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**Original Research Article**

# Correlation between clinical, radiological and arthroscopic findings in cases of osteoarthritis of knee joint

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## ABSTRACT

**Background:** Osteoarthritis (OA) is the most common degenerative joint disorder and a major public health problem throughout the world. The knees are the most commonly affected joints. In view of multiple conflicting reports in the literature the present study was undertaken to study the correlation amongst radiological, arthroscopic and pain findings in knee OA patients to facilitate early and precise diagnosis leading to appropriate and timely treatment.
**Methods:** Total 53 (39 female and 14 male) cases of primary OA were screened and selected for our study. Apley's pain score equated to Visual Analogue Score and Western Ontario and MacMaster Universities Osteoarthritis score (WOMAC) sub scales were used for assessment of pain, stiffness and physical function respectively. Radiographic evaluation were done according to Kellgren-Lawrence Grading scale (X-ray) and modification of Outerbridge classification system (MRI). Outerbridge classification system was used to assess arthroscopic findings.
**Results:** Clinical symptom of pain had statistically significant correlation with stiffness, physical disability, radiological severity and arthroscopic findings. Stiffness and physical disability scores individually doesn't have any statistically significant correlation with MRI and arthroscopic severity. Radiological findings were found to corroborate with the arthroscopic findings significantly.
**Conclusions:** Radiological and clinical findings in combination should be considered in concluding the final diagnosis and treatment of OA knee. Improvised criteria for precise diagnosis yet to be evolved.

**Keywords:** Kellgren-Lawrence grading scale, Osteoarthritis, WOMAC

## INTRODUCTION

The most prevalent degenerative joint disease worldwide, osteoarthritis (OA) is a significant cause of functional impairment and dependence in older persons.[1] It is estimated that 40% of people over 65 have OA of the knee with symptoms.[2,3] In order to reduce morbidity and disability and improve independent living, early detection and management are crucial. For OA patients who come with knee discomfort, radiography is the preferred initial course of assessment. According to community-based research, radiographic knee OA causes symptoms in 40–80% of patients, and more pain is linked to more severe cases.[4] Nonetheless, there is a significant amount of discrepancy between radiographic and clinical findings, and the early stages of OA are not accurately classified radiologically.[5-8] The multifaceted genesis of pain can be used to explain the discrepancy between radiography and pain.[6,8,9] By using arthroscopy to directly analyze the articular cartilage, a more thorough description of the lesions depth and extent, as well as minute alterations

including cartilage softening, fibrillation, and tangential flaking, can be made.[10]

Even though arthroscopy makes it easier to diagnose OA knee accurately and allows for simultaneous joint debridement,[10,11] not all patients can have it done on a regular basis. There was discrepancy in the research that compared arthroscopic, radiographic, and clinical grading. Given the contradictory reports in the literature, the current study was conducted to investigate the relationship between radiographic, arthroscopic, and clinical findings in patients with OA of the knee. This will help with early and accurate diagnosis, allowing for the prompt implementation of appropriate treatment modalities.

The objective of this study was to investigate the relationships between pain, disability, radiological and arthroscopic findings in patients with knee OA.

## METHODS

This prospective analytical study of cross-sectional design was carried out in the Department of Orthopedics at Calcutta National Medical College and Hospital from January 2021 to January 2022, in West Bengal, India. The study was conducted after receiving the necessary institutional ethical clearance.

### *Inclusion criteria*

All patients with symptomatic osteoarthritis of knee joint were included.

### *Exclusion criteria*

Patients who were unfit for surgery from anesthesia stand point and cases with secondary causes of OA, other arthropathies, metabolic bone disease, neoplasm were excluded from the study.

Informed written consent was taken from every participant. The study involved 53 patients; among which 39 were female and 14 were male. All patients were subjected to a. Standard radiological assessment of the joint (X-ray and MRI), b. Routine hematological investigation, for example, complete blood count, ESR, blood sugar, HIV and HbSAg, anti HCV IgM, c. Arthroscopy of knee joint and lavage, debridement as per patient's requirements, d. All patients were supplemented with standard nutritional supplements, including calcium and multivitamin daily.

### *Clinical parameter*

*Pain*

1. Apley's pain score equated to Visual Analogue Score was used for the assessment of pain associated with OA. 2. WOMAC sub scale (WOMAC A).

*Stiffness*

Stiffness was assessed using the stiffness sub scale of the WOMAC (WOMAC B).

*Physical function*

Physical function was assessed using the sub scale of the WOMAC (WOMAC C).

### *Radiological assessment*

*X-ray*

Weight-bearing anteroposterior and lateral semi flexed radiographs were recorded for both knees in each subject. They were radiologically graded according to the Kellgren-Lawrence index. The Kellgren-Lawrence Grading scale is a reliable and valid testing tool used in conjunction with radiograph. This method is widely used in the diagnosis as well as in epidemiologic studies on OA of the knee and was accepted by the World Health Organization.

The Kellgren-Lawrence scoring used ratings from 0 to 4, where; 0 = Normal radiograph, 1 = Doubtful pathology, 2= Minimal osteophytes, possible narrowing, cysts, and sclerosis, 3 = Moderate, as in definite osteophytes with moderate joint space narrowing, and 4 = Severe, with large osteophytes and definite joint space narrowing.

*MRI*

The modification of Outerbridge classification for cartilage defects found in MRI study of knee joint of osteoarthritic patients was used. 1) Grade 0- Homogeneous and smooth delineation, 2) Grade I- Focal areas of hyper intensity with normal contour, 3) Grade II- Blister like swelling/fraying of articular cartilage extending to the surface, 4) Grade III- Partial thickness cartilage loss with focal ulceration, 5) Grade IV- Exposed sub-chondral bone.

### *Arthroscopic assessment*

Under spinal anaesthesia and tourniquet control, diagnostic arthroscopy followed by lavage and debridement were carried out as per the requirements of the case. Outerbridge classification system was used to assess the articular damage. 1) Grade 0- Normal, 2) Grade I- Cartilage with softening and swelling, 3) Grade II- A partial-thickness defect with fissures on the surface that do not reach subchondral bone or exceed 1.5 cm in diameter, 4) Grade III-Fissuring to the level of subchondral bone in an area with a diameter more than 1.5 cm, 5) Grade IV- Exposed subchondral bone.

Next all the statistical analyses were performed using Graph pad prism and Excel for Windows. Descriptive statistics were used to describe demographic

characteristics. Spearman's rank Correlation Coefficients (Rho estimate/r) were calculated to determine the relationships between clinical, radiological and arthroscopic grades in patients with knee OA.

## RESULTS

In our present study, majority of the patient (39.6%) were aged between 51-60years and females (73.6%) were found to be more affected than male (Figure 1).

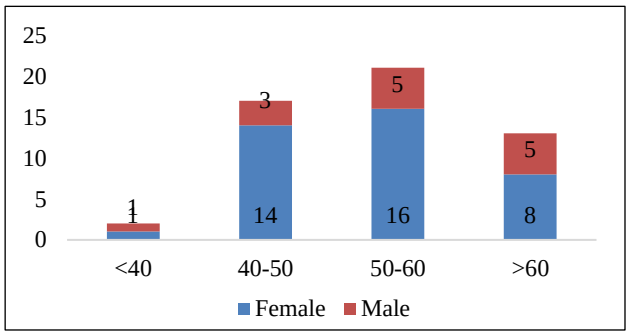


**Figure 1: Distribution of study population according to age and sex.**

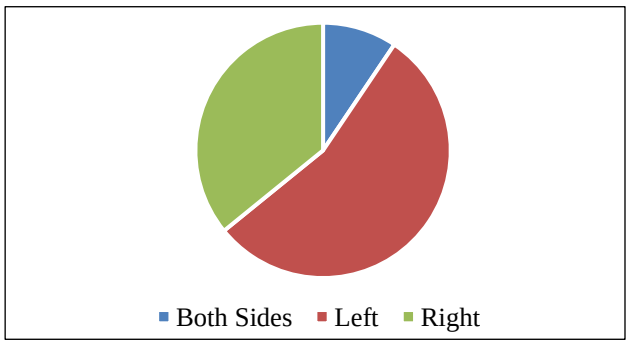


**Figure 2: Distribution of study population according to side affected.**

Among 53 OA patients; loose bodies were found only in 4 patients and 2 patients had old meniscal injuries. Others had nothing other significant findings (Figure 2).

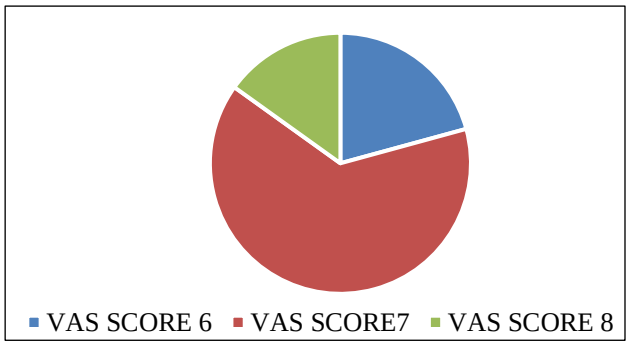


**Figure 3: Distribution of patients according to visual analogue score.**

In this study, VAS score recorded among the patients were mostly between 6-8 (Figure 3).

We found that 58.9% of the evaluated x-rays were grouped into grade 3 Kellgren-Lawrence grading scale.

**Table 1: Distribution of evaluated x-rays of patient according to K-L grading scale (n=58).**

| Kellgren-Lawrence grading scale | No. of evaluated X-rays |
|---|---|
| **Grade 0** | 0 |
| **Grade 1** | 0 |
| **Grade 2** | 18 |
| **Grade 3** | 33 |
| **Grade 4** | 07 |

**Table 2: Distribution of evaluated MRIs of patient according to modified outerbridge classification.**

| Modified outerbridge grading | No. of evaluated MRIs |
|---|---|
| **Grade 1** | 15 |
| **Grade 2** | 27 |
| **Grade 3** | 08 |
| **Grade 4** | 02 |

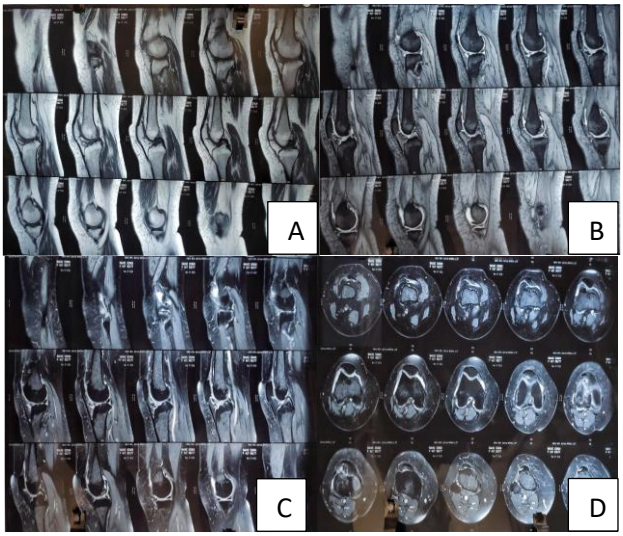


**Figure 4 (A-D): As per modified outerbridge classification based on MRI Grade IV osteoarthritis of knee joint in a patient.**

**Table 3: Distribution of patients according to outerbridge classification during arthroscopic evaluation.**

| Outerbridge grading (arthroscopic) | No. of patients |
|---|---|
| **Grade 1** | 14 |
| **Grade 2** | 27 |
| **Grade 3** | 09 |
| **Grade 4** | 02 |

**Table 4: Correlation between clinical, radiological and arthroscopic findings (n=53).**

| | Visual analogue score | WOMAC A | WOMAC B | WOMAC C | Kellgren-Lawrence score (X-ray) | Modified outerbridge grade (MRI) | Outerbridge grade (arthroscopy) |
|---|---|---|---|---|---|---|---|
| **Visual analogue score** | | | | | | | |
| Correlation coefficient (r) | 1 | 0.481 | 0.348 | 0.354 | 0.374 | 0.283 | 0.287 |
| Significance | | <0.001 | 0.011 | 0.009 | 0.006 | 0.040 | 0.037 |
| **WOMAC A** | | | | | | | |
| Correlation coefficient (r) | | 1 | 0.794 | 0.662 | 0.445 | 0.376 | 0.340 |
| Significance | | | <0.0001 | <0.0001 | <0.001 | 0.006 | 0.013 |
| **WOMAC B** | | | | | | | |
| Correlation coefficient (r) | | | 1 | 0.837 | 0.392 | 0.296 | 0.253 |
| Significance | | | | <0.0001 | 0.004 | 0.031 | 0.068 |
| **WOMAC C** | | | | | | | |
| Correlation coefficient (r) | | | | 1 | 0.294 | 0.176 | 0.174 |
| Significance | | | | | 0.033 | 0.207 | 0.212 |
| **Kellgren- Lawrence Score (Xray)** | | | | | | | |
| Correlation coefficient (r) | | | | | 1 | 0.846 | 0.821 |
| Significance | | | | | | <0.0001 | <0.0001 |
| **Modified Outerbridge Grade (MRI)** | | | | | | | |
| Correlation coefficient (r) | | | | | | 1 | 0.969 |
| Significance | | | | | | | <0.0001 |
| **Outerbridge grade (arthroscopy)** | | | | | | | |
| Correlation coefficient (r) Significance | | | | | | | 1 |

## DISCUSSION

In this present study it has been seen that 3.8% were in the ≤40 years age group, 32.1% were aged between 41-50 years, 39.6% were aged between 51-60 years and rest 24.5% were aged >60 years. 26.4% were male and 73.6% were female. Previous studies by Link et al, Kijowski et al, Naoshi et al, Ayhan et al, Duygu et al, Razak et al also showed similar type of age and sex distribution among the participants.[12-16,5]

It was noted that among 53 participants 54.7% were left side affected, 35.8% were right side affected and 9.4% were affected both side. Previous studies by Link et al, Kijowski et al, Razak et al, Maheshwar et al, Marina et al also showed same type of distribution regarding side affected.[12,13,17,18]

This study showed that 7.5% of the study populations had loose bodies and 3.8% had old meniscal injury as additional findings. Link et al stated that lesions, bone marrow edema pattern, and meniscal and ligamentous lesions were frequently demonstrated on MR images in patients with advanced osteoarthritis.[12] Kijowski et al stated that marginal osteophytes were the most sensitive radiographic feature for the detection of osteoarthritis of the tibiofemoral joint.[13]

In this present study we found that VAS pain score had positive correlation with WOMAC A, WOMAC B, WOMAC C, Kellgren-Lawrence score, modified

outerbridge grade, and outerbridge grade. All the Correlations are statistically significant ($p<0.05$).

WOMAC A had positive correlation with WOMAC B, WOMAC C, Kellgren-Lawrence score, modified outerbridge grade, and outerbridge grade. All the correlations are statistically significant. ($p<0.05$).

WOMAC B had statistically significant positive Correlation with WOMAC C ($P<0.05$) but statistically insignificant positive Correlation with Kellgren-Lawrence score, modified outerbridge grade, and outerbridge grade ($p>0.05$).

WOMAC C had statistically significant positive Correlation with Kellgren-Lawrence Score ($P<0.05$) but statistically insignificant positive correlation with modified outerbridge grade, and outerbridge grade ($p>0.05$).

Kellgren-Lawrence score had significant positive correlation with modified outerbridge grade, and outerbridge grade ($p<0.05$).

Modified outerbridge grade had significant positive correlation with outerbridge grade ($P<0.05$).

Previous study by Link et al stated that Clinical findings showed no significant correlations with KL score and extent of findings at MR imaging.[12] Kijowski et al stated that joint space narrowing, subchondral sclerosis, and subchondral cysts were less sensitive radiographic features of osteoarthritis and rarely occurred in the absence of associated osteophyte formation.[13] Razak et al stated that the K&L scale correlated poorly with arthroscopic findings of articular cartilage degeneration in an Asian population with knee OA.[5] Maheshwar et al stated that (K-L) radiographic grades 1,2,3 lag behind the arthroscopic grading and Apley's pain grading correlates well in 1,2,4 grades and lags behind in grade 3 with the arthroscopic findings.[17]

This study has some limitations. Study has been done only in a single center (tertiary care hospital). So, hospital bias cannot be ruled out. Sample size was small, as only 53 patients were studied.

## CONCLUSION

The main symptom experienced by patients with OA knee is pain. The most widely used investigative modality for diagnosis, grading, and management protocol planning is plain radiography. The gold standard method for measuring cartilage loss and OA changes is direct arthroscopic inspection of the interior aspect of the joint. However, because arthroscopy is an intrusive surgical technique, it is not recommended for routine diagnosis of OA knee.

Our study revealed that even though radiological severity corroborated accordingly with the arthroscopic joint examination severity; joint stiffness and functional disability due to OA doesn't match up accordingly with radiological and arthroscopic findings.

Therefore, a combination of clinical and radiological results should be taken into account when classifying a patient with osteoarthritis (OA) who arrives with pain,stiffness,functional discomfort and has inconsistent radiographic findings. This will help in making a diagnosis and developing a treatment plan. In the future, a large number of knee OA patients will be compared and the grade-wise arthroscopy findings will be extrapolated in order to develop better radiological criteria.

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