $\pm$ 6.61 RHL	S=6.02 $\pm$ 9.04 RHL

**Table 2: Regression equation for the estimation for HL in various age groups (left)**

Age group	Male	Female
18-19	S=70.46 $\pm$ 5.64	S=88.67 $\pm$ 4.32
19-20	S=67.87 $\pm$ 5.87	S=55.87 $\pm$ 6.04
20-21	S=80.76 $\pm$ 4.87	S=74.68 $\pm$ 5.76
21-22	S=48.98 $\pm$ 6.68	S=6.20 $\pm$ 9.41

**Table 3: Regression equation for the estimation of height HB of various age (right) groups**

Age group	Male	Female
18-19	S=142.87 $\pm$ 3.678	S=112.76 $\pm$ 6.17
19-20	S=146.87 $\pm$ 3.98	S=91.76 $\pm$ 7.78
20-21	S=107.87 $\pm$ 7.65	S=122.86 $\pm$ 5.97
21-22	S=61.75 $\pm$ 13.978	S=61.86 $\pm$ 13.02

**Table 4: Regression equation for estimation height HB of various age groups (left)**

Age group	Male	Female
18-19	S=142.76 $\pm$ 3.876	S=112.87 $\pm$ 6.19
19-20	S=145.97 $\pm$ 3.87	S=92.87 $\pm$ 6.765
20-21	S=107.76 $\pm$ 7.20	S=132.86 $\pm$ 7.54
21-22	S=63.97 $\pm$ 13.87	S=71.97 $\pm$ 8.18

handbreadth is  $7.22 \pm 0.52$  cm. It is observed that the right handbreadth is more than the left handbreadth and it is not statistically significant.

## DISCUSSION

Rastogi *et al.*<sup>[9]</sup> the skeleton is one part of the body that resists all environmental factors for maximum time and thus can be used as a valuable tool for identification. Stature is a parameter that can be estimated even in mutilated and dismembered body parts as well as in fragmental remains.

This study aimed at the estimation of stature from hand length and handbreadth by formulating linear regression equations and multiplication factors. It is not possible always to measure all regression factors, so it is useful to have separate regression equation available for each variable.

Hundred individuals which include 50 males and 50 females were selected. All the students were between

the ages of 18 and 22 and belong to Saveetha Dental College. The students with characteristic deformities were excluded from the study. The contribution of age is insignificant in the estimation of stature from arm span, we have considered age, and regression equations are derived for different age groups.

The stature estimated in this study in male is  $170.65 \pm 9.2$  cm and for females is  $158.5 \pm 6.2$  cm. It is observed that males have greater stature than females. This can be explained based on the genetic constitution of males and also the age of puberty being 2 years later in males as compared to females which gives them additional time for growth.<sup>[10]</sup> The stature found by different authors in India in different region or state is slight different.

In both males and females, hand length showed greater correlation coefficient than handbreadth. Earlier studies also reported that arm span is the most reliable body parameter to predict stature among all other parameters shown in different studies. Although multiplication factor is used by authors to estimate body stature from body parameter, the error of estimate is usually high.

## CONCLUSION

Stature is more in males and females with statistical significance. Stature is estimated from hand length

and handbreadth with accuracy. Hand length shows greater correlation than handbreadth.

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