# Original Research

## Assessment of radiographic abnormalities of OA of the knee: An observational study

[1]Robin Goel, [2]Bhavesh Thakarsibhai Patel

[1]Assistant Professor, Department of Radio Diagnosis, Saraswathi Institute of Medical Sciences, Hapur, India;
[2]Department of Radio Diagnosis, Major S D Singh Medical College & Hospital, Farrukhabad, India

**ABSTRACT:**
**Background:** Osteoarthritis represents the most prevalent joint disorder among adults globally. Hence; the present study was conducted for assessing radiographic abnormalities of OA of the knee. **Materials & methods:** A total of 20 patients diagnosed with knee osteoarthritis (OA) were included in the study. A custom-designed questionnaire was utilized to gather comprehensive demographic and clinical information from all participants. Additionally, a thorough clinical examination was performed on each patient. Magnetic Resonance Imaging (MRI) was conducted for all individuals involved in the study. The grading of cartilage abnormalities was classified as follows: Grade 0 indicates normal cartilage; Grade I reflects alterations in internal signal intensity only; Grade IIA denotes cartilage defects measuring less than 50%; Grade IIB represents cartilage defects ranging from 50% to 99%; Grade IIIA indicates a complete cartilage defect (100%) without associated bone ulceration; and Grade IIIB signifies a complete cartilage defect (100%) accompanied by underlying bone ulceration. **Results:** A total of 20 patients were evaluated. Mean age of the patients was 55.7 years. 80 percent of the patients were males while the remaining were females. According to KL grading, 50 percent of the patients were normal while doubtful osteoarthritis, minimal osteoarthritis and moderate osteoarthritis was seen in 25 percent, 20 percent and 5 percent of the patients respectively. While assessing the cartilage abnormalities on MRI, grade I, grade II A, Grade II B, grade III A and Grade IIIB abnormalities were seen in 3, 2, 4, 4, 4 and 3 patients respectively. Significant results were obtained while correlating radiographic findings with MRI findings. **Conclusion:** MRI enables the identification of pathological alterations associated with pre-radiographic osteoarthritis (OA) at an earlier phase of the disease progression.
**Key words:** Osteoarthritis, MRI

**Corresponding author:** Bhavesh Thakarsibhai Patel, Department of Radio Diagnosis, Major S D Singh Medical College & Hospital, Farrukhabad, India

## INTRODUCTION
Osteoarthritis represents the most prevalent joint disorder among adults globally. Research conducted indicates that approximately one-third of the adult population exhibits radiological evidence of osteoarthritis. In contrast, an epidemiological investigation by Andrianakos et al. revealed that clinically significant osteoarthritis affecting the knee, hand, or hip is present in merely 8.9% of adults. Among these, knee osteoarthritis is the most frequently observed, affecting 6% of the adult demographic.[1, 2] The risk of developing osteoarthritis escalates with advancing age. Notably, studies indicate that in men aged 60 to 64, knee osteoarthritis is more prevalent in the right knee (23%) compared to the left knee (16.3%), whereas the distribution appears more uniform in women (right knee, 24.2%; left knee, 24.7%). The incidence of knee osteoarthritis peaks among individuals aged 70 to 74, reaching up to 40%. When diagnoses rely solely on clinical signs and symptoms, the prevalence among adults is significantly lower, estimated at 10%. Furthermore, there is a lack of correlation between radiological findings and symptomatic presentation; only about 15% of patients with radiologically confirmed knee osteoarthritis report experiencing knee pain. The annual incidence of this condition in individuals over 70 is approximated at 1%.[3, 4]Hence; the present study was conducted for assessing radiogrpahic abnormalities of OA of the knee.

## MATERIALS & METHODS
The present studywas conducted for assessing radiographic abnormalities of OA of the knee.A total of 20 patients diagnosed with knee osteoarthritis (OA) were included in the study. A custom-designed

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questionnaire was utilized to gather comprehensive demographic and clinical information from all participants. Additionally, a thorough clinical examination was performed on each patient. Magnetic Resonance Imaging (MRI) was conducted for all individuals involved in the study. The grading of cartilage abnormalities was classified as follows: Grade 0 indicates normal cartilage; Grade I reflects alterations in internal signal intensity only; Grade IIA denotes cartilage defects measuring less than 50%; Grade IIB represents cartilage defects ranging from 50% to 99%; Grade IIIA indicates a complete cartilage defect (100%) without associated bone ulceration; and Grade IIIB signifies a complete cartilage defect (100%) accompanied by underlying bone ulceration. All data were systematically recorded in a Microsoft Excel spreadsheet and subsequently analyzed using SPSS software. Univariate analysis was done for evaluation of level of significance.

## RESULTS

A total of 20 patients were evaluated. Mean age of the patients was 55.7 years. 80 percent of the patients were males while the remaining were females. According to KL grading, 50 percent of the patients were normal while doubtful osteoarthritis, minimal osteoarthritis and moderate osteoarthritis was seen in 25 percent, 20 percent and 5 percent of the patients respectively. While assessing the cartilage abnormalities on MRI, grade I, grade II A, Grade II B, grade III A and Grade IIIB abnormalities were seen in 3, 2, 4, 4, 4 and 3 patients respectively. Significant results were obtained while correlating radiographic findings with MRI findings.

**Table 1: Distribution of patients according to Kellgren-Lawrence score (on Radiography)**

| Kellgren-Lawrence score (on Radiography) | Parameter | Number | Percentage |
|---|---|---|---|
| Grade 0 | Normal | 10 | 50 |
| Grade 1 | Doubtful Osteoarthritis | 5 | 25 |
| Grade 2 | Minimal Osteoarthritis | 4 | 20 |
| Grade 3 | Moderate Osteoarthritis | 1 | 5 |
| Grade 4 | Severe Osteoarthritis | 0 | 0 |
| Total | | 20 | 100 |

**Table 2: Comparison of distribution of patients according to Kellgren-Lawrence score (On Radiography) and according to cartilage abnormality (On MRI)**

| Cartilage abnormality (On MRI) | Kellgren-Lawrence score (On Radiographic) | | | | Total | Fisher's Exact Test p-value |
| | Grade 0 | Grade 1 | Grade 2 | Grade 3 | | |
|---|---|---|---|---|---|---|
| Grade 0 | 2 | 1 | 0 | 0 | 3 | 0.000 (Significant) |
| Grade I | 2 | 0 | 0 | 0 | 2 | |
| Grade II A | 3 | 1 | 0 | 0 | 4 | |
| Grade II B | 2 | 1 | 1 | 0 | 4 | |
| Grade III A | 1 | 1 | 2 | 0 | 4 | |
| Grade III B | 0 | 1 | 1 | 1 | 3 | |
| Total | 10 | 5 | 4 | 1 | 20 | |

**Graph 1: Comparison of distribution of patients according to Kellgren-Lawrence score (On Radiography) and according to cartilage abnormality (On MRI)**
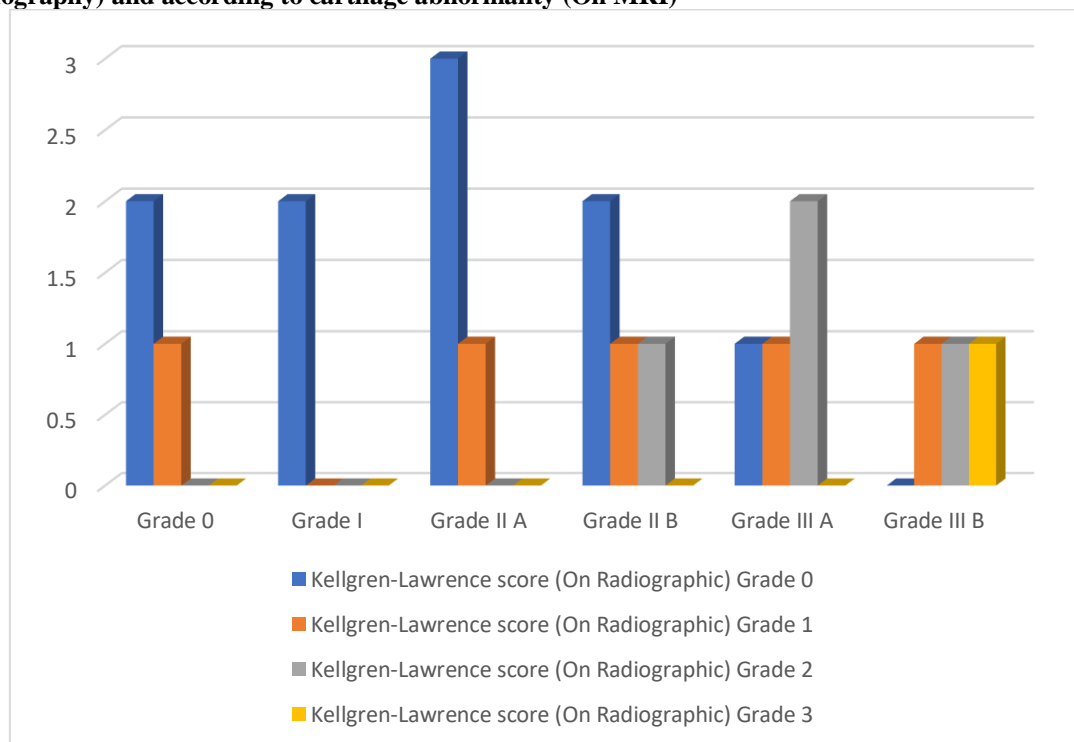


## DISCUSSION

Osteoarthritis (OA) represents one of the most widespread conditions leading to disability, particularly among the elderly. It is recognized as the most prevalent joint disorder in developed nations and serves as a significant contributor to chronic disability, primarily due to knee and hip OA. The financial implications of OA are substantial, encompassing treatment costs, the necessary adjustments individuals and families must make to accommodate the disease, and the economic impact of reduced work productivity. Individuals suffering from OA face an elevated mortality risk compared to the general population, with an odds ratio of 1.54.[5-7] Key risk factors include a history of diabetes, cancer, or cardiovascular disease, as well as the presence of walking disabilities. Increased mortality is noted across various diseases with specific causes of death, but it is especially significant in relation to cardiovascular issues. Knee OA is particularly noteworthy not only due to its high prevalence relative to other forms of OA but also because it manifests at younger ages, especially among obese women. The incidence of knee OA escalates with age and is further exacerbated by longer lifespans and higher average body weights within the population.[8-10] Hence; the present study was conducted for assessing radiographic abnormalities of OA of the knee.

A total of 20 patients were evaluated. Mean age of the patients was 55.7 years. 80 percent of the patients were males while the remaining were females. According to KL grading, 50 percent of the patients were normal while doubtful osteoarthritis, minimal osteoarthritis and moderate osteoarthritis was seen in 25 percent, 20 percent and 5 percent of the patients respectively. Menashe L et al determined the diagnostic utility of MRI in OA through a meta-analysis of published studies. A systematic literature search was undertaken to include studies that used MRI to evaluate or detect OA. MRI was compared to various reference standards: histology, arthroscopy, radiography, CT, clinical evaluation, and direct visual inspection. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and receiver operating characteristic (ROC) area under the curve (AUC) were calculated. Random-effects models were used to pool results. They concluded that MRI can detect OA with an overall high specificity and moderate sensitivity when compared with various reference standards, thus lending more utility to ruling out OA than ruling it in. The sensitivity of MRI is below the current clinical diagnostic standards. At this time standard clinical algorithm for OA diagnosis, aided by radiographs appears to be the most effective method for diagnosing OA.[10]

In the present study, while assessing the cartilage abnormalities on MRI, grade I, grade II A, Grade II B, grade III A and Grade IIIB abnormalities were seen in 3, 2, 4, 4, 4 and 3 patients respectively. Significant results were obtained while correlating radiographic findings with MRI findings. Baum Tcompared magnetic resonance imaging (MRI)-based knee cartilage T2 measurements and focal knee lesions and 36-month changes in these parameters among knees of normal controls and knees of normal weight,

overweight, and obese subjects with risk factors for knee osteoarthritis (OA). A total of 267 subjects ages 45-55 years from the Osteoarthritis Initiative database were analyzed in this study. Two hundred thirty-one subjects had risk factors for knee OA, but no radiographic OA (Kellgren/Lawrence score ≤1) at baseline. Thirty-six subjects were normal controls. Subjects with OA risk factors were stratified in 3 groups: normal weight (n = 78), overweight (n = 84), and obese (n = 69). All subjects underwent 3T MRI of the right knee at baseline and after 36 months. Focal knee lesions were assessed and cartilage T2 measurements (mean T2 and T2 texture analysis) were performed. The baseline prevalence and severity of meniscal and cartilage lesions were highest in obese subjects and lowest in normal controls. Obese subjects had the highest mean T2 values and the most heterogeneous cartilage (as assessed by T2 texture analysis), while normal controls had the lowest mean T2 values and the most homogeneous cartilage at baseline. Increased body mass index (BMI) was significantly associated with greater progression of cartilage lesions and constantly elevated cartilage T2 entropy over 36 months. They concluded that in preclinical OA, increased BMI is associated with more severe cartilage degeneration as assessed by both morphologic and quantitative MRI measurements.[11]Gudbergsen H assessed correlations between Kellgren& Lawrence (KL) gradings, minimum joint space width (mJSW) measurements and the Boston Leeds Osteoarthritis Knee Score (BLOKS) within a cohort of obese patients with knee osteoarthritis (KOA). 192 Participants were recruited from an outpatient clinic inclusion criteria were age ≥50 years, body mass index (BMI) ≥30 kg/m2 plus symptomatic and verified KOA. 1.5 T magnetic resonance imaging (MRI) scans were assessed using BLOKS and bi-plane radiography by mJSW and KL. Statistics used were Spearman rank correlation coefficients. They concluded that Extensive pathological damage is present even in mild radiographic KOA and BLOKS gradings and KL scores increase together. Analyses of compartment specific KL scores revealed differences in their relationship to the assessed MRI variables. Their study displayed the segregation of MRI gradings with respect to location and level of radiographic scores, reveals a high inter-dependency of MRI-assessed structures, and describes some redundancy of specific BLOKS variables.[12]

## CONCLUSION
Magnetic Resonance Imaging (MRI) enables the identification of pathological alterations associated with pre-radiographic osteoarthritis (OA) at an earlier phase of the disease progression.

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