



## DETERMINATION OF SEX BY MULTIVARIATE ANALYSIS OF ACETABULAR DIMENSIONS

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### Abstract-

**Background:** Establishing the identity of deceased is a common requirement by law and anthropologists. During establishing the identity age, sex, race and stature play a great role. So we decided to study acetabular dimensions to determine the sex of the deceased.

**Materials and Methods:** 139 human adult hip bones of known sex were used for the study. Vertical, transverse and distance between pubic tubercle and nearest acetabular margin was measured. Statistical analysis was done.

**Results:** 1. Sex determination was correctly done in 83.34% of hip bones; 2. Sex determination was correctly done in 83% of male and 84.5% of the female hip bones.

**Conclusion:** Acetabular dimension is one of the reliable methods for determination of sex.

**Keywords-** Sex determination, Acetabular dimension, hip bones

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### Introduction

Identification of the sex of deceased is a difficult task for forensic experts. This becomes a challenge when the material of the deceased body is very limited. During establishing an identity sex, age, race and the stature are the main questions to be answered. Race, climate, heredity, and geographical areas have strong influence over the anthropometric parameters of bone [1]. Anatomical parameters of bony components of hip bone may be useful for establishment of sex of deceased. So by keeping the main aim to find out the relation of acetabular parameters with identification of sex, we studied 139 hip bones. Parameters of acetabulum are also helpful for anthropologists, orthopedicians and prosthetists.

### Materials and Methods

139 human adult hip bones of known sex (81 males, 58 females) available in the bone bank of department of Anatomy of GMC Aurangabad were used for the study.

Measurements were taken with the help of digital vernier caliper [Fig-1].

Following parameters were studied:

1. Vertical diameter (VD) of acetabulum [Fig-2](B) The point on acetabulum margin just below anterior inferior iliac spine to the perpendicular point on inferior margin of acetabulum.
2. Transverse diameter (TD) of acetabulum [Fig-2](A)-The point on the acetabular margin just posterior to lateral or outer border of

pectineal surface to perpendicular point on acetabular margin.

3. Distance between pubic tubercle and nearest acetabular margin [Fig-2] (C&D).

All the distances were measured by using vernier calliper and by holding the hip bone in anatomical position.



Fig. 1- shows instruments used for studying acetabular parameters

### Results

Discriminant linear regression analysis was applied to the above parameters and the data was then cross validated.

The formula obtained is:

Differential functional score (DFS) =  $22.37 + 0.165 (VD) + 0.281 (TD)$   
 The sectioning DFS is 20.837.  
 The DFS (Males) is 20.364 and DFS (Females) is 21.310.

On cross validation the result obtained is:

1. 83.34% of hip bones were correctly sexed
2. 83% of male hip bones were correctly sexed
3. 84.5% of female hip bones were correctly sexed.

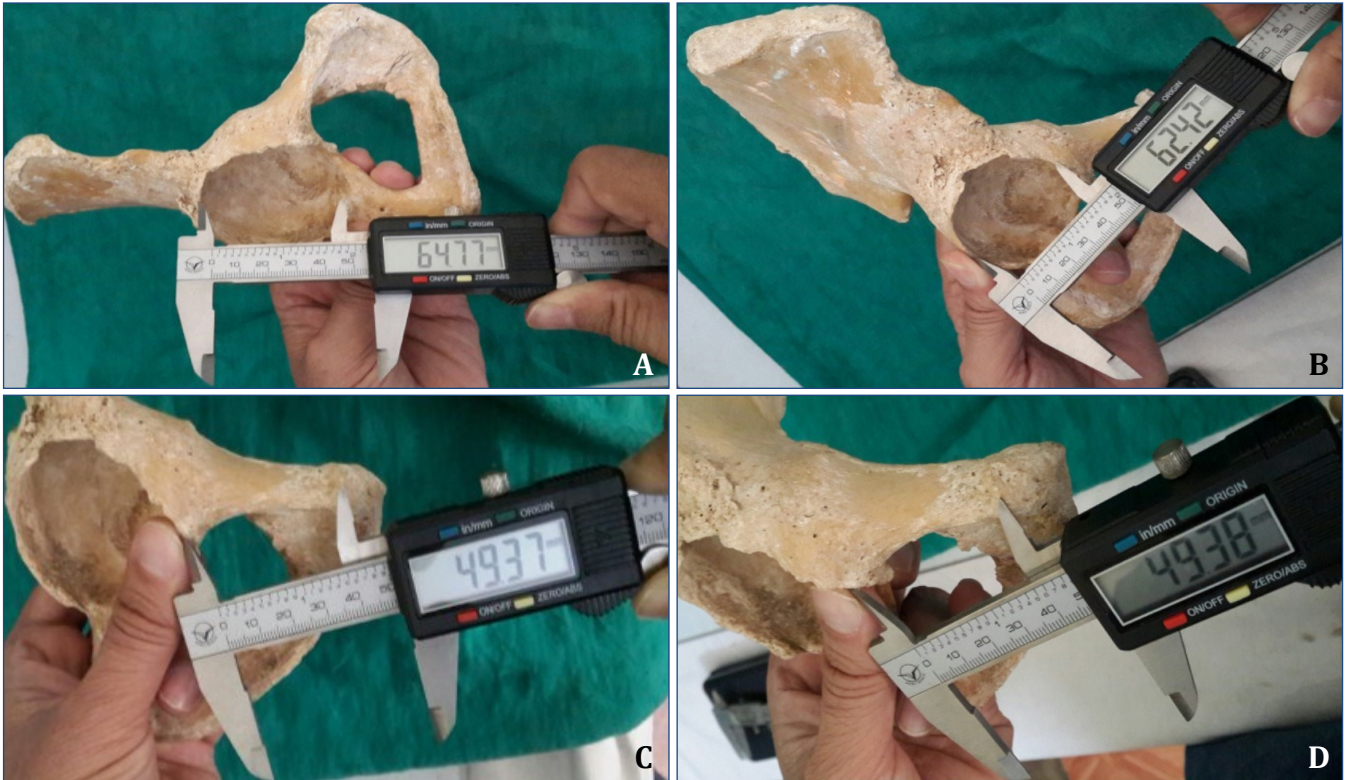


Fig. 2- (A) Transverse diameter; (B) Vertical Diameter; and (C&D) distance between nearest acetabular margin and pubic tubercle.

**Discussion**

Hip bone is large, irregular, constricted centrally and expanded above and below [2]. It is of interest from forensic, anthropology and anatomy point of view. Morphometry of hip bone carries lot of importance during recognizing sex of deceased with the limited sources. Determination of sex is very important step in forensic anthropology [3]. Acetabulum is a hemispherical cavity situated about the centre of the lateral aspect of the hip bone [2]. It derives its name from its resemblance to a shallow Roman vinegar cup [4]. The parameters related to acetabulum are clinically important as surgeons are keen to study different diameters studied by radiographs in case of acetabular dysplasia. Morphological features are more than often very effective since they are developmental in nature [5].

Table 1- Comparison of % of hip bone sexed by different authors with present study

Sr. No.	Name of the worker	% of Hip bone sexed
1	Day M.H. [9]	90%
2	Schulter Ellis F.P [10]	96%
3	Schulter Ellis F.P, Hayek L.A. [11]	89-91%
4	Patriquin M.L. [12]	84%
5	Benazzi S. [3]	96.40%
6	Present Study	83.34%

Parameters in relation to acetabulum may give valuable data in recognizing sex x deceased. Other researchers like Shiiho [6],

Krogman [7], Duric [8] used acetabular dimensions in addition to other pelvic measurements and found that they are helpful in the determination of sex. In the present study we found that along with the pelvic measurements, acetabular parameters also contribute in the determination of sex. Thus these parameters can be used as reliable parameter during the determination of sex.

[Table-1] Shows comparison of % of hip bone sexed by different authors with present study.

**Conclusions**

Multivariate linear discriminant analysis of acetabular dimensions is one of the reliable methods for determination of sex. This can be one of the reliable criteria if acetabular fragment of the deceased is available.

**Conflicts of Interest:** None declared.

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