Original Research Article

# To Estimate Stature from Head Height in Western Rajasthan Population

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## Abstract

**Background:** Stature is an important biological parameter in medico-legal forensic examination. It may so occur that many a times highly decomposed or mutilated bodies or fragmentary remains of skull are brought for medico-legal examination. The present study was conducted to estimate the stature from head height. **Materials and Methods:** The present study was conducted among 160 healthy population in the age group of 20 to 60 years including 80 males and 80 females. All the subjects were measured for stature and head height. It was measured with spreading caliper. All the measurements were recorded by same person. The recorded data was compiled and data analysis was done. Analysis included descriptive statistics, correlation between stature and head height and derivation of regression formulae for stature from head height. **Results:** In the present study a total population of 180 studied. Mean ± SD of stature was 165.34 ±7.75 cm. Mean ± SD of head height was 9.67 ± 0.74cm. Mean ±SD of age was 35.05 ± 9.23 years. Correlation coefficient (r) of stature and head height in age group 20-30 was 0.650 which was highly positively correlated. Similarly in 31-40 age group it was 0.432 i.e, it was moderately positively correlated. In 41- 50 'r' is 0.413. In those aged 41-50 aged, stature and head height were highly positively correlated 'r' is 0.612. Coefficient of correlation for total population was 0.567 i.e, highly positively correlated. Correlation coefficient 'r' in males was 0.523 that shows high positive correlation and 'r' was 0.489 in females showing moderately positive correlation. **Conclusion:** The present study concluded that there was a positive correlation between stature and head height. In males, stature and head height had a high positive correlation whereas females shows a moderate positive correlation.

**Keywords:**Head Height, Stature, Correlation Coefficient.



### Introduction

Stature is the height of a person in the upright posture[1]. In the identification of unknown human remains, stature estimation is a preliminary investigation[2,3]. Establishment of Alternative Methodologies for personal height estimation is essential for a number of reasons, firstly in cases where height estimates needed to be made from fragments of bones in archeological procedures or in forensic science after mass disasters or genocide[4]. Secondly estimates of pharmacokinetic parameters and evaluation status rely on accurate measurement of not only body weight but also on height. In clinical Practice, Population height, and age specific data on cranial dimensions gives an indication of growth and development of an individual and also any abnormalities of cranial size and shape.[5]Stature is one of the important and useful anthropometric parameter that helps in determining the physical identity of an individual[1] .The height of a person in the upright posture is referred to as Stature[6].An individual attains maximum height by the age of 21 years i.e, when all the long bones get ossified. It is an important parameter for personal identification[7].

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Stature is important for identification is underlined by the fact that one can calculate the stature both in the living individuals as well as in the skeleton even long after a person has died[8].There are two basic methods for calculating height from skeletal remains. The mathematical method i.e., also called as regression method based on proportionality between height and the length of long bones and the anatomical method i.e., also called as multiplication method based on the measurements of the whole skeleton, including the spinal column, and adding the dimensions of the soft parts[9]. The present study was conducted to estimate the stature from head height.

### Materials and Methods

The present study was conducted among 160 healthy population in the age group of 20 to 60 years including 80 males and 80 females. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written consent was taken from the patient after explaining the study. Healthy adult males and females of chronological age of 20 to 60 years were included in the study. Subjects with physical abnormalities, Visibly malnourished & obese subjects and chronological age less than 20 or more than 60 were excluded from the study. All the subjects were measured for stature and head height. Stature (S): It is the vertical distance between standing surface and the vertex (highest point on head) when the subject is standing in the anatomical position. Head Height: It is the projective distance between tragus and the vertex

with the subject in sitting position and looking forward. It was measured with spreading caliper. The measurements were taken at fixed time of the day i.e, between 2 to 5 p.m. to avoid diurnal variations. All the measurements were recorded by same person. Head height was recorded from right and left side. The recorded data was compiled, and data analysis was done using SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). Analysis included descriptive statistics, correlation between stature and head height and derivation of regression formulae for stature from head height. The regression was performed with stature as dependent variable and head height as independent variable. Regression formula obtained was of Y=A+B(X) where Y is stature, X is Head height (an independent variable), A is regression constant and B is regression coefficient.

**Results**

In the present study a total population of 180 studied. Mean ± SD of stature was 165.34±7.75 cm. Mean ± SD of head height was 9.67 ± 0.74cm. Mean ±SD of age was 35.05 ± 9.23 years. Correlation coefficient (r) of stature and head height in age group 20-30 was 0.650 which is highly positively correlated. Similarly in 31-40 age group it was 0.432 i.e, it was moderately positively correlated. In 41-50 'r' was 0.413. In those aged 41-50 aged, stature and head height were highly positively correlated 'r' was 0.612. Coefficient of correlation for total population was 0.567 i.e, highly positively correlated. Correlation coefficient 'r' in males was 0.523 that shows high positive correlation and 'r' wa 0.489 in females showing moderately positive correlation.

**Table 1: Distribution of population according to stature, head height and age**

| Parameter (N=160) | Mean ±SD |
|---|---|
| **Stature** | 165.34±7.75 |
| **Head height** | 9.67±0.74 |
| **Age** | 35.05±9.23 |

**Table 2: Correlation between stature and head height with respect to age**

| Age Group(yrs) | Parameters | Correlation coefficient |
|---|---|---|
| **20-30 (n=42)** | **stature and head height** | 0.650 |
| **31-40 (n=61)** | **stature and head height** | 0.432 |
| **41-50 (n=34)** | **stature and head 5height** | 0.413 |
| **51-60 (n=43)** | **stature and head height** | 0.612 |

**Table 3: Correlation between stature and head height in males and females**

| Gender | Correlation coefficient |
|---|---|
| **Male (n=80)** | 0.523 |
| **Female (n=80)** | 0.489 |
| **Total (n=160)** | 0.567 |

**Discussion**

Various methods are used to establish the identity of unknown human remains. The reliability of each method varies[2]. Estimation of stature, as part of identification process has a long history in physical anthropology. A drawback to these techniques is limited applicability to fragmentary remains.[10] When the body has been mutilated, it is common to have the extremities or head amputated from the trunk. An estimate must then be made based on the known relationship of the remains to stature[3].

Purohit N et al conducted a study and the results showed that two parameters correlated positively with stature except head breadth in females. Also, regression analysis showed that the cephalic dimensions give a better prediction of stature than any other body part measurements and it could be useful in forensic investigations and in Anthropometry[11].

Stature, Head length and head breadth were significantly greater in males when compared with females which is in occurrence with other studies[12-14].

Another study on cadavers included a wide age range and reported a statistically insignificant correlation of maximum anteroposterior length and circumference of skull to stature for both males and females. Combined data were not used by these investigators[15].

Kalia S et al concluded that significant sexual dimorphism was observed for the parameters studied ( $P < 0.05$). Highly significant correlation was found between height and other parameters when combined data and data for males were regressed. The equation relating height to the combined mesiodistal width of maxillary anterior teeth was derived as height = 982.421 + 13.65 x combined mesiodistal width of maxillary anterior teeth ( $P < 0.0001$). Similarly equations were obtained by regressing height to head circumference and skull diameter ( $P < 0.0001$ for both). The above findings may hence provide reliable method of estimation of height from skeletal remains in the forensic setup[16].

Satbir S et al concluded that there was a positive correlation between stature and head height. In males, stature and head height had a high positive correlation whereas females show a moderate positive correlation[17].

**Conclusion**

The present study concluded that there was a positive correlation between stature and head height. In males, stature and head height had a high positive correlation whereas females shows a moderate positive correlation.

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