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Original Article

Estimation of Stature from the length of Clavicle in Vidarbha region of Maharashtra

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ABSTRACT

Objectives: Anthropometric study of bones conveys information regarding race, sex, age and height of person. Little data is available for stature estimation from short bones. The present study was planned in Vidarbha region to determine the stature from clavicle for individuals of the region which will be helpful medico legally since different regions need different formulas. **Materials and Methods:** The study consist of fully ossified clavicles belonging to the 60 dissection hall cadavers out of which 48 were males and 12 were females of known sex and stature collected from different medical colleges of the region. The cadaveric stature was measured and the living stature was obtained by deducting 15 mm for males and 20 mm for females from the length of cadavers. The linear relationship between the living stature and length of clavicle of each side was worked out in the form of regression equations. **Results:** In male, the mean living stature was 1620.37mm while in females it was 1542.25mm. Majority of males cases (43.75%) were in between the range of 1601-1650mm while least cases (0.00%) were in between 1451-1500mm range. In female majority of cases (50%) were in between the range of 1551-1600mm while least cases (0.00%) were in between 1601-1750mm and 1401-1450mm range. **Conclusion:** We observed the average living stature in male as 1620.37 mm and in females 1542.25 mm. The obtained regression formulas from the present study can be used to predict the stature from the length of clavicle in the population of Vidarbha region of Maharashtra, India.

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1. Introduction

Anthropometric study of bones conveys information regarding race, sex, age and height of person[1]. Anatomist and Forensic experts have been consulted frequently regarding identification of skeletal remains found under suspicious circumstances and are asked to pronounce an opinion which may form an important evidence in the court. Examinations of the skeletal samples of the burials are often fragmentary and they are found in mixed lots. In medico legal work the investigating authority always asks for stature of the victim, as determined from the bones recovered by them. Majority of data available at present is helpful for calculating the stature from long bones. Little data is available for stature estimation from short bones. But estimation of stature from clavicle has already been studied and they determined that the clavicle can also be used for stature estimation although it has little use. Moreover, anthropological study of clavicle has been somewhat neglected that's why we planned the present study.

Maharashtra is a big state where climatic condition nutritional status varies in different regions of the state which have Vidarbha, Marathwada, Western Maharashtra zones. It necessitates different formula for different region of the state for estimation of individual stature. The present study was planned in Vidarbha region to determine the stature from clavicle for individuals of the region

2. Material and Methods

The present study was carried out in the department of anatomy, Government Medical College, Nagpur, Vidarbha Maharashtra, India. It consist of fully ossified clavicles belonging to the 60 dissection hall cadavers out of which 48 were males and 12 were females of known sex and stature collected from different medical colleges of the region. The bones of each side of both sexes were numbered and kept separately. Bones showing pathological deformity or fractures were excluded from the present study.

Each bone was measured between its anatomical ends in millimeters with the articular cartilage intact and a millimeter at each end was allowed when the bones were devoid of articular cartilage[2] Measurements were taken with the help of osteometric board[2], vernier caliper and spreading caliper[3].

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The bony points were first localized and the measurements of both the sides were taken simultaneously. The cadaveric stature was measured in millimeters and the living stature was obtained by deducting 15 mm for males and 20 mm for females from the length of cadavers[4],[5].

The data obtained was analyzed statistically using Microsoft excel software and the average living stature for an adult male and female was determined. The linear relationship between the living stature and length of clavicle of each side was worked out in the form of regression equations and chi-square test was applied for determination of significance (p value) of it.

3.Results

The length of cadaver was measured and the living stature was calculated after deducting 15 mm in males and 20 mm in females. In male, the mean living stature was 1620.37mm with standard error of mean as 6.71. While in females it was 1542.25mm with standard deviation of 39.26mm and standard error of mean as 11.33. Table- 1

Table- 1: Average living stature in males and females

Sex	Number	Range in mm	Mean + SD
Male	48	Max 1711 Min 1460	1620.37+46.58
Female	12	Max 1600 Min 1460	1542.25+39.26

Majority of males cases (43.75%) were in between the range of 1601-1650mm while least cases (0.00%) were in between 1451-1500mm range. In female majority of cases (50%) were in between the range of 1551-1600mm while least cases (0.00%) were in between 1601-1750mm and 1401-1450mm range. Table- 2

Table- 2: Distribution of cases according to living stature

Range in mm	Males	Percentage	Females	Percentage
1401 - 1450	1	2.08	0	0.00
1451 - 1500	0	0.00	2	16.7
1501 - 1550	2	4.16	4	33.3
1551 - 1600	9	18.75	6	50.0
1601 - 1650	21	43.75	0	0.00
1651 - 1700	13	27.08	0	0.00
1701 - 1750	2	4.16	0	0.00

Regression formulae differ in both sexes. In males they are almost same for right and left clavicle where as in females they differ on the two sides. Table -3

Table- 3: Regression formulae

Sex	Regression formulae	Chi-Square (df)	Significance
Male Right Clavicle	Y= 1630.58 - 0.0772 C	X ² = 22.88, df = 46	P > 0.05= N.S.
Male Left Clavicle	Y= 1617.47 + 0.0157 C	X ² = 22.91, df = 46	P > 0.05= N.S.
Female Right Clavicle	Y= 1707.2 - 1.31 C	X ² =10.27, df =10	P > 0.05= N.S.
Female Left Clavicle	Y= 1674.58 - 1.0385 C	X ² =10.47, df =10	P > 0.05= N.S.

Y =living stature of adult, C = Clavicle, P = Probability, N.S =Not significant

4.Discussion:

The average living stature in the present study recorded in male was 1620.37 mm with SD as 46.58 and standard error of mean 6.71. In female the stature was 1542.25 mm with SD 39.26 and standard error of mean 11.33. Patil,Gawhale and Muzumdar[6] in their study conducted in Vidarbha region of Maharashtra in 1983 on long bones of upper and lower limb also reported similar types of findings which was 1619mm mean in male. Bhargava and Kher[7] in 1961 also found similar results. Their observed mean was 1615mm and range 1530-1795mm in tribal Bhils population of Madhya Pradesh and in Barelais of Madhya Pradesh mean was 1615mm with 1530-1795 range.

But as compare with the stature reported by Kolte & Bansal[8] for Marathwada region of Maharashtra (1657.8 mm) for male the stature of male in the present study is found to be shorter (1620.37 mm). Athawale[9] in their study conducted in Western Maharashtra in 1963 also found longer stature (1631mm mean and 1490.2-1778mm range) as compared to our study with using fore arm bones.

The average living stature of females in the present series was 1542.25 mm with 39.26 SD and 11.33 SEM. Our findings are comparable to the findings of Patil et al[6] and Kolte and Bansal[8]. Patil et al found 1490mm mean and 1402-1523mm range in females in Vidarbha region of Maharashtra with long bones. While Kolte and Bansal in their study conducted in the population of Marathwada region of Maharashtra in 1974 observed 1497.20 mm mean and 1370-1670mm range.

Singh & Sohal [10] in 1952 studied the estimation of stature from clavicle as well as from metacarpals and metatarsals with an average error is little over 11/2 inches and they reported the average stature of population of Punjabi is 1630 mm. The present study shows the stature little shorter than the above mention stature with an average error of 11.1mm.

Siddiqui and Shah[11] in their study conducted in Punjabi population using long bones in 1944 also observed 1636mm mean with 1487-1687mm range which is larger than the present study. While study conducted by Bose [12] in 1963 found 1666mm mean with 1546-1810mm range in East Bengal (Kayasthas of Bengal) population.

Thus there are very few studies, which mention about the estimation of stature from various parameters of clavicle. Different parameters were used. The regression formulae were derived separately for males and females and also for the right and left side. The above regression formulae for both males and females were derived which was statistically tested using Chi-square test. All positive values of Chi-square test have probabilities greater than 5%, showing that the regression lines are representatives of the relationship between the stature and the bone. However, as no earlier work is available regarding the regression formulae for clavicle, the present study could not be compared with others.

5.Conclusion:

In the present study the average living stature in male was 1620.37 mm and in females 1542.25 mm. Regression formulae are derived for both the sexes and the sides separately to estimate the stature. The obtained regression formulas from the present study can be used to predict the stature from the length of clavicle in the population of Vidarbha region of Maharashtra, India.

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