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ORIGINAL ARTICLE

Estimation of Stature from Maximum Head Length and Maximum Head Breadth among Adult Cadavers for Autopsy at Kolkata Police Morgue

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ABSTRACT

INTRODUCTION:

Forensic identification from mutilated and fragmented body parts is a critical part of forensic investigation. Stature is a major criterion of identification and provides useful clues to the investigating agency. There are established correlations of stature with body parts such as extremities, head, trunk, vertebral column, etc. This study was formulated to find out correlation between maximum head length and maximum head breadth with stature in human and to calculate a regression equation to determine stature from head length and head breadth at Kolkata Police Morgue attached to department of Upgraded department of Forensic and State Medicine, Medical College, Kolkata. It is a cross-sectional, observational study. Total 32 deceased subjects (n= 32, m=26 f=6) were selected for the study depending on inclusion and exclusion criteria. Maximum head length and breadth were measured in each using spreading callipers and stature was measured using standard autopsy procedures. The results were tabulated in excel spread sheet and analysed using Stat Cal C software and SSS (online). The mean, stature of the study population was 162.54, head length 17.78 and head breadth 13.75. r = 0.473 (head length, p <0.006) , 0.181 (head breadth, p <0.321). Regression equations : stature = 3.83 × head length + 94.43; 2.09 × head breadth + 133.69 and 3.76 × head length + 0.29 × head breadth +91.60. Head length and head breadth were correlated with stature. Regression equations can be used to estimate stature in forensic cases from head length and breadth.

KEYWORDS | stature; maximum head length; maximum head breadth; anthropometry;cadavers

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INTRODUCTION

One of the very important parameters in medico legal forensic examination is stature.[1,6] There is established biological correlation of stature with all the body parts such as extremities, head, trunk, vertebral column, etc.[1] Positive identification of the deceased from human remains, mutilated bodies and fragmented body parts is an essential part of forensic investigation. Due to increased events of mass disaster and brutal murders, dismembered body parts are sent to post-mortem examination every now and

then.[6]

Stature being one of the criteria of personal identification, it helps in narrowing down the investigation process and thus provides useful clues to the investigating agency.

Dietary habits and climate of different regions of India are variable, racial and ethnic variations also exist in different geographical regions.[8] Hence conclusions based on the results of studies done in one population cannot entirely be applicable to other population.

There are variations in the length of limb bones relative to stature and according to race, sex, age, side of body, climate, heredity and nutrition.

Despite many research works, there is dearth of substantial data regarding estimation of stature from head dimensions for population in and around Kolkata region of West Bengal. Hence this study has been designed to correlate the relationship between dimensions of head like maximum length and maximum breadth with stature through statistical analysis.

AIMS AND OBJECTIVES

Primary

- To find out the correlation between head dimensions and stature

Secondary

- To find a correlation between maximum head length and stature
- To find a correlation between maximum head breadth and stature.

MATERIALS AND METHODOLOGY

Study design

This is an institution based observational and cross-sectional study

Study period

3 months, 1/3/22 to 31/5/22

Study population

Dead bodies which came to Kolkata police morgue under upgraded department of Forensic and State medicine, Medical College, Kolkata for autopsy during the period of study.

Inclusion criteria

Gender – male and female

Age - more or equal to 18 yrs of age.

Exclusion criteria

- Dead bodies with craniofacial deformities, either congenital or acquired.
- Beheaded body / transected body from thorax and abdomen / mutilated and fragmented bodies of different parts, in which head dimensions and stature cannot be measured properly.

Sample size

- After applying inclusion and exclusion criteria, 32 adult dead bodies were taken for the study.

Study tool and technique

After going through the inquest report and other relevant papers as per protocol of medicolegal autopsy, the study was started after satisfying all the inclusion and exclusion criteria as stated above. Age was known by the supplied documents furnished by the police and verified from Aadhar card.32 dead bodies were chosen.

Stature is the length of the dead body (BL). The minimum axial distance between the vertex of the head and the heel with body in supine position.[3] (Figure 1)

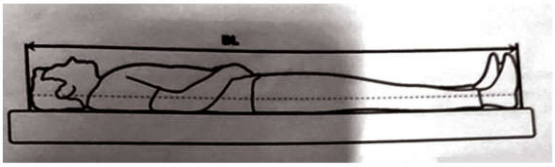


Fig. 1: Measurement of Body length (BL)

Source: Internet

Maximum head breadth (MHB) is the greatest transverse diameter from euryon to euryon.[5] (figure 2)

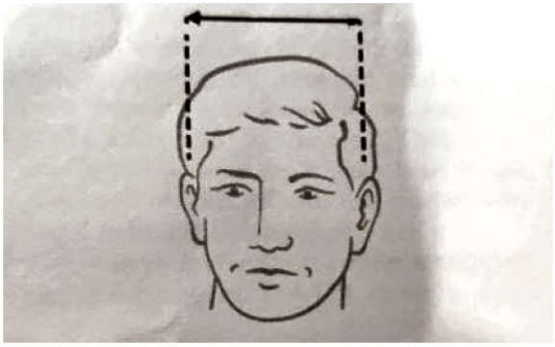


Fig. 2: Measurement of Maximum head breadth(MHB)

Source: Internet

Maximum head length (MHL) is straight distance between glabella and ophisthocranion.[5] (figure 3)

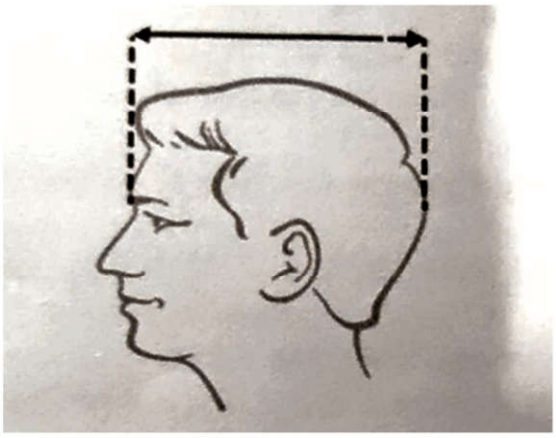


Fig. 3: Measurement of Maximum head length(MHL)

Source: Internet

The dead body was kept in supine position on the flat, hard surfaced autopsy table. Rigor mortis was broken, if had developed. The head was fixed in such a way that Frankfurt plane was at right angle to the autopsy table. Frankfurt plane is defined as plane adjoining the upper margin of the ear openings to the lower margin of the orbits of the eyes. Knee and hip joints were extended, and the neck and feet were kept in neutral position. Two wooden blocks were taken. One was kept at the vertex of the head and the other at the heel. Stature was measured between the two wooden blocks using a measuring tape (BL).[3]

For the measurement of maximum head length (MHL) and maximum head breadth (MHB) spreading callipers was used.[5]

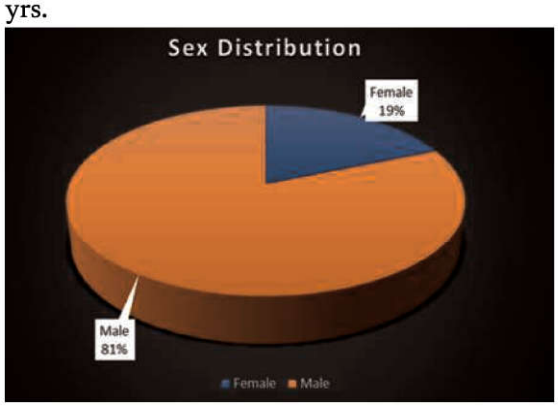
Fig. 4: Spreading callipers

Picture courtesy: Dr. Arundhati Saha

All the measurements were taken in a well-lighted room. Measurements were taken up to the nearest 0.1 cm. The collected data was tabulated with the help of Microsoft excel spreadsheet. The mean and standard deviation for each parameter was calculated. The correlation coefficient and standard error of estimate were then calculated. Finally, the regression analysis was done. The results were analysed using Stat Cal C software and SSS (online).

RESULTS

In the study, 32 deceased subjects were taken, 6 females and 26 males. The mean age was 47.25 (standard deviation of 15.69). Minimum age of subjects was 21 yrs and maximum age was 77 yrs.



The mean stature was 162.53 cm. (SD of 8.17). The minimum stature of subjects was 147 cm and the maximum stature was 178 cm. The mean head length was 17.78 cm (SD of 1.0083). The minimum head length of the subjects was 16 cm and the maximum head length was 20 cm. The mean head breadth was 13.75 cm (SD of 0.7058). The minimum head breadth of subjects was 12 cm and maximum head breadth was 15 cm.

Table 1: Descriptive Statistics

Variables	Mean	Median	Standard Deviation	Range
Age	47.25	49	15.69	56
Stature	162.53	162.03	8.174	31
Head Length	17.78	17.75	1.008	4
Head Breadth	13.75	14	0.705	3

Table 2: Correlation of Stature with head length and head breadth.

-	Pearson's Correlation	P value
Head length	0.473	<0.006
Head breadth	0.181	<0.321

Simple Regression equation

$y = Bx + A$

y is stature, B is slope, x is head length or breadth, A is y intercept

Table 3: Simple Regression Equation

-	Regression Equation	Standard Error of Estimate
Head Length	3.8307 × HL + 94.43	7.3171
Head Breadth	2.0973 × HB + 133.69	8.1677

Multiple logistic regression equation

Y is stature, X_1 is head length, X_2 is head breadth

$Y = (3.76 \times X_1) + (0.29 \times X_2) + 91.60$

The results indicate that one can successfully

DISCUSSION

estimate stature from head length and head breadth. The stature estimation can supplement the other personal identification data like estimation of age, sex, race and thus identification of the dead body.

The measurements were taken very carefully. All instruments were checked regularly for accuracy and precision while collecting data. Inter-observer errors were avoided by the author, by taking all measurements herself.

The findings of the study indicate positive correlation between head length and head breadth with stature. However it must be kept in mind that the goal of precise prediction of stature from the above mentioned head dimensions is unachievable.[1]

The study done by K.Krishnan and R.Kumar successfully estimated stature from cephalo-facial measurements in Koli adolescents – an endogamous population of North India. In adolescents, the stature is correlated with age but is complicated by the differences in rates of growth among individuals. The continuing physical growth of the long bones which contribute considerably to stature and progressive growth of the head also has some effect on the stature estimation in adolescents. Thus drawing the inference that stature is usually a straight forward parameter to demonstrate in adults.[1]

Pratik R Varu et al carried out a study on 100 male cases and 100 female cases ageing more than 20 yrs randomly selected from cadavers brought for post mortem examination. This study has found positive and statistically significant correlation of head length and head breadth with stature for population around Rajkot region of Gujarat. Moreover, it is found that regression formula derived from head length predicts stature more accurately than from head breadth. The present study has similar findings, i.e, head length has more correlation than head breadth with stature.[3]

Different geographical locations will have different regression equations, SEE, correlation coefficients as stature is influenced by number of factors like race, regional and environmental factors, etc.[8]

CONCLUSION

From the present study, it is concluded that Head length and Head breadth are correlated with Stature. Regression equations can be used to estimate Stature in forensic cases from Head length and Head breadth, with better correlation with Head length. Head length and Head breadth can predict the stature when cephalo facial remains are brought for forensic examination. It is further concluded that regression equations are population specific and will not give reliable results if applied to

other populations. However it must be kept in mind that the goal of precise prediction of stature from the above mentioned head dimensions is unachievable.[1]

LIMITATIONS

Due to changes in diet, socioeconomic status, diet, the present regression formulae may need readjustment over time.

The present study clearly has limitations in gender distribution.

Larger sample size will give more reliable regression equations.

RECOMMENDATIONS

Similar kind of study should be repeated with larger sample size with better gender distribution.

More than one observer for measuring the variables, can lead to inter observer error and that can be calculated to see if that is significant or not.

Conflict of Interest:
Nil
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