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Research article

A STUDY ON SEXUAL DIMORPHISM OF THE HUMERUS IN TAMILNADU REGION

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ABSTRACT

Sex determination from bones is of vital importance in anthropological studies and medico-legal cases. The present study focused on measurements of the Humerus and to evaluate the differences in sex present in the morphology through statistical analysis. **Method**: In our study, 120 dry adult humeri (56 right side & 64 left side) were studied of known sex. Damaged bones were excluded from the study. Each Humerus was measured for 11 parameters; measurements were taken by using a sliding caliper as described in the textbook of anthropology and previous studies. The osteometric data of the Humerus of present study is statistically analyzed and compared with other similar studies. **Results:** Statistical tests were applied to the metrical data obtained to assess whether the differences between the means of each parameter are statistically significant or not. Length of Humerus, the weight of the Humerus, Mid-shaft circumference, Transverse and Vertical diameter of superior articular surface, Bi-epicondylar width of the Humerus have been found to be more discriminatory parameters for the identification of sex from Humerus.

Keywords: Sex determination, Humerus, Anthropology, Tamil Nadu

INTRODUCTION

Sex determination from bones is of vital importance in anthropological studies and medico-legal cases. The role of the skeleton is invaluable in estimating attributes such as age, sex, race, stature and presence of disease. If the whole skeleton is available, there should be no difficulty in arriving at an accurate diagnosis of sex, but when only a part of the skeleton is available, it poses increasing difficulty in assessment. Origin: L *humerus, umerus*, the shoulder, upper arm < IE **om(e)sos*, the shoulder > Sans *áṃsa-*, Gr *ōmos*

The humerus is the longest and largest bone of the upper extremity; it is divisible into a body and two extremities.[1] Many workers have studied the morphometric data for the humerus in both sexes and statistical assessment of the value of this metrical study for sex determination of humerus. Present study focused on measurements of the humerus and to evaluate the differences in sex present in the morphology through statistical analysis. This study gives information regarding the role of human humerus in the determination of sex and to compare the present data with that of other workers. Many workers have studied the morphometric data for the humerus in both sexes and statistical assessment of the value of this metrical study for sexing humerus.

Almost all bones of the human skeleton show some degree of sexual dimorphism. The accuracy of sex determination depends on the type and condition of the bone, age of the subject, the degree of fragmentation of the bones and biological variability. Obvious sex differences do not become apparent until after puberty, though specialized measurements on the pelvis can indicate sex even in fetal material. It is recognized that

long bone cross-sectional area is greater in males as compared to females which reflects more rapid periosteal bone growth in boys.[2]

MATERIALS AND METHODS

120 dried adult humeri (56right side & 64 left side) were collected from the Anatomy Department of Karpagam Faculty of Medical Sciences & Research, Coimbatore. Damaged bones were excluded from the study. Measurements were taken by using a caliper as described in textbook of anthropology[3] and previous studies.

Metrical data of each humerus was collected using 11 Anthropometric parameters as described below.

1. Vertical diameter of the superior articular surface
2. Transverse diameter of superior articular surface
3. Circumference of the superior articular surface of humerus
4. Maximum width of the upper end or transverse diameter of the upper end
5. Circumference of the surgical neck
6. Mid-shaft circumference
7. Least shaft circumference
8. Transverse diameter of the lower articular surface
9. Transverse diameter of the lower end or Biepicondylar width
10. Maximum length of the humerus
11. Weight of the humerus

Fig 1: Measuring the maximum width of the upper end

RESULT

120 dried adult humerus (56right side & 64 left sides) were studied in present study. Each humerus was measured for 11 parameters were already described as above. The measurements were tabulated and statistically analyzed. For each parameter we calculated Mean, Median, Mode, Standard deviation, T value and P Value.

Table 1: Measurements of Right Humerus (n=56)

		Mean	Range	Standard Deviation	T value	Degree of Freedom	P value
Vertical diameter of the superior articular surface (cms)	M*	4.2	3.3-4.5	0.38	2.37	54	<0.02
	F*	3.8	3.2-4.1	0.55			
Transverse diameter of superior articular surface (cms)	M	3.96	3.5-4.1	0.26	2.2	54	<0.02
	F	3.7	3.2-4.3	0.38			
Circumference of the superior articular surface of humerus (cms)	M	12.8	11.5-14.3	0.88	2.9	54	<0.001
	F	12.1	10.8-14.5	1.10			
Maximum width of the upper end or transverse diameter of the upper end cms)	M	4.63	4.2-5.2	0.28	2.2	54	<0.02
	F	4.4	3.9-5.2	0.36			
Circumference of the surgical neck (cms)	M	8.6	6.7-10	1.11	2.7	54	<0.001
	F	7.2	5.6-9.4	1.13			
Mid-shaft circumference (cms)	M	6	5.1-5.2	0.67	2.49	54	<0.01
	F	5.5	5.2-6.6	0.56			
Least shaft circumference (cms)	M	5.6	5.2-6.4	0.58	1.24	54	>0.1
	F	5.4	5-6.4	0.52			
Transverse diameter of the lower articular surface (cms)	M	5.1	3.5-6.2	0.99	1.6	54	>0.1
	F	4.6	4.5-5.9	0.74			
Transverse diameter of the lower end or Biepicondylar width (cms)	M	5.2	4.2-6.4	0.89	2.5	54	<0.01
	F	4.5	3.3-6	1.2			
Maximum length of the humerus (cms)	M	31	26-32.7	6.64	2.2	54	<0.02
	F	26	28.5-33.6	9.68			
Weight of the humerus (cms)	M	99.3	60-126	24.9	2.1	54	<0.05
	F	84.8	60-120	19.2			
	P<0.05 considered as Significance; * M-Male; F- Female						

Table 2: Measurements of Left Humerus (n=64)

		Mean	Range	Standard Deviation	T value	Degree of Freedom	P value
Vertical diameter of the superior articular surface (cms)	M*	3.87	3.2-4.4	0.38	2.79	62	<0.01
	F*	3.9	3.4-4	0.45			
Transverse diameter of superior articular surface (cms)	M	3.91	3.6-4.2	0.24	2.4	62	<0.01
	F	3.7	3.1-4.4	0.36			
Circumference of the superior articular surface of humerus (cms)	M	12.2	10.8-13.5	0.83	2.73	62	<0.01
	F	11.5	10.2-13.4	1.14			
Maximum width of the upper end or transverse diameter of the upper end (cms)	M	4.4	3.9-4.8	0.29	1.8	62	<0.05
	F	4.22	3.7-5.2	0.41			
Circumference of the surgical neck (cms)	M	6.85	6.6-9.3	1.47	2.06	62	<0.05
	F	6.25	5.8-9.7	1.05			
Mid-shaft circumference (cms)	M	5.8	5.2-6.8	0.47	3.7	62	<0.001
	F	5.69	5.2-6.4	0.53			
Least shaft circumference (cms)	M	5.54	5-6.6	0.48	1.6	62	>0.1
	F	5.22	3.5-5.9	0.82			
Transverse diameter of the lower articular surface (cms)	M	4.52	4.3-6.1	0.92	0.5	62	>0.3
	F	4.39	4.2-6.1	0.88			
Transverse diameter of the lower end or Biepicondylar width (cms)	M	4.9	3.8-6.4	0.97	2.5	62	<0.01
	F	4.35	3.4-6.2	0.86			
Maximum length of the humerus (cms)	M	30.2	26.3-32.4	1.99	2.5	62	<0.01
	F	29	27.8-32.5	1.77			
Weight of the humerus (cms)	M	97.2	70-140	22.84	2.3	62	<0.02
	F	81.2	60-120	28.97			
	P<0.05 considered as Significance; *M- Male; F-Female						

DISCUSSION

In the present study, there has been found a difference in the Vertical diameter, Transverse diameter and Circumference of the superior articular surface of right and left sides in the male and female humerus. These findings of our study are in conformity with the studies of Girish Patil (2011)[4] study on south Indians and Derya Atamturk, M. Akif Akcal, Nucket mas (2010)[5], but it is lower than the studies of Iscan MY et al (1998).[6] The Maximum width of the upper end shown high differences between right and left sides in male and female humerus. Similar findings are reported by Derya Atamturk (2010).[5]

Significant range of differences observed in the measurements of Mid-shaft circumference and least shaft circumference. These findings of our study are in conformity with the studies of Singh S (1972)[7], Kshirasagar et al (2001)[8], Salles AD et al (2009)[9], Derya Atamturk, (2010)[5] and Iscan M.Y et al (1998)[6], and Girish patil (2011)[4], a study on south Indians.

In the present study, there has been found a difference in the Bi-epicondylar width of right (table-17) and left sides (table-18) in male and female humerus and it is statistically highly significant. Results of our study are tallying with the results of studies by Singh S (1972)[7], Singh et al (1974), Derya Atamturk, (2010)[5], Girish patil (2011)[4] study on south Indians, but not tallying with the findings of Iscan MY et al (1998).[6]

In the present study, the Maximum length of humerus is highly significant parameter there is a considerable amount value difference is found between males and females. Our findings are in conformity with the findings reported by Singh S (1972)[7], Derya Atamturk, (2010)[5] and Iscan M.Y et al (1998)[6], and Girish patil (2011)[4] study on south Indians, show statistically significant sex differences between mean of Maximum length of right and left in males and females.

In the present study, there has been found a difference in the Weight of the humerus of right and left sides in male and female humerus. Reports of similar study (same parameter) are not available for comparison.

CONCLUSION

To know the significant findings for identification of sex of humerus 120 (56right side & 64 left side) adult, fully ossified, dried humeri were studied. The measurements obtained from the humerus were compared to the values reported by previous workers. From the results it is cleared that based on no single parameter, sex of humeri cannot be decided. All the parameters have to be considered together for this purpose.

Length of the humerus, Weight of the humerus, Mid-shaft circumference, Transverse and Vertical diameter of the superior articular surface, Bi-epicondylar width of humerus have been found to be more discriminating parameters for the identification of sex from humerus. However, the sex overlap is observed in all the parameters and indices. This may be due to genetic, nutritional and socio-economical difference in the individuals or may be due to hypo masculinity in female humerus and hyper masculinity in male humerus.

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