



Original Research Article

Maximum Length of the Humerus - Major Discriminative Variable in Sexual Dimorphism

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ABSTRACT

Sex Determination of individual bones may vary within or between the populations of different regions. A total of 100 (Male - 72, Female - 28) human humeri were utilized to study the parameters like maximum length and total length of the humerus in south Indian population by using Osteometric board. The mean maximum length in male was 31.97cm \pm 0.155, female it was 28.65cm \pm 0.153 and the mean total length of humerus in male was 31.532 cm \pm 0.154, in female it was 28.35cm \pm 0.153. Our study suggesting that maximum length and total length are highly significant parameters (<0.0001) to consider as major discriminative variables in sexual dimorphism of humerus.

Keywords: humerus, maximum length, sex determination

INTRODUCTION

Humerus plays very important role in anthropological and forensic practice to identify its length from the segmental measurements; this method is an essential step in assessing health, sexual dimorphism and the general body size that trends among the past populations. [1,2] Femur and tibia of the lower limb collectively remains the best for the assessment of living stature of the individual. [3,4] However in their absence, estimation of living stature can also be done from the long bones of the upper limb viz. Humerus, radius & ulna. [5,6] The humerus has rarely been tapped as a site for sex determination, though it has often demonstrated an even greater accuracy than other long bones such as the femur. [7,8]

MATERIALS AND METHODS

A total of 100 (Male - 72, Female - 28) human humeri were utilized to study the parameters like maximum length and total length of the humerus in south Indian population by using Osteometric board. Out of 100 humeri 24 from the Department of Anatomy, ESIC Medical College & PGIMSR, Chennai and 76 humeri were collected from the Department of Anatomy, Sri Venkateswara Institute of Medical Sciences, Tirupati. Maximum Length (ML) measured from straight distance between the highest point of the head of the humerus to deepest point on trochlea and Total Length of Humerus (TLH) measured from the projective distance between the highest point of the head of the Humerus and

deepest point of the capitulum by using Osteometric board (Figure-1).

RESULTS

The mean maximum length in male was 31.97cm \pm 0.155, female it was 28.65cm \pm 0.153 and the mean total length of humerus in male was 31.532 cm \pm 0.154,

in female it was 28.35cm \pm 0.153 [Table-1&2].Statistical analyses of the parameters showing t - value for maximum length 12.406, for total length of humerus 12.168 was observed [Table-3]. The parameters in our study are significant (<0.0001) to consider as major discriminative variables in sexual dimorphism of humerus.

Table-1: Maximum length and total length of Male humeri

Bone No	Maximum Length	Total Length	Bone No	Maximum Length	Total Length
1	32.3	32.1	45	31.1	30.6
3	31.7	31.4	46	31.8	31.4
4	30.2	29.8	47	31.6	30.9
5	31.4	31	49	31.7	31.2
6	32.2	32	50	32.6	32.5
7	32.5	32.2	51	32.1	31.7
9	30.4	29.9	52	32.5	32
10	30.7	30.4	53	30.8	30.3
11	32	31.4	54	30.8	30.2
12	32.4	32.1	55	31.1	30.7
13	32	31.6	56	33.7	33.3
14	33.4	33.2	57	30.7	30.4
15	34.6	34.2	59	30	29.6
17	32.8	32.4	61	32.4	32.2
18	31.9	31.2	62	32.6	32.3
19	34.5	34.1	63	30.3	30
21	32.5	32	64	32.9	32.7
22	33	32.6	65	32.9	31.5
23	30	29.8	67	30	29.5
24	32.8	32.4	69	35.7	35.4
25	31.3	31	70	36.1	35.7
26	34	33.3	71	32.3	31.9
27	30.9	31.3	75	31.9	31.7
29	31.6	31.4	76	30.3	30
30	32.2	31.5	78	32	31.5
31	31	30.8	80	31.5	31.1
32	33.9	33.5	84	32	31.7
33	30.4	30.1	88	32.5	31.9
34	32.05	32	89	30.9	30.4
36	31.3	31.1	90	31.9	31.7
37	32.9	32.4	92	31.5	31.1
39	30.8	30.5	93	31.5	31
40	30.2	30	95	30	29.6
41	31.4	31	96	30.9	30.4
42	34.3	33.8			
43	31.1	30.8	Mean	31.9176	31.532
44	30.9	30.4	Sd	1.31024	1.3004

DISCUSSION

The mean value of total humerus length gives an important evidence to indicate the characteristic features of a population as a whole. [2] Munoz et al stated the total humerus length by a remains of humerus segment, for estimating of sex from whole skeletal or remains. [9] The maximum

length was the measurement with the greatest sex difference. The reliability of sex determination from each variable was tested and the maximum length was found to be the most sensitive one (88.9%) with the highest rate of accuracy (90%). [10] Maximum length was present as a factor only in the Chinese. They found that the

highest rate of accuracy was 86. 8% in the Chinese, 92.4% in the Japanese and 97.1% in the Thais. [11] The mean maximum length in male was 31.97cm \pm 0.155, female it was 28.65cm \pm 0.153 and the mean total length of humerus in male was 31.532cm \pm 0.154, in female it was 28.35cm \pm 0.153 these

values are mere with previous studies. [12] The mean values of the male measurements were significantly higher than those of the females. In our study the mean maximum length of the humerus values are higher in males than those of females [Table -1 & 2].

Table-2: Maximum length and total length of Female humeri

Bone No	Maximum Length	Total Length
8	28.7	28.4
16	29.7	29.4
20	29.8	29.5
28	28.9	28.7
35	29.1	28.9
38	27.8	27.4
48	27.9	27.6
58	29.8	29.5
60	28.8	28.5
66	26.7	26.5
68	29.7	29.4
72	29.4	29.2
73	28.8	28.7
74	29	28.6
77	29.1	28.7
79	29.2	29
81	28.5	28
82	27.9	27.6
83	28.3	28
85	29.4	29.1
86	27.7	27.4
87	29.5	29.1
91	28.5	28
94	28.3	28.1
97	27.9	27.6
98	26.8	26.6
99	28.4	28.1
100	28.8	28.4
Mean	28.6571	28.357
Sd	0.82885	0.8244

Stature based sexual dimorphism peaks in societies that are at the extremes of protein consumption, both high and low. [13] DiBennardo and Taylor suggested that shape measurements are of major significance for the correct diagnosis of sex, because the

functional demands of weight bearing and musculature affect the circumferential measurements more than the length. [14] Literature investigations data were exaggerated and it is said that greatest accuracy in estimating living stature from

long bones length will be obtained when sex and ethnic identity are available. [15] This is clearly stated in our study as a major

discriminative variable for sex determination.

Table -3: Statistical analysis.

Parameters	Mean ± SEM (Males = 72)	Mean ± SEM (Females = 28)	t value	P value
Maximum length	31.97±0.155	28.65±0.153	12.406	<0.0001*
Total length	31.532±0.154	28.35±0.153	12.168	<0.0001*

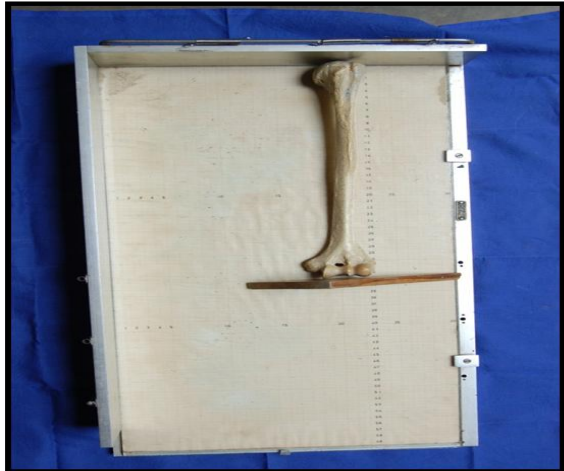


Figure -1: Measuring Maximum Length of the Humerus by using Osteometric board

CONCLUSION

Our study suggesting that humeri of unknown gender can be sexed to the extent of 75-80% by using parameters like Maximum length, Total length of humerus which gives prior knowledge for sex determination.

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