International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Determination of Sex by Mid Shaft Antero Posterior Diameter of Femur in Gujarati Population

Urvik Kukadiya[1], Jayesh Rathava[1], Pratik Trivedi[2]

[1]Tutor, Department of Anatomy, Shree M P Shah Medical College, Jamnagar, Gujarat.
[2]Tutor, Department of Anatomy, GMERS, Junagadh, Gujarat.

Corresponding Author: Urvik Kukadiya

Received: 24/02/2015 *Revised: 25/02/2015* *Accepted: 25/03/2015*

ABSTRACT

Introduction: Femur is the longest and strongest bone in human body. Determination of sex is relatively easy if the entire skeleton is available for examination. In the absence of skull and pelvis long bones either individually or in combination has been used for determining sex.
Materials and methods: Present Study was carried out on 141 human femora (115 male, 26 female) of known sexes in Anatomy Department, M. P. Shah Government Medical College, Jamnagar, Gujarat by using demarcating point method. mid shaft Antero posterior diameter of femur is distance between the anterior and posterior surfaces of the bone, approximately at the middle of the shaft i.e. the highest elevation of linea aspera, measured with caliper.
Results: Average mid shaft Antero posterior diameter of right male femur was 26.56 mm, average mid shaft Antero posterior diameter of right female femur was 24.33 mm, average mid shaft Antero posterior diameter of left male femur was 26.57 mm and average mid shaft Antero posterior diameter of left female femur was 24.07 mm. DP method identified 1.82 % right and 0% left male femur correctly as male. DP method also identified 0% right and 0 % left female femur was correctly as female.
Conclusion: Mean mid shaft Antero posterior diameter of femur of male femur is more than female femur in the Gujarati population of present study. Findings of the present study may be useful in medico legal cases for estimation of sex from available fragmentary femora. The study can also be useful to anatomist & physical anthropologist.

Key words: femur, sexual dimorphism, mid shaft Antero posterior diameter of femur.

INTRODUCTION

Femur is the longest and strongest bone in human body. [(1)] Determination of sex is relatively easy if the entire skeleton is available for examination. For determination of sex accurately, skull and pelvis are the highly reliable skeletal element. [(2)]

Sometimes determination of sex becomes a difficult task for the forensic anthropologist, especially in the absence of the skull and pelvis. So, most of the long bones, either individually or in combination, have been subjected to statistical and morphological analysis for determining sex. Sexual dimorphism in the femur is due to modification of the female pelvis with respect to its specialized function of reproduction. Therefore, the stress and strain experienced by the femur is different in a male than it is in a female. [(3)]

The study of sexual dimorphism of mid shaft Antero posterior diameter of femur has been carried out by other workers in different population, but in Gujarat few studies have been done. So, the present study has been carried out to establish sexual dimorphism of vertical diameter of femoral head in Gujarati populations.

MATERIALS AND METHODS

Present Study was carried out on Dry femora of known sexes in Anatomy Department, M. P. Shah Government Medical College, Jamnagar, Gujarat. The femora were obtained by maceration of the dead bodies received as voluntary donations or unclaimed bodies received at this department. A total of 141 human femora (115 male, 26 female) were used for the present study. Femora showing pathological abnormality, fractured and unknown sex were not included in study.

First of all, side of each femur will be determined. To avoid intra- observer error, each measurement was taken at three different times and their average was used as final reading. The present study was conducted after taking approval from the Institutional Ethics Committee.

The distance between the anterior and posterior surfaces of the bone, approximately at the middle of the shaft i.e. the highest elevation of linea aspera, measured with caliper. [4] (Photograph 1)

Demarcating point (DP) for femur: [5]

Demarcating point was measured by using mean ± 3SD (calculated range, cover 99.75% of sample) for all the parameters.

Demarcating point for maximum length of both male and female femur was calculated as follows: Greatest length recorded for the female femur by using calculated range was the demarcating point for male femur and the shortest length recorded for the male femur by using the calculated range was the demarcating point for female femur.

Photograph 1:- Showing mid shaft antero posterior diameter of femur.

Table 1: Showing the mid shaft antero posterior diameter of femur (mm) and its statistical analysis (N= number, SD=standard deviation, mm= millimeter, DP = demarcating point)

Statistical values	RIGHT		LEFT	
	Male(N=55)	Female(N=12)	Male(N=60)	Female(N=14)
MEAN (mm)	26.56	24.33	26.57	24.07
SD (mm)	2.43	2.87	2.45	3.00
3SD (mm)	7.30	8.61	7.34	9.00
MEAN ±3SD(mm)	19.27-33.86	15.72-32.95	19.23-33.90	15.07-33.07
DP (mm)	>32.95	<19.27	>33.07	<19.23
% of DP(N)	1.82 (1)	0.00 (0)	0.00 (0)	0.00 (0)
P VALUE	<0.01		<0.01	
REMARKS	Highly significant		Highly significant	

All bones having length more than the Demarcating point for male was identified as male femur and all bones having length less than the Demarcating point for female was identified as female femur.

RESULTS

As shown in table 1, average mid shaft Antero posterior diameter of right male femur was 26.56 mm, average mid shaft Antero posterior diameter of right female femur was 24.33 mm, average mid shaft Antero posterior diameter of left male femur was 26.57 mm and average mid shaft Antero

posterior diameter of left female femur was 24.07 mm.

DP for mid shaft Antero posterior diameter for right male femur was >32.95 mm and for right female femur was <19.27 mm, while for left male femur >33.07 mm and for left female femur <19.23 mm. DP method identified 1.82 % right and 0% left male femur correctly as male. DP method also identified 0% right and 0 % left female femur was correctly as female.

Data for mid shaft Antero posterior diameter of femur of both sides male and female was statistically highly significant, as p value was <0.01

Mean mid shaft Antero posterior diameter male femur was more than the mean mid shaft Antero posterior diameter of female femur and the data was statistically highly significant, as p value was <0.01.

DISCUSSION

In present study found that the mean mid shaft antero posterior diameter of male femur was higher than the female femur & it was statistically highly significant which is similar with findings of Liu wu, [7] Soni G, [8] Maske SS et al. [9]

In present study, by using DP method for mid shaft antero posterior diameter of femur, 1.74 % of male femur was correctly identified as male femur and 0 % correctly identified female femur.

Maske SS et al, correctly identified 51.19 % of male femur & 48.15 % of female femur by using mid shaft antero posterior diameter of femur. [9]

There was difference in mid shaft antero posterior diameter of femur between the present study and Maske SS et al [9] may be due to variation in population.

Table 2: Showing the comparison of mid shaft anteroposterior diameter of male and female femur (mm) of Gujarati population with the findings of other workers (N= number, mm= millimeter, M= male, F= female, R= right, L=left, HS = highly significant)

Author	Popula-tion	Sex	No.	Mean (mm)	SD (mm)	DP (mm)	% Of Identified Bones	p Value	Remarks
Dittrick J& Myers(1986) [6]	California	M	148	30	2.5	-	80.30	-	-
		F	146	26	2.2	-			
Liu wu (1989) [7]	Chinese	M	74	27.0	2.6		79.4	<0.001	HS
		F	67	23.7	1.7	-			
Purkait R & Chandra (2002) [3]	Central india	M	200	27.94	2.12	-	84.00	0.05	NS
		F	80	23.38	1.79	-	90.00		
Soni G et. Al (2010) [8]	North –west region India	M	40	27.82	3.09	-	67.5	<0.0001	HS
		F	40	25.25	2.10	-	73.7	<0.0001	HS
Maske SS et al. (2012) [9]	Marath-wada	M	189	26.54	2.3	29.28	51.19	<0.0001	HS
		F	179	23.1	2.1	19.80	48.15		
Present study	Gujarat	M	115	26.57	2.42	>32.85	1.74	<0.01	HS
		F	26	24.19	2.88	<19.29	0		

By discriminate analysis for mid shaft antero posterior diameter of femur

Dittrick J & Myers, correctly identified male and female femora using only mid shaft antero posterior diameter of femur in 80.30 % femora. [6]

Liu wu, correctly identified male and female femora using only mid shaft antero posterior diameter of femur in 79.4 % femora. [7]

Purkait R & chandra, correctly identified 84 % of male femur & 90 % of female femur by using mid shaft antero posterior diameter of femur. [3]

Soni G et al, correctly identified 67.5 % of male femur & 73.7 % of female femur by using mid shaft antero posterior diameter of femur. [8]

The Mid shaft anteroposterior diameter of Gujarati population is less than the mid shaft anteroposterior diameter of California, North - West region of Central India population.

There was more marked difference in mid shaft antero posterior diameter of

femur between the present study and Dittrick J & Myers, [6] Liu wu. [7] Purkait R & Chandra, [3] Soni G [8] is the low percentage of correct sexual classification in the mid shaft antero posterior diameter of femur in present study. This could be explained on the basis of statistical method applied. While the studies referred above were based on discriminate analysis, present study had used the demarcating point analysis.

CONCLUSION

Mean Mid shaft anteroposterior diameter of male femur is more than female femur in the Gujarati population of present study. In Gujarati population, if mid shaft anteroposterior diameter of male femur is >32.85 mm than it is definitely male femur and if it is <19.29 mm than it is definitely female femur.

Findings of the present study may be useful in medico legal cases for estimation of sex from available fragmentary femora. The study can also be useful to anatomist & physical anthropologist.

REFERENCES

1. Standring S, Borley NR, Coliins P, Crossman AR, Gatzoulis MA, Healy JC et al; Gray's Anatomy The Anatomical Basis Of Clinical Practice; Ch. 80 In Pelvic Girdle, Gluteal Region And thigh; 40th Edition; Spain; Elsevier Churchill Livingstone; 2008; Page No. 1360-1365.
2. Krogman WM and Iscan MY; Human skeleton in forensic medicine; Ch. 5 sex differences in the long bones; 3rd edition; Springfield USA; Charles C. Thomas; 1978; Page No. 143-150.
3. Purkait R and Chandra H; sexual dimorphism in femora: Central India study; Forensic science communications; 2002; volume 4; issue 3; Page No 1-6.
4. Singh IP & Bhasin MK;A manual of biological anthropology; Ch. 4 osteology; Delhi, India; kamla –raj enterprises; 2004; Page No. 79-84.
5. Igbigbi PS & Msamati BC; Sex Determination from Femoral Head Diameters in Black Malawians; East Afr Med J.; 2000; volume 77; issue3; Page No. 147-151
6. Dittrick J and Suchey JM; Sex determination of prehistoric central california skeletal remains using discriminante analysis of femur and humerus; Am J Phys Anthrop; 1986; volume 70; Page No 3-9.
7. Liu Wu; Sex determination of Chinese femur by discriminates function; J Forensic Sci; 1989; volume 34; issue 5; Page No.1222-1227.
8. Soni G, Dhall U & Chhabra S; Determination Of Sex from Femur: Discriminate Analysis; J Anat Soc India; 2010; volume 59; issue 2; Page No. 216-221.
9. Dr. Maske SS, Dr. Prathamesh K, Dr. Joshi DS; Sexing the femora from Marathwada region using demarcating point method; International Journal of Healthcare & Biomedical Research; 2012; Volume: 1; Issue: 1; Page No. 13-16.

How to cite this article: Kukadiya U, Rathava J, Trivedi P. Determination of sex by mid shaft antero posterior diameter of femur in Gujarati population. Int J Health Sci Res. 2015; 5(4):128-131.

****