



CORRELATION BETWEEN THE FUNCTIONAL AND RADIOGRAPHIC PARAMETERS OF KNEE OSTEOARTHRITIS - A CROSS-SECTIONAL STUDY

KEYWORDS

Osteoarthritis knee, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Kellgren – Lawrence scale (K-L).

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ABSTRACT **Aim:** To determine the correlation between pain, function and radiographic findings in patients with osteoarthritis knee.

Design: Cross-sectional study.

Materials and methods: Thirty patients with knee osteoarthritis were selected from the Institute of Geriatrics, RGGH, Chennai -3. Patients with other medical illness and knee pain due to other causes were excluded. Clinical symptom assessment was done using WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index) score including sub scores of pain (0-20), stiffness (0-8) and physical function (0-68) and the radiological assessment was done using Kellgren-Lawrence Index.

Result: None of the WOMAC sub scores were related with Kellgren-Lawrence scale ($P > 0.05$). The WOMAC disability score was significantly ($P < 0.01$) associated with pain and stiffness score.

Conclusion: It is better to consider the functional status and clinical findings of the osteoarthritis patients instead of waiting for radiological features while planning the treatment for Osteoarthritis.

Introduction:

Osteoarthritis knee is the most common cause of locomotor disability in the elderly and is the second most common rheumatological problems in India^[1]. It is a chronic degenerative disorder of multifactorial etiology characterized by loss of articular cartilage and periarticular bone remodeling.

The prevalence of osteoarthritis increases with age and is more common in women. In the rural population, the prevalence is about 5.8% whereas in the urban it is estimated between 21% to 27%^[2]. About 40% of the Indian population around the age of 65 suffer from osteoarthritis among which 2% of the population experience severe pain and disability^[3].

In the present scenario, Osteoarthritis commonly presents with pain and it more likely worsens over time. The treatment modalities available are aimed at the reduction of symptoms and improvement of functional capability^[4]. As the rehabilitation is planned by considering the radiological features, it is necessary to acquire knowledge about the relationship between functional status and radiological features before proceeding to the treatment.

Aim and objective:

To determine the correlation between pain, disability and radiographic findings in patients with knee osteoarthritis.

Materials and methods:

Proper clearance from the Institutional Ethics Committee was obtained. The study was conducted at Institute of Geriatrics, Rajiv Gandhi Government General Hospital, Chennai. Thirty knee osteoarthritis patients who were diagnosed recently based on American College of Rheumatology (ACR) Criteria were enrolled in this study after obtaining the consent for their participation.

ACR Clinical and Radiographic Classification Criteria^[5]:

Presence of knee pain with any one of the following three clinical items:

- Age > 50 years
- Morning stiffness < 30 minutes
- Crepitus on knee motion

Presence of the following radiographic criteria:

- Osteophyte in the knee X-ray

Inclusion criteria: The study includes patients of both the genders with diagnosis of OA (according to the ACR criteria) in between the age group 50 - 70 years.

Exclusion criteria: Patients with knee pain due to other disorders and those undergoing treatment for OA were excluded from the study.

Assessment of patients:

Clinical symptom assessment: It has been done using WOMAC Index

The Western Ontario and McMaster Universities Osteoarthritis Index including sub scores of pain, stiffness and physical function have been used widely in investigating patients of Osteoarthritis knee^[6]. This index is the subjective method of assessing the severity of symptoms. (Figure.1)

The interpretations of the scoring are:

Pain (0-20; 0- minimum pain, 20- maximum pain)

Stiffness (0-8; 0- minimum stiffness, 8- maximum stiffness)

Physical function (0-68; 0- minimum physical function; 68- maximum physical function)

The figure shows a WOMAC index questionnaire form. At the top, it asks for the patient's full name and today's date (Month, Day, Year). Below this is the title 'WOMAC OSTEOARTHRITIS INDEX'. The form contains five main sections of questions:

- Concerns the amount of pain you are currently experiencing in your knee. For each situation, please enter the amount of pain you have experienced in the past 48 hours.
 - A. Walking on a flat surface
 - B. Going up or down stairs
 - C. At night while in bed
 - D. Sitting or lying
 - E. Standing upright
- Describe the level of pain you have experienced in the past 48 hours; for each one of your knees:
 - A. Right knee
 - B. Left knee
- How severe is your stiffness after first awakening in the morning?
 - A. Right knee
 - B. Left knee
- How severe is your stiffness after sitting, lying, or resting later in the day?
 - A. Right knee
 - B. Left knee
- Concerns your physical function. By this we mean your ability to move around and to look after yourself. For each of the following activities, please indicate the degree of difficulty you have experienced in the last 48 hours, in your knee:
 - A. Descending (going down) stairs
 - B. Ascending (going up) stairs
 - C. Rising from sitting
 - D. Standing
 - E. Bending to floor
 - F. Walking on a flat surface
 - G. Getting in/out of car
 - H. Going shopping
 - I. Putting on socks/stockings
 - J. Rising from bed
 - K. Taking off socks/stockings
 - L. Lying in bed
 - M. Getting in/out of bath
 - N. Sitting
 - O. Getting on/off table
 - P. Heavy domestic duties (sawing the lawn, lifting heavy grocery bags)
 - Q. Light domestic duties (such as tidying a room, dusting, cooking)

Each activity is followed by a scale with five boxes labeled 'None', 'mild', 'moderate', 'severe', and 'extreme'.

Figure 1: WOMAC index questionnaire

Radiological assessment: Kellgren-Lawrence (KL) Index was used to assess the radiological symptoms.

The Kellgren and Lawrence system is a method of classifying the severity of osteoarthritis knee based on radiological features^[1]. It has five grades of classifying the disease and was proposed by Kellgren et al in 1957. (Figure.2)

Grade 0: no radiographic features of OA are present.

Grade 1: doubtful joint space narrowing (JSN) and possible osteophytic lipping.

Grade 2: definite osteophytes and possible JSN on anteroposterior weight-bearing radiograph.

Grade 3: multiple osteophytes, definite JSN, sclerosis, possible bony deformity.

Grade 4: large osteophytes, marked JSN, severe sclerosis and definite bony deformity.

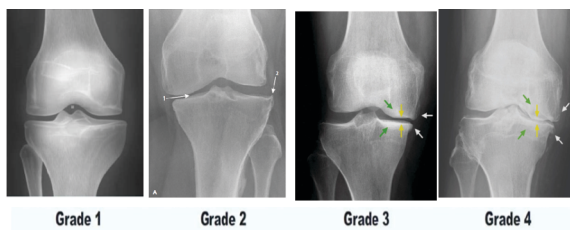


Figure.2 The Kellgren – Lawrence system of classifying osteoarthritis of knee

Doubtful	Mild	Moderate	Severe
Minute osteophyte: doubtful significance	Definite osteophyte: normal joint space	Moderate joint space reduction	Joint space greatly reduced: subchondral sclerosis

Statistical analysis:

The statistical analysis was done by Spearman's rank correlation coefficient using SPSS software version 21. The p value of less than 0.05 was considered as statistically significant.

Results:

There were 8 males and 22 females participated in this study. The ages of patients were between 55 to 70 years (mean 62.13±3.88). The mean BMI was 27.68 ± 2.83. On radiographic assessment, 18 patients(60%) were under grade 2, 10 (33%) of them were under grade 3 and 2(7%) patients were categorised under grade 4. The mean WOMAC score was found to be 68.33 ± 8.16. The demographic, clinical and radiological data were presented in the table 1. Correlation between the components of WOMAC index and Kellgren-Lawrence grade and their statistical significance were noted in Table - 2 and in Figures 3 to 6.

Table:1 Baseline characteristics with Mean ± S.D and n (%)

S.no	VARIABLE	MEAN ± S.D	n (%)
1.	Age (Years) n=30	62.13 ± 3.88	-
2.	Gender – Female	-	22 (73)
	Male	-	8 (27)
3.	Duration of symptoms (Years) n	3.33 ± 1.44	-
	Less than 3 years (%)	-	8 (27)
	3 years or more (%)	-	22 (73)
4.	Body Mass Index (Kg/m ²)	27.68 ± 2.8	-
	Less than 30 kg/m ² (%)	-	25(83)
	30 kg/m ² or more (%)	-	5 (17)
5.	Radiological Grade KL (%)		

	KL 2	-	18 (60)
	KL 3	-	10 (33)
	KL 4	-	2 (7)
6.	WOMAC – Total score	68.33 ± 8.16	-
6.	WOMAC –PAIN subscale (0-20)	10.66 ± 2.52	-
7.	WOMAC –FUNCTION subscale (0-68)	53.4 ± 7.32	-
8.	WOMAC- STIFFNESS subscale (0-8)	5.06 ± 1.14	-

WOMAC - The Western Ontario and McMaster Universities Osteoarthritis Index

KL - Kellgren-Lawrence Index

Table 2: Correlation between the functional components of WOMAC and the Kellgren-Lawrence (KL) radiological grade

PARAMETERS	SPEARMAN'S COEFFICIENT T (r)	P VALUE
WOMAC – Physical function & Pain	+0.630*	<0.001
WOMAC – Physical function & Stiffness	+0.719**	<0.001
WOMAC (Pain) & KL	-0.199	0.291
WOMAC (Stiffness) & KL	-0.170	0.368
WOMAC (Physical function) & KL	-0.192	0.309

** denotes 'r' with a strong positive correlation

* denotes 'r' with a moderate positive correlation

P < 0.001 denotes very high significance

Correlation between WOMAC subscores

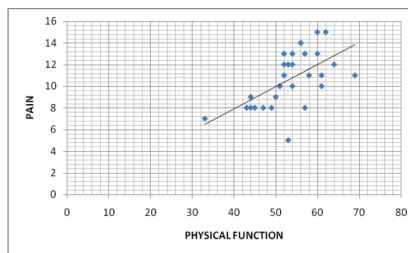


Fig.3 Physical Function and Pain

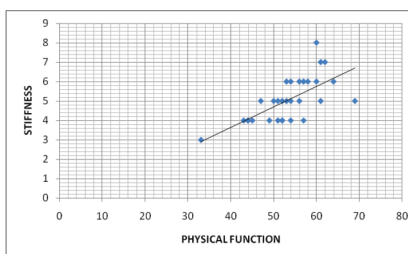


Fig.4 Physical Function and stiffness

Correlation between WOMAC subscores and (% KL grade

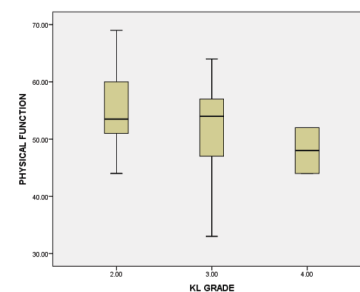


Fig.5 KL grade and WOMAC Physical Function

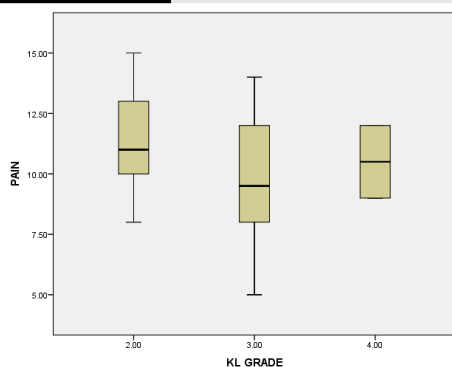


Fig.6 KL grade and WOMAC Pain

Discussion:

The osteoarthritis of knee is particularly significant in point of its high prevalence and disability among the elderly population^[6]. Pain is the most common complaints among the patients with knee osteoarthritis. The risk of disability among the osteoarthritis patients increases with the presence of knee pain^[9]. Hence the knowledge about the factors which contribute to disability is essential.

This cross sectional study shows a strong positive correlation between the pain severity and disability as noted among the WOMAC subscales. This is in accordance with the findings of Jordan and Mc Alindon et al, who concluded that severity of knee pain is much more essential in determining the disability than the severity of knee OA as assessed by radiographic features^[10,11]. In addition, Creamer et al concluded that the physical function of osteoarthritic patient is determined mainly by the pain and obesity than by the structural changes as seen radiologically^[12]. Thus we can consider this finding as a vicious cycle of pain leading to decreased functional capability.

On the other hand, no statistical correlation is seen between the WOMAC scores and the X-ray findings (table 2) as concluded by Larsson et al^[13].

The conventional radiography exhibits the structural bony changes rather than the severity of disease. It provides only an approximation of changes in articular cartilage with the measurement of joint space narrowing and it poorly depicts the other soft tissues (J.Hodler and D.Resnick et al., 1996)^[14]. Too the x-rays are not reliable in 15% cases in osteoarthritis.

In our study, the symptomatic knee osteoarthritis has been reported more frequently in women than in men^[15]. This may be due to the hormonal differentiation and the imbalance between formation and destruction of bone. The menopausal stage is associated with the increase in production of IL-1, an important cytokine involved in the inflammatory process of osteoarthritis. Hence, in post-menopausal females the decrease in oestrogen level is associated with increased levels of IL-1 which contributes to the arthritic processes^[16].

We also find that the risk of osteoarthritis increases with the advancing age which is in concordance with certain epidemiological studies. The reason may be due to the changes in cartilage with respect to aging, weakness of muscles, loss of chondrocytes and the loss of flexibility of subchondral bone assisting joint damage^[17].

Conclusion:

The clinical and radiological parameters are both essential in the diagnosis and management of osteoarthritis. But it would be better to begin with the clinical assessment of patients prior to the radiological investigation and the treatment should be based on both the clinical and radiological findings.

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