

## Evaluation of the Relationship between Depth and Diameter of Acetabulum in Dry Hip Bone of Human

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### Abstract

**Background:** The acetabulum (Latin Acetabulum-Shallow Vinegar Cup) is an approximately hemispherical cavity central on the lateral aspect of the innominate bone, facing anteroinferiorly and surrounded by an irregular margin deficient inferiorly at the acetabular notch. The acetabular fossa forms the central floor and is rough and non-articular. The articular lunata surface is widest above (the 'dome'), where weight is transmitted to the femur. All three innominate elements contribute to the acetabulum, but unequally. The pubis forms the anterosuperior fifth of the articular surface, the ischium forms the floor of the fossa and rather more than the posteroinferior two-fifths of the articular surface, and the ilium forms the remainder. **Aim:** To evaluate the Relationship between Depth and Diameter of Acetabulum in Dry Hip Bone of Human. **Materials and Method:** In the present study consists of 154 dry human hip bone of unknown sex. To determine the depth and width of human acetabulum in dry hip bone of indian population, using the Stainless steel sliding caliper and Slide Scale, The mean  $\pm$ S.D value of depth and diameter of acetabulum were  $27.14 \pm 3.50$ mm,  $47.57 \pm 3.99$ mm. The maximum and minimum measurements of acetabulum depth were 38.0 mm; 13.0 mm and maximum and minimum measurements of acetabulum diameter were 56.0 mm, 39.0 mm respectively. **Conclusion:** Morphological study on adult hip bone is useful for anatomists, anthropologists, experts in Forensic medicine, and orthopedics for performing surgical procedures in this area.

**Keywords:** Depth of acetabulum, Diameter of acetabulum, dry hip bone, Stainless steel sliding caliper and Slide Scale

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### Introduction

The acetabulum is a deep cup-shaped cavity on the lateral aspect of the hip-bone about its center, and is directed laterally, downwards and somewhat forwards. It is surrounded by an irregular projecting margin which is deficient inferiorly; this gap is termed the acetabular notch[1-3]The floor of the cavity is roughened and non-articular and is termed the acetabular fossa. The sides of the cup present a horseshoe-shaped articular surface which is widest superiorly; in this situation the weight of the trunk is transmitted to the femur in the erect attitude. In the recent state this strip is covered with articular cartilage and provides the surface on which the head of the femur moves within the hip-joint. All three elements of the hip-bone contribute to the formation of the acetabulum in human, but not in equal proportions[4].

The pubis forms the upper and anterior fifth of the articular surface; the ischium forms the floor of the acetabular fossa and rather more than the lower and posterior two-fifths of the articular surface and the ilium forms the remainder of the articular surface[5]

Therefore this study was conducted to evaluate the Relationship between Depth and Diameter of Acetabulum in Dry Hip Bone of Human.

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### Materials & Method

This prospective study was conducted at department of Forensic Medicine and Toxicology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar. The study was approved by the institutional ethical and research committee. The study was conducted for a period of five Months from June 2020 to October 2020.

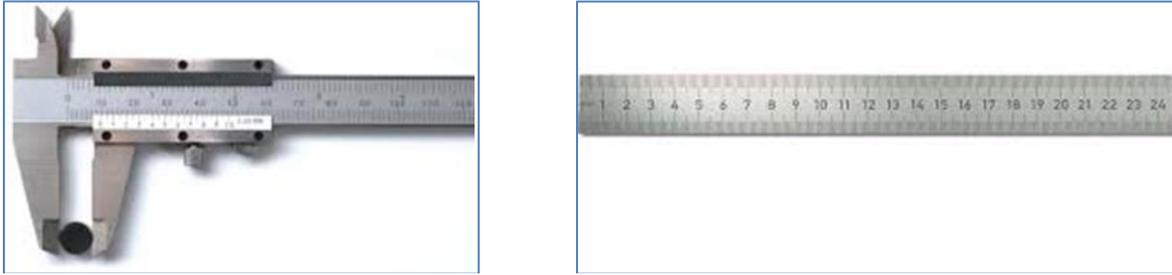
The material for the present study consists of 154 dry human hip bone of unknown sex. All these bones were fully ossified bones and free from any pathological or congenital defect. These bones were obtained from various sources:-

Sample size: In the present study the sample no. are 154. It's estimation based on precision. The Precision consists of significance levels and the allowable error. In this study 5% significance level and various levels of significance are considered. Correlation between morphometrical parameters were investigated using z-test,  $p < 0.0001$  was significant level.

From the study the Standard Deviation (S.D) for various parameters are as follows-

S.D. of Acetabulum- Diameter- 0.399 Depth- 0.350

Measurements were taken using:-Stainless steel sliding caliper  
Slide Scale



**Fig 1: Showing Used Instruments**

The measurements were done on intact parts of normal bones. Bones showing wear and tear, fracture or any pathology were not considered. Each linear recording was taken to the nearest millimeter.

**Following parameters were used for measurement:** Acetabulum-Diameter and depth. Measurements for all the above indices were taken as per the norms described in anthropometry. The data obtained for all parameters were analyzed statistically to find range, z-test, mean and standard deviation (S.D.). Each variable was

measured 2 times at 2 different sessions by the same observer and the mean value of the 2 measurements was calculated for each variable of each bone for the measurements of these variables a scale.

**Depth of Acetabulum**

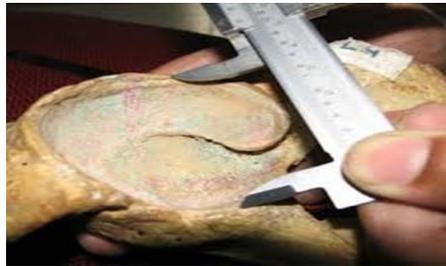
A thin slide scale was placed across the diameter of the acetabulum. Depth of the acetabulum was measured in mm using vernier scale from the center of the acetabulum to the slide scale (fig.no-2). Measurements were recorded accurately to 1/10 of a millimeter by this scale.



**Fig 2: Showing measurement of depth of acetabulum**

**Diameter of acetabulum**

Maximum transverse diameter of the acetabulum was measured using vernier calipers (fig.no-3).



**Fig 3: Showing measurement of diameter of the acetabulum.**

**Result**

Summarizes the means and standard deviations of depth and diameter of acetabulum of the hip bone. The result shown in below.

**Table 1: Depth and diameters of acetabulum of the hip bone**

| No. of steps       | Depth    | Diameter  |
|--------------------|----------|-----------|
| Mean               | 27.14    | 47.57     |
| Standard deviation | 3.50     | 3.99      |
| z-test             | -96.2282 | -147.9519 |
| P value            | < 0.0001 | < 0.0001  |
| Correlation(r)     | 0.48     |           |

The mean  $\pm$ S.D value of depth and diameter of acetabulum were 27.14  $\pm$  3.50mm, 47.57  $\pm$  3.99mm. The maximum and minimum measurements of acetabulum depth were 38.0 mm; 13.0 mm and maximum and minimum measurements of acetabulum diameter were

56.0 mm, 39.0 mm respectively. Distribution of anatomical parameters of hip bone and unknown sex related differences within various ethnic parameters are presented in Table. Statistical software

namely SPSS 10.0 was used for analysis of data. Microsoft word and Excel have been used to generate graphs, tables, etc.

#### Discussion

In the present study effort has been made to find the dried human hip bone with the available data in relation to the various parameters. Total of about 154 hip bone have been studied. The parameters have

been selected from the literature available in the well-known Anatomy textbooks and published articles. In these articles the study was on identification of validity of the parameters in the hip bone of known sex. In the following section the results of the present study when compared with that of previous ones show the following results[6,7].

**Table 2: Comparison of present study with earlier studies**

| Acetabulum         | Mean (Depth) | Mean (Dia mention) |
|--------------------|--------------|--------------------|
| Present study      | 27.14mm      | 47.57mm            |
| FundaTastekinAksu  | 29.49mm      | 54.29mm            |
| Croft et al        | 14.4mm       | Not available      |
| Lau et al          | 11.8mm       | Not available      |
| Jeremicdejan et al | 11.9mm       | ±2.8               |
| Jeremic et al      | 11.9mm       | ±2.8               |

The mean(FundaTastekin Aksu,2006) depth of acetabulum of the dried hip bone was 29.49mm. In the present study it is 27.14mm and is low when compared with the previous study. Whereas the range in the present study lies within the range observed in the previous study (refer Table No.2). The mean (FundaTastekinAksu, 2006) diameter of acetabulum of the dried hip bone was 54.29mm. In the present study it is 47.57mm and is low when compared with the previous

study. Whereas the range in the present study lies within the range observed in the previous study (see Table No.3). The whole of the study relates with all the relevant past studies except fundatuskienaksu whose study is greater than the observed in the present study. The acetabular depth is less than 9 mm so it may be considered as the acetabular dysplasia[8,9].

**Table 3: Comparison of present study with earlier studies**

| Acetabulum         | Mean (Depth) | Mean (Diamention) |
|--------------------|--------------|-------------------|
| Present study      | 27.14mm      | 47.57mm           |
| FundaTastekinAksu  | 29.49mm      | 54.29mm           |
| Croft et al        | 14.4mm       | Not available     |
| Lau et al          | 11.8mm       | Not available     |
| Jeremicdejan et al | 11.9mm       | 2.8mm             |

#### Conclusion

Most of the Previous Studies have been done on those parameters which determine the gender variations in the hip bones. After comparing the findings of the present study with the previous data available, the observation are similar while others are varying due to the formulas used for these calculations. Morphological study on adult hip bone is useful for anatomists, anthropologists, experts in Forensic medicine, and orthopedics for performing surgical procedures in this area. A radiological study may be added for further accuracy. The purpose of this work is to contribute to the scientific literature, providing anatomical data on the similarities and variations. The depth of acetabulum correlates with acetabular diameter so this information may be helpful during hip arthroplasty, treatment of joint fracture and in diagnosing congenital hip dysplasia.

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**Conflict of Interest: Nil**

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