



COMPARATIVE STUDY OF ESTIMATION OF STATURE USING FEMUR LENGTH AND HUMERUS LENGTH: AN ANTHROPOMETRIC STUDY

Mrudula C ^{1*} and Naveena S ²

¹Associate Professor, ²Assistant Professor, MD, Department of Anatomy,
Apollo Institute of Medical Sciences and Research, Hyderabad, Telangana 500096, India.

ABSTRACT

Stature is defined as the natural height of a human or animal in an upright position. Estimation of stature helps in identification of a person in medico legal cases. In many cases only the remains of some bones are available which act as a guide for estimation of the individual. In the present study 50 femur and 50 humerus bones are taken. The height or stature is calculated based on the length of these bones and compared with each other. It is concluded in the study that there is significant correlation between the length of the individual bones and the stature. This study is useful for anthropologists and forensic experts.

Keywords: Femur length, Humerus length, Stature, Anthropology, Medico legal.

INTRODUCTION

The natural height of the person is described as the stature. One of the criteria to establish identity of the person is this stature. To know stature of individual, length of long bones is needed. Use of more than one long bone gives accurate result. The femur and humerus are the longest and strongest bones in the human body [1]. They have shaft, proximal end and distal end. Femur and humerus are selected in the present study because it helps in assessing the height of the individual more accurately compared to the other long bones. The application of osteometry is most important in medico legal investigation for estimating the height which is part of achieving the goal of estimating age at the time of death, sex, race, ancestry, ethnicity, stature, body weight and body build. The relation between stature and the length of long bone shows a difference amongst the three races like Caucasoid, Negro and Mongoloid. Therefore, there is a need to derive separate, specific formulae for different races [2]. The result of studies done in one population cannot be entirely applicable to other population¹. Considering all the features the estimation of height is calculated from the length of femur and humerus bones and compared.

MATERIAL AND METHODS

The present study is done using 50 femur bones and 50 humerus bones, in the department of anatomy, Apollo institute of medical sciences and research, Hyderabad. The length of the individual bones is calculated by using the tape. The fig (1) and fig (2) show the method of measurement of the length. The distance between the most proximal part of the head and the most distal part of the lower end of the bones is taken and length is calculated. The points between the two ends is marked and measured with the scale.

All the data are taken and tabulated. The data were analysed later using Statistical Package for Social Sciences (SPSS) version 11. The data were analyzed for range, mean, standard deviation and standard error [3].

RESULTS

The length of 50 individual femur bones and the length of 50 humerus bones were noted and subjected to statistical analysis and compared. The regression equation to calculate the stature used is :

$$\text{Stature} = 2.32 \times \text{Femur length} + 65.53 \pm 3.94 \text{ cm}$$

$$\text{Stature} = 2.89 \times \text{Humerus} + 78.10 \pm 4.57 \text{ cm}$$

The following results were obtained:

Table 1. Length of femur

Minimum length(cms)	Maximum length	Mean	Median	Mode	Standard deviation
35.5	47.3	41.85	42.1	41.3	2.83

Table 2. Length of humerus

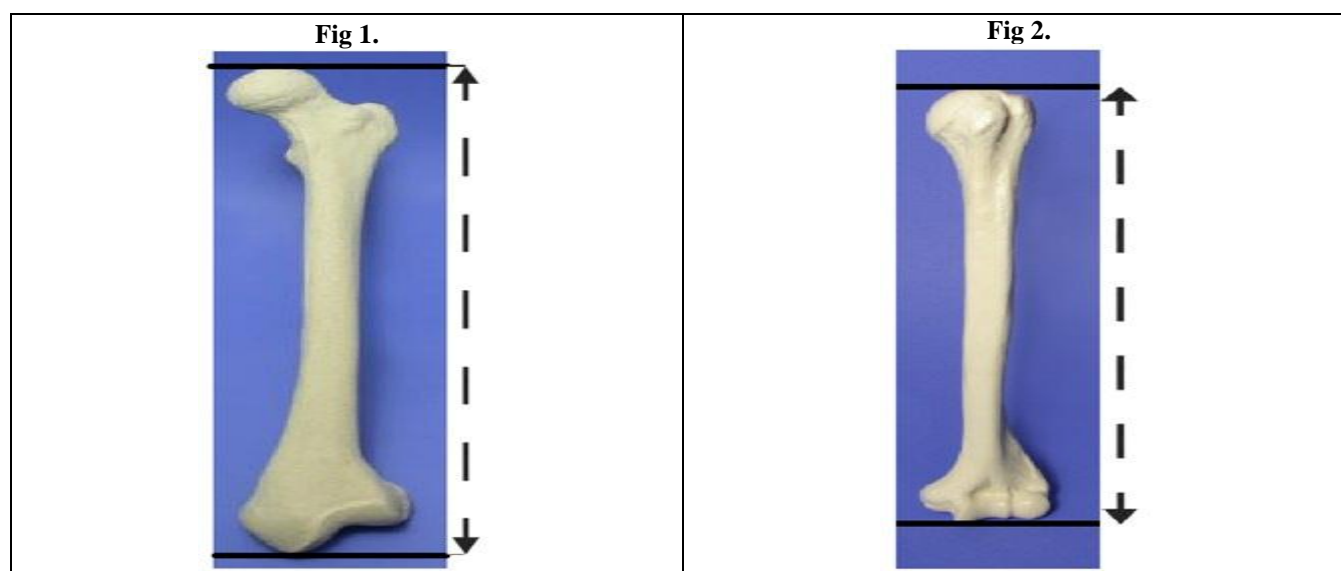
Minimum length	Maximum length	Mean	Median	Mode	Standard deviation
25.5	34.9	30.19	30.05	30	2.28

Table 3. Stature based on the length of the femur

Minimum length	Maximum length	Mean	Median	Mode	Standard deviation
147.89	175.26	162.62	163.2	161.34	6.57

Table 4. Stature based on the length of humerus

Minimum length	Maximum length	Mean	Median	Mode	Standard deviation
151.79	178.96	165.35	164.94	164.8	6.57



DISCUSSION

Estimation of stature from bones plays an important role in identifying unknown bodies, parts of bodies or skeletal remains. In the present study, an attempt has been made to show relationship between stature and length of femur, length of humerus. The study was conducted in total 100 individual bones (50 Femur and 50 humerus bones) taken from the Department of anatomy, Apollo institute of medical sciences and research, Hyderabad [4].

Individuals stop growing in height on completion of union of the epiphysis and the diaphysis, which is usually by the age of 18 to 20 years. So all bones used in the study were above the age of 20 years. Karl Pearson (1898) [5] for the first time attempted to estimate the stature of a person from the measurement of individual bones. According to the formula stature = $81.231 + 1.880 \times \text{femur length}$. In 1952 Trotter and glesser [6] measured

skeletons of military personnel killed in world war II and correlated the skeletal length with known living height. The use of formula to calculate the stature is done by steele [7]. KR Nagesh [8] estimated the stature from length of tibia, radius and ulna in medical students belonging to South Indian population. In his study, the multiple regression equations parameters showed higher correlation coefficients (0.829 in males and 0.747 in females). Bhavna and Surender Nath [9] in their study on male Shia Muslims in Delhi derived the linear regression equation. Celbis [10] derived regression formulae and found a good correlation between the length of the tibia bone and the stature of the person. Thus we can say that regression equations, SEE and correlation coefficients are different for different geographical locations, as stature is influenced by number of factors like race, regional and environmental factors etc [11,12].

CONCLUSION

We conclude that the length of femur and humerus are useful for forensic examination. Regression

equations are population specific and will not yield exact stature if applied to other population.

REFERENCES

1. Siddiqui MA and Shah MA. Estimation of stature long bones of Punjabis. *Indian J Med Res*, 32, 1944, 105-8.
2. Trotter M, Gleser GC. Estimation of stature from long bones of American Whites and Negroes. *Am J Phys Anthropol*, 10, 1952, 463-514.
3. Guharaj PV. Text book of forensic medicine, 2003, 43-45.
4. Gehring KD, Graw M. Determining body height by the femur and femoral fragments. *Arch Kriminol*, 207(5-6), 2001, 170-80.
5. Pearson Karl. The German Passion-Play: A Study in the Evolution of Western Christianity, in *The Chances of Death and Other Studies in Evolution*. London: Edward Arnold, 1987, pp. 246-406.
6. Mildred trotter and Goldine C. Gleser. Estimation of stature from long bones of american whites and negroes. *Am J Phys Anthropol*, 10(4), 1952, 463-514.
7. Steele DG, Mckern TW. A method for assessment of maximum long bone length and living stature from fragmentary long bones. *Am. J. Phys. Anthropol*, 31(2), 1969, 215-27
8. Nagesh KR, Kumar GP. Estimation of stature from vertebral column length in South Indians. *Leg Med*, 8(5), 2006, 269-72.
9. Bhavna, Nath S. Use of lower limb measurements in reconstructing stature among Shia Muslims. *Internet J Biolog Anthropol*, 22, 2008, 18-24.
10. Celbis O, Agritmis H. Estimation of the stature and the determination of sex from the radial and the ulnar bone lengths in a Turkish corpse sample. *Forensic Sci Int*, 158(2-3), 2006, 135-9.
11. Dayal Manisha R., Maryna Steyn, Kuykendall Kevin L. Stature estimation from bones of south African whites, south. *African journal of science*, 104, 2008, 3-4.
12. Sah RP, Shrestha. Estimation of stature from percutaneous length of tibia in the population of Birgunj, Nepal. *Journal of Kathmandu medical college*, 3(2), 2014, 58-62.