

Research Article

Morphometric study of distance between posterior inferior iliac spine and ischial spine of the human hip bone for sex determination

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ABSTRACT

Background: Objective of current study was to study the distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) of human hip bone for determination of sex.

Methods: The study comprised unpaired 149 adult human hip bones of known sex. The posterior inferior iliac spine and ischial spine were identified in all the hip bones and a vernier calliper was used to measure the distance between the PIIS-IS.

Results: It was observed that the mean distance of PIIS-IS in males and females were 49.64 mm and 54.35 mm respectively. The standard deviation in males was 5.75 mm and that of females was 5.15 mm. Maximum no. i.e. 78.66% of males & 62.16% comes under the range of distance between 41-55 mm.

Conclusion: It was observed that out of 149 hip bones taken for study 75 were of males and 74 were of females. The Mean distance in females was observed to be greater in comparison to males. Statistically calculated T- test reveals that the parameter taken for study is very highly significant in terms of sex differentiation.

Keywords: Posterior inferior iliac spine, Hip bone, Ischial spine, Morphology, Topography, Sex determination.

INTRODUCTION

The hip bone, due to its irregularity in shape, called os-innominatus. It is constricted in the center and expanded at its two ends. It is composed of three bones: ilium, ischium, and pubis which fuse with each other in acetabular cavity to form a single hip bone. Sex determination by using skeletal remains is of great importance for archaeologists and forensic experts. The metric and non-metric differences in skeletal component among populations are evident. Human hip bone has several parameters which can be helpful in determination of sex compared to other skeletal remains like sacrum, femur, clavicle, mandible etc.

Non metric method for determination of sex is not so relevant. But metric methods used for sex determination

of human hipbone have shown highest accuracy level.¹ Superiority of objective assessment by metrical methods over simple morphological observations has been well stressed.² Indices and angles of greater sciatic notch are known to be highly sexually dimorphic. Consequently they have been considered to be reliable sex discriminators. The greater sciatic notch and acetabulum are located in central portion of the hip bone; hence they are better preserved.³ Several studies has been done taking into consideration various parameters along the anterior border as well as posterior border of the human hip bone.

The present study was undertaken since there were very few studies set out to establish the morphological pattern of distance between posterior inferior iliac spine and ischial spine of hipbone along its posterior border.

METHODS

149 unpaired adult human hip bones (75 males and 74 females) of known sex obtained from department of anatomy of our institution. The hip bones were selected after rejecting the bones, having fractures and pathological deformities. Only the bones with intact posterior border were used for the study. The side of the hip bone was determined morphologically on the basis of predetermined criteria. For each hipbone, the distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) was measured using vernier caliper and metallic scale to avoid all possible errors (Figure 1).



Figure 1: Measurement of distance (PIIS-IS) using vernier caliper.

The measurements were taken twice and the mean value of it was taken for purpose of data analysis to avoid maximum probable errors. The mean and standard error of the distance between PIIS-IS of male & female were calculated. T test calculation was also done to establish the significance of the study. The photographs were taken by the digital camera for more clarity. The data were analysed using the Statistical Package for the Social Sciences (SPSS). The graph was drawn using Microsoft excel (Table 1).

RESULTS

In the present study the mean distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS in mm) were calculated in both the sexes. The mean distance in males was 49.64 mm and the mean distance in females was 54.35 mm. The difference in the mean distance between PIIS-IS between males and females were found to be very highly significant. The Standard Deviation (SD) is more in male i.e. 5.75 mm suggesting greater variation in the distance between PIIS-IS of male along the posterior border of the hip bone in comparison to female in which the SD is 5.15 mm.

Table 1: Mean distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) in males and females.

Parameters			Range (in mm.)					
Sex	No.	Mean ± S.D	25 - 40	%	41 - 55	%	56 - 75	%
Male	75	49.64 ± 5.75	7	9.33	59	78.66	9	12
Female	74	54.35 ± 5.15	0	0	46	62.16	28	37.83

The data were ranged between 25-40, 41-55 and 56-75. Out of 75 males and 74 females 7 (9.33%) of them fall in the range between 25-40 whereas no female comes under this category, 59 (78.66%) males & 46 (62.16%) females fall in the range between 41-55 and 9 (12%) males & 28 (37.83%) females (Table 1). This reveals that maximum number comes under the range between 41-55 both in male and female.

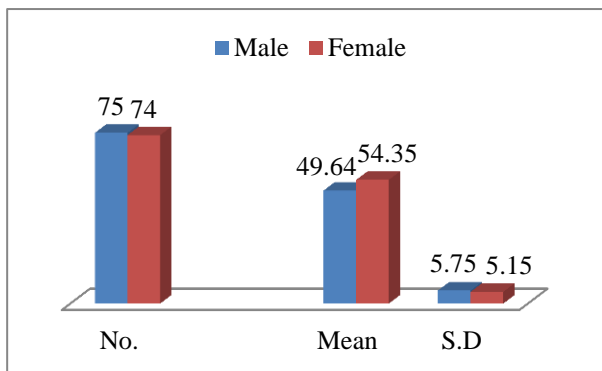


Figure 2: Mean distance between posterior inferior iliac spine and ischial spine and SD in males and females.

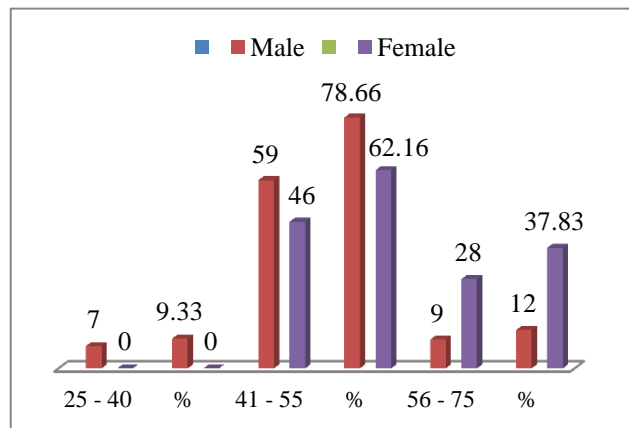


Figure 3: Range for the distance between posterior inferior iliac spine and ischial spine in males and females.

DISCUSSION

Recently many researchers have attempted to determine the sex from various parameters of the hip bone. The posterior border of the hip bone is used in different studies considering different populations for sex

determination. An author has done substantial work on various parameters related to the posterior border of the hip bones. The measurements of 42 hip bones (27 males and 15 females) of known sex were used to study eight variables on its posterior border for the determination of sex.³ Highest average accuracies were 88% for males (pubic length, greater sciatic notch posterior width, acetabulum diameter, total height) and 85% for female (pubic length, greater sciatic notch posterior width, acetabulum diameter, iliac breadth).

M. Steyna used the geometric morphometric method to study the greater sciatic notch of 115 known skeletons of South African origin, and observed that the South Africans have the typical narrow shape of the greater sciatic notch, while both black and white females have typical greater sciatic notches.⁴ Hence they indicated that for identification of sex the width of greater sciatic notch may not be a reliable criteria, especially in South Africans white males. Iiknur Ari studied the morphometry of greater sciatic notch on 26 adult hipbone excavated from remains of male.⁵ He measured the width and depth of posterior segment and two indexes to find out the variation in right and left. Doshi et al worked on posterior border of the hip bone taking three parameters in consideration and found that the distance between the PIIS-IS is one of the significant parameter for the determination of sex which also supports and re-enforces the 5 present findings.⁶ Margam et al. studied two parameters along the posterior border of human hip bone i.e. Dist. PSIS-IT & Dist. PIIS-IT and both were found significant for sexing of human hipbone.⁷

In the present study parameter taken for study was PIIS-IS and was found that the mean distance between posterior inferior iliac spine and ischial spine in 76 male hip bones was 49.64 ± 5.75 mm and in 72 female hip bones was 54.35 ± 5.15 mm. In females the mean distance is apparently greater, and statistically it was found to be Very Highly Significant. This shows that the mean distance between PIIS-IS in males was very less than that of females, which can be considered as an important metric parameter for identifying the sex of an individual. This makes the present study more objective as well as relevant.

CONCLUSION

The present study was done to identify the measurements between PIIS-IS along the posterior border, which significantly differentiates the sex of human hip bone. There was a significant difference observed in the distance between posterior inferior iliac spine and ischial spine which will be useful in anatomical, anthropological, archaeological and forensic studies.

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Conflict of interest: None declared

Ethical approval: Not required

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