



Study of Pilasteric Index of Femur in Gujarat Region

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ABSTRACT

Introduction: *Pilasteric index of femur is a measure of flatness of middle of the shaft. It is obtained by dividing midshaft AP diameter of femoral shaft with midshaft transverse diameter of femoral shaft.*

Aims and objectives: *Present study was aimed to ascertain values of pilasteric index in Gujarat region and to evaluate its possible efficacy as a racial characteristic.*

Material and Methods: *Study sample consisted of 242 dry, human, adult femora [176male (87 right, 89 left) and 66 female (32 right, 34 left)] from skeletal collections of Anatomy departments of two different Medical Colleges of Gujarat. Midshaft AP diameter & midshaft transverse diameter of femur were measured and pilasteric index was calculated using the formula, $\text{Pilasteric index} = (\text{Mid Shaft AP diameter} * 100) / \text{Mid Shaft transverse diameter}$.*

Observations and Results: *Mean values of pilasteric index of normal human adult femora from Gujarat region, in male were 102 (Right) & 100.20 (Left) and for female were 93.82 (Right) & 102.37 (Left). Mean pilasteric index of male in present study was lower than the Australia and Andaman and was similar to English, Male thai, India, Ceylonese, Japan and China. Mean pilasteric index of left side female femora in present study was lower than the Australia and Andaman and was similar to English, India, Ceylonese, Japan and China; while for right side female femora it was lower than the Australia, Andaman, English, India, Ceylonese, Japan and China.*

Keywords: *Pilasteric index, Midshaft femoral diameter, Femur.*

INTRODUCTION

The femur is the longest, strongest and heaviest bone in the skeleton, which transmits the weight of the trunk from the hip bone to the tibia ^[1].

According to Susan Standring (2004) ^[2], length of the femur is associated with striding gait and its strength with weight and muscular forces.

The human femur, as a consequence of its central role in bipedal posture and locomotion is subjected to loads, during walking three to four times of bodyweight which accounts for large size and robusticity of this bone ^[3].

Midshaft region of femur is known as a pilasteric region. Pilasteric index gives ratio between

midshaft AP diameter and transverse diameter. It is calculated by following formula^[4].

Pilasteric index= (Mid Shaft AP diameter *100)/ Mid Shaft transverse diameter.

It is a measure of flatness of middle of the shaft, the flat femur (whole shaft) occurs most frequently in Whites, and independently of the flatness of other long bones; it is rare and possibly somewhat abnormal condition^[5].

Pilasteric index of femur has been studied by several workers in different populations [Pearson & Bell (1919) in English femora^[6], Vadhava S. & Sood S. (1967) in Male Thai sample^[7], Kate B.R. (1976) in Indian, Ceylonese, Japanese, Chinese, Australian & Andamanese population^[8].

Standards of morphological and morphometric attributes in the skeleton may differ with the population samples involved and this is true with reference to dimensions and indices (average and range) and as a general rule standards should be used with reference to group from which they are drawn and upon which they are based, they are not interchangeable^[9].

AIMS AND OBJECTIVES

Present study was aimed to ascertain values of pilasteric index in Gujarat region and to evaluate its possible efficacy as a racial characteristic.

MATERIAL AND METHODS

Study sample consisted of 242 dry, human, adult femora [176 male (87 right, 89 left) and 66 female (32 right, 34 left)] which included the femora from the skeletal collection of Anatomy department of two different medical colleges of Gujarat. Femora showing pathological abnormality or from the persons outside Gujarat region were not included in the study.

Pilasteric index was calculated by following formula^[4].

*Pilasteric index= (Mid Shaft AP diameter *100)/ Mid Shaft transverse diameter.*

Mid Shaft Anteroposterior Diameter: The distance between the anterior and posterior surfaces of bone

at right angle to the ventral surface of the middle of the shaft, measured with the caliper^[4, 10].

Mid Shaft Transverse Diameter: The distance between the lateral margins of bone at right angle to the sagittal diameter of the middle of the shaft, measured with the caliper^[4,10].

Each bone was measured thrice and measurements were repeated by two independent observers, mean of these observations was taken as a final reading to nullify any intra and inter-observer error. Data collected was tabulated and analysed statistically

OBSERVATION AND RESULTS

Right Femur

The pilasteric index of right male femur varied from 75 to 124 (average: 102.0 & S.D.:8.98) and of right female femur varied from 76 to 107.41 with an average of 93.82 & S.D. of 11.00.

Mean value of pilasteric index was lower in female as compared to male. Calculated z-value and P value showed that the difference in the mean index in male and female was statistically highly significant with $P < 0.001$.

For right male bone calculated range was 75.07 to 128.94 and for right female bone it was 60.82 to 126.83 (Table: 1). With the demarking point for right male bone (>126.83) we can correctly identify a sex of 0 bones out of 87 (0.00%) and for female right bone (<75.07), demarking point will definitely identify a sex of 0 bone out of 32 (0.00%).

Left femur

The pilasteric index of left male femur varied from 78.79 to 117.39 (average: 100.20 & S.D.:9.61), and of left female femur varied from 79.46 to 112.20 (average: 102.37 & S.D.:8.94). (Chart: 1)

Mean value of pilasteric index was higher in female as compared to male. Calculated z-value and P value showed that the difference in the mean pilasteric index in male and female was statistically insignificant with $P > 0.05$ on left side. Difference of mean between right & left bone was statistically insignificant in male while it was highly significant in the female. (Table: 1)

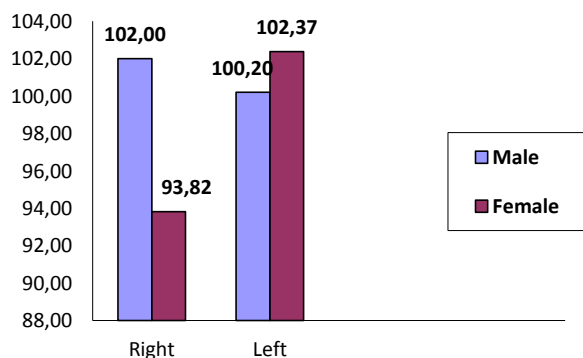


Chart 1: Mean Values of Pilasteric Index

DISCUSSION

The pilasteric index of right male femur varied from 75 to 124 (average: 102.0 & S.D.:8.98) and of left male femur varied from 78.79 to 117.39 (average: 100.20 & S.D.:9.61). Calculated z-value and P value showed that the difference of the mean between right & left male was statistically insignificant with $P > 0.05$

The pilasteric index of right female femur varied from 76 to 107.41 (average: 93.82 & S.D.:11.00) and of left female femur varied from 79.46-112.2 (average: 102.37 & S.D.:8.94)

Table 1: Statistical Values of Pilasteric Index

Statistical values	Right		Left	
	Male (n=87)	Female (n=32)	Male (n=89)	Female (n=34)
Range	75-124	76-107.41	78.79-117.39	79.46-112.2
Mean	102.0	93.82	100.20	102.37
S.D.	8.98	11.00	9.61	8.94
z-value	3.77		1.18	
P value	$P < 0.001$		$P > 0.05$	
Calculated Range mean±3SD	75.07-128.94	60.82-126.83	71.36-129.03	75.54-129.19
D.P	>126.83	<75.07	<75.54	>129.03
% & no. identified by D.P.	0.00% (n=0)	0.00% (n=0)	0.00% (n=0)	0.00% (n=0)
	Male		Female	
	Right (n=87)	Left (n=89)	Right (n=32)	Left (n=34)
z-value	1.76		5.58	
P value	$P > 0.05$		$P < 0.001$	

Calculated z-value and P value showed that the difference of the mean between right and left female was statistically highly significant with $P < 0.001$.

In present study, mean value of pilasteric index was higher in male on the right side, while on the left it was higher in female. Calculated z-value and P value showed that the difference in the mean pilasteric index in male and female was statistically highly significant with $P < 0.001$ on right side and insignificant on the left side ($P > 0.05$).

With the demarking point for male right bone (>126.83) we can correctly identify a sex of 0 bone out of 87 (0.00%) and for female right bone (<75.07), demarking point will definitely identify a sex of 0 bone out of 32 (0.00%).

Comparison of pilasteric index between present study and other studies has been shown in table: 2. Mean male pilasteric index value in present study was 102.0 (right) & 100.20 (left) in other studies it varied from 103.85 to 105.80.

Mean male value in present study was similar to mean values of the study in English [6] and Male Thai [7].

Kate B.R. (1976) [8] reported mean pilasteric index values in Ceylonese, Korea, Japan, China, Australia and Andaman without sex wise division. Mean male value of present work was similar to India [8], Ceylonese [8], Formosa [8], Japan [8] & China [8] and lower than the Andaman [8] & Australia [8].

Table 2: Comparison of Pilasteric Index

Population & Study		Pilasteric Index					
		Male			Female		
		Mean	S.D.	% Identified	Mean	S.D.	% Identified
Pearson & Bell (1919), English	Rt.	105.80	4.18	-	103.85	4.55	-
	Lt.	103.85	4.55	-	99.47	4.50	--
Vadhana S. & Sood S. (1967) Male Thai		104	8.3	-	-	-	-
Kate B. R. (1976), India		Mean: 106					
Kate B. R. (1976), Ceylonese		Mean: 105, S.D.: 2.50					
Kate B. R. (1976), Japan		Mean: 105					
Kate B. R. (1976), China		Mean: 100.7					
Kate B. R. (1976), Australia		Mean: 122.2					
Kate B. R. (1976), Andaman		Mean: 113.5					
present study (n=242)	Rt.side (119)	102.0	8.98	0.00%	93.82	11.00	0.00%
	Lt.side (123)	100.20	9.61	0.00%	102.37	8.94	0.00%

Mean female value in present study was 93.82 (right) and 102.37 (left), while in English femora, index was higher than these values on both side (103.85 right & 99.47 left) ^[10].

Mean value of right female bone in present study was lower than the Ceylonese [8], Korea [8], Japan ^[8], China ^[8], Australia ^[8] and Andaman ^[8].

Mean value of left female bone in present study was similar to India ^[8], Ceylonese ^[8], Formosa ^[8], Japan ^[8] & China ^[8] and lower than the Andaman ^[8] & Australia ^[8].

In present study, mean value of left female bone was higher than the right female bone with $p < 0.001$ (statistically highly significant). While in English femora in female, right side mean was higher than the left side ^[10].

CONCLUSION

Mean values of pilasteric index of normal human adult femora from Gujarat region, in male were 102 (Right) & 100.20 (Left) and for female were 93.82 (Right) & 102.37 (Left). Difference in the mean pilasteric index between male and female was statistically highly significant on the right side, while in the left side bone it was insignificant. Difference in the mean pilasteric index between

right and left side was statistically highly significant in the female, while in male bones it was insignificant. Mean pilasteric index of male in present study was lower than the Australia and Andaman and was similar to English, Male thai, India, Ceylonese, Japan and China. Mean pilasteric index of left side female femora in present study was lower than the Australia and Andaman and was similar to English, India, Ceylonese, Japan and China; while for right side female femora it was lower than the Australia, Andaman, English, India, Ceylonese, Japan and China.

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