

# Association between Pain, Functional Impairment and Radiographic Findings in Patients with Osteoarthritis of Knee

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## ABSTRACT

**Objective:** To explore the relationship between pain, functional impairment (disability) and the radiographic findings in patients with osteoarthritis of the knee.

**Study Design:** Cross sectional study

**Place and Duration of Study:** Department of Rheumatology, Pakistan Air Force Hospital Islamabad from 1<sup>st</sup> September 2020 to 28<sup>th</sup> February 2021

**Methodology:** One hundred and thirty eight patients of knee joint osteoarthritis were included. Weight bearing antero-posterior and lateral views X-ray for both knees were performed on each patient and Kellgren-Lawrence (KL) system was used to grade the severity of OA. We used Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for assessment of pain, stiffness and functional impairment.

**Results:** The mean age was 53.76±7.14 years and females were 92 (67 %) and males were 46 (33 %). Average duration of disease was 3.7 years and mean body mass index was 26.78±2.25 Kg/m<sup>2</sup>. There was no statistically significant association of pain, stiffness and functional impairment with Kellgren-Lawrence radiographic grades.

**Conclusion:** Functional impairment is more associated with level of pain, stiffness in joint and body mass index of patient than the severity of radiographic changes on knee X-ray. Therefore, we would recommend considering functional status of patient alongside radiological findings while planning treatment for patient with knee osteoarthritis.

**Key words:** Osteoarthritis, Pain, function, Radiography

## INTRODUCTION

Osteoarthritis (OA) is one of the most common chronic and dynamic diseases involving the whole joint characterized by cartilage loss and bone remodelling. The prevalence of osteoarthritis increases progressively with age and it has doubled since the mid 20<sup>th</sup> century.<sup>1</sup> In Pakistan, the prevalence of knee osteoarthritis has been reported between 25-28%.<sup>2</sup> Osteoarthritis is a leading cause of disability worldwide and causes significant economic burden. Old age, female gender and obesity are the traditional risk factors for osteoarthritis. People living in highland also suffered more from osteoarthritis of Knee joint.<sup>3</sup> Diagnosis of osteoarthritis is usually made from clinical features and radiography. Some patients may have advance changes on x-ray without having severe symptoms. There are different treatments strategies including joint replacement surgery which may be recommended for patients suffering from severe disease. Knee replacement surgery is considered a cost effective intervention<sup>4</sup>, however treating patients solely based on radiological finding can lead to unnecessary surgery and drug use. Hence it is vital to have clear understanding of the relationship between clinical features including pain and functional impairment (disability) and the radiographic features. Research work has been done on this subject with conflicting results. To the best of our knowledge, similar studies have not been conducted on Pakistani population. The objective of this study is to explore the relationship between pain, disability and the radiographic findings in patients with osteoarthritis of the knee.

## MATERIALS AND METHODS

This cross sectional hospital based study was performed at the Pakistan Air Force Hospital Islamabad from 1<sup>st</sup> September 2020 to 28<sup>th</sup> February 2021 and comprised 138 patients of knee joint osteoarthritis. Patients presenting with knee pain were further evaluated for recruitment into the study by applying American College of Rheumatology (ACR) for OA.<sup>5</sup> Out of total one hundred and fifty four patients who were offered to take part in the study 16 were excluded based on the exclusion criteria (history of trauma, surgery, intra-articular injection, inflammatory arthritis, metabolic bone disease and serious systemic diseases). Information regarding age, gender, BMI and duration of disease was collected on structured data sheet. We used Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) for assessment of pain, stiffness and disability.<sup>6</sup>

Weight bearing antero-posterior and lateral views X-ray for both knees were performed on each patient and Kellgren-Lawrence (KL) system<sup>7</sup> was used to grade the severity of OA. The Kellgren-Lawrence system rates X ray from 0-4 grades, where 0 = normal, 1= doubtful features of OA, 2= Normal joint space with definite osteophytes, 3=moderate joint space reduction, 4= joint space greatly reduced with sclerosis and large osteophytes. Each radiograph was reported by radiologist who was blinded to patient details. The data was analysed through SPSS-26. Association between pain, stiffness, functional impairment and radiographic grades of arthritis was derived using Spearman's rank correlation coefficients whereas Kruskal-

Wallis test was used to analyse the differences in the level of pain, stiffness and disability in different radiographic grades. In all analyses the level of significance was set at P value <0.05.

## RESULTS

The mean age was 53.76±7.14 years and females were 92 (67 %) and males were 46 (33%). Average duration of disease was 3.7 years and Mean BMI was 26.78±2.25 Kg/m<sup>2</sup>. More than half of our patients 72 (52.17%) were Grade-3 on Kellgren-Lawrence radiographic index followed by 36 (26.09%) in Grade-2. There were 18 (13.04 %) in Grade-1 and 12 (8.07%) in Grade-4. Using the Spearman's Correlation there was no statistically significant association of pain, stiffness and disability with Kellgren-Lawrence radiographic grades (Table 1).

However, our study demonstrated quiet a significant association between disability with pain and stiffness and BMI (Table 2). This data did not support any statistically significant difference (P value >0.05) in the level of pain, stiffness and disability in different radiological grades (Table 3).

Table 1: Correlation of KL grade with pain, stiffness, disability

Spearman's correlation	KLS	P value
WOMAC-A (pain)	0.009	>0.05
WOMAC-B (stiffness)	0.36	>0.05
WOMAC-C (disability)	-0.009	>0.05

Table 2: Correlation of Disability with pain, stiffness, BMI

Spearman's correlation	WOMAC-C (disability)	P value
WOMAC-A (Pain)	0.961	<0.01
WOMAC-B (stiffness)	0.904	<0.01
BMI	0.742	<0.01

Table 3: Correlation of different radiological KL grades with pain, stiffness and disability

Variable	KL Grade I	KL Grade II	KL Grade III	KL Grade IV
WOMAC-A (Pain)	16.0±3.3	13.67±3.91	13.83±5.28	16.33±2.46
WOMAC-B (Stiffness)	6.2±1.9	5.50±1.83	5.83±2.21	6.83±1.75
WOMAC-C (Disability)	50.3±6.1	48.17±7.84	49.17±7.68	53.17±7.27

## DISCUSSION

Osteoarthritis of knee joint is a very common condition causing disability with huge suffering and economic costs for patient and society. In the current study we investigated the relationship existing between pain, stiffness and disability, with the X-ray findings among patients having osteoarthritis of the knee. Majority of our patients were female 92 (66%). Ahmed et al<sup>9</sup> also found that 56 (62%) patients in their study were female. The high incidence of osteoarthritis in female may be due to their anatomic differences. Hormonal and reproductive factors also contribute to the development of osteoarthritis.<sup>9</sup>

Mean BMI of our patient was 26.78±2.25 Kg/m<sup>2</sup>. Studies carried out in Bangladesh have shown the similar results.<sup>8,10</sup> This similarity in BMI may be explained by perhaps similar ethnicity and socioeconomic condition of two countries.

In this study we could not establish significant association between severity of Radiographic grades and WOMAC sub-score of pain, stiffness and disability. Few other authors also found similar results in their studies.<sup>11,12</sup>

Our results have shown that the disability is positively associated with pain and stiffness in knee joint rather than X-ray findings. Similar results were illustrated in the studies conducted by McAlindon et al<sup>13</sup> and Jordan et al<sup>14</sup> that knee pain brings about more disability than the severity of osteoarthritis on knee radiographs. In another study Creamer et al. inferred that pain and obesity are directly linked with functional ability in patients of knee osteoarthritis than the severity of changes on plain radiographs.<sup>15</sup> In contrast to these findings there is data supporting the increase in disability with increasing radiographic severity, although this effect may not be significant when pain and other confounding factors are taken into account.<sup>16</sup>

Findings of current study that the disability is not associated with severity of X-ray grades could be due to the characteristics of our patients. Our cohort had only 12 (8.07 %) patients with advanced disease (Grade-4 changes on x ray). It is possible that disability and X-ray features are more closely linked with each other only in advanced stages of osteoarthritis as compared to mild to moderate arthritis. Other factors also play part in disability of patient for example the health of muscles and tendons which cannot be seen on X-rays and may be responsible for discordance between function and severity of radiographic changes.

We also found high BMI as a determinant of disability. The most likely explanation of this is that obese people need greater muscle power to undertake their daily activities and this put them at mechanical disadvantage. It has been observed that obese people have weakness of quadriceps muscles and high prevalence of poor muscle quality<sup>17</sup> which put them at higher risk of disability. Weight reduction has been proved an effective intervention for reducing pain and disability in patients with osteoarthritis of knee joint.<sup>18</sup>

This study also demonstrated that the age of patients and duration of disease was positively associated with radiographic findings. Other authors have also observed this association.<sup>19</sup> Older age is the most established risk factor for osteoarthritis. The most common explanation for this is the accruing effect of mechanical burden over the years combined with inflammatory and metabolic processes causing changes in cartilage, subchondral bone, menisci and muscles.

Potential limitations of our study were that the data was collected from single tertiary care hospital and participants were primarily from urban background. Inclusion of patients from rural background would have given a better picture of a balance of urban and rural section of society. Secondly, the design of our study was cross sectional rather than longitudinal follow-up with relatively small number of patient with radiographically advanced disease. Moreover, we collected self-reported data by using WOMAC questionnaire so there may be a chance of bias as confounding factors contributing to the disability of patients could not be assessed accurately.

## CONCLUSION

Knee pain and functional impairment is not associated the severity of radiographic changes on Knee X-ray. Functional impairment is more associated with level of pain, stiffness in joint and body mass index of patient. Therefore, we would recommend considering functional status of patient alongside radiological findings while planning treatment for patient with knee osteoarthritis.

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