

Original Research Article

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

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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=0.01cm). 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, Vernier 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.⁸⁻¹¹ 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.¹² Humerus can alone be used for the purpose of forensic study.⁹ 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 Osteometric 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 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.

Table 1: mean length of humerus and its segments millimetres.

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

distance between most distal point and most proximal point along the edge of Olecranon fossa (H3) was 23.12 ± 3.96 mm on right side and 22.89 ± 2.75 mm on left side. The mean distance between the most distal part of Olecranon process and trochlea of humerus (H4) was 17.46 ± 2.50 mm on the right side and 18.13 ± 3.03 mm on the left side. The mean distance between the proximal edge of Olecranon fossa and proximal point of trochlea of humerus (H5) was 32.75 ± 4.00 mm on the right side and 34.34 ± 3.50 mm 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 ± 13.61 mm on right side and 305 ± 18.95 mm 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 ± 18.9 mm 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 ± 22.9 mm on right side and 289.45 ± 21.8 mm 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 ± 1.45 mm on right side and 7.02 ± 1.63 mm on the left side in the present study. In a study conducted by S.D. Desai et al, it was 6.9 ± 1.2 mm and 7.1 ± 1.1 mm on right and left side respectively.¹⁴ Akman et al, observed these values as 6.5 ± 1.6 mm on right side and 6.6 ± 1.3 mm 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 ± 4.04 mm on right and 32.52 ± 5.32 mm on the left side respectively, while as in Turkish population it was observed by Akman et al, as 41.0 ± 5.1 mm and 40.9 ± 3.9 mm 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 ± 3.96 mm on right side and 22.89 ± 2.75 mm on left side. The same measurement in Turkish population as revealed by Akman et al, study as 24.2 ± 2.07 mm and 23.9 ± 2.6 mm on right and left side respectively.¹³ Somesh MS et al, observed the same measurement as 20.1 ± 3.4 mm on right side and 19.0 ± 2.9 mm on left side respectively.¹⁵

In this study the mean distance between the most distal part of Olecranon process and trochlea of humerus (H4) was 17.46 ± 2.50 mm on the right side and 18.13 ± 3.03 mm on the left side. In Indian population Somesh MS et al, observed the same measurement as 37.26 ± 4.7 mm on right side and 35.72 ± 4.3 mm on left side, and Akman et al, found the same values as 24.2 ± 2.07 mm and 23.9 ± 2.63 mm 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 ± 4.00 mm on the right side and 34.34 ± 3.50 mm on the left side respectively. Desai SD et al, found the values as 25.72 ± 2.9 mm and 22.56 ± 2.9 mm on right and left humerus respectively.¹⁴ Somesh MS et al, found the same distance as 37.2 ± 4.7 mm on right humerus and 35.7 ± 4.3 mm on left humerus.¹⁵ Akman SD et al, observed this measurement as 40.6 ± 3.3 mm on right side and 39.7 ± 3.4 mm on left side.¹³

CONCLUSION

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.

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