ORIGINAL RESEARCH

Association Between Knee Inflammation and Knee Pain in Patients with Knee Osteoarthritis: An Institutional Based Study

Shakti Condil Sharma[1], Vijay Sharma[2]

[1]Associate Professor, Department of Orthopaedics, Rama Medical College Hospital and Research Centre, Hapur, Uttar Pradesh, India
[2]Associate Professor, Department of Orthopaedics, Saraswathi Institute of Medical Sciences, Hapur Road, Anwarpur, Uttar Pradesh, India

Correspondence:
Vijay Sharma
Associate Professor, Department of Orthopaedics, Saraswathi Institute of Medical Sciences, Hapur Road, Anwarpur, Uttar Pradesh, India
Email: drvijaysharma1412@gmail.com

ABSTRACT
Objective: The aim of the present study is to determine the association between knee inflammation and knee pain in patients with knee osteoarthritis.
Methods: A total of 250 patients with knee OA were included in this study. The diagnosis was based on the American College of Rheumatology (ACR) criteria for knee OA. The severity of knee pain, stiffness, and disability were measured using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).
Results: The mean age of the patients was 50.11 ± 6.34 years. Kellgren-Lawrence grading scale and age or disease duration were positively and significantly associated, whereas none of the WOMAC sub-scores were found to be related with Kellgren-Lawrence grading scale ($P > 0.05$). On the other hand, WOMAC disability scores were significantly associated with WOMAC pain and WOMAC stiffness ($P < 0.01$).
Conclusion: Knee pain, stiffness, and duration of disease may affect the level of disability in the patients with knee OA. Therefore, treatment of knee OA could be planned according to the clinical features and functional status.
Keywords: Knee Pain, Osteoarthritis, Kellgren–Lawrence Grading, Western Ontario and Mcmaster Universities Arthritis Scores.

INTRODUCTION

Knee osteoarthritis (OA) is one of the most common degenerative joint diseases with a prevalence of 28.7% in India.[1] Pain is the major clinical symptom in osteoarthritis of the knee and a key determinant for seeking medical care. Pain related to osteoarthritis of the knee not only contributes to functional limitations and reduced quality of life but is also the leading cause of impairment of mobility in the elderly population.

Osteoarthritis (OA) is the most common degenerative joint disorder and a major public health problem throughout the world. It affects any joint containing hyaline cartilage[2] and the knees are the most commonly affected joints.[3]

Prevalence of OA increases with age and aging is associated with decreasing physiological functions, thus leading to major health problems. As a larger proportion of the elderly population in developed countries increasingly lives to an extreme old age, OA will be more prevalent and will be an important cause of disability in the future.[4]

Knee OA leads to typical degradation of articular cartilage and soft‑ tissue structures encircling the knee joint. Even though it can be diagnosed clinically, imaging techniques aid

specifically in the identification of structures involved, adequacy of treatment planning, and preventing the factors responsible for progression.[5,6]

Various treatment strategies are recommended, which are aimed to reduce symptoms and prevent further functional deterioration.[7,8] While planning rehabilitation or making arthroplasty decision many physicians take into consideration the radiographic features.

The aim of the present study is to determine the association between knee inflammation and knee pain in patients with knee osteoarthritis.

MATERIALS AND METHODS

The present study included 250 participants which were eligible out of 300 and aims to identify risk factors for incident symptomatic knee osteoarthritis and progressive osteoarthritis in a sample either with or at high risk of osteoarthritis. Each knee joint was scored for Kellgren and Lawrence grade (0- 4), maximal osteophyte grade (0-3), and maximal joint space narrowing grade (0-3).

In brief, people considered at high risk of developing knee osteoarthritis included those who were overweight or obese and those with knee pain, aching, or stiffness on most of the previous 30 days, a history of knee injury that made it difficult to walk for at least one week, or previous knee surgery.

The participants in the study as having knee OA according to the American College of Rheumatology (ACR) Classification Criteria were included. Exclusion criteria were inflammatory knee disorders, other arthropathies, metabolic bone disease, serious systemic diseases, depression, neoplasms, history of knee trauma or knee surgery, and previous intra-articular injections.

ASSESSMENT OF PAIN

We used three measures to characterise knee pain. These were presence of frequent knee pain, consistency of frequent knee pain, and severity of knee pain.

FREQUENT KNEE PAIN

All participants were asked a knee specific question about knee pain at the clinic visit: "During the past 30 days, have you had pain, aching, or stiffness in your knee on most days?" All participants were asked about knee symptoms at the clinic visit with the following questions: "In the past 30 days, have you had pain, aching or stiffness on most days in either of your knees?" followed by, "Was the pain, aching or stiffness in your right knee, left knee or both knees?" if the response to the first question was positive. For both cohorts, positive responses to the pain questions were considered to indicate the presence of frequent knee pain; negative responses were considered to indicate the absence of frequent knee pain.

CONSISTENCY OF FREQUENT KNEE PAIN

Participants were asked the same frequent knee pain question as described above during a telephone screen before the clinic visit, on average 33 days before the visit. A knee was considered to have consistent frequent knee pain if it had frequent knee pain at both the telephone screen and clinic visit or to have inconsistent frequent knee pain if frequent knee pain was present at only one of the telephone screen or clinic visit.

Pain was assessed using the pain section of the WOMAC (WOMAC A). This measure of pain includes 5 summed items and is commonly used as an indicator of OA knee pain. Total subscore for pain can range between 0 and 20. Stiffness. Stiffness was assessed using the stiffness subscale of theWOMAC (WOMAC B) which includes two items and has a total subcore of zero to eight.[9]

STATISTICAL ANALYSIS

All statistical analyses were performed using SPSS version 12 for Windows. Descriptive statistics were used to describe demographic characteristics. Spearman's rank correlation coefficients were calculated to determine the relationships between clinical parameters and radiographic grades in patients with knee OA. Kruskal- Wallis test was used to analyze if there were any significant differences in the level of pain, disability and stiffness according to Kellgren-Lawrence grading scale. In all analyses, P values <0.05 were considered statistically significant.

RESULTS

250 patients with knee OA who were eligible for the current analysis were included in this study. The ages of the OA patients were between 40 and 60 years (mean 50.11 ± 6.34) and the majority of the OA patients was females. The disease duration of knee OA patients was between 1 and 20 (mean 4.14 ± 4.15) years. Sixty five percent of the patients reported bilateral knee pain.

Table 1: Demographic features, WOMAC and clinical of the patients.

Age (years) (mean ± SD)	50.11 ± 6.34
Gender	
Females	160 (64%)
Males	90 (36%)
Disease duration (years) (mean ± SD)	4.20 ± 4.16
WOMAC pain score (mean ± SD)	15.50 ± 4.35
WOMAC stiffness score (mean ± SD)	6.54 ± 1.90
WOMAC function score (mean ± SD)	45.80 ± 8.02

WOMAC: Western Ontario andMcMaster UniversitiesOsteoarthritis Index.

Table 2: Kellgren and Lawrence (KL) grade frequencies for pairs of knees discordant for frequent knee pain

KL grades for knees without frequent knee pain	KL grades for knees with frequent knee pain				
	0	**1**	**2**	**3**	**4**
0	50	20	14	10	5
1	35	10	5	6	1
2	20	8	2	3	4
3	5	5	1	1	2
4	0	0	3	2	2

Tables 2 showed the distribution of Kellgren and Lawrence grades for the paired knees within people who were discordant in their frequent knee pain status. The table showed that knees with frequent pain were more likely to have higher Kellgren and Lawrence grades than were the contralateral knees without frequent pain (upper right-hand parts of the tables). As few participants had one knee with Kellgren and Lawrence grade 4 and the contralateral knee with grade 0, the confidence interval for this effect estimate was relatively wide.

DISCUSSION

In the present study we investigated if there was any association between pain and disability in patients with knee OA. Our results demonstrated that age and disease duration were found to be positively associated with Kellgren-Lawrence grading scale. Also, disability scores were significantly associated with pain and stiffness scores as measured by WOMAC.

Several studies have examined the association between radiographic features in the knee in osteoarthritis and knee pain across individual patients. Studies have concluded that only modest associations exist between knee pain and osteoarthritis.[10-12]

This natural variability in responses to pain is influenced by a variety of factors and may contribute in part to variations in reports of joint pain among people with comparable pathological changes.

Relatively few studies have examined the potential contribution of other such factors to the experience of pain or functional limitations in knee osteoarthritis,[11,13,14,15] and a recent study contended that only a modest discrepancy exists between pain and structural pathology in osteoarthritis.[16]

Knee OA is particularly important in view of its high prevalence and association with severe pain and disability.[17] Pain is the main complaint among patients with knee OA, a leading cause of physical disability.[18] The risk of disability increases with the presence of knee pain in the community.[19,20] Thus it is important to understand the factors which contribute to disability in patients with knee OA. There are some studies which report the relationship between pain and physical functions in patients with knee OA.[21,22]

McAlindon et al.[16] demonstrated that knee pain and age are more important determinants of functional impairments in elderly subjects than the severity of knee OA as assessed by radiographic features. In another study it was reported that the disability index was related to the severity of pain assessed either through the McGill Pain Questionnaire or a visual analog scale.[23] In accordance with these studies, we demonstrated a positive correlation between pain severity and disability when assessed by the WOMAC subscales. The WOMAC scale allows a detailed analysis of pain. Using the WOMAC pain subscale, patients score the pain severity while performing specific activities. We considered this finding as a result of vicious consisting pain leading to decreased functional ability.

Also in some studies, correlation between self-reported disability and radiographic change could not be established.[22] Similar to these findings we found no correlation between function and radiographic features. In contrast to these findings, it was demonstrated that knee pain and reduced function were more likely to be found if radiographic OA features were present in both tibiofemoral (medial and/or lateral) and also patellofemoral compartments rather than the involvement of only either of them.[24]

In recent studies, it has been shown that the Kellgren- Lawrence score was not related to WOMAC score but that it was important to follow up the progress of the disease.[24]

Secondary changes occurring in the joint with increasing age cause OA to be one of the major health problems in the elderly. In the epidemiological studies, the relationship between age and OA was found to be the most striking finding.[19] We also found a positive correlation between age and disease duration. Increased prevalence of OA with advanced age may be due to changes in cartilage with aging, muscle weakness, the loss of chondrocytes, the loss of flexibility of subchondral bone, and inadequate neuromuscular response facilitating joint damage.

Symptomatic knee osteoarthritis in women has been reported more frequently than that in men.[25,26] In our study, the number of female patients with knee OA is striking. This condition could be partly explained in aging women with the differentiation of the hormonal status and the imbalance in the formation and destruction of bone.

Menopause has been associated with an increased production of interleukin-1 which is the part of the cytokine response in OA. In postmenopausal women as the level of estrogen decreases interleukin-1 levels can increase which leads to OA.[27]

CONCLUSION

In terms of tackling the conundrum of discordance between structure and symptoms, this study has confirmed that a strong structure-symptom association definitely exists in osteoarthritis of the knee We conclude that knee pain, stiffness, and duration of disease may affect the level of disability in the patients with knee OA. Therefore, it would be better to consider mainly the functional status of patients in addition to clinic and radiological findings while planning the treatment of OA.

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