Cross-cultural adaptation and validation of the Moroccan version of the Knee injury and Osteoarthritis Outcome Score (KOOS) in knee osteoarthritis patients

Angéla Filankembo[1], Nada Otmani[1],Nessrine Akasbi[2], P. Conde[1],K. EL Kinany[1], A. Chrifi Alaoui[1], M. Atassi[1], N. Tachfouti[1], M. Berraho[1], T. Harzy[2], S. EL Fakir[1]

1*Laboratory of Clinical Research and Community Health, Department of Epidemiology, Faculty of Medicine and Pharmacy of Fez, Sidi Mohammed Ben Abdellah University, Morocco.*
2 *Rheumatology Department, CHU Hassan II, Fez, Morocco*
Corresponding author: Angéla Christie FILANKEMBO KAVA
Mail: fackava@gmail.com
Tel : +212630636729

Abstract: *Introduction: The KOOS (Knee injury and osteoarthitis outcome score) is a scale used to assess the impact of the knee injuries. The original version was developed in English. The aim of our study was to adapt and validate the KOOS, in the Moroccan Arabic dialect, and to assess its psychometric properties. Method: A cross-sectional study design was employed. The cross-cultural adaptation was performed according to published recommendations. The study was conducted in center of Hassan II hospital in Fez. The sample size was defined according to Streiner curve[1] for an ICC of 0.70 and a precision of 0.10. Result: A total of 98 subjects were included in the study. The mean age of subjects was 53.3 years (SD=16), mostly male (53.1%) and generally without educational levels (30.9%). The overall Cronbach alpha of 0.95 indicated adequate internal consistency. The ICC between two interviewers, ranged from 0.90 for "QOL" to 0.97 for "ADL". The test–retest reliability was assessed using the ICC, which ranged from 0.85 for "pain" to 0.97 for "ADL "and "QOL". The ADL, Sport/Rec and QOL exhibited 100% item-convergence (r: 0.69-0.86; 0.84-0.93and 0.84-0.93, respectively) and 100% item-discriminance (r : 0.19-0.68, 0.24-0.74 and 0.30-0.54, respectively).SF-36 bodily pain was highly correlated with the KOOS subscale Pain and QOL. Conclusion: The Moroccan version of the KOOS disease specific questionnaire offers psychometrics properties that make it valid and reliable instrument for patients with various knee pathologies in particular to assess quality of life subscale.*

Keywords: KOOS, quality of life, knee injury, SF-36

INTRODUCTION

Musculoskeletal diseases affect millions of people around the world. There are nearly 150 kinds of them, including joint disease, rheumatoid arthritis, osteoarthritis, osteoporosis, spinal disorders, low back pain and severe trauma[2].

Osteoarthritis is one of the 10 most disabling diseases in developed countries. Globally, it is estimated that 9.6% of men and 18% of women over the age of 60 have it[3]. It is helpful to make a diagnosis of osteoarthritis based on the affected joint and the clinical stage.

In Morocco, osteoarthritis of the knee is the most debilitating and the most frequent disease[4], rendering the patient unable to work and enjoy life to the fullest[3]. It constitutes 16% of rheumatology consultations [5].

The value of measurement scales for assessing health status is increasingly being demonstrated. However, the use of a reliable and valid tool is necessary.

The KOOS (Knee injury and osteoarthitis outcome score) is a scale used to assess the impact of the knee injuries that can lead to post-traumatic arthritis; injury to the anterior cruciate ligament, meniscus, or chondral. The KOOS contains several dimensions, one of which is used to assess the quality of life related to painful knee symptoms.

The original version was developed by Roos EM et al in 1998 [6] and validated in many languages including French, Swedish, Persian, Finish, Polish, Egyptian Arabic and Saudi Arabian [7–13] but not yet in Moroccan dialectal Arabic.

Then, the aim of our study was to adapt and validate the KOOS, in the Moroccan Arabic dialect, and to assess its psychometric properties.

METHODS

Characteristics of the koos original version

The KOOS (Knee and Osteoarthritis Score) is a patient-reported outcome measurement instrument, developed to assess the patient's opinion on his knee and the problems associated with it. The KOOS assesses the short and long term consequences of knee injury as well as the consequences of primary osteoarthritis. It holds 42 items in five separately labeled subscales: KOOS Pain, KOOS Symptoms, Function in Daily Living (KOOS ADL), Function in Sport and Recreation (KOOS Sport / Rec) and Knee-Related Quality of Life (KOOS QOL) (6) .

Translation and cultural adaptation

The cross-cultural adaptation was performed according to published recommendations(6,7). A first translation from English into Moroccan Arabic was carried out by two independent translators. A Consensus meeting was then held between the first two translators and the research team, which discussed and compared the Moroccan Arabic version with the original English version of the questionnaire. Subsequent back-translation into English was performed by a second separate group of two translators highly skilled in English, who had no previous contact with the first two translators or the research team. A pre-final draft of the Moroccan Arabic version of the KOOS was then decided on by group consensus. This pre-final version of the Moroccan Arabic version of the KOOS was then tested in a small pilot study of 20 patients, who were asked to comment on the clarity and their understanding of each scale item. Consequently, the patients' comments

were discussed and resolved by the research team, producing the final Moroccan Arabic version of the KOOS. As most of the patients in our sample were illiterate, the questionnaire was administered by two interviewers. Their task was to read out the questions and mark the chosen answers for this category of patients without providing any input.

The subject's recruitment

A cross-sectional study design was employed. The study was conducted in center of Hassan II hospital in Fez. Data collection was conducted over a period of June 2019 in September 2020. The criteria of inclusion were patients seen in consultation or hospitalized in a rheumatology or adult trauma service with painful knee symptoms. Exclusion criteria included patients with several chronic pathologies of the musculoskeletal system and cognitive disorders. The sample size was defined according to Streiner curve[1] for an ICC of 0.70 and a precision of 0.10.

Instruments and procedures

Two questionnaires of the Arabic version of the KOOS were administered to patients by two different interviewers. The order of interviewers was randomly defined. They re-administered the same questionnaire after 15 days to assess reproducibility. Participants provided socio-demographic and clinical data and a measure of pain on a visual analogical scale.

Short Form-36 (SF-36)

The SF-36 is a generic health status questionnaire that contains 36 items. It measures eight dimensions (bodily pain; physical function; social function; role limitations because of physical problems; role limitations because of emotional problems; mental health; vitality; general health perceptions) and is widely used, has shown to be reliable and valid in the Moroccan general population, and is easy to complete[14].

Scoring

Standardized response options are given (5 Likert zones) and each question obtained a score from 0 to 4 and then transforms this to a value on a 0–100 scale. A higher score corresponds to absence of symptoms and lower score corresponds to more frequent and/or more intense symptoms[14].

Statistical analysis

Descriptive statistics were generated to evaluate missing data and score distributions (i.e. mean, range). For each scale of the Koos, floor and ceiling effects were determined according to a threshold of 20 % of the participants reporting lowest or highest possible score [1]

Reliability

Internal consistency reliability of the multi-item scales was assessed by Cronbach's coefficient α. A value of 0.70 or greater was considered as adequate[15]Inter-rater and test-retest reliabilities were assessed by the intraclass correlation coefficient (ICC), derived from a two-way analysis of variance in a random effect model.

Validity

We used multitrait scaling analysis to examine the extent to which the items of the questionnaire could be combined into the hypothesized multi-item scales. This analysis was based on an examination of item-scale correlations for item-convergence and item-discriminance[16]. Evidence of item-convergence was defined as a correlation of 0.40 or greater between an item and its own scale. Item-discriminance was satisfied if each item has a substantially higher correlation with its hypothesized scale than with scales measuring other concepts. Construct validity was also tested using Spearman's correlation between Koos scales and SF36.

All statistical analyses were performed using R software (R Foundation for Statistical Computing, GNU, and global public license).

RESULTS

Sample socio-demographic and clinical characteristics

A total of 98 subjects were included in the study. The mean age of subjects was 53.3 years (SD=16), mostly male (53.1%) and generally without educational levels (30.9%). Knee osteoarthritis represented 6.0% of all lesions (table 1).

Table 1: characteristics of participants

	Frequency
Age (mean±SD)	53.3±16.0
Gender	
Male	53.1
Female	46.9
Study level	
Without	30.9
Koranic	26.6
Primary	4.3
Secondary	23.4
Universitary	14.9
Profession	
Farmer	28.9
Artisan	32.0
Frame	2.1
Worker	24.7
Without profession	12.4
Habitat	
Rural	15.3
Urban	84.7
Need to climb the stairs to get home	
Yes	62.9
No	37.1
Sport	
Without	23.7
Recreational or Competition	76.3
BMI	
Skinny	5,1
Normal	30,8
Overweight	64,1
Comorbidities	
Yes	37.5

No	62.5	
Type de lesions		
Contusion / distortion	3.6	
osteoarthritis of the knee	6.0	
Anterior cruciate ligament tear	4.8	
Meniscal tear	2.4	
Patellofemoral syndrome	2.4	
Patellar dislocation	1.2	
Other	79.5	
Laterality		
Unilateral	52.6	
Bilateral	47.4	
EVA	5.9±2.3	
Surgery		
Yes	73.9	
No	26.1	
Orthopedics		
Yes	92.4	
No	7.6	
Symptomatic treatment		
Yes	28.3	
No	71.7	

Descriptive statistics

Data on central tendency and variability of KOOS scale are presented in Table 2. The scores for different scales ranged from 30.0 to 59.1. "Sports/Rec "scale had the lower score. Neither floor effects norceiling effects were found for the patients.

Table 2: KOOS score distribution

Domains	Mean (SD)	Floor (%)	Celling(%)
Symptoms	51.6 (20.9)	0.0	0.0
Pain	59.1 (16.1)	0.0	1.0
ADL	54.8 (20.9)	0.0	0.0
Sports	30.0 (25.3)	15.1	2.2
QOL	43.0 (28.9)	6.2	4.1

Reliability

Data on reliability of Koos scale are presented in Table 3. Throughout the instrument, only one scale (symptoms) did not meet the 0.70 internal consistency criterion. The overall Cronbach alpha of 0.95 indicated adequate internal consistency. The ICC between two interviewers, ranged from 0.90 for "QOL" to 0.97 for "ADL".In order to determine test–retest reliability, all participants completed the Koos twice separated by an interval of two weeks. The test–retest reliability was assessed using the ICC, which ranged from 0.85 for "pain" to 0.97 for "ADL "and "QOL".

Table 3: internal consistency and reliability of the KOOS

Domains	Cronbach's α	Reliability ICC (IC 95%)	
		Inter-observer	Test-retest
Symptoms	0.49	0.92 (0.89-0.95)	0.89 (0.82-0.94)
Pain	0.91	0.95 (0.92-0.97)	0.85 (0.74-0.91)
ADL	0.97	0.97 (0.96-0.98)	0.97(0.93-0.98)
Sports	0.93	0.96 (0.93-0.97)	0.91(0.84-0.95)
QOL	0.92	0.90 (0.95-0.98)	0.97(0.94-0.98)

Total	0.95		

Construct validity

Results for multitrait scaling analysis are shown in Table 4. The ADL, Sport/Rec and QOL exhibited 100% item-convergence (r: 0.69-0.86; 0.84-0.93and 0.84-0.93, respectively) and 100% item-discriminance (r : 0.19-0.68, 0.24-0.74 and 0.30-0.54, respectively).

Table 4: Multitrait scaling analyze of the KOOS

Scales	Convergence (r, % success)*	Discriminance (r, % success)**
Pain	0.63-0.82,100	0.32-0.73,48
Symptoms	0.10-0.73,73	0.005-0.34,68
ADL	0.69-0.86,100	0.19-0.68,100
Sport	0.84-0.93,100	0.24-0.74,100
QOL	0.84-0.93,100	0.30-0.54,100

*Number of item-scale correlations greater than 0.40 /total number of item-scale correlations.
**Number of correlations of items with own scales significantly higher than correlations with other scale/total number of correlations.

SF-36 bodily pain was highly correlated with the KOOS subscale Pain and QOL. The highest correlations between the KOOS subscale ADL and the SF-36 physical function was found (Table 5).

Table 5: Correlation between KOOS and SF36

	KOOS pain	**KOOS symptoms**	**KOOS ADL**	**KOOS Sport**	**KOOS QOL**
SF-36 PF	0.61	0.17	0.64	0.59	0.73
SF-36 GH	0.22	0.13	0.21	0.10	0.30
SF-36 VT	-0.24	0.14	-0.10	-0.11	-0.01
SF-36 MH	-0.05	0.32	0.10	0.00	0.19
SF-36 RP	0.54	0.18	0.57	0.47	0.66
SF-36 RE	0.48	0.22	0.46	0.39	0.67
SF-36 SF	0.34	0.48	0.41	0.40	0.56
SF-36 BP	-0.66	-0.31	-0.61	-0.53	-0.74

DISCUSSION

In this paper, we report the result of a cross-cultural adaptation and evaluation of the psychometric properties of the Moroccan Arabic version of the Koos in patients with painful knee pathologies. The necessary number of subjects used was calculated based on the reliability curve of Streiner [1] and was considered sufficient to evaluate psychometric properties.

Time between test and retest was 15 days on average. Streiner and Norman indicated that expert opinions regarding the appropriate interval varies from one hour to one year, depending on the task, but generally, a retest interval of 2 to 14 days is usually used [1].

The mean score for the sport/Rec and AOL subscales were lower than others subscales scores as found in previous studies[7,8]. This can be explained by the fact that painful knee limit activities.

As the Egyptian Arabic and Finnish KOOS version [12,17], our study didn't demonstrate floor and ceiling effects. The higher percentage Floor scores were for the KOOS sport/Rec (15%). The higher ceiling was for the KOOS QOL (4.1%). These results are an indicator for a good comprehension of the questionnaire by the patients.

The Cronbach's alpha ranged from 0.49 to 0.97. this result are closely similar to Egyptian version who reported a Cronbach's alpha of 0.95 and as Alfadhel and al who reported a Cronbach's alpha ranged from 0.87 to 0.92 [12,13]. Moroccan Arabic version of KOOS has good internal consistency measure for pain, ADL, sports and QOL in patients with painful knee pathologies. The consistency was bad for the KOOS symptoms. It was satisfactory for four of the five subscales. It indicates that the KOOS Moroccan version is reliable and valid .In comparison with Persian version, only three of five subscales presented a satisfactory consistency[10]. This difference can be explained by the recruitment status. In the Persian study, patients were recruited in the only one department of orthopedics. Our patients came from orthopedics and rheumatologic department.

The inter-observer and test-retest reliability coefficients were high for all subscales ranging from 0.92 to 0.97 and 0.85 to 0.97 respectively. These results are according with the Persian version of the KOOS, polish KOOS version, Egyptian Arabic and saoudian Arabic version[9,11–13].

Construct validity was assessed by testing convergent and discriminant validity of items and the associations between the scores of each domain and the SF36. All items exceeded the 0.4 criterion for convergent validity on all scales except one. Item-discriminant validity was 100% successful for all items except two. This result for multitrait scaling confirmed the hypothesized scale structure, implying that the translation of the items and the response choices are appropriate.

Considering correlation between SF-36 with KOOS, we don't find very strong correlations. These results are in opposite with that reported by other studies about transcultural KOOS version[8–10,18]. The highest correlation was obtained between KOOS QOL and SF-36 BP but was negatively correlated. Regarding similar subscales in the 2 scales, body pain of KOOS and SF-36 was negatively linked. The correlation coefficients of 0.64 between KOOS ADL and SF-36 PF were close to the one found in Persian and Swedish version. The correlation coefficients of 0.59 between KOOS sport/rec and SF-36 PF was higher than the one found in these last [8,9]

Unlike the original version of the KOOS, as well as other validated versions of the same scale that were self-administered, our patients were directly interviewed by the investigator due to the high frequency of illiteracy among the participants, thus, the questionnaire could not be self-administered, except for a minority of the Moroccan population.

Also, we proceeded with a cross-sectional study, so the sensitivity of the scale to changes over time (after surgery, for example) could not be studied.

Nevertheless, based on the results obtained in the present study, this instrument is reliable and valid and when the quality of life is the main focus, the use of the instrument is the most suitable.

CONCLUSION

The Moroccan version of the KOOS disease specific questionnaire offers psychometrics properties that make it valid and reliable instrument for patients with various knee pathologies in particular to assess quality of life subscale.

WHAT IS ALREADY KNOW

- In Morocco, osteoarthritis of the knee is the most debilitating and the most frequent disease
- The KOOS (Knee injury and osteoarthitis outcome score) is a scale used to assess the impact of the knee injuries that can lead to post-traumatic arthritis; injury to the anterior cruciate ligament, meniscus, or chondral

WHAT THIS STUDY ADDS

- The Moroccan version of the KOOS disease specific questionnaire offers psychometrics properties that make it valid and reliable instrument

FUNDING

AUTHORS CONTRIBUTIONS

Angéla Christie Filankembo Kava, Nabil Tachfouti, Mohammed Berraho, Taoufik Harzy, Samira El Fakir: concept and design, writing and revision of manuscript., Khaoula El Kinany, Amina Alaoui, Maryam Atassi, Passy Conde,Nada Otmani: revision of manuscript. Angéla Christie Filankembo Kava, Nessrine Akasbi: data collection/interpretation, ,writing and revision of manuscript. Angéla Christie Filankembo Kava, Samira El Fakir: Literature search, table creation, writing and revision of manuscript

BIBLIOGRAPHY

1. Streiner DL, Norman GR. *Health Measurement Scales*. 2008. Oxford University Press doi:10.1093/acprof:oso/9780199231881.001.0001.

2. Musculoskeletal conditions. https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions. Accessed 21 June 2021.

3. OMS | Des millions de personnes souffrent de pathologies de l'appareil locomoteur. WHO. https://www.who.int/mediacentre/news/releases/2003/pr81/fr/. Accessed 13 March 2019.

4. Dr. Ali KADER YETTEFTI | Chirurgien Traumatologue Orthopédiste El Jadida Maroc | Arthrose. http://www.traumatologue.com/page/arthrose. Accessed 13 March 2019.

5. Janani S, Nassar K, Rachidi W, Mkinsi O. Physiopathologie de l'arthrose. Journal de Pharmacie Clinique. 2013;32(4):227–231.

6. Knee Injury and Osteoarthritis Outcome Score (KOOS)—Development of a Self-Administered Outcome Measure | Journal of Orthopaedic & Sports Physical Therapy. https://www.jospt.org/doi/abs/10.2519/jospt.1998.28.2.88. Accessed 21 June 2021.

7. Ornetti P, Parratte S, Gossec L, Tavernier C, Argenson J-N, Roos EM, et al. Cross-cultural adaptation and validation of the French version of the Knee injury and Osteoarthritis Outcome Score (KOOS) in knee osteoarthritis patients. Osteoarthritis Cartilage. 2008;16(4):423–428.

8. Roos EM, Roos HP, Ekdahl C, Lohmander LS. Knee injury and Osteoarthritis Outcome Score (KOOS) - validation of a Swedish version. Scandinavian Journal of Medicine & Science in Sports. 2007;8(6):439–448.

9. Salavati M, Mazaheri M, Negahban H, Sohani SM, Ebrahimian MR, Ebrahimi I, et al. Validation of a Persian-version of Knee injury and Osteoarthritis Outcome Score (KOOS) in Iranians with knee injuries. Osteoarthritis and Cartilage. 2008;16(10):1178–1182.

10. Multanen J, Honkanen M, Häkkinen A, Kiviranta I. Construct validity and reliability of the Finnish version of the Knee Injury and Osteoarthritis Outcome Score. BMC Musculoskelet Disord. 2018;19(1):155.

11. Paradowski PT, Witoński D, Kęska R, Roos EM. Cross-cultural translation and measurement properties of the Polish version of the Knee injury and Osteoarthritis Outcome Score (KOOS) following anterior cruciate ligament reconstruction. Health Qual Life Outcomes. 2013;11(1):107.

12. Almangoush A, Herrington L, Attia I, Jones R, Aldawoudy A, Abdul Aziz A, et al. Cross-cultural adaptation, reliability, internal consistency and validation of the Arabic version of the Knee injury and Osteoarthritis Outcome Score (KOOS) for Egyptian people with knee injuries. Osteoarthritis and Cartilage. 2013;21(12):1855–1864.

13. Alfadhel SA, Vennu V, Alnahdi AH, Omar MT, Alasmari SH, AlJafri Z, et al. Cross-cultural adaptation and validation of the Saudi Arabic version of the Knee Injury and Osteoarthritis Outcome Score (KOOS). Rheumatol Int. 2018;38(8):1547–1555.

14. EchellesDeQualitéDeVieSF12etSF36. Scribd. https://www.scribd.com/doc/59168437/EchellesDeQualiteDeVieSF12etSF36. Accessed 8 January 2018.

15. Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. J Clin Epidemiol. 1993;46:1417e32.

16. User's Guide for the Multitrait Analysis Program (MAP) | RAND. https://www.rand.org/pubs/notes/N2786.html. Accessed 30 April 2021.

17. 57_poly_arthrose.pdf. http://www.medecine.ups-tlse.fr/dcem3/module05/57_poly_arthrose.pdf. Accessed 13 March 2019.

18. Gonçalves RS, Cabri J, Pinheiro JP, Ferreira PL. Cross-cultural adaptation and validation of the Portuguese version of the Knee injury and Osteoarthritis Outcome Score (KOOS). Osteoarthritis Cartilage. 2009;17(9):1156–1162.