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

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**ABSTRACT**

**Background:** : Osteoarthritis (OA) is a disease with progressive loss of articular cartilage, which is due to a variety of genetic and environmental risk factors and pathophysiological processes. The main cause of trauma and discomfort in joint mobility leading to disability in osteoarthritis is simultaneous new bone generation and synovial growth. Disruption of articular cartilage, osteophyte generation, subchondral sclerosis, meniscal disintegration, bone marrow lesions, and synovial proliferation are the typical characteristics of osteoarthritis (OA) (1)

The progression and morbidity due to arthritis can be reduced significantly with the help of 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. Early structural changes in the disease may also be captured with the help of imaging studies and this can help in the initiation of therapy at an earlier stage and good outcome of the disease Detection of those subjects with co-morbidities and with early knee, OA may offer an opportunity to successfully intervene in the disease and reduce the burden on patients and the community. Aim: To evaluate the effectiveness of an integrated approach to clinical assessment and management in the whole sample population.

**Methods**: According to the sample size calculation, a total of 70 patients were selected after screening and exclusion. Baseline characteristics and clinical scores of 70 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 70 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**

## INTRODUCTION

One of the most challenging arthritic disorder is Osteoarthritis (OA) , having a high burden of disease with  no available disease-modifying treatments. Efforts to define patient populations with symptomatic early-stage knee OA on the basis of validated classification criteria are ongoing. Such criteria, as well as the identification of molecular and imaging biomarkers of disease risk and/or progression, would enable well-designed clinical studies, facilitate interventional trials, and aid the discovery and validation of cellular and molecular targets for novel therapies. Treatment strategies, relevant outcomes and ethical issues also need to be considered in the context of the cost-effective management of symptomatic early-stage knee OA. The common presentation of Osteoarthritis (OA) of knee is pain, disability and deformity of the knee joint(2) . It is a dynamic mechanobiological derangement of articular cartilage of knee.It is characterized by loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis and range of biochemical and morphological alterations of the synovial membrane and joint capsuleand is caused due to chronic degeneration of the articulating surfaces of the joint(3) .Late stage changes of OA include softening, ulceration of the articular cartilage, synovial inflammation also may occur.Patients usually present with symptoms of pain, particularly after prolonged activity and weight bearing; whereas stiffness is experienced after inactivity (4). Most patient with Osteoarthritis have no known cause. This is known as Primary osteoarthritis. Primary osteoarthritis is mostly related to aging. It can be localized, generalized or as erosive osteoarthritis. Secondary osteoarthritis is caused by another disease or condition. OA Knee has multiple Risk factors (5), which include age (>50 in Males and >45 in females), sex (Female > Male), BMI (>25%), History of joint injury, frequent stair climbing (15 or more flights per day), frequent lifting of heavy weights (10 kg or more), occupations involving kneeling or squatting for more than 2 hour per day, occupations with climbing for more than 1 hour per day, continuous standing for more than 2 hours per day or walking more than 3 hours per day. OA Knee usually presents in patient in the 61-70 age group, more commonly in females than in males in any Orthopedic Out patient department. Most of these patients present with advanced level disease, with complains of pain over a chronic period of time, with some patient presenting with visible deformities in the joint.

## MATERIALS AND METHODS

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

**Research Design:** Prospective cohort study

**Settings:** The study was conducted at the outpatient department of Orthopedics in Geetanjali Medical college and Hospital, Udaipur(Rajasthan),from January 2022 to August 2022.

**Population:** The population for the study was patients with knee osteoarthritis attending the Out Patients Department at GMCH, Udaipur.

**Sample Size:** Total 70 patients attended the outpatient department and completed the follow up.

N = 4pq / L2 = 4x 22x78/ 100 = 65.89 = 66

Where p = prevalence of knee osteoarthritis = 22 % (6) p = 22%, q = 78, L= allowable error 10%

So minimum sample to be taken was 70.

**Sampling Techniques:** Convenient sampling technique

**Criteria for sample collection**

**Inclusion Criteria**

1. Early OA knee – Kellgren and Lawrence (K and L) Grade 0 and 1.

2. Qualitative C- reactive Protein – Negative.

3. Erythrocyte Sedimentation Rate- < 6 mg/dl

4. Total Leucocyte count < 10000/ Cu.mm.

Exclusion Criteria

1. Advanced OA knee with Kellgren And Lawrence (K and L)> Grade 2

2. Joints pain due to Rheumatological or Systemic diseases

3. Malalignment of Weight Bearing Axis

4. 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.

**Procedure Methodology**

Informed written consent was taken in patient's language. 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. Questionnaire was divided broadly in to two parts. Socio-demographic details were included in first part, while the second part consisted of the possible risk factors for developing OA of the knee such as age, gender, occupation, family history of OA, physical activity, history of injury to the knee etc. X-ray, weight and height measurement along with all necessary investigations according to standard protocol were done. On basic evaluation, patients having symptoms suggestive of OA Knee were sent for X-rays. On X-ray, Grade 2 patients were excluded from the study and Grade 0 and Grade 1 patients were included. Baseline biochemical parameters of these patients were recorded, and patients were followed up after 3 and 6 months. Simultaneously, patients were started on medication and physiotherapy.

**Statistical Analysis**

Medcalc software was used for Statistical analysis. To test the null hypothesis an unpaired t test was used. The procedure calculates the difference between the observed means in two independent samples. A significance value (P-value) and 95% Confidence Interval (CI) of the difference is reported. The P-value is the probability of obtaining the observed difference between the samples if the null hypothesis were true. The null hypothesis is the hypothesis that the difference is 0. P value < 0.05 is considered significant.

**RESULT**

Among Both the genders prevalence OA knee was found to be almost equal. An almost equal number of elderly (above the age of 60) and non-elderly were involved in the study. Hence early changes of knee OA may not necessarily be age dependent. Majority of the patients were belonging to lower and middle classes and overweight or obese.

**Table 1: Socio-demographic profile of the study subjects (N=70)**

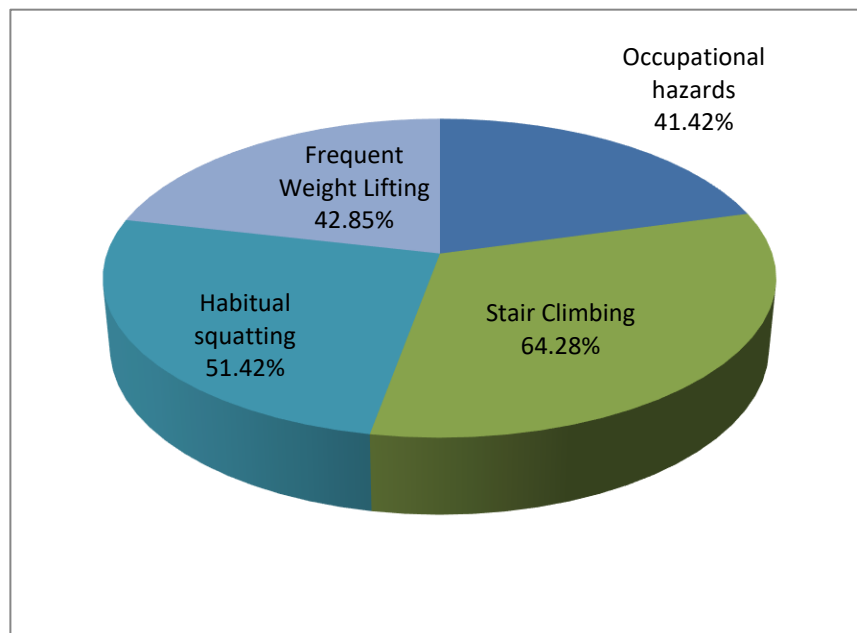| Age Group | Number | % | Gender | | |
|---|---|---|---|---|---|
| ≤40 | 5 | 7.15 | **Males** | 33 | 47.14 |
| **41-45** | 8 | 11.43 | **Female** | 37 | 52.86 |
| **46-50** | 11 | 15.72 | **Socioeconomic-Status** | | |
| **51-55** | 6 | 8.58 | **Lower Class** | 30 | 42.86 |
| **56-60** | 8 | 11.42 | **Middle Class** | 28 | 40.00 |
| **61-65** | 14 | 20.00 | **Upper Class** | 12 | 17.14 |
| **66-70** | 7 | 10.00 | | **Mean Age(Years)** | **Standard Deviation** |
| **71-75** | 8 | 11.42 | **Overall Study Population** | 56.67 | ± 12.84 |
| **76-80** | 3 | 4.28 | **Males** | 60.85 | ± 12.84 |
| | | | **Females** | 52.71 | ± 12.74 |



**Diagram 1: Relation of Posture And Habits With Osteoarthritis* (*multiple response)**

**Table 2: Risk Factors Associated with Osteoarthritis**

| Particulars | Number | % |
|---|---|---|
| **Diabetes Mellitus** | 13 | 18.57 |
| **Hypertension** | 6 | 8.57 |

| | | |
|---|---|---|
| **Previously operated** | 3 | 4.28 |
| **History of injury to knee** | 5 | 7.15 |
| **Family history of Osteoarthritis** | 18 | 25.71 |

Family history of OA Knee was frequently associated with the observed patients. Diabetes Mellitus was found to be most common (18.57%) co-morbidity associated with Osteoarthritis followed by Hypertension , history of injury to knee and previously operated respectively

**Table 3: 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 | 48 (68.57) | 22 (31.43) | 0 |
| Sr. Calcium | (9-11 mg/dl) | 47 (67.15) | 15(21.42) | 08(11.43) |
| Sr. Phosphorus | (2-4.5 mg/dl) | 30(42.29) | 40(57.14) | 0 |
| Vit. B12 | (191- 663 pg/mL) | 25(35.72) | 43(61.43) | 2(2.85) |
| Uric acid | (3 to 7 mg/dl ) | 22(31.43) | 28(40.00) | 20(28.57) |
| Vit. D3 | (5.2–60.4 ng/mL) | 67(95.71) | 3(4.29) | 0 |
| PTH | (12–50 ng/L) | 22(31.43) | 48(68.57) | 0 |

Majority of the patients were found to be vitamin D deficient and anemic, and were given supplementation accordingly.

**Table 4: 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 Months | P value | Value after 6 (Mean) | SD | % Change from Baseline in 6 Months | P value |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean ACR Score | 1.8 | 0.52 | 1.24 | 0.53 | 31.11 | < .00001 | 0.94 | 0.72 | 47.78 | < .00001 |
| LEFS Score | 39.29 | 9.14 | 48.21 | 9.20 | -22.70 | < .00001 | 54.5 | 9.02 | -38.71 | < .00001 |
| VAS Score | 3.14 | 0.49 | 2 | 0.52 | 36.31 | < .00001 | 1.27 | 0.52 | 59.55 | < .00001 |
| K and L Score | 2.64 | 1.33 | 2.6 | 1.19 | 1.52 | 0.3208 | 1.78 | 0.77 | 32.58 | < .00001 |

**Table 5: Baseline Analysis of Treatments Being Taken**

| TREATMENT | NUMBER | % |
|---|---|---|
| ANALGESICS | 57 | 81.43 |
| PHYSIOTHERAPY | 56 | 80 |

**DISCUSSION**

70 patients having findings suggestive of early OA knee on X Ray were interviewed with the aim of developing an effective tool for early diagnosis and intervention of Osteoarthritis of Knee Joint. Their baseline biochemical parameters taken and then were routinely followed up on OPD basis for analgesics and physiotherapy.

It was observed that, an almost equal number of elderly (above the age of 60) and non-elderly were involved in the study. In a study done in Jammu and Kashmir, one third of the population above the age of 65 was found to have Osteoarthritis (7). An increase in incidence of OA Knee is seen with increasing age (8).

Among Both the genders prevalence OA knee was found to be almost equal in our study, since our study only included only patients with early OA Knee changes, it can be postulated that incidence of early OA knee might be the same in both the sexes. However owing to higher susceptibility in females, the progression of the disease in females is faster, owing to a higher prevalence of late stage OA Knee overall. Most studies however have shown that Females are more predisposing to the disease than males(9,10,11,12). Owing to the fact, that females have a higher and earlier onset of Osteoporosis (13) and in general are more susceptible to low serum calcium and vitamin D levels than males (14).

In middle and lower socioeconomic groups incidence was higher than the upper groups, due to the fact that people in these groups usually engage in activities that require labor and exert more mechanical stress to the knee joint(15).

Further stressing on the involvement of mechanical stress on the knee joint is the fact that the study showed higher incidence of OA Knee in patients engaging in frequent stair climbing and those who engage in habitual squatting. Altered knee biomechanics as a result of previous trauma to the knee or any previous operative procedure on the knee also seems to play a role, since both were seen to be associated with a risk of developing OA Knee in our study.

An evaluation of the associated co morbidities, can lead us to the conclusion that there is a strong link between Diabetes Mellitus and OA Knee. This can be accounted to the fact that both in general are associated with an increase in BMI (16). There lacks a definitive evidence that one can lead to the other and vice versa. 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 (17,18). There lacks definitive evidence to show a one to one correlation between the two. The evident improvement in values of the VAS, ACR, LEFS (19,20,21,22) and other scores in the study population can help us conclude that there is definite role of early diagnosis and intervention in these patients. Role of early physiotherapy has been reinstated in this study as has been multiple times earlier (23, 24,25,26).

Thus, it is essential to have an integrated approach in the management of OA Knee by means of clinical evaluation, radiological evaluation and biochemical studies, such that there is an early diagnosis and early intervention, which can significantly reduce the morbidities caused due to Osteoarthritis of Knee.


**CONCLUSION**

Early diagnosis of Osteoarthritis of knee joint with simple questionnaire and X Ray evaluation can help initiate early intervention in the form of analgesics and physiotherapy, which can significantly reduce the progression and the morbidity of Osteoarthritis.

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