

# Validity And Reliability Of The Arabic Version Of WOMAC Osteoarthritis Index In Egyptian Patients With Knee Osteoarthritis

Reda K. Abd Elrazik<sup>1</sup>, Fatma M. Alfeky<sup>2</sup>, Adel ME Zedan<sup>3</sup>, Sara Mohamed Samir<sup>4</sup>

- 1- Assistant professor at Department of Physical Therapy for Musculoskeletal Disorders and Its Surgery, Faculty of Physical Therapy, Benha University, Benha, Egypt
- 2- Lecturer at Department of Basic Science, Faculty of Physical Therapy, Benha University, Benha, Egypt
- 3- Assistant lecturer at Department of Physical Therapy for Musculoskeletal Disorders and Its Surgery, Faculty of Physical Therapy, Benha University, Benha, Egypt
- 4- Lecturer at Department of Physical Therapy for Musculoskeletal Disorders and Its Surgery, Faculty of Physical Therapy, Cairo University, Cairo, Egypt.

DOI: 10.47750/pnr.2022.13.S07.558

## Abstract

**Background:** Western Ontario and McMaster Universities (WOMAC) Osteoarthritis index is a multidimensional self-reported disease-specific questionnaire that assesses pain, stiffness and physical disability in patients with Osteoarthritis (OA) of the knee joint. **Purpose:** The aim of the study was to assess validity and reliability of the Arabic Version of WOMAC Osteoarthritis index in Egyptians with knee OA. **Methods:** The Arabic version of WOMAC Osteoarthritis Index was administered to fifty Egyptian knee OA. Range of motion (ROM) of knee flexion and radiographic severity were assessed for all patients by digital goniometer and X-Ray, respectively. Validity was assessed by relating the WOMAC to knee flexion range of motion and radiographic severity using spearman correlation coefficient. Besides, internal consistency and reliability were evaluated by Cronbach's alpha and intra-class correlation coefficients (ICC), respectively.

**Results:** Arabic Version of WOMAC Osteoarthritis Index showed weak correlation with knee flexion range of motion ( $\rho=-0.36$ ,  $P=0.037$ ) and little non-significant correlation with radiographic severity. Cronbach's alphas were 0.74–0.82. Test–retest reliability was 0.58–0.693.

**Conclusion:** Arabic Version of WOMAC Osteoarthritis Index is a reliable but less valid index for use in Egyptian patients with knee OA.

**Keywords:** Arabic Version; Egyptian; Knee Osteoarthritis; Reliability; Validity; WOMAC

## Introduction

Knee Osteoarthritis (OA) is a chronic progressive multifactorial knee joint disease and the most prevalent form of arthritis in elderly. It exerts a devastating economic burden on patients and healthcare system [1,2].

Majority of patients with knee OA have pain and disability in daily activities. In the absence of objective radiological findings, the patient-reported outcomes are crucial for clinical decision making in case of lack of objective radiological measure. As a result, OA treatments can be based on clinical aspects and functional status rather than relying on radiological findings (3,4).

Evaluation of knee symptoms in knee OA patients is important to assess the disease and to determine the treatment effectiveness. Thus, there is a need for valid and reliable measure to quantify the effect of OA of the knee joint on pain and disability and to assess the efficacy of interventions [5].

The “Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index” is a three-dimensional self-administered composite questionnaire to evaluate pain, stiffness and physical disability. It is the most commonly used instrument for the evaluation of OA of the knee and the hip [6].

The WOMAC Osteoarthritis Index (English version) has been assessed for validity and reliability and it was reports that it is valid and reliable (6). The original English language version of the WOMAC Osteoarthritis Index has been translated and validated into more than fifty languages as German (7), French (8), Spanish (9), Italian (10), Turkish (11), Moroccan (12) and classic Arabic (13).

The classic Arabic version of the WOMAC (ArWOMAC) was in literal Arabic language to match the largest Arab population use. However, literal terms may differ from dialectic ones. Also, the same dialectic word can differ in meaning among countries and regions (13) So, research about translation of WOMAC and adaptation to different cultures are important to enable comparison between assessments in different countries.

To our knowledge, there has been no published data concerning the validity and reliability of ArWOMAC for Egyptian knee Osteoarthritic patients. Thus, the aim of the current study was to evaluate validity and reliability of ArWOMAC Osteoarthritis Index in Egyptians with knee OA.

## Materials and Methods:

### Patients

A total of fifty Egyptian patients with primary knee OA aged over 40 years fulfilling the clinical and radiological criteria of the American College of Rheumatology for knee OA (14) were enrolled in the study. They were recruited from the Outpatient Orthopedic Physical Therapy Department at Kasr Al-Ainy Hospital, Cairo, Egypt.

Patients were excluded if they have secondary knee OA, acute synovitis, severe cardiovascular diseases, lower limb injuries or surgeries and intra-articular injections five months before the evaluation.

All patients were asked about demographic data, the most painful joint and symptoms duration. The study was approved from the research ethical committee No: P.T-BAS-12/2022-501. Informed consents were obtained from all patients. Confidentiality of data was retained.

Knee X-Ray was taken for each patient to grade knee radiographic severity based on Kellgren and Lawrence radiological scoring [15]. Range of motion (ROM) of knee flexion was assessed for all patients by digital goniometer.

### Procedures:

The ArWOMAC Osteoarthritis Index (13) was administered to the patients at baseline. The questionnaires were filled in quiet isolated room. The patients were assisted in reading and understanding of the questionnaire if they needed. Patients took 10-20 minutes to fill the questionnaire and illiterates took 5 minutes more.

The WOMAC Osteoarthritis Index consists of 24 items divided into three subscales: pain, joint stiffness and physical function. The pain subscale includes 5 questions about pain. The stiffness subscale includes 2 questions. The physical function subscale includes seventeen questions about the degree of activities of daily living difficulty. The questions are rated on a 5-point Likert scale version with 5 response levels for each item representing different intensity degrees scored from 0 to 4: zero is none, 1 is mild, 2 is moderate, 3 is severe, and 4 is extreme. The scores are summed for items in each subscale, with the following ranges: pain: 0–20, stiffness: 0–8, physical function: 0–68. Total WOMAC score was calculated by summing the items for all three subscales and ranged from 0 to 96. The WOMAC was assessed as total and also as three individual subscales. Higher scores indicate worse OA health status [4].

The subscales and their components of questions and manner of rating were presented in figure (1).

WOMAC index	استمارة ومارك
0 : not any	0 - لا شيء
1 : a little	1 - قليلة،
2 : moderate	2 - متوسطة،
3 : important	3 - كبيرة
4 : very important - extreme	4 - كبيرة جداً
<b>P Subscale :</b>	<b>(أ) الأوجاع :</b>
How much pain do you have:	ما هي شدة الأوجاع التي تصب بها ؟
1: walking on flat surface	1 - عندما تمشي على أرض مستوية.
2: going up or down stairs	2 - عندما تصعد أو تنزل الدرج.
3: at night while in bed	3 - في الليل و أنت في فراشك.
4: sitting or lying	4 - عند الجلوس أو الاستلقاء.
5: standing upright	5 - عند الوقوف.
<b>S Subscale :</b>	<b>(ب) اليبوسة أو التصلب المفصلي :</b>
how severe is your stiffness	ما هي شدة اليبوسة بمفاصلك ؟
1:After first wakening in the morning	1 - عندما تستيقظ في الصباح.
2:After sitting lying or resting later in the day	2 - بعد الجلوس أو الاستلقاء أو الاستراحة لثناء النهار.
<b>PF subscale:</b>	<b>(ج) الحركة الوظيفية :</b>
What degree of difficulty do you have	ما هي شدة الصعوبة ؟
1: descending stairs	1 - عندما تنزل الدرج.
2: ascending stairs	2 - عندما تصعد الدرج.
3: rising from sitting	3 - عند الوقوف بعد الجلوس
4: standing	4 - عند الوقوف.
5: bending to floor	5 - عندما تتحني إلى الأرض.
6: walking on flat	6 - عندما تمشي على أرض مستوية.
7: getting in / out of car	7 - عندما ترتكب أو تنزل السيارة.
8: going shopping	8 - عندما تذهب إلى السوق.
9: putting on socks / stockings	9- عندما تلبس الجوارب (القسيطة، الكلاسيك، القاتر)
10: rising from bed	10- عندما تقوم من الفراش.
11: taking off socks / stockings	11- عندما تزع الجوارب (القسيطة، الكلاسيك، القاتر)
12: lying in bed	12 - عندما تستلقي على الفراش.
13: getting in / off bath	13 - عندما تدخل أو تخرج من حوض الاستحمام.
14: sitting	14 - عند الجلوس على الكرسي.
15: getting on / off toilet	15 - عندما تجلس أو تقوم من المراحيض.
16: heavy domestic duties	16 - عندما تقوم بأعمال منزلية كبيرة.
17: light domestic duties	17 - عندما تقوم بأعمال منزلية خفيفة.

Fig. (1): The Arabic Version of WOMAC index used in the current study.

To examine test–retest reliability, patients were asked to refill WOMAC index for another time, after about two weeks from first one.

## Statistical analysis:

Descriptive statistics were presented for baseline characteristics of all patients. To compare the construct validity, correlations of WOMAC with Range of motion (ROM) knee flexion and radiographic severity were tested by Spearman's correlation test. To test the internal consistency of the WOMAC, Cronbach's alpha coefficient was used. A Cronbach's alpha value of 0.70 is generally sufficient, but values less than 0.60 are not reasonable. Also, Test–retest reliability coefficient was calculated. Intra-class correlation coefficients (ICC) with 95% confidence intervals (CI) were calculated, an ICC  $\geq 0.70$  is considered acceptable. Correlation coefficients were interpreted based on

previous studies [7, 16]. The strength of agreement for the ICC values was interpreted based on other previous research [9]. Statistical package “SPSS version 24 for Windows” was used for analysis. Significance level was 0.05.

## Results

Fifty Egyptians with knee OA aged of 56 ( $\pm 6$ ) years were studied. Baseline characteristics and clinical features were shown in Table 1. Seventy four percent (n=37) of knee OA patients were female. Fifty percent of the patients were right –sided affected. Body mass index (BMI) was 28.5 ( $\pm 3.6$ ) kg/m<sup>2</sup>.

**Table 1 Demographic data and baseline characteristics**

Variable	Mean $\pm$ SD
Age (years)	56 $\pm$ 6
BMI (kg/m <sup>2</sup> )	28.5 $\pm$ 3.6
Duration of disease (months)	9.5(54) <sup>^</sup>
<b>Radiological grade (n, %)</b>	
Grade I	8 (16)
Grade II	19 (38)
Grade III	19 (38)
Grade IV	4 (8)

(<sup>^</sup>): median (IQR); BMI body mass index

Patient characteristics as age, BMI, and duration of disease were analyzed for correlations with WOMAC. BMI correlated significantly with total scores of WOMAC (r=0.36) and all WOMAC subscales (r=0.31-0.45). Age correlated significantly with only stiffness subscale (r=-0.24) (Table 2).

**Table 2 Correlations between socio-demographic and baseline characteristics with WOMAC**

	Pain	Stiffness	Physical function	Total
Age	-	-0.24*	-	-
DOI	-	-	-	-
BMI	0.45*	0.35*	0.31*	0.36*

**BMI body mass index; WOMAC Western Ontario and McMaster Universities osteoarthritis index, DOI duration of illness, (-): insignificant weak or no correlation, (\*): significant at P<0.05**

Validity results were shown in Table 3. Correlation between WOMAC subscales (except stiffness) and total scores and ROM knee flexion was found weak. No correlations between radiological grades and the WOMAC subscales or total score were detected. The correlations between pain and stiffness subscales were 0.73, between pain and physical function subscales were 0.78 and between stiffness and physical function subscales were 0.72.

**Table 3 Construct validity of the WOMAC of knee OA patients**

WOMAC	ROM knee flexion	Radiographic severity	Pain	Stiffness	Physical function
Pain	-0.3*	-		0.73	0.78
Stiffness	-	-			

<b>Physical function</b>	-0.423*	-		0.72	
<b>Total</b>	-0.45*	-	0.87	0.81	0.98

**WOMAC Western Ontario and McMaster Universities osteoarthritis index, ROM Range of motion, (-): insignificant weak or no correlation, (\*): significant at P<0.05.**

Reliability findings revealed that WOMAC subscales had a moderate reliability (ICC 0.58–0.693). Cronbach’s alpha for pain, stiffness and physical function were 0.74, 0.81 and 0.82, respectively. Item and total scale correlations were 0.4– 0.89. (Table 4)

**Table 4 Internal consistency and reliability of WOMAC of knee OA patients**

<b>WOMAC knee</b>	<b>Score (test) Mean±SD</b>	<b>Score (retest) Mean±SD</b>	<b>Item-scale correlation<sup>a</sup></b>	<b>ICC (95% CI)</b>	<b>Cronbach’s alpha</b>
<b>Pain</b>	9.4±3.85	11.31±3.74	0.53–0.89	0.58 (0.26–0.79)	0.74
<b>Stiffness</b>	3.9±2	5.1±1.85	0.4	0.68 (0.41–0.85)	0.81
<b>Function</b>	37.4±14.84	38.25±12.15	0.46–0.7	0.69 (0.41–0.86)	0.82
<b>Total</b>	51.6±19.9	54.12±16.6	0.65-0.95	0.47 (0.37–0.59)	0.95

**WOMAC Western Ontario and McMaster Universities osteoarthritis index, ICC intra-class correlation coefficient, (°): Correlations are computed with the item of interest deleted**

## Discussion:

There is no doubt that, patient-self-reported outcome measure should be adequately valid for the disease and patients of interest and highly reliable. Validity and reliability of the Arabic version of the questionnaire should be assessed to ensure that this version similar to the original one. This is also important to allow comparison between measurements made in different populations.

The present study evaluated the validity and reliability of Arabic version of WOMAC Osteoarthritis index in Egyptian patients with knee OA.

The current study found that Arabic Version of WOMAC Osteoarthritis Index showed weak correlation with knee flexion range of motion (and little non-significant correlation with radiographic severity. Cronbach’s alphas of the WOMAC subscales were sufficient. Test–retest reliability of the WOMAC subscales was less than the acceptable level.

Findings of the present study support what was found by Guerhazi et al. [13]. They translated and adapted the WOMAC Osteoarthritis Index to Arabic language to suit Tunisian population and reported that the translated questionnaire is reliable but not valid in its original form.

The results of the current study are similar to Stucki et al. [17].They found that the internal consistency of German version of WOMAC were 0.81–0.96 similar to results of the current study, but ICC values were lower. They found moderate correlations between the WOMAC with radiological grade and range of motion, but the current study showed no correlations for subscales and total score of WOMAC with radiological grade and weak correlation with ROM.

In agreement with our finding, Basaran et al. [16] reported no correlations for subscales and total score of WOMAC with radiological grade.

Similar to the current study results, internal consistency values for subscales of WOMAC in Korean version were found to be 0.81–0.96 in patients with knee OA [3].

Cronbach's alpha values for subscales of WOMAC in Tunisian version were found to be 0.78–0.94 in patients with knee OA Basaran et al. [16]. Item-scale correlations and ICC values of WOMAC were higher than current study values. Responsiveness of The WOMAC was responsive in patients with lower limb osteoarthritis [18].

Validity and reliability of the French version WOMAC was assessed and found a good reliability and no validity for the index to assess dysfunction (2).

The study results confirm the findings of Tuzun et al. [11]. The internal consistency values were 0.71- 0.94, which were similar to findings of the present study and results of Basaran et al. [16] which were 0.78, 0.81, and 0.94, respectively. Construct validity was assessed (using SF-36) by Basaran et al. [16] and Tuzun et al. [11]. The correlation values for WOMAC total and physical functioning were -0.73 and -0.63, respectively in both studies.

The correlation between pain and stiffness subscales was 0.57. The correlation between pain and physical function subscales 0.67 and between Stiffness and physical function subscales 0.71 were reported by Guermazi et al. [13], which were slightly lower than the values of the present study.

Khuman et al., (19) showed that WOMAC is reliable (test-retest reliability or ICC of 0.986) and valid compared to VAS ( $r = 0.716$ ) and dynamometry ( $r = -0.915$ ). This report partially agrees with results of the current study. The difference may be due to differences in measuring convergent validity.

In agreement with the present study, Williams et al. (20) found that WOMAC had acceptable reliability and responsiveness to examine change in functional status of knee OA patients.

Ebrahimzadeh et al. (21) showed that Persian WOMAC index is valid (compared to KOOS and SF-36), contradicting with the current study results. However, they reported that WOMAC was reliable (Cronbach's alpha of 0.917) patient-reported clinical instrument for knee OA supporting the current results.

Seifeldein et al. (22) reported that WOMAC pain and stiffness was valid compared to ultrasonography (articular cartilage thickness) and  $r = 0.342-0.414$  suggesting that the severity of Knee OA ultrasonographic severity revealed good correlation with WOMAC index. The present study does not support the finding of Seifeldein and colleagues may be due to differences in measuring methods.

Contradicting to the current study results, Ferreira et al. (23), Roos and Lohmander (24), and Faik et al. (12) found that Brazilian, Swedish, and Moroccan versions of WOMAC were valid, respectively.

**In conclusion**, Arabic version of WOMAC Osteoarthritis Index showed acceptable reliability and weak validity in Egyptians with osteoarthritis of the knee.

## Recommendation

Authors of the current study recommend Translation and Cross culture adaptation of WOMAC osteoarthritis index to better suit Egyptians with knee OA.

**Disclosures:** None declared by the authors.

## References

1. Hunter D.J., Bierma-Zeina S. Osteoarthritis. *Lancet*. 2019; 393(10182):1745–1759.
2. Mobasheri A, Fonseca JE, Gualillo O, Henrotin Y, Largo R, Herrero-Beaumont G, et al. Editorial: inflammation and biomarkers in osteoarthritis. *Front Med*. (2021) 8:727700. doi: 10.3389/fmed.2021.727700
3. Faucher M, Poiraudou S, Lefevre-Colau MM, Rannou F, Fermanian J, Revel M (2002) Algo-functional assessment of knee osteoarthritis: comparison of the test-retest reliability and construct validity of the WOMAC and Lequesne indexes. *Osteoarthritis Cartilage* 10:602–610
4. GAZAR Y, MOHAMMED H, GHAI M. the Relationship between Pain Pattern and Disability in Patients With Knee Osteoarthritis. *Al-Azhar Int Med J*. 2022;3(1):1–6.

5. Bae SC, Lee HS, Yun HR, Kim TH, Yoo DH, Kim SY (2001) Cross-cultural adaptation and validation of Korean Western Ontario and McMaster Universities (WOMAC) and Lequesne Osteoarthritis Indices for clinical research. *Osteoarthritis Cartilage* 9:746–750  
*Clin Rheumatol* (2010) 29:749–756 755
6. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW (1988) Validation study of WOMAC: a health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. *J Rheumatol* 15(12):1833–1840.
7. Stucki G, Meier D, Stucki S, Michel BA, Tyndall AG, Dick W, Theiler R (1996) [Evaluation of a German version of WOMAC (Western Ontario and McMaster Universities) Arthrosis. Index]. *Z Rheumatol* 55(1):40–49
8. Choquette D, Bellamy N, Raynauld JP (1994) A French–Canadian version of the WOMAC osteoarthritis index. *Arthritis Rheum* 18:402–405
9. Escobar A, Quintana JM, Bilbao A, Azkarate J, Guenaga JI (2002) Validation of the Spanish version of the WOMAC questionnaire for patients with hip or knee osteoarthritis. *Western Ontario and McMaster Universities Osteoarthritis Index. Clin Rheumatol* 21(6):466–471
10. SalaY F, Lear dini G, Canesi B, Mannoni A, Fioravanti A, Caporali R, Lapadula G, Punzi L (2003) GOnorthrosis and Quality Of Life Assessment (GOQOLA) reliability and validity of the estern Ontario and McMaster Universities (WOMAC) Osteoarthritis Index in Italian patients with osteoarthritis of the knee. *Osteoarthritis Cartilage* 11(8):551–560
11. Tuzun EH, Eker L, Aytar A, Daskapan A, Bayramoglu M (2005) Acceptability, reliability, validity and responsiveness of the Turkish version of WOMAC osteoarthritis index. *Osteoarthritis Cartilage* 13(1):28–33
12. Faik, A.; Benbouazza, K.; Amine, B.; Maaroufi, H.; Bahiri, R.; Lazrak, N.; Aboukal, R.; Hajjaj-Hassouni, N. Translation and validation of Moroccan Western Ontario and McMaster Universities (WOMAC) osteoarthritis index in knee osteoarthritis. *Rheumatol. Int.* 2008, 28, 677–683. [CrossRef]
13. Guermazi M, Poiraudau S, Yahia M, Mezganni M, Fermanian J, Elleuch MH and Revel M. Translation, adaptation and validation of the Western Ontario and McMaster Universities osteoarthritis index (WOMAC) for an Arab population: the Sfax modified WOMAC (2004) *OsteoArthritis and Cartilage* 12, 459–468.
14. Altman R, Asch E, Bloch D, Bole G, Bormstein D, Brandt K, et al. Development of the criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. *Arthritis Rheum.* 1986;29(8):1039–49.
15. Kellgren JH, Lawrence JS (1987) Radiologic assessment of osteoarthritis. *Ann Rheum Dis* 16:494–501.
16. Basaran S & Guzel R & Seydaoglu G & Guler-Uysal F. Validity, reliability, and comparison of the WOMAC osteoarthritis index and Lequesne algofunctional index in Turkish patients with hip or knee osteoarthritis. *Clin Rheumatol* (2010) 29:749–756 DOI 10.1007/s10067-010-1398-2.
17. Stucki G, Sangha O, Stucki S, Michel BA, Tyndall A, Dick W, Theiler R (1998) Comparison of the WOMAC (Western Ontario and McMaster Universities) osteoarthritis index and a self-report format of the self-administered Lequesne-Algofunctional index in patients with knee and hip osteoarthritis. *Osteoarthritis Cartilage* 6:79–86
18. Theiler R, Shanghai O, Schaeren S, Michel BA, Tyndall A, Dick W, Stucki G (1999) Superior responsiveness of the pain and function sections of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) as compared to the Lequesnealgofunctional Index in patients with osteoarthritis of the lower extremities. *Osteoarthritis Cartilage* 7:515–519.
19. Khuman RP, Chavda D, Surbala L, Bhatt U (2018) Reliability and validity of modified western ontario and mcmaster universities osteoarthritis index gujarati version in participants with knee osteoarthritis. *Physiother - J Indian Assoc Physiother* 12:8-15.
20. Williams VJ, Piva SR, Irrgang JJ, Crossley C, Fitzgerald K (2012) Comparison of reliability and responsiveness of patient-reported clinical outcome measures in knee osteoarthritis rehabilitation. *J Orthop Sports Phys Ther* 2012;42(8):716–723.
21. Ebrahimzadeh MH, Makhmalbaf H, Birjandinejad A, Keshtan FG, Hoseini HA, Mazloumi AM (2014) The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) in persian speaking patients with knee osteoarthritis. *Arch Bone Jt Surg* 2(1),57-62.
22. Seifeldein GS, Haseib A, Hassan HA et al. (2019) Correlation of knee ultrasonography and Western Ontario and McMaster University (WOMAC) osteoarthritis index in primary knee osteoarthritis. *Egypt J Radiol Nucl Med* 50, 28. <https://doi.org/10.1186/s43055-019-00294>.
23. Ferreira CDB, Dibai-Filho AV, Almeida DOD, Bassi-Dibai D, Barreto FS, de Oliveira AR, Fidelis-de-Paula-Gomes CA (2020) Structural validity of the Brazilian version of the Western Ontario and McMaster Universities Osteoarthritis Index among patients with knee osteoarthritis. *Sao Paulo Med J* 138(5):400-6.
24. Roos M, Lohmander LS (1999) WOMAC Osteoarthritis Index: reliability, validity, and responsiveness in patients with arthroscopically assessed osteoarthritis. *Scand J Rheumatol* 28(4):210–215.