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Cross Cultural Validation of the Bangla Version of the Functional Independence Measure for Patients with Stroke

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Abstract **Original Research Article**

Background*:** The Functional Independence Measure (FIM), a part of the Uniform Data System for Medical Rehabilitation (UDSMR), examines key gradations in function from full independence to entire support using a 7-level scale to evaluate performance of essential daily living tasks (18 questions). ***Objectives: The objectives of this study were to develop a culturally adapted Bangla version of FIM and to test its reliability and validity in stroke patients. ***Materials and Methods*:** From March 2013 to February 2014, this observational research was conducted in the departments of physical medicine and rehabilitation and neurology at Bangabandhu Sheikh Mujib Medical University (BSMMU). Following recognized cross-cultural adaption techniques that Beaton *et al.*, advised, the FIM was translated into Bangla. The final Bangla version of the FIM was then administered to 48 stroke patients for interviews in order to assess reliability and validity, and the same patients were re-interviewed one week later. Internal consistency (Cronbach's alpha), inter-rater reliability, and the intraclass correlation coefficient were used to evaluate dependability (ICC). Three professional physiatrists assessed the content validity, and construct validity was examined by relationship with the SF- 36's Physical Functioning Subscale (PF-10). ***Results*:** The Bangla version of the FIM was easily understood by 85-42% of respondents, whereas 10.42%(5) had trouble understanding one item and 4.17%(2) had trouble understanding two (n=48). All FIM items received responses from all participants. It was determined to contain 100% genuine material. The 35% ceiling effect was only seen in the cognitive score. For the overall FIM score, internal consistency was determined to be Cronbach's a = 0.97, and the estimated total FIM Intra-class Correlation Coefficient (ICC) was 0.95, with 0.92 for the motor subtotal and 0.96 for the cognitive subtotal. When evaluating construct validity, the motor subscale of the Bangla FIM exhibited a strong correlation (r = 0.87) with the Physical Functioning Subscale (PF-10) of the SF-36. ***Conclusion***: Now, this may be used to evaluate the amount of independence or degree of incapacity in Bangladeshi patients with various medical problems and persons with disabilities.

Keywords: Bangla Version, Correlation, Functional Independence Measure, Disabilities.

INTRODUCTION

A greater number of individuals are now surviving once-fatal illnesses and accidents because to advances in science and technology, which has increased the number of people with chronic illness and disabilities. To assist them return to the community as independently as possible, these persons often need the services of rehabilitation specialists. Co-morbidities and the intricacy of the impairment often call for an inpatient program. Patients with a broad range of diseases, such as stroke, burns, brain and spinal cord damage, multiple trauma, heart disorders, lung disease, amputations, and fractures, are admitted to inpatient rehabilitation facilities (IRFs). While IRFs concentrate on enhancing independence, acute care facilities emphasize enhancing health. Rehabilitation specialists use functional assessment instruments to evaluate a patient's capacity for a range of physical and mental activities in order to gauge this progress (Black 1999). Functional assessment is a "systematic and objective

evaluation of a person's level of function in a range of areas," according to its definition from 1970. (Lawton 1971). Health care system growth and evolution are now heavily influenced by the measurement and reporting of health outcomes (McKnight & Powell 2001). The American Academy of Physical Medicine and Rehabilitation and the American Congress of Rehabilitation Medicine formed a national task force in 1983 to develop a uniform data set for medical rehabilitation that could be used to record the outcomes and expense of inpatient medical rehabilitation, according to the guide for the Uniform Data Set for Medical Rehabilitation (1997). The task group realized that a tool was needed to test the functional state of a person with long-term requirements in a way that could be used consistently. After that, in 1984, the State University of New York at Buffalo created the Functional Independence Measure (FIM). From 1985 to 1987, it was further developed in three stages (Granger and Hamilton 1992), and in 1987, it was made available to rehabilitation specialists along with instructions and definitions. The Uniform Data Set for Medical Rehabilitation (UDSMR), which is also housed at the University of New York in Buffalo, was established in 1988 and quickly established itself as the national repository for FIM data for rehabilitation programs that subscribed to it. The FIM is a measure that is part of the UDSMR that is discipline-free, simple to administer, valid, and reliable for use in periodic evaluations of changes in patient performance over time and results of rehabilitation. The data set, which includes the FIM, serves as a tool for decision-making about care policies, treatment management and monitoring, the duration of hospital stays, quality assurance, program evaluation, and cost-effectiveness analysis of processes and resources. The FIM's conceptual underpinning is that the level of impairment indicates the "burden of care" (Granger *et al.*, 1989). The FIM examines key gradations in function from full independence to entire assistance using a seven-level scale over 18 questions that assesses performance of essential daily life tasks (Dodds *et al.*, 1993). It was created as an evaluation instrument that could be used by all patient demographics in an inpatient rehabilitation hospital setting (Keith *et al.*, 1987). FIM has been widely used in rehabilitation, including that for multiple sclerosis and stroke. It has mostly been created and tested on individuals with neurologic pathology (Daniel *et al.*, 2011). Its primary goal was to design a general measure that could be used by both clinicians and non-clinicians to evaluate individuals of all ages with a broad range of diseases (Granger *et al.*, 1986). Additionally, it was created so that clinicians from many disciplines, such as physiatrists, nurses, physical therapists, occupational therapists, and speech-language pathologists, could utilize it (Black 2007). The FIM has also been evaluated through telephone surveys and modified for use with kids (Calmels *et al.*, 1994) (Braun & Granger 1991).

The FIM must be dependable, valid, and responsive as an outcomes measure, or be able to recognize changes in function. Since the FIM is intended to be measured at several times in time to identify current status and functional gain, the tool's intrarater reliability must be taken into account. Sweden, Israel, the UK, Italy, Belgium, Denmark, Slovenia, Italian, and Turkey all do translation and cross-cultural validation on stroke patients (Invernizzi *et al.*, 2010, Kucukdeveci *et al.*, 2001 & Nilsson *et al.*, 2005). According to a 1990 research by Granger and colleagues, the FIM exhibited a high degree of accuracy or the capacity to identify significant change. To guarantee uniformity in scoring as well as the legitimacy and dependability of data entered into the database, Uniform Data System for Medical Rehabilitation (UDSMR) provided instructional sessions on FIM scoring and credentialing tests for its subscribers. The greatest database of medical rehabilitation results is kept up to date by UDSMR.

OBJECTIVES

To develop a culturally adapted Bangla version of FIM and test acceptability, reliability and validity of FIM in stroke patients.

MATERIALS AND METHODS

Study Design: This is an observational study.

Study Instruments

The English version of FIM instrument and validated Bangla SF-36 Physical Functioning Subscale (PF-10).

Study Place

Department of Physical Medicine and Rehabilitation and Department of Neurology of Bangabandhu Sheikh Mujib Medical University (BSMMU), Shahbag, Dhaka.

Study Period

One year from March 2013 to February 2014.

Sample Size and Statistical Basis

Study population and sample size-

1. For Comprehensibility: [According to Beaton's method]

a) For understandability: 12-year old boys and girls.
Sample size=10
b) For pretest: adult respondents
Sample size=30

2. For test-retest repeatability: stroke patients (>18 to <80) [According to Walter *et al.*,]

Sample size=48

Inclusion Criteria: Consent to participate

- Adult (>18 Years and <80 Years) stroke patient.
- Both genders.
- Willingness and ability to perform any of the requested.

Exclusion Criteria

- Inability to perform any of the requested tasks.

Study Procedure

The study was carried out in two phases. In first phase the original English FIM was translated to Bangla to make a pre-final Questionnaires. Then comprehensibility was assessed in ten 12-year-old children and in 30 adult respondents to established final Bangla FIM. We followed Beaton *et al.*, recommendation for phase 1. In second phase we assessed the reliability and validity of the final version of the questionnaire.

First Phase Comprised of-

- **Stage-1:** Forward translation of original English questionnaire to Bangla by two translators (T1 & T2).
- **Stage-2:** Synthesis of a single Bangla version (Ts) by both translators and investigators (Interviewing author, guide and co-guide).
- **Stage-3:** Back translation of Ts into English by two translators totally unaware of the Original English version.
- **Stage-4:** Expert committee review to consolidate all six versions of the questionnaire to develop a pre-final target language version of the questionnaire for field-testing.
- **Stage-5:** Pre-testing the pre-final Bangla version (comprehensibility testing, Test-1).

Comprehensibility Testing in Children

As a general recommendation for questionnaires or tools that they should be understood by the equivalent of 12-year-old (roughly a Grade 6 level of reading) and the instrument was administered to ten 12-year-old children from different socio-economical status. 5 boys and 5 girls were interviewed at this stage. Among the children three were from high socio-economic class (Father: consultant physician, business man, lawyer), three from middle socioeconomic class (Father: Govt. service holder and small businessman), and four from low socioeconomic class (Father: farmer, cultivator, labourer). 8 of them were school going (5 at class 7 and 3 at class 6 of their school) and 2 never had any formal education. Each of the items was presented to the participating children and they were asked to describe what they understood by them and how they would answer if the condition were present in them. It was found that most of the items were comprehensible. During comprehensibility testing participants though found difficulty in understanding some words but all of them could understood after explanation. After consulting with the expert committee, these words were simplified as much as possible. Then we proceed for pre-testing to see the outcome in adults. In the absence of clear cut criteria, sample population stratified into 3 classes:

- **Upper class:** Every member of a family excluding house servant and guard who lived in own building or owns a house or posses a car in their family was included in the upper class.
- **Middle class:** Every member of a family excluding house servant guard who had a freeze in the family but no car or owns building, was included in the middle class
- **Lower class:** Remaining of the population was included in the lower class.

Statistical Analysis

After collection of information, data were checked, verified for consistency and edited for finalized result. All statistical analysis was done from collected data using SPSS windows version 22. We assessed content validity through calculation of responses by the experts for each question. Internal consistency of the domains and total score were measured by the Cronbach's a statistic. Test-retest reliability was measured by Spearman's Correlation coefficient and ICC. For construct validity, validated Bangla version of SF-36 Physical Functioning Subscale (PF-10) was compared with Bangla version of FIM.

RESULTS

Pre-Testing: Test-1:

Among 30 respondents 2 (6.7%) could only write and read their names, 10 (33.3%) had primary level education, 8 (23.7%) had secondary level and 5 (16.7%) had higher secondary and degree level education respectively (Table 1).

Table 1: Educational qualification of the patients

Educational Status	Frequency	Percent
Can read and write	2	6.7
Primary	10	33.3
Secondary	8	26.7
Higher Secondary	5	16.7
Digree	5	16.7

All participants (n=30) respond to all items. No one had any problem to answer any item. So it was acceptable by the respondents. 17 (56.7%) of them completely understood all item, 10 (10 (33.3%) faced difficulty in understanding in 1 item and 3 (10%) faced difficulty in understanding in 2 items (Table 2).

Table 2: Number of items response

No of items	No of subject (%)
0 item	17 (56.7%)
1 item	10 (33.3%)
2 items	3 (10%)

Test-Retesting: Test-2:

Out of 48 patients (60.4%) were males and (39.6%) were females. Mean age of the rest population was 56.54 ± 11.82 and age ranged from 24 – 80 (Table 3).

Table 3: Gender and Age of the patients

Gender	**Percent**
Male	60.4
Female	39.6
Age	**Percent**
20-29	2.1
30-39	4.2
40-49	12.5
50-59	35.4
60-69	25.0
70 and above	20.8
Mean ± SD (age):	**56 ± 11.82 (24-80)**

Most of the respondents came from middle class whose monthly income within 10,001-20,000 tk (Table 4). 93.75% had milathemiplegia. 56.25% RT sided & 37.5% LF sided & 6.25% had both sided.

Table 4: Family income of the patients

Family income	Frequency	Percent
5000-10000	16	33.3
1001-20000	17	35.4
2001-30000	12	25.0
>3001	3	6.3
Total	**48**	**100.0**

Distribution of FIM Scores

The total score ranged from 22-126 with motor sub-score ranged from 15-91 and sub-score ranged from 06-35. Mean scores total 83.15 (27.57), motor 56.81 (1884) and cognitive 26.58 (09.50). Only cognitive score showed significant ceiling effect (35%) (Table 5).

Table 5: Distribution of FIM scores

Scale	Items	Range	Mean (SD)	% Floor[a]	% Ceiling[b]
Total FIM	18	22-126	83.15 (27.57)	0	2
Total Motor	13	15-91	56.81 (18.84)	0	2
FIM Cognitive	5	6-35	26.58 (09.50)	0	35

Internal consistency was acceptable, with Cronbach's alpha for all 18 items of FIM instrument was 0.97 and for motor (13 items) and cognitive (5 items) being 0.97 and 0.94 respectively (Table 6, 7).

Table 6: Internal consistency of the scale

Score	N of Items	Cronbach's alpha
FIM Total Score	18	0.97
Motor Subtotal Score	13	0.97
Cognitive Subtotal Score	5	0.94

Table 7: Domain score consistency

Domains	Cronbach's alpha
Self-Care Domain score (6 items)	0.96
Sphincter control score (2 items)	0.86
Transfers score (3items)	0.97
Locomotion score (2 items)	0.94
Communication score (3 items)	0.85
Social cognition score (3 items)	0.92

Test-Retest Reliability, Intra-Class Correlation Coefficient (ICC of FIM (n=44)

Calculated total FIM ICC was 0.95 (0.93-0.97) with 0.92 for motor subtotal and 0.96 for cognitive subtotal which were highly significant showed in Table 8, 9, 10.

Table 8: Intraclass Correlation Coefficient (Total FIM)

Measures	Intraclass Correlation	95% Confidence Interval		
		Lower Bound	Upper Bound	Sig.
Single Measures	0.351	0.262	0.472	0.00
Average Measures	0.951	0.928	0.970	0.00

Table 9: Intraclass Correlation Coefficient (Motor subtotal)

	Intraclass Correlation	95% Confidence Interval		
		Lower Bound	Upper Bound	Sig.
Single Measures	0.309	0.225	0.427	0.00
Average Measures	0.921	0.883	0.951	0.00

Table 10: Intraclass Correlation Coefficient (Cognitive Subtotal)

	Intraclass Correlation	95% Confidence Interval		
		Lower Bound	Upper Bound	Sig.
Single Measures	0.721	0.627	0.811	0.00
Average Measures	0.963	0.944	0.977	0.00

DISCUSSION

The cultural appropriateness of the measure is a crucial factor to take into account when employing an outcome measure instrument. According to accepted procedures, the standard US English FIM was cross-culturally translated and customized for use in the Bangladeshi culture in this research (Beaton *et al.*, 2000). The results demonstrated that the Bangla FIM given by the interviewer seemed to be a suitable, valid, and reliable tool for assessing impairment in Bangladeshi stroke patients. The term "sphincter" was challenging for translator 1 throughout the translation process, but not for translator 2 due to their shared medical experience. Although the back translation of the modified Tsword did not match, experience equivalence was used in this case. After going through numerous phases of translation, a preliminary Bangla version was created, and 10 12-year-old youngsters from various socio-cultural backgrounds were used to assess its comprehension. Three of them belonged to the upper socioeconomic strata (fathers were lawyers, consulting physicians, and businessmen), three to the medium strata (fathers were government employees, and four to the lower strata), and four to the lower strata (Father: farmer, cultivator, labourer). Eight of them attended school (5 in class 7 and 3 in class 6 at their school), while two never received any kind of official education. The majority of the items were simple to grasp, and following explanation, those who had trouble understanding the tough words were able to do so. Some of these terms have been as simply expressed as possible after consultation with the expert committee. The term "Toileting" underwent conceptual equivalence whereas others were left unchanged to see the results in adult responders. For test 1, 30 adult patients were included, along with patients of both sexes who were present outside. 10 (33.3%) of them had completed elementary school, 8 (23.7%) had finished secondary school, and 5 (16.7%) had completed both upper secondary and degree levels of education. Only 2 (6.7%) of them could write and read their names. The majority of the questions were easily comprehended by participants when it came to adult responders, and their replies were usually unprompted. No one had any trouble answering any of the questions, however several people had trouble comprehending some of them. 17 (56.7%) responders understood every question without any problem, 10 (33.3%) had trouble understanding one question and 3 (10%) had trouble understanding two questions. The respondents with low educational backgrounds or those with little knowledge of proper Bangla language outside of local language did not understand the Bangla meaning of the word

"Independence" (), whereas stroke patients, their caregivers, or patients with bowel or bladder issues were able to understand the Bangla meaning of "sphincter control" .A redesigned final Bangla version of FIM was created after pre-testing. 100% of the instrument's items received good marks in the professional physiatrist's review, indicating improved readability and content validity. We selected 48 stroke patients and evaluated their degree of independence for the purposes of validity and test-retest reliability testing (Test-2). The test-retest repeatability parameter was used to calculate the sample size for this investigation. First visit, the FIM was certified in its final Bangla translation. The patients or their attendants (as applicable) were asked to complete the Bangla version of the SF-36 PF-10 questionnaire, and the responses were recorded. The completion of both instruments took an average of 30 to 40 minutes. Data were again gathered in the same way after 7 days. One was sent to the ICU, two responders dropped out during the second visit, and I passed away. The dropout rate was 8.3%. Eight patients did not show up for their second session, and their information was gathered over the phone. Following that, the validity and reliability of the data were evaluated. A socio-demographic study of test-2 revealed that 60.4% of participants were men and 39.6% were women. The patients' average age was 56.54 11.82, and they varied in age from 24 to 80. Six of the respondents were illiterate, five can read and write, sixteen studied up to the elementary level, and eight and ten respondents, respectively, finished the SSC and HSC. The remaining one had finished their degree, and two had finished high school. The majority of respondents are from the middle class, with monthly incomes between 10,000 and 30,000 taka. 42 (87.5%) respondents comprehended every question without any difficulty, whereas 5 (10.42%) and 2 (4.17%) had trouble comprehending two questions. The distribution of FIM data scores revealed that the total score with motor2 components varied from 22 to 126. The cognitive sub-score went from 06 to 35, while the sub-score ranged from 15 to 91. Average scores were 83.15 (27.57), 56.81 (18.84), and 26.58 for motor and cognitive (09.50). Only the cognitive sub-score (35%) had a significant ceiling impact. In this study, it is found that the Bangla version of the FIM has an internal consistency score of 0.97 with Cronbach's a for all 18 items and 0.97 and 0.94 for the motor (13 items) and cognitive (5 items), respectively. These were satisfactory (Cronbach's alpha should be > 0.7, which is typical for all scales, according to Dodds *et al.*, to test inter-rater reliability). Both Dodds *et al.*, 1993's and Brosseau *et al.*, 1994's reported values of 0.93 and 0.94 are in the vicinity of these numbers. A large sample of inpatients undergoing acute rehabilitation with a variety of diagnoses revealed high internal consistency for the total FIM score (Cronbach's = 0.88-0.97) (Stineman *et al.*, 1996 and Dodds *et al.*, 1993), the motor domain (=0.84-0.97) (Stineman *et al.*, 1996 & Hsueh *et al.*, 2002), and the cognitive domain (= 0.86-0.95). This study found overall FIM Intra-class Correlation Coefficient (ICC) for test-retest reliability was 0.95 (0.93-0.97), with 0.92 for motor subtotal and 0.96 for cognitive subtotal. These values are comparable to the 0.96, 0.96, and 0.91 ICCs for total, motor and cognitive reported by Hamilton *et al.*, in 1987. For concept validity, FIM was compared to the validated Bangla version of the SF-36 PF-10, which was statistically significant (r = 0.87). Lower score marks on the PF-10 imply more impairment, just as they do on the FIM and SF-36, and a positive correlation between them denotes a favorable link.

CONCLUSION

The Bangla FIM, which has been culturally modified and validated, is the first standardized validated instrument created in the Physical Medicine & Rehabilitation department of BSMMU. It can now be used to evaluate the level of independence in Bangladeshi patients with various medical conditions and people with disabilities.

RECOMMENDATION

The FIM instrument that has been translated and culturally adapted is a valid and reliable tool that can be used by doctors, other healthcare professionals, researchers in the field of health, clinical investigators, and decision-makers in the field of health policy to evaluate and develop future health care plans for Bangladeshi people with disabilities.

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