

Reliability of the Kannada Version of the Knee Injury and Osteoarthritis Outcome Score: A Cross-sectional Study

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ABSTRACT

Introduction: The Knee Injury and Osteoarthritis Outcome Score (KOOS) is a valid and reliable tool for assessing knee injury and osteoarthritis (OA). It has been cross-culturally adapted into several Indian languages. However, the reliability of the Kannada translation of the KOOS scale has not been established.

Aim: The aim of this study was to confirm the reliability of the Kannada translation of the KOOS scale and to assess the inter-rater and test-retest reliability of the culturally adapted KOOS outcome measure.

Materials and Methods: A cross-sectional study was conducted involving 74 patients diagnosed with OA. All patients were asked to complete the KOOS questionnaire. To test inter-rater reliability, two raters completed the questionnaire, while for test-retest reliability, one rater was involved. The procedure was repeated after a week. The scores of both questionnaires were then

compared to check the inter-rater and test-retest reliability of the cross-culturally adapted KOOS outcome measure. Cronbach's Alpha and the Intraclass Correlation Coefficient (ICC) were utilised to determine the scale's reliability.

Results: The entire scale demonstrated high reliability, with an ICC ranging from 0.96 to 0.98 for all subscales. The domain-wise and overall Cronbach's Alpha values were >0.70 . There was agreement between the raters ($p<0.01$) and test-retest data ($p<0.01$) for pain and activities of daily living items. Highly significant correlations were also observed between test-retest data for all items related to sport and recreation function and knee-related quality of life ($p<0.001$).

Conclusion: The Cronbach's Alpha values obtained for all domains of the scale were >0.70 , indicating the scale's reliability. Additionally, the scale demonstrated consistency as the ICC was determined to be substantial.

Keywords: Activities of daily living, Knee pain, Measurement properties, Patient-reported outcome measure

INTRODUCTION

OA is a multi-cause disease associated with genetic, hormonal, aging, mechanical, and metabolic factors [1]. It alters focal areas and leads to the loss of articular cartilage within synovial joints, which is correlated with bone hypertrophy and capsule thickness [1]. It is one of the leading causes of disability worldwide, and its prevalence could rise in response to rising life expectancies, rising rates of obesity, and decreased mobility among the population as a whole [1].

In India, the prevalence of OA with clinical symptoms affects 10% of men and 20% of women who are 45 years of age or older, while the prevalence of OA as seen on radiographs rises between 27% and 80%. Compared to rural areas, urban areas have a higher prevalence of OA [2].

When there is an increase in the prevalence of OA, it is necessary to have a Patient-Reported Outcome Measure (PROM) that reflects the impact of the condition on individuals, hence can be used to measure the effectiveness and outcome of healthcare [3,4]. This makes it important for the patient to have a reliable self-reported outcome measure to have a better understanding of the severity of their condition [3,4].

To evaluate both short- and long-term symptoms and function in patients with knee OA and ligament damage, Roos and Lohmander developed the KOOS, an independent questionnaire as an extension of the WOMAC [5]. There are 42 items in it. It evaluates five factors: knee-related quality of life, pain, symptoms, activities of daily living, sports, and recreational function [6,7].

KOOS has proven to be a valid and reliable self-reported outcome measure that can be used for short-term as well as long-term outcome measures of knee OA [8].

Due to the increase in large multicentre international studies and the requirement for globally meaningful epidemiologic and/or therapeutic

study results, there is a need for cross-cultural adaptation of health status outcome measures to use the outcome measure in the patient-specific language. It will help in better understanding the outcome measure and provide accurate results [9,10].

However, in order to cross a culturally adapted scale to be deemed reliable, its reliability needs to be tested. The previous cross-culturally adapted KOOS scale in the Kannada language has not undergone any psychometric property testing to demonstrate its reliability. This makes the usage of the scale difficult in clinical practice. Therefore, a study is proposed to test the reliability of the cross-culturally adapted KOOS [11].

MATERIALS AND METHODS

The cross-sectional study was conducted from March 2022 to February 2023 at the Department of Physiotherapy of KS Hegde Charitable Hospital. This study was approved by the Ethics Committee of NITTE Institute of Physiotherapy, NITTE (Deemed-to-be University), Mangalore, Karnataka (NIPT/IEC/Min/07/2021-2022).

Inclusion criteria: Individuals suffering from knee OA (Kellgren Lawrence grading 0-4) [12] and able to read and write the Kannada language were included in the study.

Exclusion criteria: Patients who cannot read and write the Kannada language and those with psychiatric and/or communication disorders were excluded from the study.

Sample size calculation: The sample reliability was considered at 0.75 with a population reliability of 0.5 [9]. Considering a power of 95% and an alpha error of 5%, the total sample size came out to be 74.

Procedure

Patients diagnosed with knee OA (Kellgren and Lawrence Grade 0-4) were recruited from KS Hegde Hospital after obtaining ethical

clearance from the Institutional Ethical Committee. The study included only patients who were fluent in Kannada and could read and write in the language. These patients were provided with a consent form before participating in the study. Upon completion, they were asked to fill out a cross-culturally adapted version of the KOOS questionnaire in Kannada. Neither the patients nor the therapists were given any prior instructions on how to fill out the questionnaire, ensuring unbiased and accurate responses.

Outcome measure: KOOS is a PROM that evaluates pain, symptoms, Activities of Daily Living (ADL) function, sport and recreation function, and quality of life. It is designed for both research and clinical purposes and is openly available. KOOS has been shown to be a valid, reliable, and responsive outcome measure in various patient populations with knee injuries, knee OA, and total knee replacement. It is currently offered in 50 different languages, and each question has five possible answers with scores ranging from 0 (none) to 4 (significant issues). Scores are transformed to a scale of 0-100, with 0 signifying no knee issues and 100 signifying serious knee issues [13].

Reliability: To assess reliability, the KOOS questionnaires were evaluated using the guidelines provided by the Guidelines for Reporting Reliability and Agreement Studies (GRRAS). Inter-rater and test-retest reliability were checked according to these guidelines [14].

Test-retest reliability: Once the patient gave their consent, they were asked to fill out the KOOS outcome measure for their knee OA. To ensure test-retest reliability, the questionnaires were given twice—once on the first day and then again at least seven days later to reduce memory recall. Afterwards, the therapist scored the scale.

Inter-rater reliability: When assessing inter-rater reliability, two raters, Rater A and B, each rated the questionnaire. For the initial round of questionnaire administration, one rater assessed the scale. Seven days later, the other rater assessed the same scale to ensure consistency in the outcome measure between both raters. The scale was then returned to the therapist for scoring.

STATISTICAL ANALYSIS

The data were analysed using Statistical Package for the Social Sciences (SPSS) software, version 26.0 (SPSS Inc.; Chicago, IL). The collected data were summarised using descriptive statistics, such as frequency, percentage, mean, and Standard Deviation (SD). To assess the reliability of the scales, Cronbach's Alpha and the Intraclass Correlation Coefficient (ICC) were used. Kappa Statistic was employed to determine the level of agreement between the raters. Pearson's correlation coefficient was used to analyse the test-retest data. A p-value of 0.05 or below was considered significant.

RESULTS

In this study, 74 patients with knee OA were included. The patients had a mean age of 65.1±4.0 years for males and 62.12±3.4 years for female participants, as shown in [Table/Fig-1]. The mean overall score for the KOOS questionnaire was similar for both raters, with scores of 101.3±33.1 for rater 1 and 99.7±32.9 for rater 2, respectively, as shown in [Table/Fig-2].

	Male (years)	Female (years)
Population	40	34
Percentage	54.05%	45.95%
Mean age (years)	65.1±4.0	62.12±3.4

[Table/Fig-1]: Demographic data.

Cumulative scores	Test retest-1		Test retest-2		Inter rater-1		Inter rater-2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Symptoms	17.0	6.5	16.3	6.2	16.4	6.2	16.4	6.6
Pain	21.4	7.4	20.9	7.7	21.4	7.6	21.1	7.6

Activities of daily living	40.6	14.7	39.7	14.3	40.5	14.0	39.2	14.1
Sport and recreation function	12.7	4.4	12.8	4.5	12.8	4.5	12.6	4.0
Knee-related quality of life	10.8	3.0	10.5	3.0	10.8	2.8	10.6	3.1
Overall score	102.1	33.8	100.8	32.7	101.3	33.1	99.7	32.9

[Table/Fig-2]: Descriptive statistics for the cumulative scores.

[Table/Fig-3] depicts the reliability analysis for the domains. The full domain of the scale obtained a Cronbach's Alpha of >0.70 [15], indicating its reliability. Moreover, the ICCs for all the domains were >0.94, indicating high reliability.

	Number of items	Cronbach's alpha	Intraclass Correlation Coefficient (ICC)	95% Confidence Interval (CI)
Symptoms	7	0.912	0.963	0.95 to 0.98*
Pain	9	0.919	0.967	0.95 to 0.98*
Activities of daily living	17	0.967	0.976	0.97 to 0.98*
Sport and recreation function	5	0.881	0.965	0.95 to 0.98*
Knee-related quality of life	4	0.864	0.953	0.93 to 0.97*
Overall	42	0.981	0.981	0.97 to 0.99*

[Table/Fig-3]: Reliability analysis.

There was agreement between the raters (p<0.05) as well as test-retests (p<0.01) for all the items of symptoms. The Kappa value ranged from 0.246 to 0.501 for all the items, as shown in [Table/Fig-4]. For all the items of pain, there was agreement between the raters (p<0.01) as well as test-retests (p<0.01), as shown in [Table/Fig-5]. Similarly, there was agreement between the raters (p<0.05) as well as test-retests (p<0.01) for all the items of activities of daily living, as shown in [Table/Fig-6]. Highly significant correlations were also observed between test-retest data for all the items of Sport and recreation function and knee-related quality of life (p<0.001), as shown in [Table/Fig-6,7].

(Symptoms)	Inter rater		Test re-test	
	Kappa	p-value	"r"	p-value
Do you have swelling in your knee?	0.437	<0.001*	0.698	<0.001*
Do you feel grinding, hear clicking or any other type of noise when your knee moves?	0.340	<0.001*	0.633	<0.001*
Does your knee catch or hang up when moving?	0.246	<0.001*	0.732	<0.001*
Can you straighten your knee fully?	0.328	<0.001*	0.759	<0.001*
Can you bend your knee fully?	0.325	<0.001*	0.608	<0.001*
How severe is your knee stiffness after first waking in the morning?	0.457	<0.001*	0.627	<0.001*
How severe is your knee stiffness after sitting, lying, or resting later in the day?	0.501	<0.001*	0.623	<0.001*

[Table/Fig-4]: Agreement between the raters and test and re-test (symptoms).

Pain	Inter rater		Test re-test	
	Kappa	p-value	"r"	p-value
How often is your knee painful?	0.643	<0.001*	0.643	<0.001*
Twisting/pivoting on your knee	0.483	<0.001*	0.679	<0.001*
Straightening knee fully	0.441	<0.001*	0.617	<0.001*
Bending knee fully	0.136	0.044*	0.604	<0.001*
Walking on flat surface	0.429	<0.001*	0.614	<0.001*
Going up or down	0.383	<0.001*	0.765	<0.001*
At night while in bed	0.396	<0.001*	0.662	<0.001*
Sitting or lying	0.148	0.013*	0.714	<0.001*
Standing upright	0.475	<0.001*	0.708	<0.001*

[Table/Fig-5]: Agreement between the raters in test and re-test (Pain).

Activities of daily living	Inter rater		Test re-test	
	Kappa	p-value	"r"	p-value
Descending	0.528	<0.001*	0.450	<0.001*
Ascending stairs	0.471	<0.001*	0.787	<0.001*
Rising from sitting	0.414	<0.001*	0.781	<0.001*
Standing	0.495	<0.001*	0.421	<0.001*
Bending to floor/picking up an object	0.474	<0.001*	0.635	<0.001*
Walking on flat surface	0.326	<0.001*	0.780	<0.001*
Getting in/out of car	0.166	0.016*	0.644	<0.001*
Going shopping	0.561	<0.001*	0.553	<0.001*
Putting on socks/stockings	0.278	<0.001*	0.692	<0.001*
Rising from bed	0.262	<0.001*	0.586	<0.001*
Taking off socks/stockings	0.484	<0.001*	0.720	<0.001*
Lying in bed (turning over, maintaining knee position)	0.425	<0.001*	0.711	<0.001*
Getting in/out of bath	0.394	<0.001*	0.631	<0.001*
Sitting	0.524	<0.001*	0.668	<0.001*
Getting on/off toilet	0.398	<0.001*	0.544	<0.001*
Heavy domestic duties (shovelling, scrubbing floors etc.)	0.346	<0.001*	0.742	<0.001*
Light domestic duties (cooking, dusting etc.)	0.391	<0.001*	0.708	<0.001*
Sport and recreation function	Inter rater		Test re-test	
	Kappa	p-value	"r"	p-value
Squatting	0.398	<0.001*	0.679	<0.001*
Running	0.387	<0.001*	0.700	<0.001*
Jumping	0.463	<0.001*	0.741	<0.001*
Turning/twisting on your injured knee	0.416	<0.001*	0.665	<0.001*
Kneeling	0.373	<0.001*	0.705	<0.001*

[Table/Fig-6]: Agreement between the raters in test and re-test (Activities of daily living).

Knee-related quality of life	Inter rater		Test re-test	
	Kappa	p-value	"r"	p-value
How often are you aware of your knee problems?	0.470	<0.001*	0.477	<0.001*
Have you modified your lifestyle to avoid	0.398	<0.001*	0.583	<0.001*
How troubled are you with lack of confidence in your knee?	0.377	<0.001*	0.709	<0.001*
In general, how much difficulty do you have with your knee?	0.471	<0.001*	0.796	<0.001*

[Table/Fig-7]: Agreement between the raters in test and re-test (Knee-related quality of life).

DISCUSSION

After analysing the reliability of the Kannada version of KOOS, this study found significant results in all subscales. The p-values for all subscales were less than 0.001, indicating a high level of reliability between the raters.

The Kannada version of the KOOS subscales demonstrates a remarkable internal consistency, as evidenced by Cronbach's α -values exceeding 0.70 (ranging from 0.86 to 0.98). Although concerns have been raised about cross-cultural adaptation and the requirement for patients to be bilingual [16], cross-culturally adapted outcome measures hold significant value in clinical settings. For instance, the Kannada version's values are comparable to the Finnish version (Cronbach α -range: 0.79-0.96), where the subscale Cronbach values are as follows: Pain (0.94), Symptoms (0.84), Activities of Daily Living (0.97), Sports and Recreational Activities (0.96), and Knee-Related Quality of Life (0.86) [9], as well as the Malaysian version (Cronbach α range: 0.78-0.95), where the subscale Cronbach values are as follows: Pain (0.87), Symptoms (0.77), Activities of Daily Living (0.94), Sports and Recreational Activities (0.93), and Knee-Related Quality of Life (0.90) [17]. Furthermore,

the test-retest reliability analysis confirms that the Kannada version of KOOS is highly reliable, with ICC values exceeding 0.90 (ranging from 0.95 to 0.98), and remarkable subscale Cronbach values: Pain (0.91), Symptoms (0.91), Activities of Daily Living (0.96), Sports and Recreational Activities (0.88), and Knee-Related Quality of Life (0.86).

This study observed lower test-retest reliability scores of 0.97 to 0.971 and Cronbach values ranging from 0.72 to 0.91 compared to the Urdu version of KOOS, suggesting translation and adaptation issues [18]. Similar results were also seen in the Hindi version of KOOS [19].

It is essential to adapt KOOS to ensure that the instrument maintains conceptual, linguistic, and measurement equivalence when translated into Kannada. This adaptation process involves ensuring that the translated version conveys the same meaning as the original and is culturally appropriate for the target population. Failure to achieve these goals can lead to measurement errors, compromising the instrument's validity and reliability.

This study identified that a seven-day washout period is sufficient to assess test-retest reliability compared to the previous study, which used a 21-day washout period and reported similar ICC and Cronbach's values [14].

Limitation(s)

The validity of this tool was not assessed in this study.

CONCLUSION(S)

The Kannada version of the KOOS exhibits adequate internal consistency and excellent test-retest reliability. It is a reliable tool that can be used as a self-report and disease-specific questionnaire for patients with knee OA. Future studies can be conducted to validate the Kannada version of KOOS.

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