

## Identification of Sex from Right Humerus in Maharashtra Population: Retrospective Study

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### Abstract

**Background:** Identification of sex from bone is of vital importance to medico-legal expert and anthropologists because the skeleton of a particular individual is able to adopt to its owner's way of life.

**Method:** 30 male and 30 female right side non-pathological macerated humerus were studied. Each bone was put in anatomical position and metrical parameters were carried out by vernier calliper and weight of the bones by digital weighing machine.

**Results:** Various parameters like transverse diameter of surgical neck of humerus, transverse diameter of superior articular surface, length of humerus, weight of humerus in both sexes were measured and compared and all values were highly significant ( $p < 0.001$ ).

**Conclusion:** The metrical study of humerus of both sexes will be quite helpful to medico-legal experts, anthropologists and Anatomists, because morpho-metric value of mesodermal derivatives are un-certain.

**Keywords:** Vernier Callipers, Digital Weighing Machine, Medico-Legal, Anthropological, Metrica.

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### Introduction

Identification of sex is an important factor to medico-legal expert, anthropologist to confirm regional or ethnic importance and anatomist for clinical or surgical application [1,2].

In a view of complicated structure of bone and many factors involved the actual stresses and strains which develop in bone when it is loaded are difficult to determine about the sex, because skeletal structures

have ability to adapt their structures to meet the changing demands and to restore other structural integrity and functional efficiency. Many bones have been previously used for the identification of sex and such studies emphasize that sexual dimorphism starts to appear after puberty [3]. The humerus has rarely tapped as site of sex determination, though it has often demonstrated an even, greater accuracy than other long bones such as the femur [4]. The DNA material can be

more helpful to find out the sexual dimorphism, but it is very costly procedure and every medico-legal expert or anthropological cannot afford the DNA test hence attempt is made to evaluate the metrical study of humerus in both sexes.

### Material and Methods

30right side male and 30right side female humerus bones available at Anatomy and Forensic Department of Vedanta Institute of Medical Sciences, Saswand, Palgarh (tq), Dahanu (dist) Maharashtra were studied.

**Inclusive Criteria:** Non – Pathological dried, macerated adult humerus of both sexes were selected.

**Exclusive Criteria:** Pathological, broken (fractured) bones were excluded from the study.

### Methods

Each bone was put in Anatomical position and metrical parameters were carried out by vernier calliper and weight of the bones was carried out by digital weighing machine.

The duration of study was from January 2021 to January 2023.

### Statistical Analysis

Morpho metric parameter of bones of both sexes were noted and compared with t test and significant results were noted. The statistical analysis was carried out in SPSS software. The ratio of male and female was 1:1.

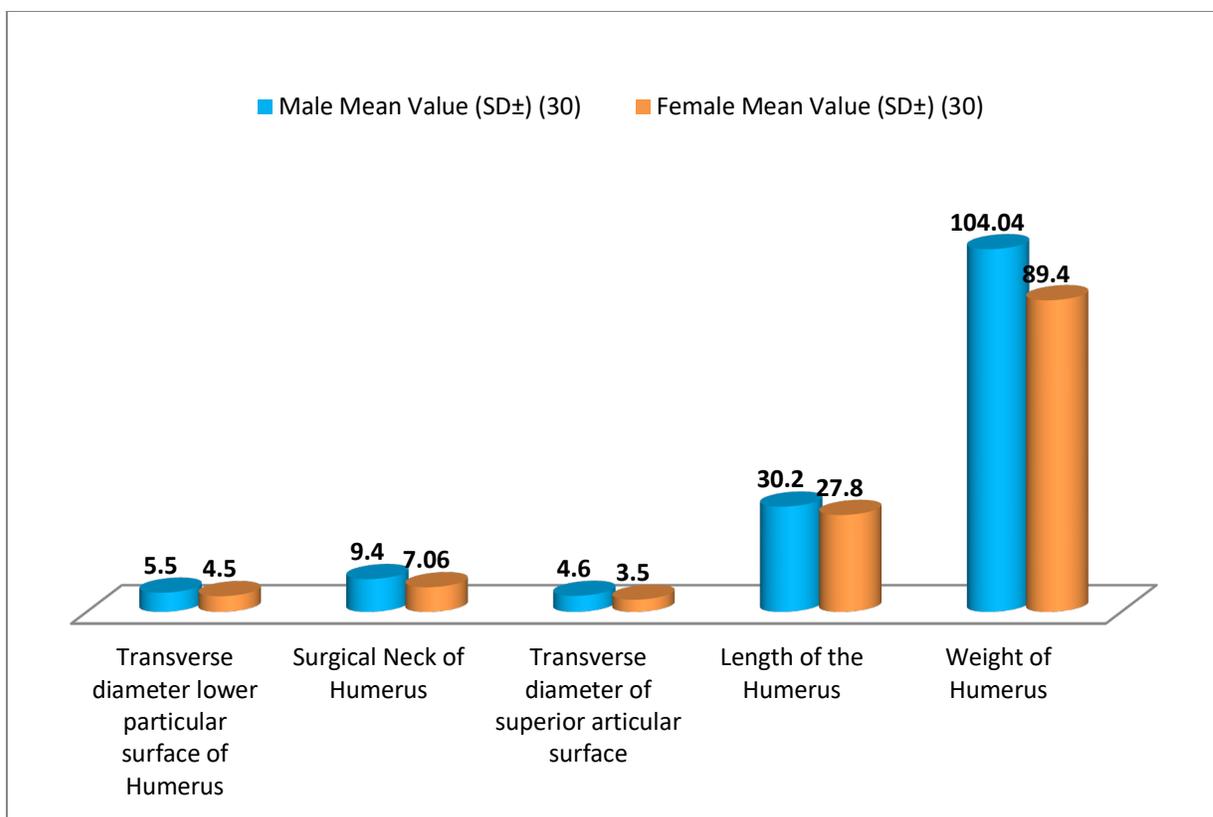
### Observation and Results

Morphometric Study of humerus in both sexes

- Transverse diameter of lower surface of humerus 5.5 ( $\pm 0.01$ ) in Male, 4.5 ( $\pm 0.1$ ) in females, t test was 57.5 and  $p < 0.01$ .
- diameter of surgical Neck of humerus 9.4 ( $\pm 0.01$ ) in males, 7.06 ( $\pm 0.01$ ) in females, t test was 57.3 and  $p < 0.001$ .
- Transverse diameter of superior articular surface 4.6 ( $\pm 0.02$ ) in male, 3.5 ( $\pm 0.01$ ) in female, t test was 32.1 and  $p < 0.001$ .
- Length of Humerus – 30.2 ( $\pm 0.02$ ) in male, 28.80 ( $\pm 2.5$ ) in female, t test was 4.22 and  $p < 0.02$ .
- Weight of humerus 104.04 ( $\pm 2.6$ ) in male, 89.4 ( $\pm 1.9$ ) in female, t test was 24.9 and  $p < 0.001$ .

**Table 1: Morphometric study of Right Humerus in both sexes (Total No. of Bones: 60)**

Sl. No.	Parameters	Male Mean Value (SD $\pm$ ) (30)	Female Mean Value (SD $\pm$ ) (30)	t test	P value
1	Transverse diameter lower particular surface of Humerus	5.5 (SD $\pm 0.01$ )	4.5 (SD $\pm 0.1$ )	57.5	$P < 0.01$
2	Surgical Neck of Humerus	9.4 (SD $\pm 0.01$ )	7.06 (SD $\pm 0.01$ )	57.3	$P < 0.01$
3	Transverse diameter of superior articular surface	4.6 (SD $\pm 0.02$ )	3.5 (SD $\pm 0.001$ )	32.1	$P < 0.01$
4	Length of the Humerus	30.2 (SD $\pm 0.2$ )	27.80 (SD $\pm 2.5$ )	4.22	$P < 0.01$
5	Weight of Humerus	104.04 (SD $\pm 2.6$ )	89.4 (SD $\pm 1.9$ )	24.9	$P < 0.01$



**Figure 1: Morphometric study of Right Humerus in both sexes**

## Discussion

Present study of Identification of sex right side humerus in Maharashtra Population transverse diameter of lower surface of humerus 5.5 ( $\pm 0.1$ ) in males, 4.5 ( $\pm 0.1$ ) in female, t test was 57.5 and  $p < 0.01$ . Diameter of surgical neck of humerus was 9.4 ( $\pm 0.1$ ) in males, 7.06 ( $\pm 0.001$ ) in females, t test was 57.35 and  $p < 0.001$ . Trans diameter of sup. articular surface of humerus 4.6 ( $\pm 0.02$ ) in males, 3.5 ( $\pm 0.01$ ) in female, t test 32.1 and  $p < 0.001$ . Length of right humerus was 30.2 ( $\pm 0.2$ ) in males, 27.80 ( $\pm 0.25$ ) in female, t test 4.22 and  $p < 0.001$ , weight of the humerus 104.04 ( $\pm 2.6$ ) in males, 89.4 ( $\pm 1.9$ ) in females, t test 24.9 and  $p < 0.01$ . These findings are more or less in agreement with previous studies [5-7].

This sexual dimorphism could be attributed more variable lifestyle and differential patterns of physical labour expected of

males versus females [8]. Moreover, early maturity of females than males, giving two or more addition years to develop physically than male bones [9]. It has been also suggested that sexual dimorphism changes have strong genetic make-up. It is also noted that dietary or nutritional intake also plays vital role in sexual dimorphism [10]. Hence nutritional status empowers the genes and hormones to function efficiently.

In addition to these skeletal structures have ability to adapt their structure to meet the changing demands and to restore their structural integrity and functional efficiency provided they are well nourished.

## Summary and Conclusion

The present study of sexual dimorphism of humerus will be useful to anatomist anthropologist and medico legal experts to

identify the sexes with particular ethnicity. But this study demands further, genetic, hormonal, nutritional, ethnic, biomechanical study because bone is the most plastic tissue next to blood.

**Limitation of Study:** Owing to tertiary location of research centre and small number of bones and lack of latest technologies, we have limited findings and results.

**Ethical Approval:** This research paper was approved by Ethical committee of Vedanta Institute of Medical Sciences, Saswand, Palgarh (tq), Dahanu (dist), Maharashtra

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