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Performance of Arabic version short form-12 in the assessment of osteoarthritis patients' quality of life

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ABSTRACT

Objectives: Osteoarthritis (OA) is the most common joint disease affecting the subchondral bone and the joint cartilage. This study aimed to evaluate the reliability and validity of the Arabic short form-12 (SF-12) questionnaire for OA patients' quality of life (QoL) and explore its association with self-reported disability and disease characteristics.

Methods: This study, conducted at the Rheumatology and Rehabilitation Department, included 95 OA patients. The validity of the SF-12-Arabic scale was evaluated by comparing it to the validated Arabic version of the Western Ontario McMaster Osteoarthritis Index (WOMAC) and the Osteoarthritis Quality of Life (OAQoL) questionnaire, and the test-retest reliability was assessed.

Results: Cronbach's alpha for the total SF-12 value was 0.802, representing good internal consistency. The pattern of correlation between the SF-12, WOMAC, OAQoL, and visual analog scale (VAS) supported the construct validity, as there was a significant negative correlation between the SF-12 total score and each of the WOMAC pain, WOMAC stiffness, WOMAC functional, WOMAC total, OAQoL, and VAS score.

Conclusion: The Arabic SF-12 questionnaire has good reliability and convergent validity but poor discriminant validity. It is a valid and reliable tool for assessing QoL in Arab patients with OA.

Keywords: Osteoarthritis, Quality of life, Reliability, Short form-12 questionnaire, Validity

INTRODUCTION

Osteoarthritis (OA) is a widely disabling chronic degenerative disorder that affects people all over the world. It has a significant financial and social impact on individuals as well as healthcare systems in various countries.[1] Around the world, 250 million people are affected by the progressive deterioration of joints, which causes physical impairment.[2]

OA affects around 30% of the people over the age of 60. Of adults over 50, about 40% exhibit early imaging indicators that may be related to the illness.[3] In 2020, there were 595 million cases of OA worldwide, accounting for 7.6% of the world's population and representing a 132.2% (130.3–134.1) increase in total cases since 1990.[4] The prevalence of OA is 8.5%, making it the most prevalent degenerative disease in Egypt. The condition primarily affects the knees

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and is more prevalent in women than men, whereas hip OA is uncommon.[5] Stiffness and mechanical pain have been reported to be the main clinical symptoms. The most significant reasons for seeking medical advice are increasing deterioration in articular function and osteoarticular pain. OA patients' health-related quality of life (HRQoL) is adversely affected by several factors, such as pain, function limitations, subsequent deformities, and treatment costs.[6,7]

HRQoL is essential for evaluating general health and helping to create effective disease self-management approaches, fostering patient-centered care, and creating targeted interventions to enhance confidence.[8] Various instruments were employed for assessing the QoL among OA patients, including a 36-item SF-36, Osteoarthritis Quality of Life (OAQoL) scale, World Health Organization QoL assessment (WHOQoL-100), and knee injury and OA outcome score.[6,8]

The SF-36 is frequently used in medical settings. It has been modified to be suitable for application in all chronic conditions.[9] The SF-36 scale has 36 questions and eight sub-dimensions. The SF-12 scale, a shorter version with 12 items and 8 sub-dimensions, was developed for faster completion. Both patients and physicians found the shorter scale suitable.[10] As far as we know, some studies have validated the SF-12's Arabic version for measuring HRQoL, but it has not been previously evaluated in patients with OA.[11,12]

Thus, this study aimed to evaluate the reliability and validity of the Arabic version of the SF-12 questionnaire for OA patients' QoL assessment and ascertain how it related to self-reported disability and disease characteristics.

MATERIALS AND METHODS

A cross-sectional study was conducted at the Rheumatology and Rehabilitation Department's outpatient clinic, Faculty of Medicine, University Hospitals, from July 2023 to July 2024. A convenience sample of 95 consecutive OA patients diagnosed in accordance with the American College of Rheumatology criteria for knee, hand, and hip OA.[13-15] and the recommendations of the European Alliance of Associations for Rheumatology[16] were invited to participate in the study. Native Arab men and women who can read and understand Arabic, are competent to give informed consent, and are formally diagnosed with OA of any joint, both clinically and radiologically, were eligible for the study.

Patients with insufficient mental ability, psychiatric disorders, concurrent rheumatological disease, fracture, joint arthroplasty and those who received intra-articular injection in the last 6 months were excluded from the study. Furthermore, other significant uncontrolled co-morbidities that may have an impact on QoL (e.g., congestive heart failure, cancer, and severe chronic obstructive pulmonary disease) were excluded from the study.

Assessment of sociodemographic, clinical, radiological, and laboratory

Data were obtained from history taking (e.g., age, disease duration, existing comorbidities, marital status, occupation, educational level, morning and inactivity stiffness, and medications), general examination, other systems affection and musculoskeletal examination, body mass index (BMI, in kg/m^2), and pain by visual analog scale (VAS).[17]

Laboratory investigations were conducted to rule out secondary causes, such as complete blood count, kidney and liver functions, C-reactive protein, erythrocyte sedimentation rate, uric acid, rheumatoid factor, and anti-nuclear antibody.

All recruited patients had radiological investigations, including a posteroanterior radiograph of both hands on the same film, a weight-bearing anteroposterior (AP), and a lateral knee radiograph. The severity was evaluated using the Kellgren-Lawrence (K-L) system grading.[18] Radiographs of the hips (AP view of the hip and frog-leg lateral view were obtained) and lumbar spines were obtained.

Outcome measures

QoL

The validated Arabic version of SF-12 was used.[11,19] Each of the 12 items on the SF-12 is scored in two components: The mental component summary 12 (MCS12) and the physical component summary 12 (PCS12). Although the SF-12's dimensional has never been investigated in relation to Egyptian patients with OA, prior studies have shown that it has adequate construct validity and reliability.[11,19] The SF-12 summary scores for each participant's mental and physical health were calculated in accordance with Ware *et al*.[20] Using scoring algorithms with weighted item response categories, the raw results from each item response were transformed into scores for eight scales, each of which ranges from 0 (the worst) to 100 (the best).

OAQoL questionnaire

This is a crucial tool for assessing how OA and its treatment affect patients' general QoL. It was created in English and originated in the United Kingdom. It consists of 22 items with scores ranging from 0 to 22, designed to specifically measure OA-related QoL. We employed an Arabic-validated and translated version of the OA QoL questionnaire.[21,22] This instrument's strong psychometric properties and validity for OA assessment in both upper and lower limbs, including combinations, were demonstrated by this instrument. Low QoL is implied by high scores.[21,22]

OA severity

The WOMAC score for functional assessment was evaluated using the Likert version. It consists of three subscales: Physical function (which has 17 items), stiffness (which has 2 items), and pain (which has 5 items). The score ranges from 0 to 96 (20 points for pain, 8 points for stiff joints, and 68 for physical function). The higher the score, the more severe the condition.[23]

Construct validity

Convergent validation was evaluated by comparing the Arabic versions of the OAQoL and the Arabic SF-12. The SF-12 scale was correlated with patient age, disease duration, BMI, morning and inactivity stiffness, number of swollen joints, pain score, number of tender joints, WOMAC score, and K-L Grading to evaluate discriminant validity.

Internal consistency and test-retest reliability

Test-retest reliability was investigated using two interviews conducted by the same interviewer 2 weeks apart. An Intraclass Correlation Coefficients (ICC) of 0.7 or higher indicates a high level of agreement between repeated interviews. In addition, internal consistency was evaluated using Cronbach's alpha coefficient.

Statistical analysis

The Statistical Package for the Social Sciences, version 26 (IBM Corp., 2019), was used for the statistical analysis. Frequency and percentage are the methods used to present categorical variables. Interquartile ranges (IQR), medians, means, and standard deviations are used to characterize quantitative variables. The Spearman rank correlation coefficient is used to evaluate the direction and strength of correlation between two continuous variables. The coefficients are classified as follows: Very strong (>0.8), moderately strong (>0.5–0.8), fair (0.3–0.5), and poor (<0.3).

The reliability and internal consistency of the Arabic version were evaluated using ICC and Cronbach's alpha. The agreement of SF-12 scores with OAQoL and WOMAC is evaluated using Spearman's correlation coefficient at a statistical significance level of $P < 0.05$.

RESULTS

The study group had a median (IQR) age of 59 (36–77) years. The BMI median (IQR) was 28 (25.6–31.6). The majority of patients (77.9%) were female, only 12.6% were smokers, and the majority (61.1%) were married. More than half of the patients (54.7%) were secondary school graduates, and (45.3%) were employed. More than half (52.6%) reside in villages, with only 47.4% living in cities. Approximately 51.6% of patients had comorbidities. Most patients were on regular medications (82.1%) [Table 1].

Regarding the clinical characteristics of the patients, the median (IQR) duration of disease was 8 years (2–34), the median number of swollen joints was 2 years (0–6), the median number of tender joints was 7 (3–10), and the median of K-L grading was 2. The knees were the most commonly affected (94.7%), while the back was affected in 29.5% of cases. Knee effusion was evident in 46.3% of cases, crepitus was present in all cases, and the right hand was dominant in most cases (96.8%) [Table 1].

In terms of outcome measures, the overall WOMAC score median (IQR) was 50 (21–16). The functional subscale of the WOMAC median (IQR) was 29 (18–41), stiffness was 5 (2–8), and the pain subscale was 15 (6–20). The median (IQR) VAS score for pain was 60 (10–90). The baseline total SF-12, PCS, and MCS scores median (IQR) were 53 (32–87), 55 (40–90), and 52 (26–92), respectively. When we repeated SF-12 after 2 weeks, the total SF-12, PCS, and MCS scores median (IQR) were 51 (33–87), 50 (7–100), and 52 (10–81), respectively. The OAQoL median (IQR) was 16 (6–22) [Table 2].

Cronbach's alpha for total SF-12 was 0.802, indicating good internal consistency. The item-total correlation coefficient was 0.8, indicating a moderately strong reliability range. Patients were assessed for test-retest score differences and internal consistency. The ICC between the test-retest scores was 0.99, indicating that the scale has strong consistency [Table 3].

According to Spearman's correlation analysis [Table 4], there is a significant but weak negative correlation between the SF-12 total score and each of inactivity stiffness and BMI. Furthermore, a significant but weak negative correlation was found between PCS and inactivity stiffness, as well as a significant but poor negative correlation between MCS scores and BMI, indicating that the tool has poor discriminant validity.

Table 5 demonstrates a significant positive correlation between the SF-12 total score and the total PCS and MCS scores. In addition, a negative significant correlation was found between the SF-12 total score and each of the WOMAC pain, stiffness, functional, WOMAC total [Figure 1a], OAQoL [Figure 1b], and VAS scores.

DISCUSSION

OA patients often face psychological, social, and physical difficulties that affect their QoL.[24] The study's findings revealed that the SF-12-Arabic had high internal consistency reliability, construct validity, and responsiveness when evaluating QoL among OA patients.

Table 1: Demographic, and clinical characteristics, of osteoarthritis patients (*n*=95).

Variable	Value	
Age (years): Median (IQR)	59 (36–77)	
BMI (kg/m^2), Median (IQR)	28 (25.6–31.6)	
	n	%
Sex		
Female	74	77.9
Male	21	22.2
Residence		
Urban	45	47.4
Rural	50	52.6
Education		
Primary	34	35.8
Secondary	52	54.7
High education	9	9.5
Existing comorbidities		
Yes	49	51.6
No	46	48.4
Marital status		
Married	58	61.1
Single	11	11.6
Widow	26	27.4
Occupation		
Manual worker	37	38.9
Employed	43	45.3
Self-employed or retired	15	15.8
Smoking		
Never smoke	83	87.4
Current smoking	12	12.6
Medications		
No	17	17.9
Yes	78	82.1
Affected joints		
Hips	11	11.6
Hands	25	26.3
Knees	90	94.7
Back	28	29.5
Effusion	44	46.3
Crepitus	95	100
Knee pain	90	94.7
Number of swollen joints		
Median (IQR)	2 (0–6)	
Number of tender joints		
Median (IQR)	7 (3–10)	

(Contd...)

Table 1: (*Continued*).

	n	%
Morning stiffness (min)		
Median (IQR)	5 (5–10)	
Inactivity stiffness (min)		
Median (IQR)	5 (0–10)	
Duration of knee pain in years		
Median (IQR)	8 (2–34)	

BMI: Body mass index; IQR: Interquartile range

Table 2: Outcomes measurements of osteoarthritis patients (*n*=95).

Outcome measures	Value
WOMAC-Total	
Median (IQR)	50 (21–16)
WOMAC-Functional	
Median (IQR)	29 (18–41)
WOMAC–Stiffness	
Median (IQR)	5 (2–8)
WOMAC–Pain	
Median (IQR)	15 (6–20)
VAS score	
Median (IQR)	60 (10–90)
Total SF-12 score (baseline)	
Median (IQR)	53 (32–87)
Total physical-SF-12 score (baseline)	
Median (IQR)	55 (40–90)
Total mental SF-12 score (baseline)	
Median (IQR)	52 (26–92)
Total SF-12 score (after 2 weeks)	
Median (IQR)	51 (33–87)
Total physical SF-12 score (after 2 weeks)	
Median (IQR)	50 (7–100)
Total mental SF-12 score (after 2 weeks)	
Median (IQR)	52 (10–81)
OAQoL-22	
Median (IQR)	16 (6–22)

WOMAC: Western Ontario McMaster Osteoarthritis index, VAS: Visual analog scale, SF-12: Short form-12; OAQoL: Osteoarthritis quality of Life, IQR: Interquartile range

As regards the construct validity of the Arabic SF-12, the results of our study demonstrated a strong convergent validity of the total SF-12-Arabic when assessed against the PCS, and MCS, OAQoL, WOMAC Pain, WOMAC stiffness, WOMAC functional, total WOMAC, and VAS scores, as we revealed strong positive correlations between SF-12 total

Table 3: The mean total scores of the SF-12 at the first and second administrations and by observers.

Reliability				
Variables	**Mean±SD**	**ICC (95% confidence interval)**	**Alpha coefficient**	***P*-value**
Total SF-12	55.95±14.04 53 (32–87)	0.8 (0.74–0.86)	0.802	<0.001*
SF-12 by observers				
Test	55.95±14.04 53 (32–87)	0.99 (0.99–0.995)		<0.001*
Retest	55.63±14.35 51 (33–87)			

SF-12: Short form 12, ICC: Intraclass correlation coefficients, SD: Standard deviation. **P*<0.05 = significant.

Table 4: Correlations between the SF-12 score, the total physical, mental components, and clinical parameters.

Variables	Total SF-12	Total physical SF-12	Total mental SF-12
Age			
Correlation Coefficient	−0.129	−0.120	−0.128
Sig. (2-tailed)	0.214	0.248	0.218
Disease duration			
Correlation Coefficient	−0.126	−0.091	−0.149
Sig. (2-tailed)	0.222	0.382	0.151
Morning stiffness			
Correlation Coefficient	0.043	0.025	0.024
Sig. (2-tailed)	0.681	0.808	0.817
Inactivity stiffness			
Correlation Coefficient	−0.207*	−0.251*	−0.163
Sig. (2-tailed)	**0.044**	**0.014**	0.114
BMI			
Correlation Coefficient	−0.257*	−0.201	−0.279*
Sig. (2-tailed)	**0.012**	0.051	**0.006**
Number of swollen joints			
Correlation Coefficient	0.097	0.092	0.040
Sig. (2-tailed)	0.350	0.376	0.703
Number of tender joints			
Correlation Coefficient	0.086	0.078	0.043
Sig. (2-tailed)	0.409	0.453	0.681
K-L Grading			
Correlation Coefficient	−0.034	−0.065	−0.020
Sig. (2-tailed)	0.742	0.529	0.848

P-values marked in bold are significant (<0.05), *Spearman correlation coefficient was used, BMI: Body mass index, SF-12: Short form-12, K-L: Kellgren-Lawrence grading

Table 5: Correlations between the SF-12 score and disease parameters.

Variables	Total SF- 12	
	r	*P*-value
Total physical component	0.846**	**0.001**
Total mental component	0.945**	**0.001**
OAQoL-22	−0.877**	**0.001**
WOMAC Pain	−0.516**	**0.001**
WOMAC Stiffness	−0.573**	**0.001**
WOMAC Functional	−0.868**	**0.001**
WOMAC total	−0.878**	**0.001**
VAS	−0.445**	**0.001**

P-values marked in bold are significant (<0.05), r: Pearson correlation OAQoL: Osteoarthritis quality of life, WOMAC: Western Ontario McMaster osteoarthritis index, VAS: Visual analog scale, SF-12: Short form-12, **Correlation is significant.

score and each of PCS, and MCS (r = 0.846**, r = 0.945**). Furthermore, it was found that the OAQoL score, WOMAC pain, WOMAC stiffness, WOMAC functional, total WOMAC, and VAS scores all significantly correlated negatively with the total SF-12 score; r = (0.8877**, 0.516**, 0.573**, 0.868**, 0.878**, 0.445**, respectively).

In coherence with the results of other studies using Arabic language versions of the SF-12,[11,25-27] they reported that the SF-12 score had satisfactory Cronbach alpha and test-retest values, indicating acceptable internal consistency and convergent validity for the instrument's ability to measure HRQoL in patients with various diagnoses.

Similarly, the SF-12 SF demonstrated reliability and validity when assessed against the SF-36 in patients with rheumatoid arthritis (RA).[25] Furthermore, studies on the validity and reliability of SF-12, SF-8, and SF-6 in fibromyalgia patients suggest that SF-12 may be preferable to SF-36.[28]

The SF-12 reproducibility among OA patients demonstrated high reliability with ICC values of 0.99. The results of the current study were in line with earlier research that found a high degree of internal consistency in the SF-12 component summary scores in general population studies.[29,30] This

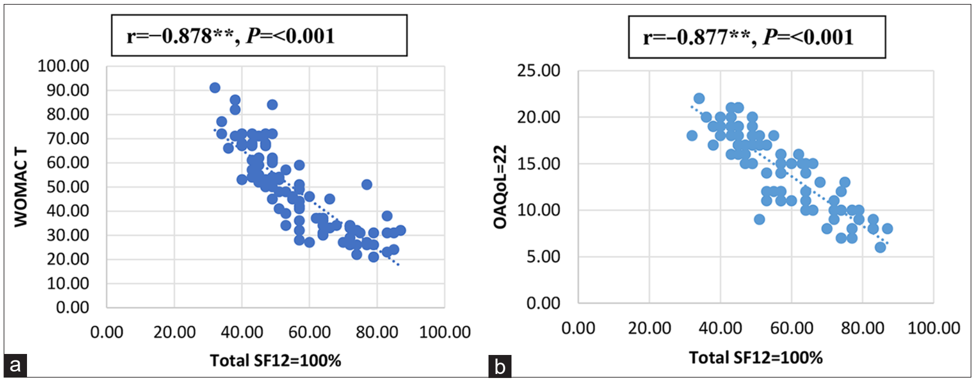

Figure 1: Correlation of total short form-12 (SF-12) with Western Ontario McMaster osteoarthritis index (WOMAC) and osteoarthritis quality of life (OAQoL)-22. (a) A significant negative correlation of total SF-12 and WOMAC total index. (b) A significant negative correlation of total SF-12 and OAQoL-22, **Correlation is significant.

consistency was observed in back pain and RA studies, with Cronbach's alpha values ranging from 0.77 to 0.91.[31,32] In addition, patients with RA have demonstrated a 2-week test-retest reliability across all domains, with an ICC of 0.991 or higher.[31]

Notably, there were negative correlations between the total SF-12 score and both inactivity stiffness and BMI. Furthermore, a negative significant correlation was found between PCS and inactivity stiffness, as well as between MCS scores and BMI. Studies on obesity and mental HRQoL have shown conflicting results; some have indicated a negative correlation, while others have demonstrated no association.

The differences among the subjects in the study may cause some of the disparities in the findings. These results generally support the present literature's findings that a higher BMI is associated with a lower overall HRQoL.[33] Overall, anxiety or depression are common responses when a person is unable to deal with the disability and pain caused by OA.[34] A higher mean inactivity stiffness has been linked to decreased physical functioning and total PCS, which is predictable given that physical function decreases with stiffness. Their pain, stiffness, and physical limitations significantly impacted the patients' QoL and overall health.[35] This is similar to current findings.

The study has some limitations, most notably the cross-sectional design, which makes establishing causality more difficult. Furthermore, the findings cannot be applied to a larger population due to the small sample size, which makes it difficult to achieve reliability and generalization. Moreover, the responses to this questionnaire were influenced by the patients' perspectives, emphasizing outcomes that are important to them rather than those prioritized by healthcare professionals and can cause potential response bias due to reliance on self-reported measures without objective clinical correlation.

Further multicenter prospective studies involving people from various cultural backgrounds and multiple comorbidities are recommended to help elucidate the causal relationships between mental health, QoL, and any barriers in individuals with OA. In addition, the SF-12 lacks mental health scales for measuring depression and anxiety in OA patients. As a result, more research is required toward the impact and management challenges of anxiety and depression in the OA cohort. In addition, a longitudinal study shall be conducted to assess the predictive validity of the SF-12 in tracking QoL changes over time. We recommend evaluating Cronbach's alpha separately for PCS and MCS to provide a more thorough reliability assessment.

CONCLUSION

The Arabic SF-12 questionnaire has good reliability and convergent validity but poor discriminant validity. It is a valid and reliable tool for assessing QoL in Arab patients with OA.

Authors' contributions: RZ, DK, WM: Design of the study, recruitment of patients, data collection, manuscript preparation and revision. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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