

# COMPARATIVE STUDY OF JOINT SPACE WIDTH OF HIP JOINT IN SOUTH INDIAN POPULATION

Sindhu K S<sup>1</sup>, Shubha R<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Anatomy, Kempegowde Institute of Medical Sciences, Bengaluru, Karnataka, India.

<sup>2</sup>Assistant Professor, Department of Anatomy, Kempegowde Institute of Medical Sciences, Bengaluru, Karnataka, India.

Received Date: 28/01/2024

Acceptance Date: 28/02/2024

## Corresponding Author:

Dr Sindhu K S, Assistant Professor, Department of Anatomy, Kempegowde Institute of Medical Sciences, Bengaluru, Karnataka, India.

**Email:** [drsindhusivankutty@gmail.com](mailto:drsindhusivankutty@gmail.com)

## Abstract

**Background:** The hip joint is a synovial joint of ball-and-socket, multi axial spheroidal, cotyloid type. Aberrant shapes of the acetabulum or the proximal femur have been identified as risk factors for the development of Osteoarthritis (OA) in the hip joint. Present study was aimed to compare joint space width of hip joint in south Indian population. **Material and Methods:** Present study was single-center, comparative study, conducted in AP view plain radiographs of right and left hip joints of adults (age < 20 yrs.) of known age and gender where there is sufficient view of hip joint. **Results:** The value of joint space width was more in men than in women and was found to be statistically significant ( $p < 0.001$ ) when the hip joint of males and females were compared on the right side. The value of left joint space width was more in men ( $12.903 \pm 5.358$  mm) than in women ( $6.654 \pm 2.022$  mm) and difference was found to be statistically significant ( $p < 0.001$ ). We compared joint space width in both genders irrespective of side, joint space width was more in men ( $10.483 \pm 4.597$  mm) than in women ( $6.673 \pm 2.026$  mm) and difference was found to be statistically significant ( $p < 0.001$ ). **Conclusion:** Joint space width in hip joint was more in men ( $10.483 \pm 4.597$  mm) than in women ( $6.673 \pm 2.026$  mm) and difference was found to be statistically significant ( $p < 0.001$ ).

**Keywords:** Joint space width, hip joint, south Indian population, Osteoarthritis

## Introduction

The hip joint is a synovial joint of ball-and-socket, multi axial spheroidal, cotyloid type. It comprises of head of femur and acetabulum of hip bone. The femoral head is closely fitted to the acetabulum in an area exceeding half a sphere, and is embraced closely by the acetabular labrum, which restrains it in the socket. The femoral head is covered by articular cartilage, except over the rough pit where the ligamentum teres is attached. In front the cartilage extends laterally over a small area on the adjoining neck. Articular cartilage is, generally, thicker centrally than at the periphery.

The joint space width measurement has been conducted by several authors to determine the normal mean and range.<sup>1,2</sup> Most studies reveal a normal mean of about 4 mm. Aberrant shapes of the acetabulum or the proximal femur have been identified as risk factors for the development of Osteoarthritis (OA) in the hip joint.

Hip OA is a common disabling disease and an important cause of pain and disability especially in elderly. Among the factors responsible for the development of OA are genetic factors, obesity, overuse and traumatic injury.<sup>3,4</sup> Present study was aimed to compare joint space width of hip joint in south Indian population.

### Material And Methods

Present study was single-center, comparative study, conducted in department of Anatomy and Department of Radiodiagnosis, Kempegowda Institute of Medical Sciences, Bangalore, Karnataka, India. Study duration was of 2 years (January 2020 to December 2021). Study approval was obtained from institutional ethical committee.

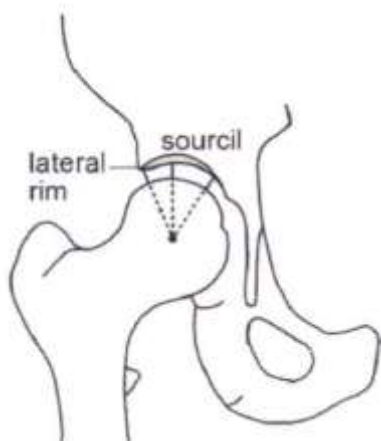
#### MATERIALS

1. Plain AP Radiographs of hip joints of 147 males and 117 females
2. DICOM VIEWER software
3. Measuring scale

Inclusion criteria: AP view plain radiographs of right and left hip joints of adults (age < 20 yrs.) of known age and gender where there is sufficient view of hip joint.

Exclusion criteria,

- Unfused acetabulum
- Radiographs of hip joint with diseases,
- Hip Joint space width 2 mm.



**Figure 1**

The joint space width (JSW) was measured radially at three locations within the joint: namely medially (at the medial margin of the weight-bearing surface), in the middle (determined by a vertical line through the center of the femoral head) and laterally (at the lateral margin of the subchondral sclerotic line).

Statistical analysis was done by finding the mean, standard deviation and percentage and the parameters were compared between hip joints of males and females on each the two sides and also irrespective of sides. The results were correlated using paired student t test and was considered significant if p value  $\leq 0.05$ .

### Results

The value of joint space width was more in men than in women and was found to be statistically significant ( $p < 0.001$ ) when the hip joint of males and females were compared on the right side.

Photograph: X ray of the Hip Joint with the line indicated by the arrow showing the Joint Space Width

**Figure 2**

(the interbone area between the acetabular roof and the part of the femoral head facing it)

**Table 1: Comparison of the right side joint space width in males and females**

Measurements	Gender	Mean	SD	SE of Mann	Mean difference	T	P-Value
JSW	Male	8.062	2.411	0.199	1.370	4.907	<0.001
	Female	6.692	2.039	0.189			

The value of left joint space width was more in men ( $12.903 \pm 5.358$  mm) than in women ( $6.654 \pm 2.022$  mm) and difference was found to be statistically significant ( $p < 0.001$ ).

**Table 2: Comparison of the left side joint space width in males and females**

Measurements	Gender	Mean	SD	SE of Mann	Mean difference	T	P-Value
JSW	Male	12.903	5.358	0.199	1.370	4.907	<0.001
	Female	6.654	2.022	0.189			

We compared joint space width in both genders irrespective of side, joint space width was more in men ( $10.483 \pm 4.597$  mm) than in women ( $6.673 \pm 2.026$  mm) and difference was found to be statistically significant ( $p < 0.001$ ).

**Table 3: Comparison of the joint space width in both genders irrespective of side**

Measurements	Gender	Mean	SD	SE of Mann	Mean difference	T	P-Value
JSW	Male	10.483	4.597	6.304	1.370	4.907	<0.001
	Female	6.673	2.026	4.390			

## Discussion

The normal values of Joint space width (JSW) are needed to set the limits of significant early radiographic alterations in patients with osteoarthritis. It refers to the inter bone area between the acetabular roof and the part of the femoral head facing it. JSW is an important determinant of osteoarthritic changes. Joint space narrowing should not be expected in an elderly or obese person unless arthritic changes develop.

Joint space width is an important determinant of osteoarthritic changes. Many authors have concluded that joint space narrowing should not be expected in an elderly or obese person unless arthritic changes develop. The average joint space in the present study was 4.5 mm (range = 2-12 mm; SD 2 mm). The authors observed no significant change among the different age groups.

In the present study the JSW was found to be  $8.062 \pm 2.411$  mm in males and  $6.692 \pm 2.039$  mm in females. The higher values in males could be attributed to the pelvic morphology. In the study done by Lequesne *et al.*,<sup>5</sup> it was found that the difference was not significant when only subjects aged 25-50 years were compared with those aged 50- 88 years and that men had

a larger JSW than women. JSW does not become narrower with age. A significant decline in JSW with age was seen in women, with a mean difference between ages 45-54 and 75-84 years. No significant change in JSW with age was seen in men.<sup>5</sup> In the study done by Saikia *et al.*, no significant difference was found among the different age groups. It was observed that the study done by Lene *et al.*,<sup>6</sup> was similar to that of Saikia *et al.*,<sup>7</sup>

The comparison shows that the JSW in the present study is higher than that of other studies. The differences could be attributed to the racial differences in the population studied.

**Table 4: Comparison of the JSW with the previous studies**

Author	Population	Age group	MALES	FEMALES
Lequesne <i>et al.</i> , <sup>5</sup>	France	18-89	5	4.69
Saikia <i>et al.</i> , <sup>7</sup>	India	20-70	4.6	4.4
Lene <i>et al.</i> , <sup>6</sup>	London	18.6	4.6	4.3
Present study	India	20-90	8.062	6.692

On average minimum joint space width for females was significantly larger than minimum joint space width for males. The authors found out that subjects with osteo arthrosis and hip dysplasia were younger than subjects with hip osteo arthrosis in normal hips, but this was not strictly significant. On average, minimum JSW for females was significantly larger than minimum JSW for males ( $p = 0.004$ ).

The CE angle decreases in acetabular dysplasia and coxa magna, which increases the radius of femoral head. The center of the head becomes displaced laterally and inferiorly. If subluxation occurs, it may move further laterally and superiorly.<sup>8,9</sup> The angle increases in coxa plana, where the center of the femoral head moves cranially and in OA where the center of the head migrates cranially due to reduced cartilage height.

ACE angle of less than  $20^\circ$  is considered by most investigators to be diagnostic of definitive acetabular dysplasia, while a CE angle of  $25-20^\circ$  is considered to be borderline normal. This parameter has some limitations. The CE angle relates acetabular coverage to the position of the femoral head and is dynamic in nature, but does not indicate the shape or depth of the acetabulum. It does not assess vertical migration of the femoral head. The authors have chosen to designate the readily identifiable lateral margin of the sub chondral sclerotic 'sourcil' as their lateral point of reference. HD is only one of several factors influencing the development of hip OA.<sup>10,11</sup> Age and genetic factors are also important.

## Conclusion

Joint space width in hip joint was more in men ( $10.483 \pm 4.597$  mm) than in women ( $6.673 \pm 2.026$  mm) and difference was found to be statistically significant ( $p < 0.001$ ). The normal values of Joint space width (JSW) are needed to set the limits of significant early radiographic alterations in patients with osteoarthritis.

**Conflict of Interest:** None to declare

**Source of funding:** Nil

## References

1. Pathak SK, Maheshwari P, Ughareja P, Gadi D, Prashanth Raj M, Gour SK. Evaluation of femoral neck-shaft angle on plain radiographs and its clinical implications. *Int J Res Orthop.* 2016;2:383-86.
2. Sharma A, Lal RK. Morphological variation of measurements of proximal end of femur in south Bihar population. *International Journal of Medical and Health Research.* 2019;5(8):220-23.
3. Chaudhary PN, Shirol VS, Virupaxi RD. A morphometric study of femoral length, anterior neck length, and neck-shaft angle in dry femora: A cross-sectional study. *Indian J Health Sci Biomed Res.* 2017;10:331-34.

4. Verma L, Gupta S, Ghulyani T, Jaiswal P. A digital image analysis method for measuring femoral neck-shaft angle and anteversion angle: A pilot study. *Indian Journal of Clinical Anatomy and Physiology*. 2016;3(3):362-69.
5. Lequesne M. [Coxometry: measurement of the basic angles of the adult radiographic hip by a combined protractor][in French] *Rev Rhum Mal Osteoartic*. 1963;30:479–485.
6. Lane NE, Lin P, Christiansen L, *et al.* (2000) Association of mild acetabular dysplasia with an increased risk of incident hip osteoarthritis in elderly white women: the study of osteoporotic fractures. *Arthritis Rheum* 43, 400–404.
7. Saikia KC, Bhuyan SK, Rongphar R. Anthropometric study of the hip joint in Northeastern region population with computed tomography scan. *Indian J Orthop*. 2008;42 (3):260-66.
8. Siwach R. Anthropometric study of proximal femur geometry and its Clinical Application. *Ann Natl Acad Med Sci (India)*. 2018;54(4):203-15
9. Bulent, A., Ali, O., Omur, O., Mazhar, T., Mumtaz, A. (2007). Osteometry of the femora in Turkish individuals: A morphometric study in 114 cadaveric in femora as an anatomic basis of femoral component design. *Acta Orthop Traumatol Turk*, 41(1), 64-68
10. de Farias TH, Borges VQ, de Souza ES, Miki N, Abdala F. Radiographic study on the anatomical characteristics of the proximal femur in Brazilian adults. *Rev Bras Ortop*. 2015 Feb 18;50(1):16-21.
11. Mourao AL, Vasconcellos H. Geometry of the proximal femur in Brazilian bones. *Acta Fisiatrica*. 2001;8(3):113-19.