

## Early Osteoarthritis of Knee an Integrated Approach to Clinical Assessment and Management

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### **Abstract**

**Background:** Early diagnosis of OA knee joint with detailed clinical history with the help of a simple questionnaire, X-ray evaluation, and baseline biochemical tests can help to initiate early intervention in the form of analgesics and physiotherapy with follow-up can significantly reduce the progression and morbidity due to arthritis. With the help of imaging studies, early structural changes in the disease may also be captured.. This can help in the initiation of therapy at an earlier stage and good outcome of the disease Detection of those subjects with comorbidities and with early knee, OA may offer an opportunity to successfully intervene in the disease and reduce the burden on patients and the community. Knowledge of the modifiable risk factors associated with knee OA in younger populations indirectly helps earlier identification of individuals at high risk of developing OA and also offers an opportunity to treat them successfully.

**Aim:** To evaluate the effectiveness of an integrated approach to clinical assessment and management in the whole sample population. To evaluate the effectiveness of an integrated approach to clinical assessment and management in subsets of the sample population.

**Material and Method:** According to the sample size calculation, a total of 50 patients were selected after screening and exclusion. Baseline characteristics and clinical scores of 50 patients were recorded. The patients were followed up after 3 months and 6 months for clinical scores. Informed written consent in a language understood by the patient was taken. Personal data, clinical findings, radiological findings, biochemical reports, and related medical records of all patients were obtained. A pre-tested semi-structured questionnaire was administered to all patients. The second part was comprised of the possible risk factors for developing OA of the knee such as age, gender, body mass index, occupation, family history of OA, physical activity, history of injury to the knee, etc. X-ray, weight, and height measurements along with all necessary investigations according to the standard protocol were done.

**Results:** An almost equal number of elderly (above the age of 60) and non-elderly were involved in the study. Hence it could be concluded that early changes in knee OA may not necessarily be age dependent. After analyzing a total of 50 patients in the study, it was observed that there was almost an equal distribution of males and females in the study. On the evaluation of BMI of the individual patients, it was noticed that the majority of the patients belonged to either the overweight or obese class. The majority of the patients were found to be vitamin D deficient and patients were anemic. Those patients were given supplementation accordingly.

**Conclusion:** All patients of early knee OA are presently getting benefitted from an integrated approach where clinical examination, imaging techniques, and laboratory investigations are used systematically and routinely for clinical assessment while simultaneously exercise,

lifestyle modifications, and medication is used for the management of knee OA. Each risk factor associated with knee OA is studied individually as a subset and thus can be of great future research potential.

**Keywords:** American College of Rheumatology, Boston Leeds Osteoarthritis Knee Score, Confidence Interval, Early Osteoarthritis.

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## Introduction

Osteoarthritis (OA) is a long-standing disease with progressive loss of articular cartilage due to a variety of genetic and environmental risk factors and pathophysiological processes. There is the simultaneous new bone generation and synovial growth that may cause trauma and discomfort in joint mobility leading to disability. The typical characteristics of osteoarthritis (OA) are disruption of articular cartilage, osteophyte generation, subchondral sclerosis, meniscal disintegration, bone marrow lesions, and synovial proliferation. [1]

Osteoarthritis (OA) is the most affected joint disease and causes joint discomfort, and reduced mobility with huge health-care expenditure in the aging population. [2] Joint pain is the most common symptom, seen in about half of the elderly people where the knee, hip, spine, and hand joints are involved in the disease process. [3,4] Knee Osteoarthritis (knee OA) presents continuous deterioration of the articular cartilage along with pathological changes in the underlying subchondral bone tissue. Although at present there is no final remedy for knee OA, posing a need for feasible and affordable early knee OA intervention methods that arrest this articular damage and control the knee OA progression.

The new definition of OA by the International society focuses on the involvement of mobile joints affected by cell stress and extracellular matrix dissociation started by micro and macro trauma that stimulates maladaptive repair responses with pro-inflammatory pathways

of immune function. There are structural joint modifications found in hip and knee OA affecting joint activities leading to disability. [5]

Knee Osteoarthritis is a dynamic mechanobiological derangement of articular cartilage. According to Deborah Symmons et al, the prevalence of arthritis in the world is estimated at around 10%. [6] The prevalence of knee OA ranges from 22% to 39% in India, which is expected to double by the year 2030. [7] Knee OA is predominantly found in rural areas with low economic status strata than in urban areas with high economic strata. [8] The proportion of patients with knee OA is on the rise day by day due to the increased life span of the person and marked rise in the obese or overweight population. [9] During the early period, few subjects over 55 years of age may suffer from recurrent knee trauma attacks, in which about one in six would approach the clinician immediately. A few of the subjects above 55 years of age have complaints related to knee OA, out of which few become disabled. Thus Osteoarthritis is considered as a chronic disease with a long "silent" period. [10]

Knee OA features damage to the cartilage with synovial disruption and its detection is based on clinical and radiographic changes although very late, showing poor sensitivity for monitoring disease progression. It is likely that morphological changes in articular structures caused by the OA process have their origins in the apparently healthy asymptomatic knee joint. [11] There were no strategies put

forward to identify early knee OA with the aim of stopping this derangement in its early stage. [12]

At present, most knee OA patients are diagnosed in the late stage, where it is impossible to control the progression or reverse the status. This study was framed to benefit patients with early OA knee with an integrated approach of clinical assessment with clinical history and classification, risk factor identification, and clinical management with exercise, lifestyle modification, and therapy for early identification and effective intervention. “No integrated approach of clinical assessment and management of knee OA are devised or put forward to identify early OA knee with the aim of arresting the derangement in its early stage and at present, there are no clear guidelines or algorithm available for clinicians to assess and manage early OA of the knee”.

## **Material and Methods**

**Source of Sample:** Data were collected from the patients attending the Out Patient Department at Hospital.

**Research design:** Prospective cohort study

## **Variables:**

**Independent variables:** Age, sex, rural/urban address, education, occupation, height, weight, BMI, past and family history, laboratory investigations, pain and other scores, radiographic diagnosis  
**Dependent variable:** Presence of early OA knee

**Settings:** The study was conducted at the outpatient department of Orthopedics in General Hospitals, from January 2020 to December 2022.

**Population:** The population for the study was patients with knee osteoarthritis attending the Out Patients Department at Medical college Maharashtra.

## **Criteria for sample collection**

### **Inclusion Criteria:**

- ✓ More than 18 years of age of both genders
- ✓ Early OA knee – KL Grade 0, 1 or Cartilage degenerative changes on MRI
- ✓ Qualitative C - reactive protein – Negative.
- ✓ Erythrocyte Sedimentation Rate- < 6 mg/dl
- ✓ Total Leucocyte count < 10000/Cu.mm.

### **Exclusion Criteria:**

- Joint pain due to rheumatologic or systemic diseases
- Patients who have undergone knee surgeries
- Malalignment of weight-bearing axis
- Internal knee derangement causing knee pain

## **Tool for data collection**

A structured questionnaire as well as a detailed data collection form was prepared. A clinical record form is used to note down clinical symptoms.

## **Plan for data analysis**

The data was calculated by using descriptive and inferential statistics which include proportion, frequency, mean, mean percentage, paired “t” test, and “chi-square” test.

## **Source data:**

Cases were selected from the patients presenting to the orthopedic outpatient department of Medical College and Hospital Maharashtra. Data collected were demographics, biochemical data, risk factors, and clinical scores.

## **Operational definitions:**

**1) Integrated approach:** It refers to the combined systematic application of assessment and management among early knee osteoarthritis patients attending outpatient departments at Hospitals, in Maharashtra.

2) Early Knee Osteoarthritis: It is the most common type of knee osteoarthritis, especially among older people. It is also called as a degenerative joint disease since it involves the destruction of cartilage in the joint.

#### **Assessment plan:**

Informed written consent in the language understood by the patient was taken. Personal data, clinical findings, radiological findings, biochemical reports, and related medical records of all patients were obtained. A pre-tested semi-structured questionnaire was administered to all patients. The questionnaire was divided broadly into two parts. The first part included socio-demographic details such as age, gender, and socioeconomic status were noted. The second part was comprised of the possible risk factors for developing OA of the knee such as age, gender, body mass index, occupation, family history of OA, physical activity, history of injury to the knee, etc. X-ray, weight, and height measurements along with all necessary investigations according to the standard protocol were done.

#### **Research outline –**

According to the sample size calculation, a total of 50 patients were selected after screening and exclusion. Baseline biochemical parameters of these patients were recorded, simultaneously, patients

were started on medication and physiotherapy and lifestyle modifications as per ACR guidelines [13] and patients were followed up after 3 and 6 months for clinical scores like VAS (Visual Analogue Scale) [14] and LEFS (lower extremity functional score) [15]

**Statistical analysis** was done by using MS excel and Med Calc software. Sources of data were demographic characteristics, biochemical data, risk factors, and clinical scores. Descriptive statistics were reported as means and standard deviation or proportions (%). An unpaired t-test was used to test the null hypothesis. The procedure calculated the variation in the observed means

#### **Result**

An almost equal number of elderly (above the age of 60) and non-elderly were involved in the study. Hence it could be concluded that early changes of knee OA may not necessarily be age dependent. After analyzing a total of 50 patients in the study, it was observed that there was almost an equal distribution of males and females in the study. On the evaluation of BMI of the individual patients, it was noticed that the majority of the patients belonged to either the overweight or obese class. An overwhelmingly low proportion of patients were found to be underweight

**Table 1: Baseline analysis of laboratory parameters in Knee osteoarthritis patients.**

| Parameters     | Normal Ranges  | Below Normal Range Number (%) | Within Normal Range Number (%) | Above Normal Range Number (%) |
|----------------|--|-------------------------------|--------------------------------|-------------------------------|
| HB (gm %)      | 12-15.5gm/dl for females and 13.5-17.5 gm/dl for males | 27 (67.14)                    | 23 (32.86)                     | 0                             |
| Sr. Calcium    | (9-11 mg/dl)   | 25 (42.86)                    | 15(31.43)                      | 10(25.71)                     |
| Sr. Phosphorus | (2-4.5 mg/dl)  | 20(34.29)                     | 30(65.71)                      | 0                             |
| Vit. B12       | (191- 663 pg/mL)                                       | 15(27.14)                     | 34(71.43)                      | 1(1.43)                       |
| Uric acid      | (3 to 7 mg/dl )  | 12(25.71)                     | 18(32.86)                      | 20(41.43)                     |
| Vit. D3        | (5.2-60.4 ng/mL)                                       | 47(95.71)                     | 3(4.29)                        | 0                             |
| PTH            | (12-50 ng/L)   | 12(31.43)                     | 38(68.57)                      | 0                             |

The majority of the patients were found to be vitamin D deficient and patients were anemic. Those patients were given supplementation accordingly.

**Table 2: Comparisons of means of scores between 3 months with baseline and 6 months with baseline using paired t-test**

| Particulars    | Baseline Value (Mean) | SD   | Value after 3 Months of Follow Up(Mean) | SD   | % Change from Baseline in 3 Months | Value after 6 Months of Follow Up (Mean) | SD   | % Change from Baseline in 6 Months |
|----------------|-----------------------|------|---|------|------------------------------------|--|------|------------------------------------|
| Mean ACR Score | 1.4                   | 0.44 | 1.14                                    | 0.43 | 25.9                               | 0.82                                     | 0.62 | 37.68                              |
| LEFS Score     | 27.23                 | 7.11 | 41.18                                   | 5.12 | -12.50                             | 46.3                                     | 6.01 | -24.60                             |
| VAS Score      | 2.10                  | 0.37 | 1                                       | 0.41 | 33.22                              | 1.18                                     | 0.45 | 50.44                              |

Comparisons in clinical scores among all knee OA patients under study from baseline to 3 months and baseline to 6 months were statistically highly significant indicating the effectiveness of the above-integrated approach in patient management irrespective of risk factors the patients have.

## Discussion

According to the WHO Global Burden of Disease study, osteoarthritis (OA) affects more than 235 million people worldwide attributed to years lived with disability. The increased life span of the world's population is adding to the number of people living with multiple consequences leading to diseases or injuries. [16] Although the major risk factors related to OA knee are modifiable as well as nonmodifiable factors, clinicians can use the identified risk factors to identify and manage patients at risk of developing or increasing knee pain. Obesity in particular needs to be a major target for the prevention of the development of knee OA. Recent studies suggest that physical activity may also play a pivotal role in the development of knee OA . [17,18,19]

Knee OA is not a disease of the whole joint alone. Clinically, the condition is presented as joint pain, tenderness, limited

mobility, crepitus, occasional effusion, and local inflammation. There are multiple pathophysiological mechanisms that are involved in causing pain and functional disabilities which affect millions of patients. [20] OA management is costly which includes pharmacological treatment including various drugs, the non-pharmacological part involving exercise, lifestyle modification and lastly rehabilitation for those individuals who must adjust their lives to the disease due to reduced work efficiency. [21]

It is an assumption that the incidence of OA knee is seen with increasing age faster, owing to a higher prevalence in late-stage of OA knee. On analyzing other studies, it was noted that an almost equal number of elderly (above the age of 60 years) and non-elderly (18- 60 years) were involved in the study. Hence it could be concluded that early changes in knee OA may not necessarily be age dependent. In comparison with the previous studies, a higher prevalence of OA with increasing age has been noted. [22]

A study on prescribing drug patterns in the management of arthritis in the department of Orthopedics revealed that about 60% of osteoarthritis patients in the study are in the age group between 51-65 years and

mostly in late knee OA condition. [23] In major studies external determinants such as occupational and internal determinants as personal were common risk factors. Two factors such as bending and stretching are considered the contributing risk factors in association with joint disease. [24]

David T. Felson (2000) observed that increased OA prevalence and its effects on physical functions accompany the disease in the knee and hip, osteoarthritis is present in conditions like trouble with climbing stairs and walking than any other disease. [25]

Implying that irrespective of the presence or absence of risk factors, if diagnosed at an early stage, OA knee will exhibit similar improvement with physiotherapy through all demographics. This further supports the reasoning behind diagnosing OA knee at an earlier stage, as the presence or absence of risk factors at this stage does not significantly alter the overall outcome of therapy. The role of early physiotherapy intervention in knee osteoarthritis which was mentioned in one study was also emphasized multiple times earlier. [26]

OA is considered a whole-organ disease that is amenable to prevention and treatment at early stages. OA develops slowly over 10-15 years, interfering with activities of daily living and the ability to work. Joint injury, obesity, and impaired muscle function are modifiable risk factors amenable to primary and secondary prevention strategies. The strategies that are most appropriate for each patient should be identified, by selecting interventions to correct-or at least attenuate--OA risk factors. [17]

Hypertension also seems to be associated with quite a few patients, but this as well can be designated to the fact that increasing age is a risk factor for both entities. [27]

OA as a whole joint disease still begs for early disease remedial measures due to

increasing obesity and aging in the population and the huge rise in morbidity and costs related to OA. However, there is no ideal drug therapy available today that targets the progression of the knee OA process due to the lack of understanding of what drives the disease process and the variability of clinical signs and symptoms of the patients but an integrated approach based on clinical assessment and management may give hope for better future. [28,29]

## Conclusion

All patients of early knee OA are presently getting benefitted from an integrated approach where clinical examination, imaging techniques, and laboratory investigations are used systematically and routinely for clinical assessment while simultaneously exercise, lifestyle modifications, and medication is used for the management of knee OA. Each risk factor associated with knee OA is studied individually as a subset and thus can be of great future research potential. Early detection and intervention due to an integrated clinical assessment and management can cause a significant improvement in the progression of the disease, irrespective of the presence or absence of co-morbidities, family history, and multiple risk factors.

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