

Cross-cultural adaptation and reliability evaluation of Iranian version of Functional Assessment Measure in spinal cord injury patients

Adaptacja kulturowa i ocena rzetelności irańskiej wersji skali Functional Assessment Measure u chorych po urazie rdzenia kręgowego

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Abstract

Background and purpose: The aim of this study was to translate and validate the Iranian version of the Functional Assessment Measure (FAM) among patients with spinal cord injury (SCI).

Material and methods: Two hundred patients with SCI participated in this study. A convenience sampling approach was used for selection of the patients. The FAM was translated into Persian language and then independently translated back into English. The reliability of the FAM was assessed by test-retest methods with a 14-day interval for interrater reliability. Intraclass correlation coefficient (ICCs) was calculated and interrater reliability and intrarater reliability were assessed.

Results: The mean age of the patients was 35.7 years (SD, 7.2) and 86% of patients were male. The Cronbach alpha coefficient for both raters was above 0.70. Intrarater reliability of the Iranian version of the FAM ranged from good to excellent agreement. The highest level of intrarater reliability was observed for *Community mobility* (ICC = 0.93). There was good to excellent agreement for interrater reliability of the

Streszczenie

Wstęp i cel pracy: Celem pracy było przetłumaczenie na język perski i walidacja irańskiej wersji skali Functional Assessment Measure (FAM) wśród pacjentów z urazowym uszkodzeniem rdzenia kręgowego.

Materiał i metody: W badaniu wzięło udział 200 pacjentów z urazowym uszkodzeniem rdzenia kręgowego stanowiących próbę uznaniową (*convenience sampling*). Skalę FAM przetłumaczono na perski, a następnie dokonano przekładu zwrotnego na język angielski. Porównywalność wyników między badającymi oceniono za pomocą testu powtarzalności badania w odstępie 14 dni. Obliczono współczynnik korelacji wewnątrzklasowej (ICC), oceniono stopień zgodności wyników między badającymi i dla tego samego badającego.

Wyniki: Średnia wieku pacjentów wyniosła 35,7 roku (SD: 7,2 roku); 86% pacjentów stanowili mężczyźni. Współczynnik alfa Cronbacha dla obu badających wynosił > 0,70. Zgodność oceny tego samego badającego za pomocą irańskiej wersji skali FAM wahała się od zgodności dobrej do doskonałej. Największą zgodność (ICC = 0,93) obserwowano w odniesieniu do elementu *Community mobility*. Zgodność

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FAM. The FAM could differentiate between subgroups of patients based on the level of injury but not for the time elapsed from the injury.

Conclusions: Based on the results of this study, the Iranian version of the FAM (FAM-Ir) was highly valid and reliable for evaluation of functional ability in patients with SCI. Therefore, we would suggest that the FAM could also be used as an assessment tool for SCI patients.

Key words: spinal cord injury, outcome assessment, rehabilitation, validity, reliability.

Introduction

Spinal cord injury (SCI) is potentially the most devastating consequence of injury to the spine [1,2]. SCI usually leads to significant dysfunction and disability for the patients. This condition negatively affects the patient's quality of life and life expectancy and imposes an economic burden [3-6].

The annual incidence of SCI is about 10 to 15 per million of the population in industrialized countries such as the United Kingdom [1]. Moreover, the incidence in the United States is estimated at about 40 cases per million [1]. Incidence of SCI in developing countries is higher and therefore more difficulties would be seen due to poor financial resources [7]. No systematic registry is available for SCI in Iran as a developing country; however, a recent study revealed that the prevalence of traumatic SCI ranged from 1.2 to 11.4 per 10,000 people in Tehran [7].

There is no definite treatment for SCI [8]; therefore, the management of SCI focuses on rehabilitation services. In this regard, there are several measurement outcomes that could evaluate the effects of rehabilitation programs on patients. One of these scales is the Functional Assessment Measure (FAM) [9]. The FAM was originally developed to evaluate the disability and functional performance in brain-injured patients.

The FAM has 12 items which include five main domains: self care, mobility, communication, psychosocial, and cognition [9]. The FAM is not a self-report measure and it is administered by raters. There is evidence that the FAM at rehabilitation discharge has less 'ceiling effect' than the Functional Independence Measure (FIM) and is more strongly related to rehabilitation charges compared to the FIM [10-12]. The FAM has been translated into several languages, including Portuguese and German [13,14]. However, despite the validation

między badającymi w ocenie FAM była dobra do doskonałej. Na podstawie FAM było możliwe zróżnicowanie podgrup pacjentów w zależności od poziomu uszkodzenia, ale nie w zależności od czasu, który upłynął od urazu.

Wnioski: Na podstawie bieżącego badania autorzy stwierdzają, że irańska wersja FAM cechuje się dużą trafnością i rzetelnością w ocenie możliwości funkcjonowania pacjentów z urazowym uszkodzeniem rdzenia kręgowego. Autorzy sugerują zatem, aby uwzględnić tę skalę jako narzędzie oceny chorych po urazowym uszkodzeniu rdzenia kręgowego.

Słowa kluczowe: urazowe uszkodzenie rdzenia kręgowego, ocena wyniku leczenia, rehabilitacja, trafność, rzetelność.

of the FAM in several countries throughout the world, the questionnaire has not been translated and validated for Iranian society and particularly in SCI patients.

The aim of this study was to translate and validate the Iranian version of the FAM among a sample of patients with spinal cord injury.

Material and methods

Participants

Two hundred SCI patients were recruited by a convenience sampling method; the patients were referred to the Brain and Spinal Injury Research Center (BASIR) in Tehran by neurosurgeons and neurologists. Inclusion criteria comprised: (a) spinal cord injury (ASIA A, B, C, or D), (b) age more than 18 years and (c) no accompanying side effects such as paraarticular ossification.

The study was approved by the ethical committee of Tehran University of Medical Sciences and the patients signed a written informed consent form to participate in the study.

Measurements

Demographic and clinical characteristics such as age, gender, and the level of injury were recorded for all participants. The Persian version of the FAM was used for data collection. The FAM has 12 items that include five main domains: self care, mobility, communication, psychosocial, and cognition. Each response scores between 1 (total dependence) and 7 (normal independence). The FIM was completed for all participants in order to assess the convergence validity of the Iranian version of the FAM.

Translation procedure

Beaton's guidelines were adopted in order to translate the English version of the FAM [15]. The translation procedure started with forward translation. Two bilingual translators, who were expert in English and Persian independently, translated the FAM into Persian. Afterward, the principle investigator (first author) reconciled the translation disparities. Once a Persian version of the FAM was developed, a backward translation was prepared. The aim was to achieve a questionnaire that was both linguistically and conceptually equivalent to the English version. The Persian version of the FAM was independently translated by two native speakers into English language. Next, the principle investigator reconciled the translations in order to observe any disparity among the translations. A pilot study was performed in order to administer the final version of the Iranian version of the FAM on a sample of patients (five patients) to evaluate the feasibility of the instrument.

Procedure

The FAM and FIM scales were completed independently by two raters. Two weeks later, the patients were again evaluated by the same raters.

Data analysis

The reliability of the FAM was assessed by test-retest methods with a 14-day interval for intrarater reliability. Intraclass correlation coefficients (ICCs) were calculated to assess the test-retest reliability. It was assumed that an ICC of < 0.40 indicated poor to fair agreement, $0.41-0.60$ – moderate agreement, $0.61-0.80$ – good agreement, and > 0.80 – excellent agreement [16]. Moreover, in order to assess the agreement between raters, interrater reliability was calculated using ICC. Internal consistency of FAM was assessed by Cronbach alpha. An alpha equal to or greater than 0.70 was considered as reasonable internal consistency. A known group comparison was performed to assess the discriminated validity of the Iranian version of the FAM. It was assumed that the FAM had an association with time since the injury and the level of injury. In other words, patients with longer duration and higher level of injury were rated with a low score for the FAM. Mann-Whitney analysis was performed in order to compare independent groups. Convergent validity was examined through an analysis of Spearman correlations among the FAM and FIM.

Table 1. Internal consistency of the Iranian version of the Functional Assessment Measure among patients with spinal cord injury

	Rater	Cronbach alpha
Self care	1	–
	2	–
Mobility	1	0.836
	2	0.842
Communication	1	0.936
	2	0.979
Psychosocial	1	0.893
	2	0.901
Cognition	1	0.779
	2	0.800
Total Score	1	0.862
	2	0.894

Results

Two hundred SCI patients (mainly due to car injury, 58%) participated in this study. The mean age of the patients was 35.7 years (SD, 7.2). Eighty-six percent of the patients were male and 62% had the injury for five years or less. Thirty-two percent of the patients were complete tetraplegic and 27% were complete paraplegic, while 25% and 16% were incomplete tetraplegic and paraplegic, respectively.

All the patients were evaluated twice by two raters. Cronbach alpha values for the overall FAM scale were 0.86 and 0.89 for the first and second rater. The Cronbach alpha coefficient for all subscales was above 0.70 for both raters (Table 1). As can be seen in Table 2, the intrarater reliability of the Iranian version of the FAM ranged from good to excellent agreement. The highest level of intrarater reliability was observed for *Community mobility* (ICC = 0.93). Results of interrater reliability of the FAM are shown in Table 3. There was good to excellent agreements for interrater reliability of the FAM.

The FAM could differentiate between subgroups of patients based on the level of injury ($p < 0.001$) but not for injury duration ($p > 0.40$; Table 4).

Furthermore, the FAM and FIM correlated significantly for each rater (Spearman rank correlation coefficient $r_{(rater1)} = 0.87$; $r_{(rater2)} = 0.84$, $p < 0.001$).

Table 2. Intrarater reliability of the Iranian version of the Functional Assessment Measure among patients with spinal cord injury

	Rater	Intraclass correlation (95% confidence interval)
Self care		
Swallowing	1	0.78 (0.73-0.82)
	2	0.74 (0.68-0.79)
Mobility		
Car transfer	1	0.79 (0.70-0.83)
	2	0.82 (0.80-0.86)
Community mobility	1	0.91 (0.89-0.92)
	2	0.93 (0.91-0.94)
Communication		
Reading	1	0.84 (0.82-0.87)
	2	0.80 (0.79-0.83)
Writing	1	0.86 (0.84-0.87)
	2	0.84 (0.83-0.85)
Speech intelligibility	1	0.78 (0.74-0.81)
	2	0.80 (0.79-0.83)
Psychosocial		
Emotional status	1	0.79 (0.66-0.85)
	2	0.84 (0.76-0.86)
Adjustment to limitations	1	0.92 (0.84-0.96)
	2	0.91 (0.74-0.96)
Use of leisure time	1	0.89 (0.74-0.93)
	2	0.92 (0.87-0.96)
Cognition		
Orientation	1	0.72 (0.59-0.86)
	2	0.74 (0.63-0.84)
Concentration	1	0.79 (0.58-0.90)
	2	0.77 (0.55-0.89)
Safety awareness	1	0.82 (0.70-0.89)
	2	0.82 (0.71-0.90)

Discussion

Physical disabilities are the main problems of SCI patients and, therefore, assessment tools have focused on these issues. However, due to the chronicity of SCI, we might expect other problems such as psychological and

Table 3. Interrater reliability of the Iranian version of the Functional Assessment Measure among patients with spinal cord injury

	Intraclass correlation (95% confidence interval)
Self care	
Swallowing	0.81 (0.64-0.86)
Mobility	
Car transfer	0.89 (0.70-0.93)
Community mobility	0.82 (0.62-0.90)
Communication	
Reading	0.79 (0.49-0.87)
Writing	0.78 (0.51-0.92)
Speech intelligibility	0.76 (0.47-0.90)
Psychosocial	
Emotional status	0.74 (0.61-0.82)
Adjustment to limitations	0.84 (0.72-0.93)
Use of leisure time	0.85 (0.64-0.97)
Cognition	
Orientation	0.74 (0.58-0.84)
Concentration	0.82 (0.70-0.91)
Safety awareness	0.84 (0.72-0.94)

cognitive disorders. Hence, in this study, we have used the Persian version of the FAM for the assessment of SCI patients in order to evaluate physical and mental abilities of these patients. In addition, functional assessments in SCI patients are critical for follow-up. The FAM was originally developed to evaluate the disability and functional performance of brain-injured patients with motor and cognitive impairments [9].

In the current study, the translation and psychometric evaluation of the FAM was carried out in Persian language. So far, the FAM has not been validated for evaluation of functional performance in SCI patients. This was the first study with regard to the validity and reliability of FAM among a sample of patients with SCI.

Out of the 12 items of the FAM, intrarater reliability was excellent in six items and good in six items whereas interrater reliability was excellent in seven, and good in five items.

The results of this study showed that motor and cognitive items had good to excellent reliability for all items. These results showed some similarities with previous

Table 4. Comparison of total Functional Assessment Measure (FAM) scores and total Functional Independence Measure (FIM) scores based on level of injury and injury duration

	Rater	Injury duration			Level of injury		
		≤ 5 years	> 5 years	p-value	Cervical injury	Thoracic and lumbar injuries	p-value
Total FAM score	1	56.1	55.9	0.88	31.2	66.9	< 0.001
	2	54.3	56.4	0.41	33.6	62.7	< 0.001
Total FIM score	1	55.8	54.3	0.69	34.4	64.2	< 0.001
	2	53.3	50.2	0.21	36.3	67.4	< 0.001

studies [14,17,18]. A reliability study of the FAM in brain-injured patients showed low interrater reliability in some items of the psychological domain such as leisure time [14]; however, our findings showed high interrater reliability for the psychological domain in SCI patients (Table 3). Accordingly, it might be suggested that the FAM is an appropriate assessment tool for psychological aspects of SCI patients.

Our results also showed that the FAM has an ability to discriminate subgroups of the patients based on the level of injury. A study on patients with SCI showed that patients who suffered from SCI at the cervical level had lower scores when compared to patients with thoracic and lumbar levels [19,20]. This study also showed high convergent validity of the FAM with the FIM, which is in accordance with the previously reported results for the FAM and quality of life [21].

Conclusions

The Iranian version of the FAM was highly valid and reliable for evaluation of functional ability in patients with SCI. Therefore, we would suggest that the FAM could also be used as an assessment tool for SCI patients.

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Disclosure

Authors report no conflict of interest.

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