

Morphometric analysis of acetabulum and pubis of pelvic bone using acetabulopubic index

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ABSTRACT

Introduction: Identification of sex of an unknown individual from the skeletal remains is the first and the most important step encountered by the forensic experts and archaeologists and the hip bone is considered as an ideal bone for sex determination as it provides the highest accuracy levels. Pelvis is the most reliable bone used in sexual dimorphism. It has been shown that sexual dimorphism of hip bone varies in different population. The objective of the present study is to analyze the morphometric sex difference in the innominate bone using acetabulum-pubis index. **Materials and Methods:** A total of 20 dry human disarticulated pelvic bones (10 right sided and 10 left sided) were obtained from the Department of Anatomy, Saveetha Dental College and Hospitals and Madras Medical College, Chennai. Using Vernier caliper, the distance from the anterior and posterior ridge to the ischial tuberosity (IT) and from midpoint to the IT was analyzed. The results obtained were analyzed, tabulated, and represented graphically. **Results:** The average value from the anterior ridge, posterior ridge, and midpoint to IT was found to be 56.8 mm, 63.68 mm, and 64.56 mm on the right side and 53.27 mm, 62.195 mm, and 63.84 mm on the left side, respectively. **Conclusion:** This study is helpful for analyzing archaeological skeleton because only one hip bone is required, unlike some other methods in which both the sides of the pelvic bones are required.

KEY WORDS: Acetabulopubic index, Acetabulum, Pelvic bone, Pubis, Sex determination

INTRODUCTION

When the human skeletal remains are found, sex determination of that anonymous bone is very important, both in forensic investigation and archaeological studies. Hence, evaluation of sexual dimorphism of bones in the human population is interesting for both forensic experts and anthropologists.^[1] The hip bone is a perfect bone for sex determination, as it reveals the dissimilarities between the two sexes and likewise displays a specific adaptation of women hip bone for childbearing.^[2] It is believed that for the sex determination of human skeleton, the hip bone shows the highest accuracy levels.^[3] The sexual dimorphism in the shape and size of the pelvis is very great since women giving birth to infants.^[4] Estimating sex from skeletal remains is a key step in the identification process in both forensic and archaeological contexts. Sex determination is the

first component of the biological profile to be assessed because elements such as age, stature, and sometimes ancestry are dependent on it.^[5] Literatures suggest that the innominate bone displays the greatest degree of sexual dimorphism in humans, making it the ideal bone for sex estimation.^[6]

Identification of sex of an unknown individual from the skeletal remains is the first and the most important step encountered by the forensic experts and archeologists, and the hip bone is considered as an ideal bone for sex determination as it provides the highest accuracy levels.^[7] The ability to determine sex from unknown skeletal remains is vital and methods to do this on various bones of the human skeleton have been researched extensively.^[8] There is a need for population-specific data as the standards of morphological and morphometric sex difference in the skeleton may differ with the population sample involved and thus cannot be applied universally. Hence, determining sex from the skeletal remains has become one of the most important steps in forensic anthropology and forensic archaeology.^[9]

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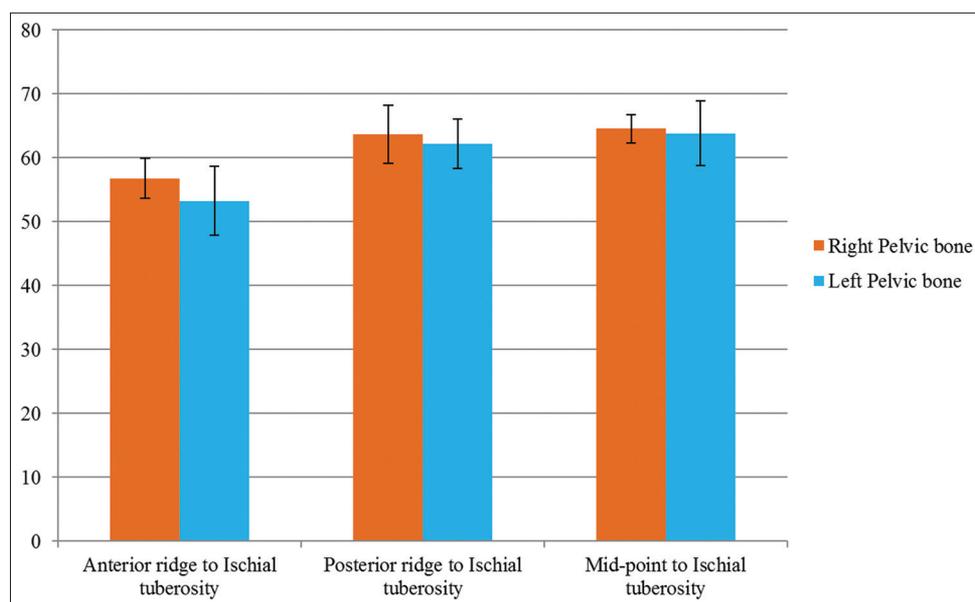


Figure 1: The measurement and comparison of pelvic indices of the right and left pelvic bone

Different criteria with different parameters were studied by several authors. Each parameter conveys some specific information with noteworthy points which has greater anatomical and clinical implication. However, a clear defined pelvic index defines such varied index of pelvimetry and suggests uniform morphometric parameter to be relied on. Pelvis is the most reliable bone used in sexual dimorphism. Various studies have been conducted to determine the accuracy of sexing the hip bone using many variables. It has been shown that sexual dimorphism of hip bone varies in different population. The objective of the present study is to analyze the morphometric sex difference in the innominate bone using acetabulum-pubis index.

MATERIALS AND METHODS

A total of 20 dry human disarticulated pelvic bones (10 right sided and 10 left sided) were obtained from the Department of Anatomy, Saveetha Dental College and Hospitals and Madras Medical College, Chennai. Using Vernier caliper, the distance from the anterior and posterior ridge to the ischial tuberosity (IT) of the pelvic bone and from the midpoint to the IT of the pelvic bone was analyzed. The results obtained were analyzed, tabulated, and represented graphically.

RESULTS

The average value from the anterior ridge, posterior ridge, and midpoint to IT was found to be 56.8 mm, 63.68 mm, and 64.56 mm on the right side and 53.27 mm, 62.195 mm, and 63.84 mm on the left side, respectively. The data were extracted and represented graphically to compare the right side with the left side. The measurement and comparison of pelvic indices of the right and left side are shown in Figure 1.

DISCUSSION

The hip bone is usually considered as an important sexually dimorphic region of the human skeleton and is one of the main features that are normally used as a reliable source for sex determination.^[10] Given the sexual dimorphism in different patterns and levels, the standards of specific populations and species cannot be applicable for all human beings. By measuring several variables simultaneously through digital tools and electronic software, it is possible to increase accuracy and reduce error in sex determination analyses.^[11]

Many studies were carried out on sex determination using various parameters on pelvic bone including greater sciatic notch. Hideo Takahashi found that the sex determination can be done using various parameters of greater sciatic notch with 88% accuracy in Japan population, Akpan *et al.* with 75–90% accuracy in Nigerian population, and Rajangam *et al.* with 87.7% accuracy in Karnataka origin of South Indians.^[12-14]

CONCLUSION

Accurate sex estimation of remains can be very important to medicolegal authorities in forensic analysis. With the results of the present study, the greater sciatic notch width, depth, and the index can be taken as the best parameter in sex determination of skeletal remains. Among the entire parameters, index was the best parameter with 100% accuracy. The data provided in the present study would be helpful in sex determination of skeletal remains in forensic analysis and anthropological studies. This study is helpful for analyzing archaeological skeleton because only one hip bone is required, unlike some other methods are required both innominate bones.

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