

ESTIMATION OF STATURE FROM MORPHOMETRIC MEASUREMENTS OF EXTERNAL EAR IN FEMALES

Running Title - External ear measurements for stature estimation

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ABSTRACT :

INTRODUCTION : Stature estimation is taken as an important framework in person identification and also in forensic examinations. Human ears are always an important determining feature of the face and its construction demonstrates various signs of age and sex

AIM : Aim of the present study was to estimate stature using measurements of external ear in females.

MATERIALS AND METHODS: This study was done among 50 females students studying Dental in a college, within the age group 18 to 20 years. the measurements of both external ears

and also the height of subjects was measured. The data collected was tabulated and statistically analysed using SPSS software (version 23) and a linear regression equation was calculated using the data.

RESULT: The linear regression equation was calculated using the formula $y = a + bx$ to be, For Female Right ear, height (y) = $120.33 + 4.39 X1$; Right ear, breadth(y) = $120.33 + 5.41 X2$ The (r) value was 0.532, it had moderate correlation. For Female Left ear, height (y) = $120.08 + 3.96 X1$; Left ear breadth (y) = $120.08 + 6.35 X2$. The 'r' value was 0.559, it had moderate correlation.

CONCLUSION : The present study concludes that there was moderate correlation among females between stature and ear measurements, it was found to be statistically significant hence, ear measurements can be used at moderate level to estimate stature in females.

KEYWORDS : Ear morphometry, stature estimation, linear regression, forensic examination, novel method

INTRODUCTION :

Stature estimation is taken as an important framework in person identification and also in forensic examinations. In living organisms, identifications are based on certain morphological criteria (1). Human ears are always an important determining feature of the face and its construction demonstrates various signs of age and sex(2). The human ear is divided into external ear, middle ear and inner ear. The external ear is also called a pinna and it receives sound waves(3). Anthropometry refers to the field where measurements of the living body are made for understanding differences. It plays a crucial role in plastic surgery, prosthetics(4). Stature estimation is a key parameter in identifying merged, mutilated and skeletal remains in forensic examinations(5, 6). Estimating human stature is one of the principal character in identification of human; however, few common diseases or deformities of the spine makes it difficult to correctly measure the height in standing position (3). Determination of height of a person helps in identification of an individual or person during mass disaster situations like earthquakes, plane crashes, traffic accidents(7). In the study by Shireen and Karadkhedkar demonstrated the existence of sexual dimorphism in the auricular dimensions on both sides (8) . Lot of studies have been done for the estimation of stature from various parts of the body like long bones, mandibles, foot, vertebral column, hands, foot and trunk (3), (6), (9,10). In few instances these parts may not be available for forensic examination after mass disasters (11) . Stature determination from limbs or their parts play a key role in identifying the deceased person in forensics (12). Sometimes the skull is the only remains available for identification(13). Human identification has a great impact in various anthropological cases or traumatic events in medicolegal field (14). The extensive knowledge and experience of our research team has been translated into high quality publications (15–22),(23),(24),(25),(26,27),(28),(29),(30–34). Few

studies of morphometric measurements of the external ear have been significantly used. The aim of this study was to estimate height of females using measurements of external ears.

MATERIALS AND METHODS:

This study was done among 50 females students studying Dental in a college, within the age group 18 to 20 years. The study was approved by SRB of the Dental College, after obtaining informed consent the measurements of both external ears i.e (right and left ear) was taken using the vernier caliper (Figure 1) and also the height of subjects was measured using standard height measurement frame. For each person, three values were taken and the average was taken for the study The data collected was tabulated and statistically analysed using SPSS software (version 23) and a linear regression equation was calculated using the data.



FIGURE 1: Measurements of height external ear by using vernier calliper

RESULTS :

Table 1- Values of regression equation for Stature estimation using Height(Y) from Ear height (X1) and Ear Breadth (X2) in females,

	Right ear	Left ear
n	50	50
Mean of Ear height (X1 in cms)	5.4	6.3
Mean of Ear Breadth (X2 in cms)	5.8	6.5
Mean of height (Y in cms)	160.4	160.4
Correlation Coefficient	0.53	0.55

A	120.33	120.08
B1	4.39	3.96
B2	5.41	6.32

Using the data obtained from Table 1, calculation of the linear regression equation was done using the formula $y = a+bx$ to be

For Female Right ear, height (y) = 120.33 + 4.39 X1

Right ear, breadth(y) = 120.33 + 5.41 X2

Where 'y' is height, 'X1' is ear height and 'X2' is ear breadth in cm. The correlation coefficient (r) of the right ear was determined to be 0.532, it had moderate correlation.

For Female Left ear, height (y) = 120.08 + 3.96 X1

Left ear, breadth(y) = 120.08 + 6.35 X2

Where 'y' is height, 'X1' is ear height and 'X2' is ear breadth in cm. The correlation coefficient (r) of the left ear was determined to be 0.559, it had moderate correlation.

DISCUSSION :

Measurement of stature estimation in both the ears of females. There was a moderate correlation between various measured parameters in the right and left ears of females. In the study by Lakshmi et al concluded that the measurements in male subjects had better correlation than in females (35). In the study by Junno et al male ears were longer and wider than female ears (36). The trend of a longer and wider ear in males than in females noted in the study. In the study Kamal and Yadav statistically significant correlation was found between height and following ear variables; right ear length ($r= 0.29$), left ear length ($r= 0.28$), right ear width ($r= 0.30$), left ear width ($r= 0.30$, $p< 0.01$) but no significant correlation was observed with ear indices of both sides, but compared to my study stature estimation among females we can see moderate correlation (2). The limitation of this study was lesser sample size especially of females was used in a limited smaller age group. In future, more numbers of males and females in a wider age group could be used for the study.

CONCLUSION:

The present study concludes that there was moderate correlation among females between stature and ear measurements, it was found to be statistically significant hence, ear measurements can be used at moderate level to estimate stature in females. From the present study we conclude that ear morphometry is an additional important tool in the estimation of stature.

AUTHOR CONTRIBUTIONS

Soumya Sri S : Study Design, Data collection, Data Analysis, manuscript writing

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

ACKNOWLEDGEMENT

We acknowledge and thank all the participants for their cooperation in the study

CONFLICT OF INTEREST

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

FUNDING AGENCY

The present project is supported/funded/sponsored by

- Saveetha Institute of Medical and Technical Sciences
SaveethaDental College and Hospitals. Saveetha University and
- Sreenadh Dental clinic

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