

RESEARCH ARTICLE

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in Persian Speaking Patients with Knee Osteoarthritis

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Abstract

Background: Osteoarthritis of the knee is the most common chronic joint disease that involves middle aged and elderly persons. There are different clinical instruments to quantify the health status of patients with knee osteoarthritis and one example is the WOMAC score that has been translated and adapted into different languages. The purpose of this study was cultural adaptation, validation and reliability testing of the Persian version of the WOMAC index in Iranians with knee osteoarthritis.

Methods: We translated the original WOMAC questionnaire into Persian by the forward and backward technique, and then its psychometric study was done on 169 native Persian speaking patients with knee degenerative joint disease. Mean age of patients was 53.9 years. The SF-36 and KOOS were used to assess construct validity.

Results: Reliability testing resulted in a Cronbach's alpha of 0.917, showing the internal consistency of the questionnaire to be a reliable tool.

Inter-correlation matrix among different scales of the Persian WOMAC index yielded a highly significant correlation between all subscales including stiffness, pain, and physical function. In terms of validity, Pearson's correlation coefficient was significant between three domains of the WOMAC with PF, RP, BP, GH, VT, and PCS dimensions of the SF-36 health survey ($P < 0.005$) and KOOS ($P < 0.0001$).

Conclusions: The Persian WOMAC index is a valid and reliable patient-reported clinical instrument for knee osteoarthritis.

Key words: Iranian version, Knee osteoarthritis, KOOS, Persian, Reliability, Validity, WOMAC

Introduction

Osteoarthritis of the knee is the most common chronic joint disease which involves middle age and old persons (1). The rate of OA is rapidly rising as the human communities become older. Pain, stiffness and crepitation on active motion of the knee, are common symptoms of knee osteoarthritis which not only decrease the abilities of the patient, but also affects the health related quality of life (2).

According to WHO-ILAR COPCORD study, the prevalence of knee OA ranged from 1.4% in urban Filipinos to 19.3% in rural communities in Iran. The same report claims, Iranians are the most involved community with

knee OA among countries that the study was done (3).

In order to quantify health status of patients with knee osteoarthritis, different patient based subjective instruments has been developed in recent decades (4).

Self-administered Western Ontario and McMaster Universities (WOMAC) index is the most common used clinical tools for evaluating patients with knee OA. It includes five questions about pain, two about stiffness, and 17 on degree of disability of activities of daily living.

Since its presentation by Bellamy *et al* in 1988, it has been validated in some countries and languages including; Spain, Germany, China, Japan, Turkey and Tunis (5-12).

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Different validation studies of WOMAC make this clinical instrument usable for knee OA evaluation before and at follow-up of treatment protocols including non-operative and operative.

These validation studies for WOMAC index also enable clinical investigators to assess those clinical outcome reports using this index for knee OA management from different parts of the world collectively.

To our knowledge, Persian version of WOMAC index has not been validated in Persian speaking patients with knee OA. Persian is spoken in Iran, Afghanistan and Tajikistan. As a result; the aim of this study was to assess validity and reliability of Persian translation of WOMAC index in Iran.

Materials and Methods

Participants

One hundred sixty-nine individuals who were diagnosed having osteoarthritis of the knee invited to participate in our survey in the knee clinic of Ghaem hospital at Mashhad University of Medical Sciences, Mashhad, Iran. Including criteria were OA of the knee as the primary problem of the patient, age minimum of 50 years, no previous surgery for knee OA and ability to read and write in Persian. Excluding criteria included knee OA with less than 50 years old, diagnosis of rheumatic disease, vascular disease, advanced cardiopulmonary disease and lower limb neuralgic impairment. In all patients, Persian was their mother tongue. The study has got approval from the Committee of Ethical Affairs in Research of Mashhad University of Medical Sciences. All participants were informed of the study and signed the consent form.

Instruments

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)

This questionnaire is used to assess the health status of osteoarthritis patients introduced in 1988 (13). It is consisted of 33 items which evaluates the health and function of the patient from various aspects including: clinical symptoms (5 questions), severity of joint stiffness (2 questions), degree of pain (9 questions), and activity of daily living (17 questions).

Each question has five subscales where best situation scores as never or none and the worst one names as extreme or always. Here, higher scores are representative of better situation and less pain.

The SF-36 Health Survey Questionnaire

The SF-36 is the most widely used clinical instrument for evaluation of health related quality of life since introduced in 1980s. This questionnaire is used to assess health status and quality of life of individuals and has 8 dimensions. Physical Functioning (PF), Social Functioning (SF), Role-Physical (RP), Bodily Pain (BP), Mental Health (MH), Role-Emotional (RE), Vitality (VT), and General Health (GH). The SF-36 was constructed to satisfy minimum psychometric standards necessary for group comparisons. This health status survey reported valid and reliable in Persian language in Iran by Montazeri *et al* in 2005 (14).

The Knee injury and Osteoarthritis Outcome Score (KOOS)

This questionnaire is actually an extended version of WOMAC. It was developed in 1990 and its psychometric properties (validity and reliability) have been examined in various languages including Persian (15-22). KOOS is self-explanatory and has 42 scales including; pain, other symptoms, activity of daily living (ADL), sport and recreation (Sport/Rec) and knee related quality of life (QOL).

The KOOS has been used in numerous studies for reporting clinical outcome of OA, post traumatic OA, ACL, chondral and meniscal management (23-27).

Translation

At first, we translated the original English questionnaire to Persian with forward backward method according to Guillimin *et al* (28). In this style, the original English form of the WOMAC questionnaire, firstly translated to Persian by two orthopedic surgeons and one professional English translator. Then we had a panel discussion to evaluate the similarities and differences of translations and reached to a unanimous interpretation. At the next step, a professional translator who her native language was English and fluent in Persian, did the backward translation by interpreting our final Persian version of the WOMAC to English. At the end, we compared the original form with backward translated paper. There was not a significant difference between the original English WOMAC and the translated transcript from Persian WOMAC index.

Validity

Construct validity examines how well a score measure what is expected to measure. Validity refers to comparison of the current test with formerly standardized test. A one-way analysis of variance was carried out in three WOMAC dimensions.

We calculated correlation analysis between Persian versions of WOMAC with SF-36 and KOOS which already are validated in Persian as standardized tests. The 8-dimensions Persian SF-36 were utilized to evaluate convergent and divergent validity of the 24-item Persian WOMAC.

Construct validation was calculated using Pearson correlation coefficients between 24-item WOMAC with the Persian version SF-36 and KOOS.

Content validity was assessed by evaluating distribution and floor effect and ceiling effect of the 24 questions of WOMAC. This content validity lets us to find out whether questions of the Persian WOMAC demonstrate all domains of the patient's disease. As their names say, ceiling effect is highest possible score and floor effect is the opposite side. For these indexes, the proportion of answer frequencies with the lowest possible score in domains of pain, stiffness and function is 4,3 and 0 respectively, and the highest possible score in domains of pain, stiffness and function is 35,25 and 68 among our patients was calculated.

A floor and ceiling effect is considered when more than 15% of the case series got the highest and lowest total possible score (29).

Table 1. Demographic features of the participants with knee OA

Gender, N (%)	
Male	40 (23.7)
Female	129 (76.3)
Age, Mean (SD)	53.9 (13.3)
Level of education, N (%)	
Primary school	118 (69.8)
Secondary school	19 (11.2)
High school	23 (13.6)
Higher education	8 (4.7)

Reliability (internal consistency)

To evaluate reproducibility of the items of Persian WOMAC, test-retest reliability and Intraclass Correlation Coefficient (ICC) was calculated. For this reason we ran-

domly asked 30 out of 169 patients to fill out the Persian WOMAC 72 hours later and in this period they did not receive any major treatment to change their condition substantially.

The ICC ranges from 0.00 (no agreement) to 1.00 (fully agreement) and describes the extent of repetition of the answers by the patients.

Internal consistency of the Persian WOMAC was evaluated by Cronbach's alpha, when this index is between 0.70 and 0.90 it indicate good reliability (30, 31).

Results

It took around 15 minutes (range from 6 to 25 minutes) for the patients to fill out the Persian WOMAC form. Most of the participants were women (76.3%) with mean age of 53.9 (Table 1).

Reliability (Internal consistency)

Assessing the data by using SPSS software revealed a Cronbach's alpha of 0.917 which presents competency

Table 2. Reliability of the Persian WOMAC index subscales

		Stiffness	Pain	Physical Function	Mean (SD)	Floor effect (%)	Ceiling effect (%)
Stiffness	r	1	0.552	0.485	15.3 (4.48)	0 (0%)	1 (0.6%)
	p		0.000	0.000			
Pain	r	0.552	1	0.826	22.57 (6.3)	0 (0%)	5 (2.9%)
	p	0.000		0.000			
Physical Function	r	0.485	0.826	1	40.94 (13.4)	1 (0.6%)	1 (0.6%)
	p	0.000	0.000				

Table 3. Correlations between SF-36 dimensions and WOMAC subscales

		Range	Mean (SD)		Stiffness	Pain	Physical Function
The SF-36	PF	0-95	39.2 (22.5)	r	-0.247	-0.561	-0.667
				p	0.001	0.000	0.000
	RP	0-100	23.3 (36.9)	r	-0.229	-0.304	-0.380
				p	0.003	0.000	0.000
	BP	0-100	29.0 (21.7)	r	-0.337	-0.548	-0.599
				p	0.000	0.000	0.000
	GH	0-100	43.7 (23.5)	r	-0.233	-0.436	-0.480
				p	0.002	0.000	0.000
	VT	5-95	47.9 (22.0)	r	-0.198	-0.397	-0.452
				p	0.010	0.000	0.000
	SF	0-100	56.1 (30.5)	r	-0.118	-0.332	-0.424
				p	0.125	0.000	0.000
	RE	0-100	56.1 (30.5)	r	-0.021	-0.149	-0.185
				p	0.782	0.054	0.016
	MH	0-100	56.5 (24.9)	r	-0.138	-0.258	-0.314
				p	0.074	0.001	0.000
PCS	0-45	29.9 (9.54)	r	-0.325	-0.541	-0.637	
			p	0.000	0.000	0.000	
MCS	2-54	44.3 (13.3)	r	-0.056	-0.189	-0.245	
			p	0.471	0.014	0.001	

Table 4. Correlation between subscales of the Persian WOMAC and total score of the Persian KOOS (N=169)

		Correlation	KOOS
WOMAC	Knee stiffness	r	-0.559
		p	0.000
	Pain	r	-0.842
		p	0.000
	Physical Function	r	-0.894
		p	0.000

of the questionnaire's internal consistency to act as a reliable tool.

Inter-correlation matrix among different scales of the Persian WOMAC index was done to discover the dependency between various aspects of the questionnaire within its subscales. The test yielded a highly significant correlation between all subscales including stiffness, pain, and physical function. Table 2 demonstrates more information regarding the findings.

ICC (Interclass Correlation Coefficients)

In order to check the test-retest reliability of the survey, Interclass Correlation Coefficient carried out. The average measure was shown to be 0.964.

Validity (construct validity)

For the purpose of finding the dependency between different domains of the Persian WOMAC and Persian SF-36, Pearson's correlation coefficient was applied. As we have showed in Table 3, there was a significant correlation between almost all dimensions of both questionnaires. However, this correlation did not occur between SF, RE, MH, MCS and Stiffness as well as RE and Pain.

Among them, the highest score which achieved by the patients was the MH sub scale (56.5). On the other hand, RP showed to have the lowest level (23.3) between them. Table 3 shows more information regarding mean SF-36 scores of the participants.

In order to check the validity of the survey more, we assessed the correlation between Persian WOMAC and KOOS as well. There was a significant negative correlation between sub scales of the Persian WOMAC and total score of the Persian KOOS (Table 4).

Discussion

Although Knee osteoarthritis is a chronic disease that is not fatal, but cause major impact on emotional, daily physical and social activity of patients. Consequently, it affects health related quality of life. Non-operative or operative treatments not only improve pain and mobility but also quality of life as a whole.

The WOMAC index is widely used by clinical investigators in clinical trials, large-scale databases and registries. The psychometric properties of the questionnaires

measuring the HRQOL are established by studying their validity, reliability and responsiveness.

As an international well known clinical specific-disease patient-reported measurement, it has been validated by different studies including the studies by Davis *et al*, Akker-Scheek *et al* and Salaffi *et al* in Italy (22, 32, 33).

Reliability

Assessment of reliability by Cronbach's alpha revealed a very satisfactory result which is 0.96. Similarly, other studies in Spain, and Italy reached to almost the same finding of Cronbach's alpha of 0.88 and 0.89 respectively (7, 33).

In the study from Netherland, Intraclass correlation of the Dutch WOMAC index demonstrated to be 0.87 (32). On the other hand, this figure in Germany showed to be between 0.55 and 0.74 (8). The lowest amount found in the Arabic translation of the questionnaire which was 0.61 (12). Test-retest reliability in the current survey of the Persian WOMAC showed to be very satisfactory and the number reached to 0.96.

Validity

The Persian SF-36 as a valid and standard questionnaire was used to examine how competent is the Persian WOMAC instrument to assess different subjects related to knee OA problem. In Turkey, the results showed a significant correlation between WOMAC and Turkish SF-36 (11). Similarly, Spanish study could reach to the same finding (7). In addition to these, Japanese investigators just could show the relation of General Health (GH) and Bodily Pain (BP) components of the SF-36 with sub scores of WOMAC (10). Conversely, Chinese version revealed a poor correlation between these two questionnaires (9). In our current study, we also did a more powerful validity assessment by comparing the Persian KOOS and Persian WOMAC index. As its shown in Table 4, the Pearson test demonstrates a negative significant correlation between items of these two instrument; the Persian KOOS and Persian WOMAC index. This finding confirms efficient validity of the Persian WOMAC index.

In conclusion, the Persian WOMAC index is a valid and reliable patient-reported clinical instrument for knee osteoarthritis.

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