

Significance of clinical parameters and role of clinical scoring systems in predicting severity of primary osteoarthritis knee

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Abstract

Introduction: Primary osteoarthritis knee has been associated with multiple variables reported to affect the disease process in different ways. Age, Sex and BMI are among the few which have been characterized to be etiologically related to the osteoarthritis knee. Various scoring systems have been implicated in depicting the severity such as VAS, WOMAC and Lequesne scoring system. Their role has been studied in different studies. **Material and methods:** Study was conducted in Deptt. of Orthopedic Surgery, CSMMU, Lucknow between 2006 and 2008. Patients of primary osteoarthritis knee were included in the study. All the variables were analyzed and severity was characterized as per VAS, WOMAC and Lequesne scoring system. X-ray was done and radiological staging was done as per Kellgren Lawrence scoring system. **Observation and Results:** 120 patients were enrolled between 2006 and 2008 out of which 46 (38.3%) were males and rest 61.7% were females. Maximum number of patients were in BMI range of >25 – 71 cases (59.17%). Mean VAS score was 6.8+/- .78 with maximum number presenting in 6 rating. Mean WOMAC pain score was 9.2+/- .08 and mean Lequesne pain score was 2.48+/- .06. Maximum number of cases presented with a VAS score of >5 - 118 cases (98.33%). 67.5% of cases presented in KL grade 3 followed by 25.83% in KL grade 2 and rest in grade 4. The 'p' values of VAS score, WOMAC score, Lequesne score were found to be 0.6127, 0.0477, 0.6943 respectively. **Conclusion:** Osteoarthritis Knee is associated significantly with age. Maximum number of patients present in KL grade 3 of the disease and WOMAC scoring system is the best predictor of severity of the disease.

INTRODUCTION

Osteoarthritis is a well known disorder affecting joints to the extent of complete degeneration. OA is the most common form of arthritis₁ and the leading cause of chronic disability in the United States₂. As per TNS Arogya survey, it is the leading disease of India as well. The pathology of the disease is completely understood but the etiological factors are not fully characterized. In OA, a variety of potential forces -- hereditary, developmental, metabolic, and mechanical -- may initiate processes leading to loss of cartilage -- a strong protein matrix that lubricates and cushions the joints₃. As the body struggles to contain ongoing damage, immune and regrowth process can accelerate damage. Overall the disease presents in various clinical forms and in varying stages of severity. Though the disease process is fully understood, the factors playing role in exaggeration of symptoms are not understood₄. Various studies have been conducted to analyze these factors in different populations_{5,6,7,8,9} but none have been conducted in

Indian population. Genetic factors₁₀, environmental factors and dietary factors₁₁ are among many others which have been reported to play important role in osteoarthritis. The radiological osteoarthritis knee has been termed a different entity which is considered to be arising as a late stage of the disease. Many scoring systems have been developed to evaluate the radiological stage of disease₁₂. The correlation of this stage with the progression of the disease is important because this is the only way we can gather information about factors promoting progression of the disease₁₃.

AIMS AND OBJECTIVES

We planned a prospective study with aim to analyze the clinical parameters of the disease process and evaluate the role of VAS, WOMAC and Lequesne knee scoring system in predicting severity of disease.

MATERIAL AND METHODS

The prospective study was conducted in the Department of Orthopedic Surgery, CSM Medical University, Lucknow,

UP. The study was conducted on patients with osteoarthritis knee enrolled on OPD basis during the year 2006 -2008. According to the data of prevalence of osteoarthritis being around 30%, at the significance level of 0.05 and power being taken as 80%, our sample size came to be around 87. We enrolled 120 cases of primary osteoarthritis knee of either sex and age >40 years from patients attending Department of Orthopedic Surgery. Cases were selected according to selection criteria given by American College of Rheumatology¹⁴. Patients having association with secondary causes of disease were excluded from the study. After the informed consent, cases were evaluated for osteoarthritis. General information about the patient were recorded in the data sheet. A detailed history was taken and thorough examination of the affected joints and related regions was done. All the findings were recorded. X-ray bilateral knee – AP (standing) and Lateral view was taken to see the radiological changes of the disease. Kellgren Lawrence staging of the X-rays was done after testing the interobserver reliability. Patients were subjected to biochemical parameters such as Serum uric acid, ESR and Rheumatoid factor to rule out cases of secondary osteoarthritis knee. We prescribed synovial fluid analysis in all the patients who were having synovial effusion. Severity of the disease was analyzed according to Visual Analogue Score¹⁵, WOMAC Index¹⁵ and Lequesne Index^{16/17/18}. Interobserver reliability was also tested for these variables. Data collected was analyzed by univariate and multivariate analysis using Spss statistical software.

OBSERVATIONS AND RESULTS

120 patients were enrolled between 2006 and 2008 out of which 46 (38.3%) were males and rest 61.7% were females. Majority of subjects in our study were found to be between 51 – 60 years – 51 cases (42.50%) of age. Females were more commonly affected in all age groups except in patients between 61–70 years of age, where there is an inverse presentation, with males being affected more commonly. Contrary to earlier belief, 54.17% affected cases were moderate workers, 40.83% were sedentary workers and only 5% were heavy workers. This disproportion can be because of more number of housewives enrolled in the study. Height strata of 151-160 cm were most commonly involved (54.17%). In our study maximum number of patients were in BMI range of >25 – 71 cases(59.17%). Mean VAS score was 6.8+/- .78 with maximum number presenting in 6 rating. Mean WOMAC pain score was 9.2+/- .08 and mean Lequesne pain score was 2.48+/- .06. Maximum number of

cases presented with a VAS score of >5 - 118 cases(98.33%). In a maximum WOMAC pain score of 20, 97 cases (80.83%) presented with a pain score of <10. All the patient in study showed a pain score of < 4 in Lequesne scoring system (Table-1).

Figure 1

Table 1: Distribution of VAS and pain subscore of WOMAC and Lequesne

Sex	VAS				WOMAC				Lequesne			
	≤ 5		> 5		≤ 10		> 10		≤ 4		> 4	
	N	%	N	%	N	%	N	%	N	%	N	%
Male	01	2.17	45	97.83	41	89.13	05	10.87	46	100.0	0	0.00
Female	01	1.35	73	98.65	56	75.68	18	24.32	74	100.0	0	0.00
Total	02	1.67	118	98.33	97	80.83	23	19.17	120	100.0	0	0.00

In a maximum WOMAC stiffness score of 8, no patient presented with a stiffness score of >4. Maximum number of patients presented with a WOMAC stiffness score between 3 – 4. In a maximum Lequesne stiffness score of 8, all patients presented with a score of <2. WOMAC physical function score came out to be comparable to Lequesne score in terms of activities of daily living. Only ten cases (8.33%) presented with swelling, male and female distribution being equal (Table-2).

Figure 2

Table 2 : Distribution of Study Population on Basis of Clinical Features

Sex	Swelling				Deformity				Crepitus			
	Absent		Present		Absent		Present		Absent		Present	
	N	%	N	%	N	%	N	%	N	%	N	%
Male	41	89.13	05	10.87	43	93.48	03	6.52	12	26.09	34	73.91
Female	69	93.24	05	6.76	66	89.19	08	10.81	24	32.43	50	67.57
Total	110	91.67	10	8.33	109	90.83	11	9.17	36	30.00	84	70.00

Only 11 cases(9.17%) presented with deformity out of which eight are female (approx. 3/4th) (Table-2). Crepitus is present in 84 cases (70.0%) amongst the study population selected with females being more commonly affected (approx.2/3rd) (Table-2). 42 cases (35%) in study population were having an ESR ranging between 21–30 mm with number of females predominating males in each subgroup.38 cases (31.67%) presented with an ESR in range of 31-40 and 37 cases had ESR range<20. Blood sugar was found to be normal in all the cases. Mean serum uric acid level was found to be 4.2+/- .6 with the range being 4 - 6 mg/dl. Articular incongruity was present in–116 cases(97.48%). Subchondral Cyst was present in 62 cases(51.67%) in left knee and 60

cases(60.42%) in right knee. Juxtraarticular Osteopenia was present in 64 cases(53.33%) in left knee and 63 cases(52.94%) in right knee and most of them are females. Loose bodies were present in 11 cases (9.17%) in left knee and 27cases (22.50%) in right knee. Extra-articular calcification was present in 27 cases (22.50%) in left knee and 26 cases (21.85%) in right knee. Subchondral Sclerosis was present in 8 cases(6.67%) in left knee and 9 cases(7.56%) in right knee. 67.5% of cases presented in KL grade 3 followed by 25.83% in KL grade 2 and rest in grade 4. We performed bivariate analysis of certain variables in relation to KL grade. We found intergroup analysis shows the difference in mean BMI to be of doubtful significance with p-value being <0.13. Probably, it may have effect on initiation of disease but not progression ('p' = 0.1391) (Table: 3).

Figure 3

Table 3: Comparison of Means of Age, Height, Weight , BMI with KL Grade

KL GRADE	MEANS OF			
	AGE (In years)	HEIGHT (In Cms.)	WEIGHT (In kg.)	BMI
2	51.730769	160.2885	65.28896	25.47077
3	53.870588	159.4059	64.18824	25.46447
4	61.777778	161.7222	70.33333	27.217789
TOTAL	54	159.7708	64.8875	25.59734

Sex, occupation and socioeconomic status were found to be insignificantly associated with KL grade of the disease. Maximum percentage of cases presenting with swelling were in KL grade 4 -33.33%(3/9) followed by in KL Grade 3 – 7.06%(6/85). Percentage of patients presenting with swelling increased with increasing severity of disease. There was found to be a significant association between stage of disease and occurrence of swelling ('p'=0.016) (Table-4).

Figure 4

Table 4: Comparision between KL grade and swelling, crepitus, deformity

KL GRADE	SWELLING		DEFORMITY		CREPITUS	
	Absent	Present	Absent	Present	Absent	Present
2	25 (96.15%)	01 (3.85%)	24 (92.31%)	02 (7.69%)	10 (38.46%)	16 (61.54%)
3	79 (92.94%)	06 (7.06%)	77 (90.59%)	08 (9.41%)	21 (24.71%)	64 (75.29%)
4	06 (66.67%)	03 (33.33%)	08 (88.89%)	01 (11.11%)	05 (55.56%)	04 (44.44%)
TOTAL	110 (91.67%)	10 (8.33%)	109 (90.83%)	11 (9.17%)	36 (30.00%)	84 (70.00%)

Crepitus and deformity were found to be insignificantly associated with stage of disease. Mean VAS score showed a progressive increase with increase in severity of the disease but there was no significant intergroup difference. Patients presenting with KL grade 4 disease presented with maximum mean value of VAS score ('p' 0.6127). Mean value of WOMAC score showed a progressive increase with increasing severity of disease and the intergroup difference was also significant. WOMAC score provided a significant idea about the severity of disease ('p' = 0.0477). KL grade 4 represents maximum mean value of Lequesne score but an insignificant association was found between severity of disease and Lequesne score ('p' 0.6943). The 'p' values of VAS score, WOMAC score, Lequesne score were found to be 0.6127, 0.0477, 0.6943 respectively. Hence, of the three clinical scoring system WOMAC is the best and also statistically significant to assess severity of disease (Table-5).

Figure 5

Table 5: Intercomparision of various scoring systems

KL GRADE	MEANS OF		
	VAS (Max.10)	WOMAC (Max.96)	LEQUESNE (Max.24)
2	6.1538462	29.57692	4.076923
3	6.1705882	30.94118	4.058824
4	6.333333	31.77778	4.277778
TOTAL	6.1791667	30.70833	4.079167

The variables found significantly associated with the severity of illness in bivariate analysis at p<0.15 level were considered for multivariable analysis to predict the severity of grade of illness on the basis of KL score. Stepwise backward ordered logistic regression analysis was done to see the effect of the variable of interest while controlling for the other variables in the model. The probability of removal was set at p>0.15. Finally age (∅ coeff 0.05) and swelling (∅ coeff 1.60) were found significantly associated with severity of illness. WOMAC score although has a 'p' value of >0.05, then too, it cannot be ignored as its 'p' value is very near to 0.05 and its significance is considerable. May be in a larger sample size its clear cut significance would be evident. Amongst radiological variables, extraarticular calcification (∅ coeff 1.04) and subchondral cyst (∅ coeff 1.59) were found significantly associated with severity of illness.

DISCUSSION

We found that the variables significantly associated with

disease progression are age, sex and BMI. WOMAC scoring system was found to be most significantly associated with the severity of the disease process. Physical function was the variable which was most significantly associated with the disease onset and severity. American College of Rheumatology has given a criteria for diagnosis of osteoarthritis which does not include swelling. However we found that swelling is the only variable which, amongst all, is significantly associated with disease severity. It should be included in diagnosing a case of osteoarthritis. Crepitus and deformity were not significantly associated with the severity of disease. In radiological findings, subchondral cyst and extraarticular calcification were associated with severity of the disease. Our results are comparable with those of WP Chan¹⁹, who showed that conventional radiography is the method, most frequently used for monitoring progression of osteoarthritis, it may not show osteoarthritic changes of knee until late in the disease and it may show involvement of only one or two compartments in patients who have tricompartmental disease. Stucki G et al studied the comparison of metric properties and validity of German versions of the WOMAC and a self-administered questionnaire-format of the Lequesne-Algofunctional-Index in patients with osteoarthritis (OA) of the lower extremities and concluded that all scales of the WOMAC were internally consistent and associated with radiological OA-severity and joint range of motion. However, only the function but not the symptom sections of the self-administered Lequesne OA index were internally consistent for both, patients with knee as well as hip OA. Also, the symptom components were not or only weakly associated with radiological OA-severity and joint range of motion²⁰. Creamer P et al conducted a study on demographic variables, psychosocial variables and physical findings that predict severity of pain in patients with symptomatic knee OA comparing 3 different pain scales. Pain severity was measured in 68 outpatients with knee OA using the WOMAC OA Index, the McGill Pain Questionnaire (MPQ) and a 0-100 visual analog scale (VAS). The study results revealed that different pain scales measure different facets of the pain experience in knee OA and cannot be used interchangeably. The WOMAC pain scale has advantages over other instruments. Helplessness, education, and BMI appear to be important, potentially treatable, factors in determining self-reported pain severity in knee OA⁸⁹. Cooper R et al in their study came to conclusion that most currently recognized risk factors for prevalent knee OA (obesity, knee injury, and physical activity) influence incidence more than radiographic

progression⁷. Our results are also consistent with those of Theiler R et al²¹, who compared the responsiveness of the WOMAC OA index and a questionnaire format of the Lequesne-Algofunctional Index in patients with OA of the lower extremities. For both indices and for both locations, the pain sections were more responsive than the function sections. However, the WOMAC scales and the WOMAC global index were more responsive than the comparable Lequesne sections and Lequesne index. They concluded that their results were based on a German version using a self-report format, the WOMAC scales appear to be more responsive than the Lequesne index in patients with OA of the lower extremities.

CONCLUSION

Osteoarthritis Knee is associated significantly with age. Swelling was significantly associated with severity of disease. Crepitus and deformity were found to be insignificantly associated with stage of disease. WOMAC scoring system is the best predictor of severity of the disease. Maximum patients reaching hospital are in KL grade 3. Extraarticular calcification and subchondral cyst were found significantly associated with severity of illness..

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