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Original Research Article

MEASUREMENT OF ANTHROPOMETRIC PARAMETERS OF ILIUM OF HUNDRED HUMAN HIP BONES IN NORTH INDIAN REGION

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ABSTRACT

Introduction: Hip bone usually displays differences in morphology in two senses due to different reproductive functions, which are influenced by sex hormones. Therefore, shapes of hip bone are different in males and females that make it interesting anatomically and anthropologically. Though non-metric methods such as visual examination of bone morphology for sex determination is entirely dependent on experience and expertise but anthropometry plays some role in creating a data which can be useful for sex determination.

Aim: Present study was done to study sexual dimorphism and bilateral asymmetry of human Ileum with respect to chilotic line.

Material and Methods: For the present study, hip bones retrieved from Department of Anatomy, PGIMS Rohtak were used. In the present study 100 adult human hip bones of known sex were studied out of which 66 were males and 34 were females. From these two groups bones were studied for metrical parameters of Ilium which involved measurement of pelvic and sacral segments of chilotic line and the chilotic index (CI) was also calculated.

Results: In this study it was revealed that the pelvic segment of the chilotic line is greater in females than in males while sacral segment was found more in males than in females. It was also found that in males, pelvic segment of right ileum was less (mean= 49.52 ± 5.19) than that of left (mean= 51.38 ± 5.58). While in females pelvic segment of right ilium is found more (mean= 54.57 ± 5.32) than that of left(mean= 53.92 ± 5.63). Left sided sacral segments in both sexes was found slightly more than that of right side. Chilotic Index was found more in males than in females but in males Chilotic Index (mean= 135.98 ± 15.79) is more on right side while in females it is more (mean=131.54 ± 18.46) on left side.

Conclusion: These variables can be used to determine sex as well as the side of the hip bones or its fragments.

KEY WORDS: Hip Bones, Chilotic Line, Chilotic Index, Ilium, Sex Determination.

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INTRODUCTION

Hip bone usually displays differences in morphology independent of size due to different sexual and reproductive functions which are influenced by sex hormones. Therefore, morphology of hip bone and its differences in shape are different in males and females that makes it interesting anatomically and anthropologically

[1]. To determine the sex of an unknown individual is a challenging tasking forensic investigations when human skeleton remains are found. Here pelvic bone has a role to play in determining the sex. Therefore, the study of sexual dimorphism of bones in human population is a matter of interest not only for anatomists and anthropologists but also for forensic experts [2].

Hip bone or Innominate bone is large irregular and shaped like a propeller, centrally constricted bone which is expanded above and below. Lateral surface of hip bone has acetabulum which is cup shaped, articulating with the femoral head. Antero-inferior to this is the large obturator foramen, which is oval or triangular in shape. In front, pubic part of the bone articulates with its other side pubic body to form pelvic girdle. Hip bone is made up of three parts. Ilium, Ischium and pubis which are connected by cartilage and are united as bones in adults. Ilium consists of upper part of acetabulum and expanded above it; the ischium includes the lower acetabulum and bone poster inferior to it; the pubis form the anterior acetabulum, separating the ilium from ischium, and the anterior median region where the pubis meet [3].

There are certain characters of human ilium visible to the eye and important for anatomists which helps in determining the sex of bone and they can also be measured and, therefore, they are statistically interesting. Results thus obtained from ilium parameters consider this part of hipbone to be of great sexual importance [4]. A hip bone is considered as an ideal bone for sex determination as it provides the highest accuracy levels for sex determination. Hence the hip bone is considered as the most reliable sex indicator in the human skeleton [5]. Morphometric measurements done on the right and left sided hip bones indicates that there is bilateral asymmetry of hip bone [3].

Subsequently researchers adopted osteometric methods to quantitatively differentiate between male and female hip bones [6]. Different studies were conducted and various ethnic and racial variations were found which determine that a sound knowledge of various parameters of the hip bone is important for the anatomists, forensic experts and anthropologists [7]. It has been attempted through this study to arrive at the appropriate conclusion regarding sexual dimorphism using hip bones representing North Indian region in relation to Chilotic line and Chilotic index.

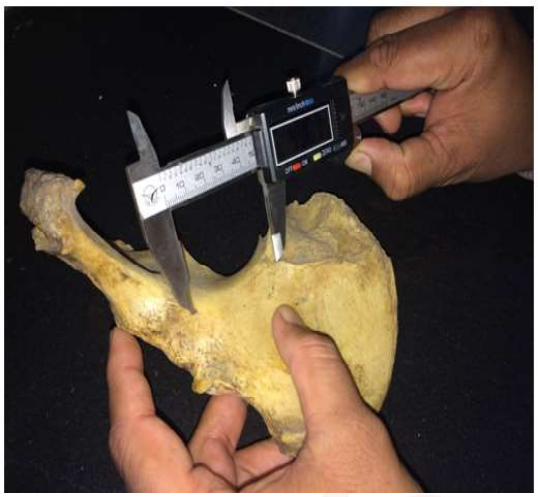
MATERIALS AND METHODS

The study was cross sectional. Material for the study consisted of 100 dry hip bones of known gender (male hip bones were 66 and female hip bones were 34). Gender was assessed through the records maintained by department of anatomy at Postgraduate Institute of Medical Sciences (PGIMS), Rohtak, Haryana. All the bones were fully ossified and free from any congenital or pathological defects. Deformed and malformed bones were also excluded from the study. Almost 123 bones were excluded because they were deformed, not properly ossified and not paired. The study was conducted on bones from teaching collection of department of anatomy at PGIMS, Rohtak. These collected bones were assessed with the metrical parameters. The metric parameters taken were, the measurement of chilotic line which is the line extending from iliopectinial eminence to the nearest point in the anterior auricular margin forming the pelvic segment and from the anterior auricular margin to the iliac crest forming the sacral segment of the Chilotic line. Using the vernier callipers, the pelvic and sacral segments of Chilotic line were measured and Chilotic index(CI) was calculated as follows.

CI= sacral segment/ pelvic segment x100

Fig. 1: Sacral segment of chilotic line

Fig. 2: Pelvic segment of chilotic line.



RESULTS

The Chilotic line of all the hundred adult hip bones were measured. After all the measurements, the observations were statistically analysed by using the unpaired t test. As shown in table 1, the pelvic segment of male hip bones fall in the range of 41.26 mm to 59.13mm of right side, with the mean value of 49.52 mm while on left side it is 41.96mm to 63.46mm and mean is 51.38mm, t value was 0.16 whereas as the pelvic segment of Chilotic line for females lies in the range of 47.26mm to 65.33mm with mean 54.57mm on right side and on the left side the range lies in between 45.79mm to 66.45mm with mean 53.92mm and t value is 0.73.

As shown in table 2, the range of sacral segment of male hip bone falls in between 56.95mm to 77.10mm with mean 66.76mm on right side and on the left side the range falls in between 55.66mm to 77.92mm with the mean 66.87mm and the t value is 0.94 whereas in case of female the range of sacral segment of Chilotic line falls in between 55.93mm to 76.47mm with the mean 61.62mm on the right side while on the left side the range falls between 55.80mm to 75.02mm with the mean 62.34mm and the t value is 0.69.

As shown in table 3, the CI for male lies in the range of 111.01 to 163.59, with the mean value of 135.98 on right side, whereas on the left side the range falls in between 99.18 to 169.09 with the mean value 131.54. The range of CI in females lies in between 91.89 to 161.81 with the mean value 114.22 on right side and the same on left side is in between 89.71 to 163.83 with the mean value 116.90 and the t value was found to be 0.65.

Table 1: Pelvic segment of chilotic line.

Group	Male		Female	
No. of bones	66		34	
	right	left	right	left
Range (mm)	41.26 - 59.13	41.96 -63.46	47.26 - 65.33	45.79 -66.45
Mean (mm)	49.52	51.38	54.57	53.92
SD	5.19	5.58	5.32	5.63
t value	0.16		0.73	

Table 2: Sacral segment of chilotic line.

Group	Male		Female	
No. of bones	66		34	
	right	left	right	left
Range (mm)	56.95 - 77.10	55.66 - 77.92	55.93 -76.47	55.80 - 75.02
Mean (mm)	66.76	66.87	61.62	62.34
SD	5.48	6.44	5.28	5.19
t value	0.94		0.69	

Table 3: Interpretation of CI.

Group	Male		Female	
No. of bones	66		34	
	right	left	right	left
Range	111.01 - 163.59	99.18 -169.09	91.89 - 161.81	89.71 - 163.83
Mean	135.98	131.54	114.22	116.9
SD	15.79	18.46	17.68	16.86
t value	0.94		0.65	

DISCUSSION

The mean values of pelvic and sacral segments of present study and mean CI in both males and females are compared with other studies as shown in table 4.

Table 4: Comparison of parameters of present study with other studies.

		Pelvic segment (mm)		Sacral segment (mm)		CI	
		Male	Female	Male	Female	Male	Female
Davivongs V 1963 [8]		45.91	58.23	64.01	56.74	129.26	98.96
Derry DE 1923 [4]		52.8	55.7	71.2	61.3	136.1	110.8
Ahmed MM 2015 [3]		54.3	63.31	62	50.35	116.3	110.5
present study	Right hip bones	49.52	54.57	66.76	61.62	135.98	114.22
	Left hip bones	51.38	53.92	66.87	62.34	131.54	116.9

In the present study, the mean value of pelvic segment and sacral segment and the mean value of CI of males of right side hip bones are found to be 49.52 mm, 66.76 mm and 135.98 respectively while that of left sided hip bones in males are 51.38 mm, 66.87 mm and 131.54 respectively. Same parameters in females are found to be 54.57 mm, 61.62 mm and 114.22 on right side respectively while on left side these parameters

are 53.92 mm, 62.34 mm and 116.90 respectively. While in other studies done on Australian aborigine by Davivongs [8], mean value of pelvic segment was found to be 49.91 mm in males and 58.23 mm in females while mean value of sacral segment was 64.01 mm in males and 56.74 mm in females and CI was found to be 129.26 in males and 98.96 in females. Similar study done by Derry [4] on english showed mean value of pelvic segment 52.8 mm in males and 55.7 mm in females while mean value of sacral segment was 71.2 mm in males and 61.3 mm in females and CI was 136.1 in males and 110.8 in females. Study in Karnataka region by Ahmed3 showed mean value of pelvic segment was 54.33 mm in males and 63.31mm in females. While sacral segment was 62.0 mm in males and 50.35 mm in females and CI was 116.30 in males and 110.5 in females.

CONCLUSION

In present study mean value of left sided pelvic segment in females was found less i.e. 53.92 mm in comparison to right sided mean value 54.57 mm. While the mean value of left sided pelvic segment of males was more (51.38 mm) than that of right side (49.52 mm). Though mean values of sacral segment in males and females are more on left side while mean value of CI of left side was found less in males i.e. 131.54 in comparison to 135.92 on right side while CI was more on left side (116.90) than the right side (114.22) in females.

Conflicts of Interests: None

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