

Original Article



Correlation of Pain, Physical Function and Radiography With Osteoarthritis of The knee

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Abstract

Background: Osteoarthritis (OA) of the knee is a major public health issue. It is important to have a clear understanding about the relationship between clinical features (Pain, functional impairment) and radiographic findings to select appropriate treatment option. **Objectives:** To investigate the relationship between pain, loss of physical function, and radiographic findings in OA of the knee joint. **Materials and Methods:** A cross sectional study on 90 patients aged 40 years and above with OA of the knee joint selected randomly. Severity of the knee pain and functional impairment were measured using the Bangla version of WOMAC (Western Ontario and McMaster Universities Osteoarthritis index). Radiograph of the knee joint were assessed with the Kellgren-Lawrence grading scale. **Results:** The mean of the age, BMI (body mass index) and duration of pain was respectively 54.2 (\pm 9.5) years, 26.0 (\pm 3.4) kg/m² and 3.6 (\pm 2.8) years. Male female ratio was 1:1.6. 55% of the patients had the Visual Analogue Scale (VAS) score of 1-3. The Pain and physical function were associated with OA of the knee where the mean physical function score was 45.1 \pm 4.2 in patients who had pain score of >10. However pain and physical function was not associated with the radiographic findings of the OA of the knee. **Conclusion:** The treatment planning for the OA of the knee should be based on clinical presentation rather than radiographic findings.

Keywords: Osteoarthritis, Pain, Function, WOMAC, Radiography.

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Introduction

OA of the knee is a major public health issue that causes chronic pain and disability.¹ It is the common causes of morbidity, disability, and work loss in rural and urban communities of Bangladesh.²

As the average life span of Bangladeshi population increases day by day the prevalence of OA knee also increases in an arithmetic fashion affecting many people after the age of thirty. Moreover the prevalence of OA knee in Bangladesh seems to be higher due to poor working conditions, heavy physical labor and occupational injuries that generate the

catastrophe in OA knee pain. This will ultimately create a higher clinical and socioeconomic burden to the population and to the national economy respectively.

The incidence and prevalence may vary widely according to the type of epidemiologic studies, as well as by whether clinical or radiological definitions are used. At least 37% (and up to 68% in some studies) of persons 60 years and older have radiographic evidence of knee OA. 12.1% of adults aged 60 or older have symptomatic knee OA. In Bangladesh perspective prevalence of OAKnee is 7.5% in rural area, 9.2% in urban slum, and 10.6% in urban affluent community.² The prevalence of osteoarthritis increases indefinitely with age,

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in Bangladesh most of the patients were in the age group of 50- 59 years.³

Pain is the main complaint among patients with knee OA, a leading cause of physical disability.⁴ This is the symptom that drives individuals to seek medical attention.^{4,5} Physical disability arising from pain and loss of functional capacity reduces quality of life and increases the risk of further morbidity and mortality.⁶

There is a wide diversification of pain pattern in the OA of knee having both intra-articular and extra-articular risk factors. The severity of symptom (pain, functional impairment) is commonly evaluated using WOMAC scale.⁷ The radiographic severity of knee OA is frequently assessed using the Kellgren Lawrence grading scale, which relies on specific findings the presence of osteophytes, joint space narrowing and subchondral sclerosis.⁸

Diagnosis of OA is usually based on symptoms (clinical OA) and is confirmed by radiography.⁴ Clinical parameter and radiographic findings were both important in the diagnosis and management of OA.

Diagnosis of OA knee according to radiological findings without clinical signs of disease, leads to unnecessary drug use in the elderly population. Therefore it is important that we should have a clear understanding about the relationship between clinical feature (Pain, functional impairment) and radiographic findings to select appropriate treatment option.

Many authors have worked out over the matter. However the previous studies had some limitations including relatively small number of study subjects,⁹ and some author analyze only those people with advance knee OA and severe clinical symptom requiring total knee arthroplasty.^{10,11}

Demographic characteristics of OA patient in our country is different from sample population of other studies. As far as we know until now no study about the matter have been carried out in a sample of Bangladeshi population.

The present study aimed to establish a noble clinical approach to elucidate the perception and pattern of pain that usually interferes with the functional quality of life in OA patient of Bangladesh and to build an armamentarium for the treatment of knee pain.

Materials and Methods

The cross sectional study was carried out in the department of Physical Medicine and Rehabilitation at BSMMU, Dhaka from August 2017 to July 2018. Patients with OA knee joint were selected who fulfilled the inclusion criteria including American College of Rheumatology (ACR) clinical and radiographic criteria with a Random sampling method. From the diagnosed case of knee osteoarthritis 90 cases were interviewed. A specific structured questionnaire data sheet was used containing questions relating to demographic data including age, gender, height, body weight, BMI, duration of the disease. A detailed history and thorough examination was

done of each patient. Clinical diagnosis was established from history and thorough physical examination and was confirmed by ACR clinical and radiographic criteria for OA of the knee. Weight bearing antero-posterior and lateral view X-ray of knee joint was done to confirm diagnosis. Each radiograph was evaluated according to Kellgren-Lawrence grading system by a radiologist who was blinded to patient identity or details. Investigations such as CBC, ESR, RA test, serum uric acid level, serum creatinine, blood sugar, urine R/E were done if required. Synovial fluid study was done when it was needed. Self-reported knee pain was recorded by using the pain section of the validated Bangla WOMAC questionnaire. Functional level of the patient was also recorded using physical function section of WOMAC questionnaire.

Before enrolment an informed written consent was taken from each patient after full explanations of the purpose of the study. There was no or minimum physical, psychological, social and legal risk. The Privacy, anonymity and confidentiality of data information identifying any patient was maintained strictly. Due respect was given to all the subjects. Each patient enjoyed every right to participate or refuse or even withdraw from the study at any point of time. Before starting this study ethical clearance was taken from Institutional Review Board (IRB) of BSMMU.

Computer based statistical analysis were carried out with appropriate techniques and systems. All data were recorded systematically in preformed data collection form. Quantitative data were expressed as mean and standard deviation and qualitative data were expressed as frequency distribution and percentage. Statistical analyses were performed by using windows based computer software SPSS 23.0 (Statistical Packages for Social Sciences) (SPSS Inc, Chicago, IL, USA). The t-test and spearman's correlation test was done to observe the relationship between variables. Level of significance was set at 0.05 and $p < 0.05$ was considered significant.

Results

The mean age was 55 (54.2 \pm 9.5) years with the range from 40 to 85 years. Almost two third 56 (62.2%) patients were female and 34 (37.8%) patients were male. Male female ratio was 1:1.6.

Among the 90 patients half (47.8%) of them had BMI 25.0-29.9 kg/m². The mean BMI was 27 (26.0 \pm 3.4) kg/m² (overweight) with a range from 19.1 to 34.7 kg/m².

The Duration of pain was ≥ 5 years in more than three fourth (77.8%) of the patients. The mean duration of pain was four (3.6 \pm 2.8) years with the range from 1.0 to 15.0 years.

The majority (45.6%) of the study populations were having the Kellgren-Lawrence radiographic features of grade 2, 25 (27.8%) were in grade 1, 20 (22.2%) were in grade 3 and 4 (4.4%) had features of grade 4.

Almost two third (65.6%) patients had the pain score >10 and 31(34.4%) patients had <10. The mean of the pain score was found twelve (11.6 ± 2.0) with a range from 8.0 to 15.0 score.

More than half (53.3%) of the patients had the physical function score of 41-50. Here the mean was 43(42.8 ± 5.0) with the range from 34.0 to 52.0.

The VAS score was 1-3 that is mild pain was present in more than half (55%) of the patients, 27.7% were having moderate pain and the VAS score was 4-7 and 16.6% presented with severe pain and VAS score was in between 8-10.

The mean physical function score was found 38.6±3.5 in the patients who had the pain score ≤10 and the mean physical function score 45.1 ± 4.2 in the patients who had the pain score >10. The difference was statistically significant (p<0.05) between the two groups.(Table:I) (Figure:1)

Again the mean of the pain score was 12.2 ± 1.6 in patients who had the Kellgren-Lawrence radiographic features of grade one, a pain score of 11.4±2.1 who had the grade two, the pain score of 11.0±2.0 who had grade three and the pain score was 13.3±1.0 who had radiographic features that of grade four. The difference was not statistically significant (p>0.05) among the four groups.(Table:II) (Figure:2)

The mean of the physical function score was 44.0 ± 4.2 in the patients who had Kellgren-Lawrence radiographic features grade one, 42.4 ± 5.5 corresponded with radiographic features of grade two, 41.8 ± 5.0 with the radiographic features of grade three and 45.5 ± 4.1 who had the radiographic features of grade four. The difference was not statistically significant (p>0.05) among the four groups.(Table:III) (Figure:3)

Table I: Relation of pain score with physical function score in OA knee (n=90)

Physical function score	Pain		P value		
	10 score		>10 score		
	(n=31)		(n=59)		
	N	%	n	%	
40	26	83.9	9	15.3	
41-50	4	12.9	44	74.6	
>50	1	3.2	6	10.2	
Mean±SD	38.6± 3.5		45.1± 4.2		0.001 ^s
Range (min-max)	34.0-51.0		36.0-52.0		

s= significant
P value reached from unpaired t-test

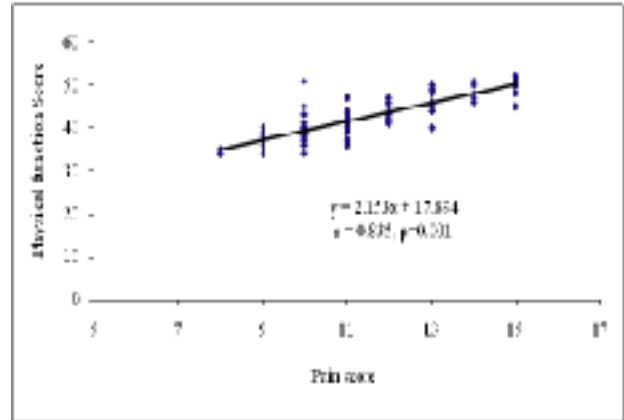


Figure 1: Scatter diagram showing positive correlation (r= 0.835; p=0.001) between pain score and physical function score of patient with OA of knee joint.

Table II: Relation of pain score with radiographic features (n=90)

Pain	Radiographic features(Kellgren-Lawrence grade)								P value
	Grade 1		Grade 2		Grade 3		Grade 4		
	(n=25)		(n=41)		(n=20)		(n=4)		
	n	%	n	%	n	%	n	%	
10 score	5	20.0	17	41.5	9	45.0	0	0.0	
>10 score	20	80.0	24	58.5	11	55.0	4	100.0	
Mean±SD	12.2± 1.6		11.4± 2.1		11.0± 2.0		13.3± 1.0		0.053 ^{ns}
Range (min-max)	9.0-15.0		8.0-15.0		8.0-15.0		12.0-14.0		

ns= not significant
P value reached from ANOVA test

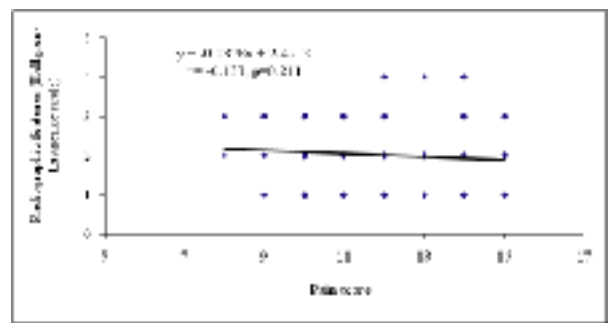


Figure 2: Scatter diagram showing no correlation (r= -0.133; p=0.211) between pain score and radiographic features (Kellgren-Lawrence grade) of patient with osteoarthritis of knee joint.

Table III: Relation of physical function score with radiographic features (n=90)

Physical function	Radiographic features(Kellgren-Lawrence grade)								P value
	Grade 1 (n=25)		Grade 2 (n=41)		Grade 3 (n=20)		Grade 4 (n=4)		
	n	%	n	%	n	%	n	%	
4-0 score	5	20.0	18	43.9	11	55.0	1	25.0	
41-50 score	19	76.0	18	43.9	8	40.0	3	75.0	
>50 score	1	4.0	5	12.2	1	5.0	0	0.0	
Mean ±SD	44.0± 4.2		42.4± 5.5		41.8± 5.0		45.5± 4.1		0.309 ^{ns}
Range (min-max)	36.0-51.0		34.0-52.0		34.0-51.0		40.0-50.0		

ns= not significant

P value reached from ANOVA test

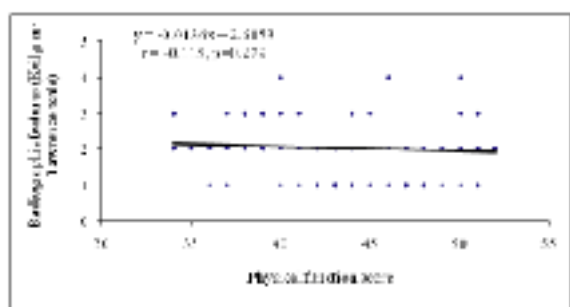


Figure 3: Scatter diagram showing no correlation ($r = -0.115$; $p = 0.279$) between physical function score and radiographic features (Kellgren-Lawrence grade) of patient with osteoarthritis of knee joint.

Discussion

This study was conducted in the department of Physical Medicine and Rehabilitation of BSMMU, Dhaka during the period of August 2017 to July 2018. Total 90 patients with OA of the knee joint diagnosed by ACR criteria were studied. Out of them, 34 (37.8%) patients were male and 56 (62.2%) patients were female. Male female ratio was 1:1.6. Almost two third 56 (62.2%) of the patients were female. Szebenyi et al (2006)¹² found that 55 (33%) were male and 112 (67%) were female. In another study it was 20% for male and 80% for female.¹³ Prevalence of symptomatic knee OA significantly higher in female than male.¹⁴ This is in favor of our findings.

The mean age of the patient was found 55 (54.2 ± 9.5) years in this study and out of 90 patients 45 patients belong to age group 40 to 50 years. Shakoor et al (2009) showed the mean age is 54 years and the maximum number of female with OA were in the age group of 35 to 45 years.¹⁵ In our study almost two third of the patients were female this will explain why half of the patient belongs to age group 40 to 50 years.

In the present study mean BMI of the patient was found 26.0 ± 3.4 kg/m² and mean duration of pain was four (3.6 ± 2.8) years. This is in favor of findings of another study.¹⁵ On the

other hand Szebenyi et al (2006) conducted a study at Bristol, UK and found that the mean BMI of the patient with knee OA was 30.2 ± 6.5 kg/m² which is higher than our findings.¹² This may be due to tall structure of the people of UK than that of Bangladeshi people.

Our findings go with the Cubukcu et al (2012)¹⁶ and Kulcu et al (2010)¹⁷ study where the mean of the duration of pain was 4.14 ± 4.15 years and 43.8 ± 26.6 months respectively whereas it is 4 years in this study.

Weight bearing antero-posterior and lateral view radiographs of the knee were done in all patients and graded according to the Kellgren-Lawrence grading system. In our study we found grade 1 in 25 cases (27.8%), grade 2 in 41 cases (45.6%), grade 3 in 20 cases (22.2%) and grade 4 in 4 cases (4.4%). Maximum cases were of grade 1 and grade 2 showing that most of the cases were having mild to moderate radiological feature. In another two studies showed maximum cases were belongs to grade 1 and grade 2 that is mild to moderate radiological features.^{13,18}

Our results demonstrated that pain was strongly associated ($r = 0.835$; $p = 0.001$) with physical function score as measured by WOMAC scale. Some authors have also investigated the association between pain and physical functions in patients with knee OA.^{19,16,20} They also found association between pain and loss of physical function. These support the current findings. The mechanism by which pain contributes to loss of physical function or disability is unclear. Pain may lead to avoidance of physical activity, resulting in a cycle of pain, inactivity and muscle wasting.²¹

However we did not found any association between pain and radiographic grading. There are some studies attempted to assess the relationship between pain and radiographic feature in patients with OA knee joint.²²⁻²⁵ Some authors found association between them.^{22,23} While others did not found any association between pain and radiographic changes.^{16,25}

Some authors worked to find out the association between loss of physical function and radiographic changes in OA knee joint.^{26,27} Some of them found association between them^{22,27} and some studies got the reverse result.^{16,26} The similarity is that we found no association between them.

Regarding characteristics and severity of pain, this study revealed that more than half (55%) of the patients had mild pain and VAS score was 1-3, 27.7% had moderate pain and VAS score was between 4-7 and 16.6% presented with severe pain and VAS score was in between 8-10.

We measured self-reported pain and functional impairment of study population by WOMAC questionnaire so there may be a chance of bias.

Age, gender and WOMAC scale²⁸ were the patient related data we collected, so we were not be able to assess the separate contribution of possible confounders that have been associated with the pain and function in knee OA such as comorbidities, anxiety and depression.

Conclusion

The treatment planning & rehabilitation measures for the patients with OA of the knee should be based on clinical presentation rather than radiographic findings. Weight reduction is encouraged to reduce symptom severity and improve functional status.

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