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"EVALUATION OF VALIDITY AND RELIABILITY OF THE GUJARATI VERSION OF KNEE INJURY AND OSTEOARTHRITIS OUTCOME SCORE (KOOS) IN KNEE PAIN PATIENTS"

Physiotherapy

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ABSTRACT

Background: The Knee injury and Osteoarthritis Outcome Score (KOOS) was originally developed in 1995 by Ewa M Roos and colleagues at the Departments of Orthopedics at Lund University in USA. Thus, the American-English and Swedish versions were developed simultaneously. Also, it has already been translated into many languages such as Hindi, Turkish, Indonesian, Spanish and Swedish. Translation of this scale into Gujarati can be more beneficial for Gujarati physiotherapist to find out better outcome. **Methodology:** The study was carried out on people aged 15 to 50 years in North Gujarat, India, those peoples who have knee pain.116 patients who fulfilled inclusion criteria were selected. Initially scale was translated to Gujarati by forward backward translation and patients were instructed to fill the scale at 1 week interval. Reliability and validity were found out. **Result:** The results of the study showed moderate to high correlation in components of The Knee Injury and Osteoarthritis Outcome Score (KOOS) Gujarati version (ICC= .851,0.835,0.814,0.891 and .977) (P<0.05) and internal consistency (cronbach's alpha = 0.868, 0.834, 0.814, 0.907 and 0.905). The Knee Injury and Osteoarthritis Outcome Score (KOOS) Gujarati version was content validated for idiomatic equivalence, semantic equivalence, content relevance. Face validity were established 100% as all participants answered the scale. For construct validity pearson correlation was done with lower extremity function scale and the pearson correlation value for all five component were -0.143 to 0.185. Correlation is significant at the 0.05 level. **Conclusion:** Gujarati version of the KOOS being a valid, reliable and responsive outcome measure in young patients having knee pain.

KEYWORDS

Knee Injuries and Osteoarthritis Outcome Score (KOOS), Reliability, Validity

INTRODUCTION

The knee is the largest joint in the body and it is a compound synovial joint. [1] The knee consists of two main joints: the femorotibial joint and the patellofemoral joint, which allow the knee to move in three different planes (sagittal, transverse, and frontal).

Patient-reported outcomes are an important element to evaluate the quality and the results of clinical practice as they directly and without any interpretation report a patient's health status.[2] Patients with ACL or meniscus injury have a higher than average risk of developing osteoarthritis, and about 50% have radiological signs of osteoarthritis 10-15 years after injury.

For the elderly population with knee osteoarthritis, well validated outcome measures exist-WOMAC-Western Ontario and McMaster Universities Arthritis Index. However, no outcome measure has been validated for use in younger or physically more active subjects with knee osteoarthritis. It may not be appropriate to use outcome measures assessing function as activities of daily living alone in younger and more active subjects with post traumatic osteoarthritis.

The Knee injury and Osteoarthritis Outcome Score (KOOS) was originally developed in 1995 by Ewa M Roos and colleagues at the Departments of Orthopedics at Lund University, Sweden and at the University of Vermont, USA.

Thus, the American-English and Swedish versions were developed simultaneously. It includes 42 items in 5 separately scored subscales; Pain, other Symptoms, Function in daily living (ADL), Function in Sport and Recreation (Sport/ Recreation), and knee-related Quality of Life (QOL).

The main reason for developing a single instrument with the purpose of covering several types of knee injury and including osteoarthritis (OA), was that traumatic knee injuries often causes concomitant damage to multiple structures (ligaments, menisci, cartilage, etc.) and frequently lead to the later development of OA.

The KOOS evaluates both short-term and long-term consequences of knee injury and include assessing pain; symptoms, such as swelling and restricted range of motion; activities of daily living; sport and recreation function; and knee-related quality of life in young and middle-aged subjects with ACL injury, meniscus injury, or posttraumatic osteoarthritis. The KOOS is self- administered and takes approximately 10 minutes to fill out as well as it is a feasible instrument.[3]

The Knee Injury and Osteoarthritis Outcome Score (KOOS) is one of the most commonly used scales that has been used by physical therapists worldwide. Also, it has already been translated into many languages such as Hindi, Turkish, Indonesian, Spanish and Swedish. Translation of this scale into Gujarati can be more beneficial for Gujarati physiotherapist to find out better outcome. So, there is a need to conduct this study.

METHODOLOGY

Study Design: A cross-sectional Study

Study Population: The study was carried out on people with knee pain in past 10 years from age group 15-50 Years in North Gujarat, India

Study Setting: Native Gujarati patients with knee pain in north Gujarat.

Sample size: 116

Sample Technique: Convenient sampling.

Inclusion criteria:

- Patients willing to participate.
- Both Male and Female
- Age: Between 15-50 years in north Gujarat
- Patient having knee pain with OA, RA and Meniscus injury and Ligament injury in past 10 years.
- Native Gujarati language and can able to read and write Gujarati.

Exclusion criteria:

- Patients having neurological disorders.
- Patient having musculoskeletal disorders other than OA, RA and Meniscus injury.
- Patients having visual problem that cannot be corrected by lenses.
- Non cooperative patients.

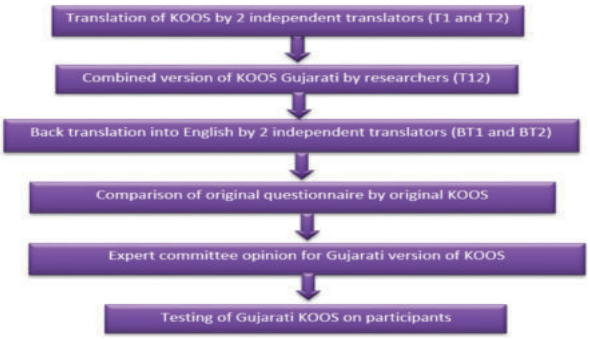

Figure 1: Flow Chart of the study Procedure

The Knee injury and osteoarthritis outcome score (KOOS) had been cross-culturally adapted into Gujarati version of Knee injury and osteoarthritis outcome score (KOOS) in following steps:

Step 1: Forward translation:
Two translators (one with the background of medical field and other with no background of medical field) who knew both English and Gujarati language were chosen to translate the questionnaire from English to Gujarati language.

Step 2: Synthesis:
Both the Gujarati versions were combined and two professionals who had knowledge of medical terminologies and were known to both the languages (English & Gujarati) developed a synthesized version.

Step 3: Back-translation:
The synthesized version of the questionnaire was back translated into English language by an independent translator, who knew both English and Gujarati language and had no information of the original questionnaire which was in English language.

Step 4: Expert panel:
A bilingual (in English and the Gujarati language) expert panel was convened which included the forward translator, health experts, as well as professionals with skill in questionnaire development and translation. The changes were done in the translated questionnaire based on the suggestions of the expert panel.

Step 5: Testing of the questionnaire:
A Pre Final Gujarati version of KOOS was given to participants who fulfilled the inclusion and exclusion criteria to find out the reliability and validity of the questionnaire.

Reliability Testing
Test-retest reliability:
The recruited patients with knee pain were asked to fill Gujarati version of Knee injury and osteoarthritis outcome score (KOOS) by themselves twice with minimum gap of one week duration. So that person may not copy the same data as well as he/she will not forgot. The readings were recorded to report test-retest reliability.

Internal consistency:
Internal consistency was measured with Cronbach's alpha (α), a statistic which was calculated from the pair wise correlations measured between paired readings of Gujarati version of Knee injury and osteoarthritis outcome score (KOOS).

Validity Testing
Construct Validity:
Convergent and divergent construct validity was determined by comparison of the administrations of the five subscales of the KOOS and the Lower extremity functional scale. It is expected the highest correlations when comparing the scales that are supposed to measure the same or similar constructs.

Content Validity:
Content equivalence was assessed under two headings: 1. Are the words in the translated Gujarati version of KOOS presented fluently and correctly as in the original version? 2. Do the words and phrase in the translated Gujarati version of KOOS have the same semantic meaning compared with the original version? For this answers from expert panel member's fall between "mostly agree" to "strong agree". This was assessed by an expert panel and they assessed the KOOS-G for content equivalence and content relevance on 5 point likert scale. Content relevance was evaluated by expert judges or panels: How the Gujarati version of KOOS statement is relevant to assess function in knee pain subjects? For this answers from expert panel members' fall between "mostly agree" to "strong agree".

Face Validity:
Face Validity was assessed by asking one question to each of the, 'Do you think this scale is relevant to your condition.' The answer was noted as 'yes' or 'no'. Face validity of the KOOS was established when all the patients questioned about the relevance of the scale to their condition.

RESULTS

All statistical analysis was done using SPSS 25.0 software for windows. Descriptive analysis was used to obtain mean and standard deviations. Reliability testing was done using **reliability analysis**. Inter class correlation coefficient, ICC (2,1) and cronbach's α were measured. Validity testing was done using **Pearson's correlation.** Confidence interval were set at 95%, p = 0.05 for all the analysis.

Age distribution:
The research was performed on 116 patients with knee pain between the age of 15-50. There were 46 patients between the ages of 15 to 30 and 70 patients between the age 31 to 50.

Gender distribution:
The research was performed on 116 patients with Knee pain. In which 55 are Females and 61 are Males.

Test-Retest Reliability:
Test-retest reliability (n=116) was tested by using the interclass correlation coefficient, ICC(2,1) and Internal consistency (n=116) was reported in terms of cronbach's α measured in two session after 1 week is reported.

Table 1: Test- Retest Reliability of Gujarati Version Knee Injury and Osteoarthritis Outcome Score (KOOS)

Knee injury and osteoarthritis outcome score (KOOS)	Session 1 (Mean)	session 2 (Mean)	Cronbach's alpha	ICC	P-value
Pain	19.34	17.22	.868	.851	0.01
Symptoms	14.67	14.29	.834	.835	0.01
Activities of daily living	34.88	36.47	.814	.814	0.04
Sport and recreation function	10.74	11.92	.907	.891	0.01
Knee-related quality of life	9.17	9.91	.905	.897	0.04

Face Validity:
Face validity of the KOOS G was established when all the 116 patients questioned about the relevance of the scale answered YES. i.e. 100%

Construct Validity:
Table 2: Correlation of Koos- G Pain and Lower Extremity Function Scale

PAINKOOS -G		LEFS
	PEARSON CORRELATION	0.023
	SIGNIFICANCE (2 Tailed)	0.804
	N	116

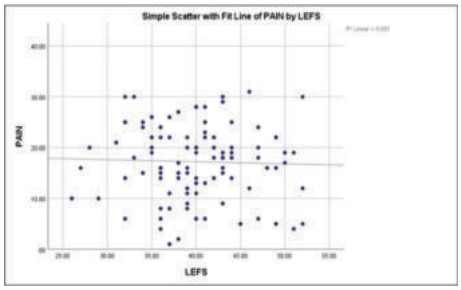

Figure 2: Correlation of KOOS- G Pain and Lower Extremity Function Scale

Table 3: Correlation of KOOS- G Symptoms and Lower Extremity Function Scale

SYMPTOMS KOOS -G		LEFS
	PEARSON CORRELATION	0.065
	SIGNIFICANCE (2 Tailed)	0.491
	N	116

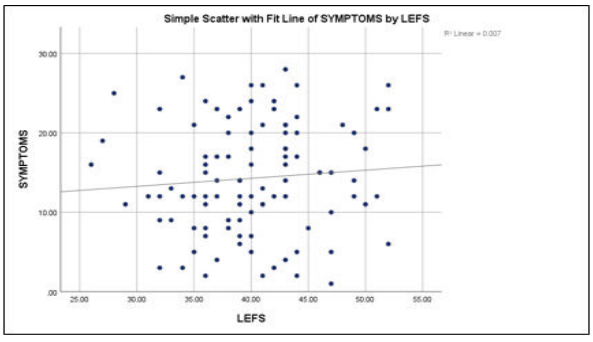

Figure 3: Correlation of KOOS- G Symptoms and Lower Extremity Function Scale

In convergent validity there was a positive correlation of ADL and sports with LEFS. There was a positive correlation between LEFS and PAIN (r=0.023) and between LEFS and SYMPTOMS (r=0.065). (Table 2 and 3)

Table 4: Correlation of Koos- G ADL and Lower Extremity Function Scale

ADL KOOS -G		LEFS
	PEARSON CORRELATION	-0.143
	SIGNIFICANCE (2 Tailed)	0.125
	N	116

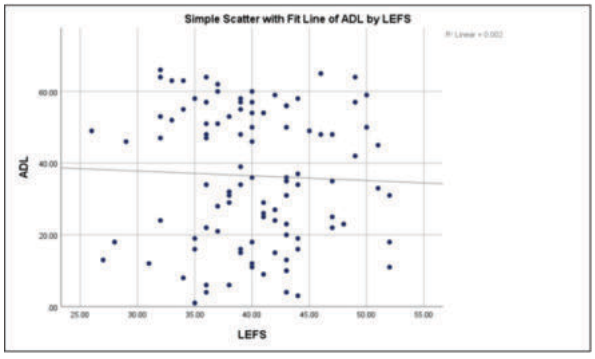

Figure 4: Correlation of Koos- G ADL and Lower Extremity Function Scale

Table 5: Correlation of Koos- G Sports and Lower Extremity Function Scale

SPORTS KOOS -G		LEFS
	PEARSON CORRELATION	-0.033
	SIGNIFICANCE (2 Tailed)	0.728
	N	116

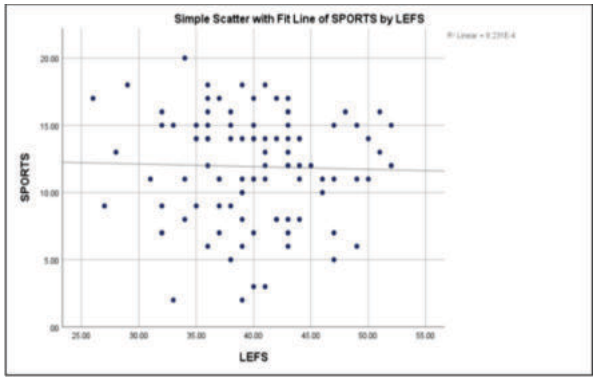

Figure 5: Correlation of Koos- G Sports and Lower Extremity Function Scale

In convergent validity there was a negative correlation of ADL and sports with LEFS. There was a positive correlation between LEFS and ADL (r= -0.143) and between LEFS and sports (r= -0.033). (Table 4 and 5)

Table 6: Correlation of Koos- G QOL and Lower Extremity Function Scale

QOL KOOS -G		LEFS
	PEARSON CORRELATION	0.185
	SIGNIFICANCE (2 Tailed)	0.046
	N	116

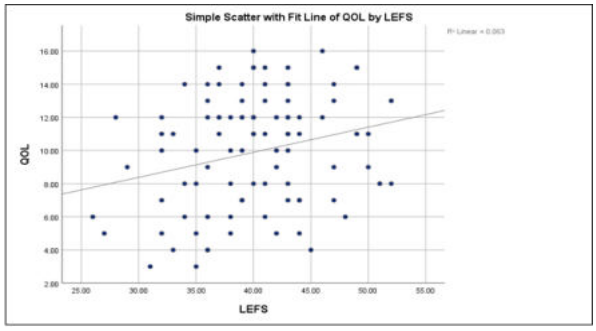

Figure 6: Correlation Of KOOS- G QOL and Lower Extremity Function Scale

In convergent validity there was a positive correlation of QOL with LEFS. There was a positive correlation between LEFS and ADL (r=0.185).

Content Validity:

The content validity of Gujarati translated knee injury and osteoarthritis outcome score (KOOS) by a 6 experts were found to be, I-CVI of individual items knee injury and osteoarthritis outcome score (KOOS) of ≥ 0.89 and overall S-CVI for idiomatic equivalence, semantic equivalence and content relevance ≥ 0.90. For content validity equivalence all 6 experts answers were located between mostly agree and strongly agree of Gujarati version of knee injury and osteoarthritis outcome score (KOOS).

Table 7: Content Validity of Gujarati Version Knee Injury and Osteoarthritis Outcome Score (KOOS)

Scale Component	I-CVI	S-CVI
Pain	0.89	0.918
Symptoms	0.94	
ADL	0.92	
Sports	0.92	
QOL	0.90	

DISCUSSION

This is a cross-sectional study of translation and measurement of psychometric properties of Gujarati version of Knee Injury and Osteoarthritis Outcome Score (KOOS) on patient with Knee pain.

In this study 116 patients participated. Gujarati version of The Knee Injury and Osteoarthritis Outcome Score (KOOS) was given twice with 1- week interval to measure the test- retest reliability and to validity. The results of the study showed moderate to high correlation in components of The Knee Injury and Osteoarthritis Outcome Score (KOOS) Gujarati version (ICC= .851,0.835,0.814,0.891 and .977) (P<0.05) and internal consistency (cronbach's alpha = 0.868, 0.834, 0.814, 0.907 and 0.905).

Both the internal consistency and the test-retest reliability results confirmed the reliability of the Gujarati version of the KOOS. We found that all the KOOS subscales on the Gujarati version have adequate internal consistency, with all Cronbach α values >0.70 (range, 0.86-0.90). These values are comparable to those for the Finnish version (Cronbach α range, 0.79-0.96) and the Malaysian version (Cronbach α range, 0.78-0.95). Our test-retest reliability analysis showed that the Gujarati version of the KOOS has excellent reliability, with all ICC values >0.90 (range, 0.91-0.99). Our results are similar to those for the Italian version (ICC range 0.85-0.95)

For content validity equivalence all 6 experts answer were located

between mostly agree and strongly agree of The Knee Injury and Osteoarthritis Outcome Score (KOOS) Gujarati version for idiomatic equivalence (average=0.89) semantic equivalence (average = 0.92) and content relevance (average= 0.93). Thus, The Knee Injury and Osteoarthritis Outcome Score (KOOS) Gujarati version was content validated for idiomatic equivalence, semantic equivalence, content relevance. Face validity were established 100% as all participants answered the scale.

For construct validity pearson correlation was done with lower extremity function scale and the pearson correlation value for all five component were -0.143 to 0.185. Correlation is significant at the 0.05 level.

In previous studies, interrater reliability and intrarater reliability of the The Knee Injury and Osteoarthritis Outcome Score (KOOS) of Turkish version were (ICC & cronbach's alpha = (0.839 and 0.904) respectively.[4]

In Indonesian version for the construct validity, moderate Pearson correlation coefficients were found between the KOOS subscales and the SF36. Cronbach α was 0.84 to 0.97 for all subscales, indicating adequate internal consistency. The test-retest reliability was excellent, with intraclass correlation coefficients ranging from 0.91 to 0.99 for all subscales.[5]

Swedish version of the scale was applied on the participants at 2 week intervals. Test-retest reliability. For the five subscales of the KOOS, the random effects intra class correlation coefficients (ICC) were: Pain 0.86, Symptoms 0.84, Activities of Daily Living (ADL) 0.91, Sport and Recreation Function 0.78, and for Knee-related Quality of Life (QOL) 0.83. Internal consistency, as measured by Cronbach's alpha, was for the subscale Pain 0.84, Symptoms 0.74, ADL 0.95, Sport/Rec 0.85, and for QOL 0.71 [6]

It was found The Knee Injury and Osteoarthritis Outcome Score (KOOS) Gujarati version items equivalent to those in original version which is intended by translators involve in this study. The results showed that it was translated this scale into other languages without losing psychometric properties of the original English version.

CONCLUSION

The present study demonstrated the Gujarati version of the KOOS being a valid, reliable and responsive outcome measure in patients having knee pain. The Gujarati KOOS can be applied as a patient-reported and disease specific instrument in future studies including Knee pain subjects in Gujarat.

Abbreviations

KOOS: Knee injury and Osteoarthritis Outcome Score, OA: Osteoarthritis, ICC: Inter class correlation, RA: Rheumatoid Arthritis, LEFS: Lower Extremity Function Scale, QOL: Quality of Life, S-CVI: Scale Level Content Validity Index, I-CVI: Item Level Content Validity Index

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