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A STUDY OF ANTHROPROMETRIC PARAMETERS OF ANTERIOR BORDER OF 100 HUMAN HIP BONES OF NORTH INDIAN REGION

Anatomy

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ABSTRACT

hip bone is a large irregular innominate bone which is useful in determining the sex of an unknown individual because of the morphology and its differences in shape in males and females. Present study was aimed to study the sexual dimorphism on the basis of anthropometric parameters of anterior border. The study was conducted on 100 dry hip bone (66 males and 34 females) collected from department of Anatomy PGIMS Rohtak in which anterior border of the hip bone from anterior superior iliac spine (ASIS) to iliopubiceminence (IPE) and anterior superior iliac spine (ASIS) to pubic tubercle (PT) were measured using vernier caliper in which differences in the mean value of distance between ASIS to PT and ASIS to IPE of hip bone of male and female was found to be statistically significant for both right and left side and also slight bilateral asymmetry was observed.

KEYWORDS:

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 if 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 large obturator foramen, which is oval or triangular in shape. Infront, pubic part of the bone bearing pubic tubercle and the body articulates with its other side to form pelvic girdle.[3]

There are certain characters of human ilium visible to the eye and important for anatomists which help in determining the sex of bone and they can also 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 level 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 qualita tively 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 anatomists, forensic experts and anthropologists.7 Present study was done to measure anterior border parameters which appreciably differentiate the sex of human hip bone which will be a handy tool in anatomical, anthropological and forensic studies.

Material 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 the anterior border of the hip bone from anterior superior iliac spine (ASIS) to iliopubic eminence (IPE) and anterior superior iliac spine (ASIS) to the pubic tubercle (PT) using the vernier calipers. Values obtained were statistically analyzed.

Results

Table 1. Distance between anterior superior iliac spine (ASIS) to pubic tubercle (PT) in mm.

Details of measurements	Right		Left	
No. of Bones 100	Male 66	Female 34	Male 66	Female 34
Range	99.17-142.25	97.3-117.52	94.49-139.41	95.41-114.13
Mean	117.73	106.30	117.07	105.95
Standard deviation	10.66	5.42	10.20	5.22
p value	0.0001	0.0001		

Table 2. distance between anterior superior iliac spine (ASIS) to illiopubic eminence (IPE) in mm.

Details of measurement	Right		Left	
No. of Bones 100	Male 66	Female 34	Male 66	Female 34
Range	59.4-89.93	61.99-73.57	64.15-90.83	59.35-77.33
Mean	73.76	65.97	72.68	64.77
Standard deviation	8.50	3.29	7.88	4.26
p value	0.00069		0.00066	

All the hundred bones were measured using two parameters. Out of 100, 66 were of males i.e. is 33 pairs and 32 were females i.e. is 17 pairs. Both male and female hip bones of right as well as left side were compared and result are shown in table 1 and 2.

The distance between anterior superior iliac spine (ASIS) to pubic tubercle (PT) in hip bone of male of right side averaged 117.73±10.66mm while the range is from 99.17-142.25mm and that of

female of right side averaged 106.30±5.42mm and range varies from 97.3-117.52mm. In hip bone of male of left side the distance from anterior superior iliac spine (ASIS) to pubic tubercle (PT) averaged 117.07±10.20mm with range from 94.49-139.41mm and that of female of left side averaged 105.95±5.22mm with the range from 95.41-114.13.The sex differences in the mean values of distance between the anterior superior iliac spine (ASIS) to pubic tubercle (PT) of hip bone of males and females is statistically significant for both right and left side.

The distance between anterior superior iliac spine (ASIS) to iliopubic eminence (IPE) in hip bone of male of right side averaged 73.76±8.50mm while the range is from 59.4-89.93mm and that of female of right side averaged 65.97±3.29mm and range varies from 61.99-73.57mm. In hip bone of male of left side the distance from anterior superior iliac spine (ASIS) to iliopubic eminence (IPE) averaged 72.68±7.88mm with range from 64.15-90.83 mm and that of female of left side averaged 64.77±4.26mm with the range from59.35-77.33mm. The sex differences in the mean values of distance between the anterior superior iliac spine (ASIS) to iliopubic eminence (IPE) of hip bone of males and females is statistically significant for both right and left side ($p<0.05$)

Discussion

Investigator	ASIS to PT		ASIS to IPE	
	Male (in mm)	Female(in mm)	Male(in mm)	Female(in mm)
Vijayeendra K5 (Right) (Left)	109±0.49 107±0.36	101±0.46 98±0.37	74±0.54 71±0.28	64±0.50 65±0.27
Gomez PL.8	121.95±8.14	115.38±9.71	79.68±6.37	76.51±8.41
Yuvraj J.B. et. al.9	110.23	106.23	71.04	68
Mitesh S. et. al.10	110.71±8.47	106.72±9.32	–	–
Present study (Right) (Left)	117.7±10.66 117.07±10.20	106.3±5.42 105.9±5.22	73.76±8.5 72.6±7.8	65.97±3.29 64.77±4.2

On comparision with other studies mean values of present study that is ASIS to pubic tubercle(PT) distance was found to be more than the study of Vijayeendra K[5] done in B. M. Patil medical college hospital, study done by Yuvraj JB[9] in department of Anatomy Seth G. S. medical college Mumbai and study done by Mitesh S et.al.[10] in Gujrat India. However study done on meditterenean caucasoid skeleton collection of the department of morphological sciences and surgery by Gomez PL[8] showed higher mean values of distance from ASIS to PT both in males and females than that of present study. Also distance from ASIS to PT was slightly more in females in study done by Mitesh S et. al [10].

With respect to distance from ASIS to iliopubic eminence(IPE) the mean values were more in males of study of VIjayeendra K (right side) and Gomez PL while mean values of study by Yuvraj JB and Vijayeendra K(left side) were less in males. In females mean values of ASIS to IPE were more in studies done by Vijayeendra K(left side) Gomez PL and Yuvraj JB while right side distance of ASIS to IPE was found less in the study of Vijayeendra K than the right side of present study in females.

Conclusion

Mean values may be variable with respect to different studies but sexual dimorphism and slight bilateral asymmetry is very well appreciated in present study.

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