Original Research Article

Usefulness of WOMAC index as a screening tool for knee osteoarthritis among patients attending a rural health care center in Tamil Nadu

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ABSTRACT

Background: Osteoarthritis is the eighth leading cause of disability and a degenerative disease that worsens over time. Hence, early diagnosis and treatment remains the key in the management of Osteoarthritis. The aim and objective of the study was to evaluate the usefulness of WOMAC index for screening Osteoarthritis among the patients older than 50 years of age attending a Rural Health Centre.

Methods: A cross sectional study was done among patients complaining of knee pain who visited a rural centre between June-August 2016. Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was applied to all participants with knee pain to assess risk for OA. Also, American College of Rheumatology criteria (ACR) was used as a standard. Descriptive statistics were used. Chi-square test with Odds Ratio was calculated to find out of the strength of association. To test the agreement of WOMAC score with ACR Clinical Criteria, McNemar's test analysis was done.

Results: Out of 103 study subjects 45 were males and 58 were females. According to WOMAC Index Scores, 20 (19.4%) subjects belonged to high risk (score ≥81) and 38 (39.6%) subjects belonged to moderate risk (score 60 - 80). The Mean±SD WOMAC Score was 64.40±15.2. Age group [OR 2.85; 95% CI 1.25-6.48) and gender [OR 2.29; 95% CI 1.01-5.24) were significantly associated with WOMAC score percentage. Comparing WOMAC score percentages with ACR criteria for knee OA revealed statistically significant agreement (p-value, 0.009) which indicated the diagnostic accuracy of WOMAC index.

Conclusions: WOMAC Index can be a useful screening tool for people at risk for Osteoarthritis and will help in identifying the disease early.

Keywords: Osteoarthritis, Rural, Screening, WOMAC index, ACR criteria

INTRODUCTION

Osteoarthritis (OA) is a degenerative disease that worsens over time after fourth decade of life. Most of this disability burden is attributable to the involvement of the hips or the knees. Globally over 100 million people worldwide suffer from Osteoarthritis and is the fourth leading cause of year lived with disability (YLDs), accounting for 3.0% of total global YLDs.[1] It also accounts for the decrease in activities of daily living (ADL) in elderly dependent population in the community.[2] OA is strongly associated with ageing and the Asian region is ageing rapidly. In India, 8% of total population are above 60 years in 2010 and is likely to rise to 21% by 2050.[3] Further, OA has been associated with heavy physical occupational activity, a required livelyhood for many people living in rural communities in developing countries.

Osteoarthritis (OA) of the hip and knee are common conditions that, in many cases, necessitate frequent follow up, medical therapy, and potentially costly treatments, such as joint replacement surgery.[4] Unfortunately, joint replacement surgery, an effective intervention for people with severe OA involving the hips or knees, is inaccessible to most people in these regions. Hence, early diagnosis and treatment remains the key in the management of osteoarthritis. Nevertheless, relatively little is known about the prevalence of these pathologies in the general population.[5] Estimating prevalence in the general population requires tools that allow investigators to screen a large sample drawn from the general population to identify those individuals most likely to have the disease.[6] This can be a screening questionnaire, blood test, imaging modality, or other simple assay. Though there are many scoring indices available for measures of knee function, all these are designed to assess the course of disease or response to treatment in patients with knee OA.[7] Currently, investigators interested in determining the prevalence of knee OA must rely on medical histories or descriptions of symptoms to identify individuals most likely to have the disease. Only the clinical evaluation of a patient with symptoms of knee OA by an experienced physician and an x-ray of the joint can provide a definitive diagnosis.

In a developing country like India, with more than 60 percent of people living in rural areas, accessibility and affordability to radiographic imaging among elderly population suffering from OA remains doubtful. Given that no single symptom can identify patients with knee OA, the most relevant ones are often combined to construct an algorithm that ideally has high specificity and reasonable sensitivity.[8,9] Individuals identified by such screening tools as likely candidates must then undergo further evaluation so a definitive diagnosis can be made. This can considerably reduce the cost of management of OA among the general population and also will reasonably reduce the cost of country's health care system in avoiding unnecessary radiographic imaging.

Rationale of the study

Most of the people suffering from OA remain undiagnosed during early stages of OA and an effective screening tool is necessary to detect patients with high risk. Many scoring indices available for OA is useful in patients post intervention. This study is done to evaluate the usefulness of one such score (WOMAC score) as a screening tool for OA and compare it to American College of Rheumatology criteria (ACR) as a standard among people aged 50 years and above.

METHODS

A cross sectional study was done among the patients aged 50 yrs and above who visited the outpatient department of rural health centre during the period between July-

September 2016. Socioeconomic status was obtained by using Modified Udai Pareek scale and categorized as low, middle and high income groups. Based on the occupation, participants were categorized as having sedentary, moderate and heavy activity. Anthropometry and clinical examination was done in all study subjects by the investigator and BMI score was used to categorize nutritional status as underweight (<18.5), normal (18.5–24.99), overweight (25.0–29.99) and obese (>30.0). Socio demographic factors and other determinants were recorded using a semi-structured questionnaire.

The WOMAC (Western Ontario and McMaster Universities) osteoarthritis index 5-point Likert version was used to detect patients for OA. The WOMAC index is the best validated and most widely used outcome measure in subjects with knee osteoarthritis.[10,11] It is a 24 item questionnaire focusing on pain, stiffness, and functional limitation.[12] In the Likert version, each item offers 5 responses: "none" scored as 0, "mild" as 1, "moderate" as 2, "severe" as 3, and "extreme" as 4. The total score for each subscale is the sum of scores for each response to each item, and can be calculated manually or using a computer. The range for possible subscale scores in the Likert format are: pain (0–20; 5 items each scored 0–4), stiffness (2 items, 0–8), and physical function (17 items, 0–68). Higher scores indicate worse pain, stiffness, or physical function. The maximum score obtained by the subjects would be 96. Based on the WOMAC score obtained, patients were categorized as low risk (score ≤60), moderate risk (score 60–80) and high risk (score ≥81). WOMAC scores is also expressed as percentages and categorized into low risk (≤70%) and high risk (>70%). If 2 or more pain items, both stiffness items, and 4 or more physical function items are missing, the response is regarded as invalid and the deficient subscale(s) is not included in analysis.[13]

All the study participants were also subjected to American College of Rheumatology (ACR) clinical classification criteria[14]. In this criterion the presence of knee pain along with at least three of the following six items is classified as having knee OA in the patients:[16]

1. Age >50 years old
2. Morning stiffness <30 minutes
3. Crepitus on knee motion
4. Bony tenderness
5. Bony enlargement
6. No palpable warmth.

All the interns were trained on using ACR criteria and clinical examination of knee joint was performed under the supervision of a qualified orthopaedician. All consenting subjects aged 50 years and above complaining of knee pain of both genders were included in the study after obtaining informed consent. Patients with known bony deformities, who have undergone any knee surgeries and other causes of arthritis like Rheumatoid

arthritis were excluded from the study. Institutional ethical clearance was obtained for the study.

Statistical analysis

Data was entered on Microsoft excel sheet and analyzed using statistical software SPSS version 15. Descriptive statistics such as frequencies, proportions, mean and standard deviation were used. Chi-square used to check the association and $p<0.05$ considered as statistically significant. Odds ratio with 95% confidence interval was calculated to find out of the strength of association. McNemar's test was done to analyze the agreement between WOMAC index and ACR clinical criteria.

RESULTS

During the study period, a total of 103 subjects were included. Of which 45 (43.7%) were males and 58 (58.3%) were females. Majority of them (49.5%) were in the age group of 50–59 years. Hindus contributed major share (84.5%) of the sample and 71.8% of them had normal BMI scores. About 40.5% of them were housewives. Socio demographic characteristics are shown in Table 1.

Table 1: Socio demographic variables of the study population (n=103).

Variables	Number	Percentage (%)
Gender		
Male	45	43.7
Female	58	56.3
Age group		
50–59 years	51	49.5
60–69 years	35	34.0
70 years & above	17	16.5
BMI		
<18.50	08	7.8
18.50-24.99	74	71.8
25.00-29.99	19	18.4
≥30.00	02	1.9
Occupation		
White collar job	02	1.9
Skilled	05	4.9
Semiskilled	22	21.4
Unskilled	24	23.3
House wife	42	40.8
Unemployed	08	7.8
Religion		
Hindu	87	84.5
Muslim	11	10.7
Christian	05	4.8
Socio economic status		
Low	63	61.2
Middle	31	30.1
High	09	8.7

The study revealed that based on WOMAC index, 43.7% of the subjects had low risk (score ≤60), 39.6% had moderate risk (score 60–80) and 19.4% had high risk (score ≥81) for knee osteoarthritis. The mean±SD WOMAC score among the subjects was 64.40±15.2. According to ACR clinical criteria, 73.8% of the study subjects satisfied the criteria for having osteoarthritis. The scores of each item in the WOMAC index and WOMAC scores as a percentage among study population are shown in Table 2.

Table 2: Osteoarthritis screening tool scores among study population (n=103).

Variables	Number	Percentage (%)
WOMAC index		
Pain score (out of 20)		
Mean (S.D)	13.19 (3.2)	-
Minimum score	02	
Maximum score	18	
Stiffness score (out of 8)		
Mean (S.D)	5.17 (1.7)	
Minimum score	0	
Maximum score	08	
Physical function score (out of 68)		
Mean (S.D)	46.04 (11.2)	
Minimum score	19	
Maximum score	67	
WOMAC index total score (out of 96)		
Mean (S.D)	64.40 (15.2)	-
Minimum score	27	
Maximum score	92	
WOMAC index score categories		
Low risk (score ≤60)	45	43.7
Moderate risk (score 60–80)	38	39.6
High risk (score ≥81)	20	19.4
WOMAC score (as %)		
Low risk (≤ 70%)	62	60.2
High risk (> 70%)	41	39.8
ACR criteria		
Yes	76	73.8
No	27	26.2

To study the association between study variables and osteoarthritis, WOMAC scores as percentage [low risk (≤70%) and high risk (>70%)] were used. The independent variables are age group, BMI, occupation, activity, history of chronic diseases like hypertension, diabetes, trauma, family history and hysterectomy done. Age group [OR 2.85; 95% CI 1.25-6.48) and gender [OR 2.29; 95% CI 1.01-5.24) were significantly associated with WOMAC score percentage using Chi square test analysis. Other factors were not found to be significant (Table 3).

Also, the WOMAC score percentage was compared with ACR clinical criteria. Out of 76 subjects who were positive with ACR criteria, 36 (47.4%) had high risk WOMAC scores (>70%). This is shown in Table 4. Thus, WOMAC index showed greater diagnostic accuracy with statistically significant agreement with a p-value 0.009 using McNemar's test.

Table 3: Association between risk factors for OA and WOMAC index among the study population using Chi square test.

Variables	Low risk (≤70) n (%)	High risk(>70) n %	Total (n)	Odd's ratio (95% C.I)/ P value
Age group				
50–59 years	37 (72.5)	14 (27.5)	51	1
≥60 years	25 (48.1)	27 (51.9)	52	2.85 (1.25, 6.48)
Gender				
Male	32 (71.1)	13 (28.9)	45	1
Female	30 (51.7)	28 (48.3)	58	2.29 (1.01, 5.24)
BMI				
<18.5	4 (50)	4 (50)	8	
18.5-22.99	21 (51.2)	20 (48.8)	41	0.193 #
≥23	37 (68.5)	17 (31.5)	54	
Activity				
Sedentary	5 (50)	5 (50)	10	
Moderate	32 (60.4)	21 (39.6)	53	0.773 #
Heavy	25 (62.5)	15 (37.5)	40	
H/O trauma				
No	59 (59.6)	40 (40.4)	99	1
Yes	3 (75)	1 (25)	4	0.49 (0.05, 4.89)
H/O hypertension				
No	55 (61.8)	34 (38.2)	89	1
Yes	7 (50)	7 (50)	14	1.62 (0.52, 5.02)
H/O diabetes				
No	50 (61)	32 (39)	82	1
Yes	12 (57.1)	9 (42.9)	21	1.17 (0.44, 3.10)
H/O thyroid disorders				
No	60 (59.4)	41 (40.6)	101	0.516 #
Yes	02 (100)	0 (0)	2	
H/O hysterectomy (n=58)				
No	25 (55.6)	20 (44.4)	45	1
Yes	05 (38.5)	08 (61.5)	13	2.00 (0.57, 7.07)
H/O OA in family				
No	37 (57.8)	27 (42.2)	64	1
Yes	25 (64.1)	14 (35.9)	39	0.76 (0.34, 1.74)
Total	62	41	103	

#p-value as Odds Ratio could not be computed for these variables.

Table 4: Agreement analysis of WOMAC index compared to ACR clinical criteria for diagnosing osteoarthritis among the study population using McNemar's test.

	ACR criteria			
WOMAC score	**Yes**	**No**	**Total**	**P value**
High risk (>70%)	36	05	41	
Low risk (≤70%)	40	22	62	0.009*
Total	76	27	103	

*statistically significant; p<0.005

DISCUSSION

In the present study, subjects aged 50 years and above were included as OA risk is significantly high among elderly. WOMAC is well known tool used to assess the course of disease or response to treatment in patients with knee OA. It is the most widely used condition-specific instruments for the assessment of knee OA.[10,11,15,16] But in the present study, it was attempted to use WOMAC to assess the risk profile of study participants complaining of knee pain for OA. This warranted us to compare the WOMAC outcome with a standard tool for OA. For this purpose, American College of Rheumatology (ACR) clinical classification criteria was used.[14] ACR criteria remain a popular method of classifying knee osteoarthritis, recommended for clinical and epidemiological studies and the practice of primary care.[17,18] Various well known risk factors for OA were studied to find any association with subjects with high risk WOMAC score percentage. For ease of analysis to compute Odds Ratio, age group was categorized into two groups as 50-59 years and ≥60 years. Also, BMI was classified according to revised guidelines for Asian Indians.[19] It was found in the study that subjects aged ≥60 years of age had high WOMAC score percentage (51.9%) compared to subjects less than 60 years (27.5%) with [OR 2.85; 95% CI 1.25-6.48]. Many studies showed increasing age to be a risk factor for OA.[20-22] Females had high WOMAC score percentage (48.3%) compared to males (28.9%) with [OR; 2.29; 95% CI 1.01-5.24]. This was consistent with higher incidence rates of knee OA in women than men reported by many other studies.[23-26] Although overweight/obesity is a known risk factor for knee OA, the present study did not find any significant association (p-value, 0.193) with increased BMI and high risk WOMAC score percentage.[23,27] There are evidence that specific occupations were risk factors for knee pain, for example, farming, construction work, standing (>2 h per day) and physical education teaching.[28] In the present study subjects with moderate activity (39.6%) had more WOMAC score percentage which was not statistically significant (p-value, 0.773).

Though previous knee injury is a known risk factor for OA, only one out of four subjects who reported past history of knee trauma had high WOMAC score percentage.[28] Hence, its association was not significant [OR 0.49; 95% CI 0.05-4.89]. Participants with history of hypertension had high WOMAC score percentage (50%) compared to non-hypertensives [OR 1.62; 95% CI 0.52-5.02] but was not significant. There is mixed evidence of the association of hypertension with onset of knee OA with few showing significant positive association and few revealing no association.[28] Other chronic diseases like diabetes and thyroid disorders were not found to have any effect on WOMAC scores in the study. There are also no evidence linking these to OA.[28] There are studies which evaluated hysterectomy as a risk factor suggesting there may be a modest association of hysterectomy with onset of knee OA, although all three results were non-

significant.[28] In the present study also there was no significant association with hysterectomy. We could not find any association between family history of OA and WOMAC scores though Cooper et al in their study found family history [OR 2.7; 95% CI 1.3-5.5] as one of the independent risk factor for OA.[29] Comparing WOMAC score percentages with ACR criteria for knee OA revealed statistically significant agreement which indicated the diagnostic accuracy of WOMAC index. Since ACR criteria is a well-known tool for diagnosing knee OA clinically, we can count on WOMAC index also in detecting high risk individuals who can be further evaluated for OA.

CONCLUSION

Osteoarthritis is one of the most chronic debilitating diseases among elderly and early diagnosis & treatment still remains the key in reducing the morbidity. In a resource constraint country like India, a simple questionnaire based tool to detect high risk individuals for knee OA at an early stage is the need of the hour. WOMAC index which is usually used to evaluate effectiveness of treatment for OA patients can be used as a screening tool.

Limitations

A community based study with a larger sample would have been better to evaluate the effectiveness of the WOMAC index. Radiographic imaging is the reference standard for diagnosing knee OA. The ACR clinical criteria seem to reflect later signs in advanced disease. Upon using ACR Clinical classification criteria a significant percentage of the cases of early knee OA can be missed.

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