Correlation of humeral length and its segments in a sample of Indian population: an osteological study

Saima Samoon, Mohd Saleem Itoo*, Neelufur Jan, Gh. Mohd Bhat

Department of Anatomy, Government Medical College Srinagar, Jammu and Kashmir, India

Received: 11 November 2018
Revised: 05 December 2018
Accepted: 08 December 2018

*Correspondence:
Dr. Mohd Saleem Itoo,
E-mail: dr.saleem68@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Anthropometry measurements are very useful and have definite medico legal significance. In case of missing persons in the absence of pelvis and cranium, the remains of long bones of an individual play an important role in anthropological practice for morphometric analysis. The stature of an individual can be estimated from the humerus alone. Estimating the mean values of different segments of humerus helps in forensic and anthropometric practice. Previous studies have confirmed that humerus is one of the strongest long bones of the human skeleton and its fragments can be recorded in a forensic case. The present study was done to assess the mean values of different segments of humerus and their correlation with its length.

Methods: Seventy dry adult humerus bones (32 rights and 38 left) were collected randomly from the anatomy department. Broken bones and the bones in a poor condition were excluded from the study. The segments of the humerus were studied for morphometric analysis.

Results: All of the measurements were obtained in millimetres (mm). The measurement of the maximum length of humerus (MHH) was done by using an osteometric board and the different segments of humerus were measured by a vernier calliper (precision=0.0 cm). Mean and SD were calculated.

Conclusions: This study has helped us to observe the maximum length of humerus and the mean values of the different segments of humerus in a sample of Indian population. The study also suggests that there are some differences between various segments of humerus within different populations.

Keywords: Anthropometry, Humerus, Osteometric board, Venier calliper

INTRODUCTION

Human populations differ in their physical characteristics and their bones also show a wide range of differences. Human growth is influenced by many factors such as race, nutrition and ethnicity, so nomograms are species specific.1

For the estimation of stature and the bone length anthropometry measurements are very useful and are to be obtained from the skeletal remains.2 Anthropometry measurements have definite medico legal significance in situations like natural disasters, accidents and in case of missing persons in the absence of pelvis and cranium, the remains of long bones of an individual play an important role in anthropological practice for morphometric analysis.3 Lower limb bones like femur and tibia together are used for the assessment of living stature of an individual and are considered as best.4,5 If the bones of lower limb are not available the stature of an individual can be estimated from the long bones of upper limb like humerus, radius and ulna.6,7
In some situations, due to non-availability of the whole of the long bones, fragments of the long bones such as of radius and femur, femur and tibia, ulna and tibia and humerus can be used. Estimating the mean values of different segments of humerus helps in forensic and anthropometric practice. Previous studies have confirmed that humerus is one of the strongest long bones of the human skeleton and its fragments can be recorded in a forensic case. Humerus can alone be used for the purpose of forensic study. The present study was done to assess the mean values of different segments of humerus bone and the total length of humerus in a sample of Indian population.

METHODS

The present study was conducted in the post graduate department of Anatomy, Government Medical College, Srinagar over a period of two months after getting clearance from the departmental ethical committee. Seventy dry adult humerus bones (32 rights and 38 left) were taken for this study.

The bones used were taken from the bone bank of Anatomy Department. These bones were purchased by the department about 60 years back and belonged to the people from different regions of India. The segments of the humerus were studied for morphometric analysis. All of the measurements were obtained in millimetres (mm). The measurement of the maximum length of humerus (MHH) was done by using an Otseometric board and the different segments of humerus were measured by using Vernier calliper (precision=0.1cm). Mean deviation (MD) and standard deviation (SD) were calculated. The following parameters were studied for the present study.

- Maximum length of humerus
- The mean distance between the most proximal point on the articular segment of humeral head to the most proximal point of the greater tuberosity.
- The mean distance between the most proximal point of head of humerus and the surgical neck of humerus.
- The mean distance between the most distal point and most proximal point along the edge of Olecranon fossa.
- The mean distance between the most distal part of Olecranon process and trochlea of humerus.
- The mean distance between the proximal edge of Olecranon fossa and proximal point of trochlea of humerus.

**Inclusion criteria**

- Bones with normal anatomy
- Bones without fractures
- Bones with out deformity.

**Exclusion criteria**

- Broken bones
- Bones in a poor condition
- Fractured and deformed bones.

RESULTS

The results were, maximum length of the humerus was 309.68±13.61mm on right side and 305±18.95mm on left side.

| Parameter                                              | Right (Mean±SD) | Left (Mean±SD) |
|--------------------------------------------------------|-----------------|----------------|
| Maximum length of humerus                               | 309.68±13.61mm  | 305±18.95mm    |
| The mean distance between the most proximal point on the articular segment of humeral head to the most proximal point of the greater tuberosity (H1) | 7.06±1.45mm     | 7.02±1.63mm    |
| The mean distance between the most proximal point of head of humerus and the surgical neck of humerus (H2) | 34.68±4.04mm    | 32.52±5.32mm   |
| The mean distance between most distal point and most proximal point along the edge of Olecranon fossa (H3) | 23.12± 3.96mm   | 22.89±2.75mm   |
| The mean distance between the most distal part of Olecranon process and trochlea of humerus (H4) | 17.46± 2.50mm   | 18.13±3.03mm   |
| The mean distance between the proximal edge of Olecranon fossa and proximal point of trachea of humerus (H5) | 32.75±4.00mm    | 34.34±3.50mm   |

The mean distance between the most proximal point on the articular segment of humeral head to the most proximal point of the greater tuberosity (H1) was 7.06±1.45mm on the right side and 7.02±1.63mm on the left side. The mean distance between the most proximal point of head of humerus and the surgical neck of humerus (H2) was 34.68±4.04mm on right and 32.52±5.32mm on the left side respectively. The mean
In this study the mean distance between the most distal part of Olecranon process and trochlea of humerus (H4) was 17.46±2.50mm on the right side and 18.13±3.03mm on the left side. In Indian population Somesh MS et al, observed the same measurement as 37.26±4.7mm on right side and 35.72±4.3mm on left side, and Akman et al, found the same values as 24.2±2.07mm and 23.9±2.63mm in right and left humerus respectively.13,15 present study values are closely related with the Turkish population.

The findings of the present study regarding the mean distance between the proximal edge of Olecranon fossa and proximal point of trochlea of humerus (H5) was 32.75±4.00mm on the right side and 34.34±3.50mm on the left side respectively as shown in the Table 1.

**DISCUSSION**

Humerus is one of the long bone of upper limb and is used in forensic and anthropologic studies. The total length of the bone and the measurement of its various segments can be used for identification of an individual and also for assessing the stature and bone length from skeletal remains. The present study was conducted on seventy adult humerus (32 right and 38 left). The maximum length of humerus in this study was 309.68±13.61mm on right side and 305±18.95mm on left side. A study conducted by Akman et al (13) observed the maximum length of humerus as 307.1±20.6 mm on right side and 304±18.9mm on left side in Turkish population and these values are comparable with ours, while as in a study conducted by Desai et al, the mean length of humerus was 292.3±22.9mm on right side and 289.45±21.8mm on left side respectively.14

The mean distance between the most proximal point on the articular segment of humeral head to the most proximal point of the greater tuberosity (H1) was 7.06±1.45mm on right side and 7.02±1.63mm on the left side in the present study. In a study conducted by S.D. Desai et al, it was 6.9±1.2mm and 7.1±1.1mm on right and left side respectively.14 Akman et al, observed these values as 6.5±1.6mm on right side and 6.6±1.3mm on left side.13

Observations of the present study revealed the mean distance between the most proximal point of head of humerus and the surgical neck of humerus (H2) as 34.68±4.04mm on right and 32.52±5.32mm on the left side respectively, while as in Turkish population it was observed by Akman et al, as 41.0±5.1mm and 40.9±3.9mm on right and left side respectively. The values were lower in studied population as compared to Turkish subjects.13

In the present study the mean distance between most distal point and most proximal point along the edge of Olecranon fossa (H3) was 23.12±3.96mm on right side and 22.89±2.75mm on left side. The same measurement in Turkish population as revealed by Akman et al, study as 24.2±2.07mm and 23.9±2.6mm on right and left side respectively.13 Somesh MS et al, observed the same measurement as 20.1±3.4mm on right side and 19.0±2.9mm on left side respectively.15

In conclusion, this study has helped us to observe the maximum length of humerus and the mean values of the different segments of humerus in a sample of Indian population. This data can be used to provide information in forensic and anatomic studies as well as in clinical assessment of various fractures and their treatment. The study also suggests that there are some differences between various segments of humerus among different populations.

**ACKNOWLEDGEMENTS**

Authors would like to thank Dr. Shaheen Shahdad, Head Department of Anatomy and member of Institutional Ethical Committee for providing us needful research material and equipment for this study. Authors are also thankful to all colleagues for their cooperation and guidance.

**Funding: No funding sources**

**Conflict of interest: None declared**

**Ethical approval: The study was approved by the Institutional Ethics Committee (Anat/EC/05/2018)**

**REFERENCES**

1. Bhatnagar DP, Thapar SP, Batish MK. Identification of personal height from the somatometry of the hand in Punjabi males. Forensic Sci Int. 1984 Feb 1;24(2):137-41.
2. Hoppa RD, Gruspier KL. Estimating diaphyseal length from fragmentary subadult skeletal remains: implications for palaeodemographic reconstructions of a Southern Ontario ossuary. Am J Physical Anthropol. 1996 Jul;100(3):341-54.

International Journal of Research in Medical Sciences | January 2019 | Vol 7 | Issue 1 | Page 249
3. Nath S, Badkur P. Reconstruction of stature from long bone lengths. Anthropologist. 2002 Apr 1;4(2):109-14.
4. De Mendonca MC. Estimation of height from the length of long bones in a Portuguese adult population. Am J Physical Anthropol. 2000 May;112(1):39-48.
5. Radoinova D, Tenekedjiev K, Yordanov Y. Stature estimation from long bone lengths in Bulgarians. J Comparative Human Biol. 2002 Jan 1;52(3):221-32.
6. Celbis O, Agritmis H. Estimation of stature and determination of sex from radial and ulnar bone lengths in a Turkish corpse sample. Forensic Sci Int. 2006 May 10;158(2-3):135-9.
7. Kate BR, Mujumdar RD. Stature estimation from femur and humerus by regression and autometry. Cells Tissues Organs. 1976;94(2):311-20.
8. Mysorekar VL, Verma PK, Mandedkar AN, Sarmat TC. Estimation of stature from parts of bones-lower end of femur and upper end of radius. Med Sci Law. 1980 Oct;20(4):283-6.
9. Steele DG, McKern TW. A method for assessment of maximum long bone length and living stature from fragmentary long bones, Am J J Physical Anthropol. 1969 Sep;31(2):215-27.
10. Mysorekar VR, Nandedkar AN, Sarma TC. Estimation of stature from parts of ulna and tibia. Med Sci Law. 1984 Apr;24(2):113-6.
11. Wright LE, Vásquez MA. Estimating the length of incomplete long bones: forensic standards from Guatemala. Am J Physical Anthropol. 2003 Mar;120(3):233-51.
12. Albanese J, Cardoso HF, Saunders SR. Universal methodology for developing univariate sample-specific sex determination methods: an example using the epicondylar breadth of the humerus. J Archaeol Sci. 2005 Jan 1;32(1):143-52.
13. Akman ŞD, Karakaş P, Bozkir MG. The morphometric measurements of humerus segments. J Turkish J Med Sci. 2006 Apr 21;36(2):81-5.
14. Desai SD, Shaik HS. A morphometric study of humerus segments. J Pharmaceut Sci Res. 2012 Oct 1;4(10):1943.
15. Somesh MS, Prabhu LV, Shilpa K, Pai MM, Krishnamurthy A, Murlimanju BV, et al. Morphometric study of the humerus segments in Indian population. Int J Morphol. 2011 Jan 1;29(4):1174-80.

Cite this article as: Samoon S, Itoo MS, Jan N, Bhat GM. Correlation of humeral length and its segments in a sample of Indian population-an osteological study. Int J Res Med Sci 2019;7:247-50.