Research Article

"CORRELATION BETWEEN HEIGHT AND FACIAL MEASUREMENTS IN CENTRAL CHHATTISGARH" -A RESEARCH STUDY

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ABSTRACT

When it comes to establish the identity in cases of skeletal remains, the task becomes difficult, as there is nothing to point out in particular to the identity. The most commonly recommended method to identify is DNA analysis. But, in certain cases the skeletonization is to such an extent that the DNA cannot be extracted for comparison. Moreover, it is too costly affair to compare DNA of remains to every relative whose dear one is missing. In such scenario, if the identification is narrowed down to only handful number of missing persons, DNA may be of better use.

Height is one of the most sorted features in the identification data, either it is for portfolio or for identifying a skeletal remain. Since way long back, scientists have used each and every bone of the human skeleton, from femur to metacarpals in estimation of stature. They all have reached a common conclusion that stature can be estimated with great accuracy even from the smallest bone. Hence, the aim of the present study was to determine the stature using facial measurements.

This study comprises of 100 subjects (61 male & 39 female) >18 years of age. The mean facial height for male and female in this study was found to be 12.75cm and 11.57cm respectively. The correlation between height and facial height, as well as height and bizygomatic width was found to be significant.

INTRODUCTION

Measurements of human including living one, the dead and also the skeletal remains in order to help in identification is known as anthropometry. Forensic anthropology is a mere continuation of parent anthropology, with a scientific approach. Forensic medicine is application of medical knowledge for the administration of law. In other words, it is to help in administration of law [1].

Identification is one of the major area where forensic play a helping hand. The basis of identification is on mainly four factors such as age, sex, race and ethnicity. The variance in these factors is due to multiple reasons. The appearance of individual is different, due to socio-economic status, region, race, nutrition etc. Thus the facial feature is dependent on these multiple factors.

When it comes to establish the identity in cases of skeletal remains, the task becomes difficult, as there is nothing to point out in particular to the identity. The most commonly recommended method to identify is DNA analysis.

But, in certain cases the skeletonization is to such an extent that the DNA cannot be extracted for comparison. Moreover, it is too costly affair to compare DNA of remains to every relative whose dear one is missing. In such scenario, if the identification is narrowed down to only handful number of missing persons, DNA may be of better use.

MATERIAL & METHOD

This study was conducted on individuals of central Chhattisgarh, to understand the correlation of facial measurement to height. This study comprises of 100 subjects (61 male & 39 female) >18 years of age. Facial measurements were taken by using Vernier Calliper and stature by use of Stadiometer. Individual with facial deformity, growth deformity and any history of facial trauma with reconstruction were excluded. The study was conducted over a span of two months. Prior consent was obtained from the participants. Results and observation were tabulated to a specifically designed proforma and was subjected to analysis by SPSS Ver.21.

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Observation
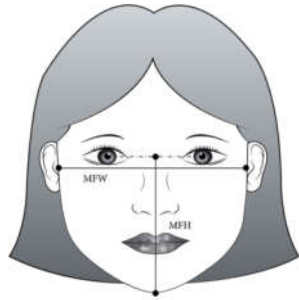
Figure 1 [MFW= BZW (Bizygomatic Width) ; MFH= FH (Facial Height)]

Table 1

Correlation Between Height	
Facial Height (FH)	<0.01 (Pearson coefficient)
Bizygomatic Width (BZW)	<0.01 (Pearson coefficient)

Table 2

Regression Equation to Calculate Height in Male	
From FH	From BZW
(-6.991) FH + 258.812	(-2.859) BZW + 201.897

Table 3

Regression Equation to Calculate Height in Female	
From FH	From BZW
(0.690) FH + 151.808	(3.090) BZW + 130.890

DISCUSSION

Facial height (FH) is the straight distance from the nasion to lowest point on the lower border of the mandible in the midsagittal plane gnathion. Bizygomatic width (BZW) is the width between the most lateral points on the either zygomatic arch, as depicted in Figure.1.

Numerous methods have been used since the history of anthropometry towards the establishment of identity [2]. Height is one of the most sorted features in the identification data, either it is for portfolio or for identifying a skeletal remain. Since way long back, scientists have used each and every bone of the human skeleton, from femur to metacarpals in estimation of stature. They all have reached a common conclusion that stature can be estimated with great accuracy even from the smallest bone [1].As the facial height and bizygomatic width, is distance between two bony landmarks, which is also not subjected to any change, can also be used for the very same purpose. Hence, the aim of the present study was to determine the stature using facial measurements.

It was observed in this study that the height of male subjects was greater than that of female subjects. Also the facial height and bizygomatic width was observed to be greater than that of female subjects. The correlation between height and facial height was found to be significant with Pearson coefficient (2-tailed) 0.008 (<0.01). Similarly correlation between height and bizygomatic width was found to be significant with Pearson coefficient (2-tailed) 0.0001 (<0.01), as is depicted in Table 1. By analyzing the data, a regression equation was derived in order to calculate height from facial height and bizygomatic width for both male and female, as is depicted in Table 2 & 3. The regression equation was then applied to 20 different data at random from the collection and was found appropriate, with

standard error of 10-12cm and 4-5cm, in male and female respectively.

The mean facial height for male and female in this study was found to be 12.75cm and 11.57cm respectively. While in the study conducted by Anibor et al.[3], mean facial height for male and female was 11.58 cm and 10.86 cm, respectively which is lesser compared to the current study. Prasanna*et al*.[4] in their study found 12.36 cm and 11.7 cm in male and female, respectively, in North Indian populations and 11.97 cm and 10.1 cm in male and female, respectively, in South Indian populations. The values for north indian population is near similar, while that for the south indian population is lower than the values of the current study.

Now a day's cosmetology is not restricted only to the skin texture and color, but has advanced to facial proportion. With this advancement there are surgeries to bring all the facial measurement in such a ratio that can beautify the look. Such surgeries are performed by collaboration of plastic surgery, orthodontic surgery and maxillofacial surgery. Hence, this data can be of help to those who are engaged in performing such work.

There are various factors acting on the skeletal remains, responsible in bringing significant change in the structure of DNA and its extractability. Temperature plays an important role as the maximum activity of the chemical reaction occurring inside the body is around $35 - 40\ ^{\circ}$C. The process of hydroxylation is faster and evident in humid atmosphere, so is the role of humidity in the surrounding environment. The oxidative reaction inside body is hastened by availability of oxygen [7].

There is biological decomposition of human remains due to acidic and alkaline environments. Chemical modifications to hydroxyapatite and DNA are influenced by the pH of decompositional environment [5,6,7]. Thus in such a condition, it is difficult to extract the DNA from the bones. So, if the data to one of the necessary identification factor is available, the narrowing down of the search can be achieved.

Superimposition is the technique applied to determine whether skull is that of the person in photograph [8]. In this technique there are numerous points of comparison. Photographs are enlarged keeping interpupillary distance constant. With the use of knowledge of average bizygomatic width, the same may also be applied.

CONCLUSION

Estimation of height is very simple, and doesn't require an expertise; this makes it much fast and precise data. With the knowledge of facial height and bizygomatic width, height can be predicted and identification of skeletal remain can be narrowed down. This will eventually help the police authority in identifying the individual fast and easy. Moreover, the long chase behind DNA can also be cut short.

The technique of enlarging the photographs in superimposition method is subjected to non-varying interpupillary distance. As, the bizygomatic width is distance between two bony landmarks, which is also not subjected to any change, can also be used for the very same purpose.

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