

## STATURE ESTIMATION USING CEPHALIC INDEX

**Running Title** - estimating stature with cephalic index

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**ABSTRACT :****INTRODUCTION :**

Stature or body height is an important parameter to determine the physical identity of an individual. Cephalic index is the ratio of maximum breadth of the skull to its maximum length. Cephalic index is an important feature that characterizes different races. The aim of the study is to estimate the stature using cephalic index.

**MATERIALS AND METHODS :**

This study was conducted among 30 males and 30 females studying in saveetha dental college. The height of the person was measured using a stadiometer. Cephalic length and cephalic breadth was measured using a spreading calliper. Cephalic index can be calculated by cephalic length/cephalic breadth x100. All the measurements were taken by an observer to avoid error. Three values were recorded and the average value was taken as the main value. All the measurements were tabulated and SPSS software was used to analyze the data. Using a linear regression calculator an appropriate formula was calculated.

**RESULTS :**

For males,  $Y=174.59+0.013X$ ,  $r=0.0103$  ( $r<0.20$ ) and for females it is  $Y=172.84-0.145X$ ,  $r=0.120$  ( $r<0.2$ ). Where, Y is height in cm and X is cephalic index. There is no correlation coefficient between cephalic index and stature in both males and females.

**CONCLUSION :**

The result shows that there is no correlation between stature and cephalic index in both male and female. From the present study we can conclude that cephalic index is not a reliable source of stature estimation.

**KEYWORDS :** novel stature estimation; cephalic index; spreading calliper; Linear regression equation

## INTRODUCTION :

Cephalic index is an important parameter for classifying populations.cephalometry is a branch of anthropometry in this measurements of anatomical dimensions of head and face are measured.On the basis of horizontal cephalic index, head shapes are grouped into four international categories which includes dolichocephalic, brachycephalic and mesocephalic (1).Stature is an important biological parameter in medico-legal forensic examination.Stature or body height is most important parameter to determine the physical identity of an individual.(2). Stature estimation is an important parameter in identification of coalesce, mutilated and skeletal remains in forensic examinations. Estimating height or stature is one of the key elements within the human identifying process.stature estimation was previously also done using intermastoid distance, physiognomic facial length. Stature estimation is taken as a crucial parameter in medico-legal and forensic examinations.(3).

Different body parts are directly proportional to stature and hence, shows a definite biological and genetic relation with each other. In forensic cases, stature or body height is usually estimated using anatomical and mathematical techniques.(4). Cephalic index is the ratio of maximum breadth of a skull to its maximum length.An index of less than 75 means that the skull is long and narrow when seen from the top such skull is called dolichocephalic, an index of 75-80 means that the skull is nearly oval such skulls are called mesocephalic. A skull having an index of 80 is broad and short and is called brachycephalic. Cephalic index has been studied by several authors regarding gender, ethnicity, race, growth, age and clinical uses thereby classifying the head sizes.(5).Estimation of height in standing position is carried out as one of the processes in building the biological profile to decrease the number of missing individuals and increase the chances of individual identification. When isolated head alone is taken, stature is the most sought data(6)

Estimation of stature has been described as a preliminary investigation in the identification of unknown human remains and relationship with each and every part of the human body.This relationship helps a forensic scientist to calculate stature from mutilated dis-membered body parts with the aid of linear regression equations. Stature is the height of a person in upright posture which is one of the parameters for personal identification. More studies have been

conducted based on the estimation of stature from different body parts including leg, hands and feet, intact vertebral column as well as head, face and trunk. This is because stature has a proportional biological relationship with each and every part of the human body.(7). The anatomical and mathematical methods are two important techniques for estimation of stature. Anatomical method involves the direct reconstruction of stature by measuring and adding together the lengths of all skeletal elements and figuring a correction for soft tissues.(8). Our team has extensive knowledge and research experience that has translated into high quality publications (9–16),(17),(18),(19),(20,21),(22),(23),(24–28). In this study the height of a person and cephalic index was measured, the aim of this study was to estimate the stature using cephalic index.

### **MATERIALS AND METHODS :**

In this study 30 males and 30 females from 1st year BDS from Saveetha Dental College were used to take the measurements. Firstly, height measurements were taken. Height was measured by using a stadiometer by making the person stand in an upright position. Height measurements were taken in centimetres (cm). Then cephalic length (figure 1) and cephalic breadth (figure 2) were measured by using a spreading calliper. Cephalic index was calculated by the formula as follows : cephalic breadth/cephalic length x 100. All measurements were taken by an observer to avoid error. Three values were recorded and the average value is taken as the main value. SPSS software was used to analyze the data.



Figure 1: Measurement of cephalic length  
Using a spreading calliper.



Figure 2: Measurement of cephalic breadth  
Using a spreading calliper.

**RESULTS :**

**Table 1: values of Regression equation for estimation of height (Y) from cephalic index (X) in male and females, a and b are constant.**

|  | <b>MALE</b> | <b>FEMALE</b> |
|--|-------------|---------------|
| n  | 30          | 30            |
| Mean value of cephalic index<br>(x in cms) | 82.66       | 84.50         |
| Mean value of height<br>(y in cms)         | 175.733     | 160.566       |
| Correlation coefficient<br>(r)             | 0.010       | -0.12         |
| A  | 174.59      | 172.84        |
| B  | 0.0173      | -0.145        |

Using the data from Table 1, the linear regression equation was calculated to be

For males,  $Y=174.59+0.013x$  ,  $r=0.0103$  ( $r<0.20$ )

Where, Y is height in cm and X is cephalic index in cm,

There is no correlation between cephalic index and stature in male.

For females,  $Y=172.84-0.145x$  ,  $r= -0.12$  ( $r<0.2$ )

Where, Y is height in cm and X is cephalic index in cm,

$r<0.2$  hence there is no correlation between cephalic index and stature in females.

The result shows when statistically comparing the data between males and females, there is no correlation between stature and cephalic index in both male and females.

**DISCUSSION :**

Study on estimation of stature from various aspects were done in several research. The present study was a cross-sectional study comprising 30 males and 30 females from Saveetha Dental College. This study showed that cephalic index is not a reliable source of stature estimation as there is no correlation between cephalic index and stature for both male and females. Whereas in another similar study there was moderate correlation between cephalic index and stature(29). In

another study estimation of stature from vertebral column length was done using regression analysis (30). In a study conducted, Pearson correlation coefficient was used for assessing the relationship between the stature and hand/foot dimensions which was unique in that study (31). The study used an anthropometer to take measurements and it also consists of both simple linear regression analysis (32). Many previous studies have shown moderate correlation between stature and cephalic index of both male and females.

Stature is a parameter that can be estimated even in mutilated and dismembered body parts and also in fragmental remains. Various studies have given data for stature estimation from different parts of the body. In the study, stature estimation from various body parts was done using anthropometric technique and by regression analysis which is similar to our present study(33). Stature estimation from various skeletal parts was done using anthropometric technique and by regression analysis which is similar to our present study. Height estimation is one of the biological profiles used in the identification of individuals in cases of airline crash, calamity, fatal auto crash, bombing, homicides and also in crime investigations(33). Stature estimation is widely used in determining the sex differences, especially in individuals whose identity is unknown (4). So, here cephalic index is not a reliable source of stature estimation. The limitations of our present study is that it was done in a smaller population and within a limited age group, in future an extensive study with a large population with a different group can be done to get better intervention in the results.

## **CONCLUSION :**

From this study we can conclude that cephalic index is not a reliable parameter for stature estimation. Since, there is no correlation between cephalic index and stature in both male and females.

## **AUTHOR CONTRIBUTIONS**

Pavithra Sekhar: Study Design, Data collection, Data Analysis, manuscript writing

Yuvaraj Babu K: Study Concept, Data verification, Data Analysis, manuscript drafting and correction

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## CONFLICT OF INTEREST

The authors reported the conflict of interest while performing this study to be nil

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