

## Cross-cultural Adaptation and Validation of a Bengali Health Assessment Questionnaire for Use in Rheumatoid Arthritis Patients

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To test the reliability and validity of a modified and translated version of the original Health Assessment Questionnaire (HAQ) on patients with rheumatoid arthritis (RA) a cohort of 130 RA patients from different districts of Bangladesh were recruited and asked to participate in the study. Thirteen questions had been changed to suit the Bengali culture and to tackle some aspects that are commoner to be performed in the Bengali culture. After modification, translation and retranslation of the questionnaire, it was administered to the selected patients and tested for internal consistency, reliability and construct validity by correlating the yield of the questionnaire with other disease activity parameters. The questionnaire was administered again after a 1 week interval for evaluation of the reliability of this test. The modified questions were tested for their loyalty to the principal component and comparing their correlation with that of the other unchanged items. Test-retest showed strong reliability with a high percentage of agreement and high values for Kappa. Internal consistency showed a high value for standardized alpha (Cronbach's): 0.959 that did not show any significant change if any of the 20 items had been eliminated. The modified questionnaire had shown a strong validity when correlating its results with other disease activity parameters. This correlation was the strongest with tender joint count (TJC), swollen joint count (SJC), morning stiffness (MS) and visual analogue scale (VAS) and the least with erythrocyte sedimentation rate (ESR). The Bengali HAQ is a reliable and valid instrument that can be self-administered to Bangladeshi RA patients to evaluate their functional disability. Its measurement properties were comparable to versions in other languages.

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**Key words:** Health assessment questionnaire

### Introduction

The increasing interest in using health related quality of life outcome measures in rheumatoid arthritis (RA) has been made possible with the development of measures specific to this condition. In fact, assessment of measures of physical function is essential in RA patients to evaluate the course of the disease and assess treatment effects.<sup>1</sup> As the American College of Rheumatology (ACR) introduced its preliminary definition of improvement in RA, patients' assessment of physical function has

been considered one of the determinants of disease activity measures.<sup>2</sup> A number of instruments have been developed to measure functional disability, ranging from physical assessment by trained assessors, to self-administered questionnaires.<sup>1,3</sup> Some of these questionnaires such as the Health Assessment Questionnaire (HAQ)<sup>4</sup> and its modified version,<sup>5</sup> the Arthritis Impact Measurement Scales (AIMS)<sup>6</sup>, AIMS2<sup>7</sup> and their shortened versions<sup>8,9</sup> and the functional status index,<sup>10</sup> are specifically designed for patients with RA.

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Among these, HAQ is probably the most widely used. Its advantages lie in ease of use, being short and having excellent reliability and validity. In contrast to other instruments mentioned above, which can be considered as multidimensional health status measures, HAQ has been reported as the best tool targeting functional disability.<sup>11</sup> Moreover, the validity and reliability of the HAQ have been confirmed in several ethnic groups. Translated versions of HAQ in Spanish, Portuguese, Swedish, French, Italian, Korean and Chinese are available<sup>11-18</sup>. The only published Bengali study that introduced a Bengali version of HAQ was a mere translation of the questionnaire from English to Bengali without consideration of the Bengali culture.<sup>19</sup> The aim of our study was to assess the cultural appropriateness of HAQ for Bangladesh, translate the questionnaire and study its psychometric properties for research and clinical application.

### Methods

Two groups of patients with rheumatoid arthritis (RA) were consecutively selected and enrolled for the study. The first group of thirty patients was tested for face and content validity (TEST-1) and the second group of 100 patients for construct validity and test-retest reliability (TEST-2). Both groups were adult patients with aged 17 years or more who fulfilled the American Rheumatism Association (ARA) 1988 revised criteria for RA and were able to understand and cooperate with the study procedure. Any subject not willing to participate in the study or with cognitive impairment was excluded from the study. The study was conducted at the Rheumatology wing of the department of Medicine, BSMMU. All patients were first interviewed for history and clinical examination. Laboratory and radiological tests were requested and the patients were interviewed again 1 week later to assess the results of their investigations as well as the

prescribed therapy. At each visit, the following variables were recorded: tender and swollen joint count (SJC) according to the definition of ACR Glossary Committee,<sup>21</sup> duration of morning stiffness (MS), patient self assessment of pain using a 10 cm horizontal visual analogue scale (VAS) between 0 (no pain) and 10 (severe pain), Ritchie articular index (RAI),<sup>22</sup> erythrocyte sedimentation rate (ESR) by Westergren method and C-reactive protein (CRP) by nephrometry. All patients were informed about the nature of the study and they accepted to share in the work. Patients completed an Bengali modified HAQ questionnaire at each visit.

### Original questionnaire

The original questionnaire<sup>4</sup> contains 20 questions grouped into eight subscales (dressing and grooming, arising, eating, walking, hygiene, reach, grip, activities). The response categories are “without any difficulty” (score = 0), “with some difficulty” (Score = 1), “with much difficulty” (Score = 2), and “unable to do” (Score = 3). The highest score for any question determines the score for the subscale in question. The use of any assistive device or any other person’s help was given a score of 2. The HAQ disability index was calculated as the sum of the scores for various subscales, divided by the number of subscales responded to, and results in a score between 0 and 3.

### Translation of HAQ

Before conducting the present study, the investigators discussed the activities most commonly practiced by Bengali population as well as the patients. The translation of HAQ into Bengali (BHAQ) was done following the proposed guidelines by Guillemin et al.<sup>23</sup> and was done by three translators including one of the authors, in addition to two professional translators with medical background from Pabna and Rajshahi (Table I). Back translation

was done by three different translators including another author as well as two professional translators from Dhaka. The translators had been informed about the importance of stating the precise and accurate activity listed in the original questionnaire in literal, simple Bengali words that are understandable to all Bengali cultures. Ten questions were modified to convene the Bengali culture.

This resulted in a preliminary Bengali version of HAQ that included 20 (8 subscales) original and 23 added (modified) questions.

#### *Comprehensibility*

Considering that we were dealing with patients from different countries, and though they were all speaking Arabic, we had to consider the possibility of presence of different expressions or traditions especially those concerning the activities of daily living. Hence, we asked all the 184 patients to rate each question with regards to whether they understood and were familiar with the task described (comprehensibility) in reflecting one's function on a 4 point scale (1: slightly comprehensible; 2: moderately comprehensible; 3: quite a bit comprehensible; 4: extremely comprehensible). The question was considered as comprehensible when patients answered 3 or above.

#### *Reliability*

Reliability was tested by test-retest reliability and internal consistency. The test-retest was performed with a 1-week interval. Internal consistency was calculated from the results of the first administration.

#### *Construct validity*

Construct validity was assessed by comparing the response of the first administration and five established measures of disease activity: (1) number of tender joints; (2) number of swollen joints; (3) RAI; (4) patient's self-assessment of pain; (5) ESR and CRP. The thirteen revised items showed similar correlation to the first component as the other unchanged items.

#### *Statistics*

All statistical analyses were done from data collected in TEST-2. Internal consistency was evaluated by Cronbach's alpha coefficients of reliability. Test-retest reliability was assessed using Spearman's Correlation. To assess content validity, a cut-off criteria of  $\geq 25\%$  impairment response in subjects who answered each of the physical functioning items with a response denoting impairment (occasionally and never) will be regarded as valid item. We also assessed content validity through calculation of percent of missing data. Construct validity was assessed by searching the association between HAQ total score and disease severity variables. Statistical analyses were performed by entering data in computer using SPSS for Windows (version 12).

#### **Results**

A total of 100 RA patients were recruited to participate in this study after explanation of the nature of the work and agreement on participation. twenty males (20%) and 80 females (80%) were included with a mean age of 40.4 years and a standard deviation of 13.6 years. their ages ranged from 18 to 80. The duration of their illness was varied from 1 year to 30 years (Table II).

Table I: Translated and Modified BHAQ

Activities KvR - Kg®	Questions ckgij v	Responses			
		Without any difficulty ‡Kvb Kó bvb	With some difficulty ‡KQ Kó	With much difficulty ‡ekx Kó	Unable to do cwi b
1. Dressing and grooming ‡cvlvK civ l vb‡Ri hZetbqv	Are you able to: a. Dress yourself including, tying shoelaces and doing buttons? ‡cvlvK ci‡Z, R‡vi wdzv l tevZvg j wM‡Z cv‡i b? b. Wash your hair with soap? mvevb w ‡q gv_v a‡Z cv‡i b?				
2. Arising Dv	Are you able to: a. Stand up from jalchoki or mora? Rj P‡K/ tgvov ‡_‡K D‡V `wM‡Z cv‡i b? b. Get in and out off bed and can use blanket/katha/lep? weQvbrq N‡gv‡Z ‡‡Z, bvg‡Z Ges Ku_v/ tj c/K‡f M‡tq w ‡Z cv‡i b?				
3. Eating Lvl qv - `vl qv	Are you able to: a. Cut your vegetables? Zi Kvi x K‡‡Z cv‡i b? b. Lift a full cup or glass to your mouth? ‡ra kap va g‡s m‡xe t‡l‡te p‡ren? c. Open a new packet of salt or chips? j eb/ wPc‡n Gi c`‡K‡U wQo‡Z cv‡i b?				
4. Walking nvlv	Are you able to: a. Walk out doors on flat ground? ‡Lvj v `‡b mgvb RvqMvq nvlv‡Z cv‡i b? b. Climb up five steps? wmo ‡etq c‡P aic D‡‡i DV‡Z cv‡i b?				
5. Hygiene cwi`vi cwi`Qb‡v	Are you able to: a. Wash and dry your entire body? mg`-kixi a‡Z Ges i K‡Z cv‡i b? b. Take a bath? vb‡R ‡Mmj Ki‡Z cv‡i b? c. Get on and off the pan or flat toilet? c`vb ev mgZj cvqLvb‡Z em‡Z Ges DV‡Z cv‡i b?				
6. Reach bvMvj cvl qv	Are you able to: a. Reach out and get down a bag of 2 kg (a bag of potato) from shell/Tak just above your head? gv_v ‡‡q mgvb` DP‡v ZvK/ tmj dl ‡_‡K 2 ‡_‡K 2.5 ‡KvR l R‡bi fvi x wR‡bm ai‡Z Ges bvg‡Z cv‡i b? b. Bend down to pick up anything				

Activities KvR - Kg®	Questions ckgij v	Responses			
		Without any difficulty †Kvb Kó bvB	With some difficulty wKQKó	With much difficulty tekx Kó	Unable to do cwi bv
	from the floor? S†K tg†S †_†K †Kvb wKQzZj †Z c†i b?				
7.Grip nvZ gj/ Ki v	Are you able to: a. Open a drawer? LwP - l qj v W†vi Lj †Z c†i b? b. Open jars which have been previously opened? c†e†Lj v n†q†Qj Ggb e†qg ev wKuk Lj †Z c†i b? c. Turn on and off a bottle of medicine/syrup/oil? Jl†ai wKuk ev wmi vc/ †Z†j i tevZj Lj †Z c†i b?				
8. Activities KvR - Kg®	Are you able to: a. Walk from door to door in hospital for treatment? nmcvZ†j N†i N†i W <sup>3</sup> vi †` L†Z c†i b? b. Get in and out of a rickshaw / autorickshaw? wi · v A†Uv wi · vq DV†Z Ges by†Z c†i b? c. Pray in the usual way? bygv†h i "Kz wR`v w †Z c†i b?/ Mo n†q c†v†g mn Dc†mbv Ki †Z c†i b?				

Table II: Demographic and disease characteristics of patients with rheumatoid arthritis

Characteristics	All patients N = 100	Minimum	Maximum	
Age of the respondent in years	40.4 ± 13.6	18	80	
Sex of the respondent				Male 20% Female 80%
Duration of morning stiffness (hour)	2.6 ± 0.9	1	6	
Duration of disease (year)	5.7 ± 5.5	1	30	
Number of tender joint	47.3 ± 13.0	5	68	
Number of swollen joint	16.8 ± 12.3	4	47	
Patients assessment of pain (vas)	4.4 ± 1.7	2	10	
Patients global assessment of disease activity score	4.5 ± 1.7	2	9	
Physicians global assessment of diseases activity score	4.4 ± 1.6	1	9	
ESR	69.3 ± 23.5	10	140	
Rheumatoid factor (RF)				Positive-60% Negative-40%

Table III: Comprehensibility of the BHAQ

Question No	Description	Percentage
Q1.1	Dress yourself, including tying shoelaces and doing buttons	100.0
Q1.2	Shampoo your hair	100.0
Q2.1	Stand up from an armless straight chair	100.0
Q2.2	Lie down and arise off a bed	100.0
Q3.1	Cut your meat	100.0
Q3.2	Lift a full cup or a glass to your mouth	100.0
Q3.3	Open a new carton of milk (or soap power)?	100.0
Q4.1	Walk outdoors on flat ground	100.0
Q4.2	Climb up five steps	100.0
Q1.3	Soap your hair	100.0
Q2.3	Stand up from jalchaki or mora	100.0
Q2.4	Stand up from tool or bench	100.0
Q2.5	Lie down and arise off a bed and use Katha, Lep and Blanket	100.0
Q3.4	Cut your vegetables	100.0
Q3.5	Cut yours fruits	100.0
Q3.6	Tear your meat	100.0
Q3.7	Separate bone from fish	100.0
Q3.8	Tear new cartoon of salt or chips	96.7
Q4.3	Climb up from pookur ghat	93.3
Q4.4	Climb up from Nowka/kheya ghat	93.3
Q5.1	Wash and dry your entire body	100.0
Q5.2	Take a bath	100.0
Q5.3	Get on and off the toilet	100.0
Q6.1	Reach and get down a bag of object (e.g. a bag of potatoes) from just above your head	66.7
Q6.2	Bend down to pick up clothing from the floor	93.3
Q7.1	Open car door	26.6
Q7.2	Open jars, which have been previously opened	100.0
Q7.3	Turn taps on and off	96.7
Q8.1	Run errands and shop	90.0

Question No	Description	Percentage
Q8.2	Get in or out of a car	93.3
Q8.3	Do chores vacuuming, household work and light gardening	40.0
Q5.4	Get on and off high commode	76.7
Q5.5	Get on and off pan or flat toilet	100.0
Q6.3	Reach and get down a bag of 2.5kg object (e.g. a bag of potatoes) from tak or .shelf just above your head	100.0
Q6.4	Bend down to pick up anything from the floor	100.0
Q7.4	Open drawer with handle	100.0
Q7.5	Open bottle of medicine or syrup	100.0
Q7.6	Open and close cork of bottle of oil	100.0
Q8.4	Walk house to house	100.0
Q8.5	Attend doctors from door to door at hospital	100.0
Q8.6	Get in or out of a rickshaw or auto-rickshaw	100.0
Q8.7	Sweep floor or yard with broom	100.0
Q8.8	Pray with ruku and sezda	100.0

Table IV: Agreement and kappa statistics for the test-retest results of the eight subscales of the BHAQ.

Category	Test mean $\pm$ S.D.	Retest mean $\pm$ S.D.	Agreement(%)	kappa statistic
Dressing/grooming	1.13 $\pm$ 0.5	1.15 $\pm$ 0.4	96.0	0.866
Arising	1.24 $\pm$ 0.5	1.42 $\pm$ 0.4	99.0	0.969
Eating	1.30 $\pm$ 0.6	.796 $\pm$ 0.3	89.0	0.629
Walking	1.23 $\pm$ 0.5	1.20 $\pm$ 0.4	80.0	0.500
Hygiene	1.37 $\pm$ 0.5	1.38 $\pm$ 0.4	98.0	0.960
Reach	1.45 $\pm$ 0.5	1.44 $\pm$ 0.5	96.0	0.891
Grip	1.08 $\pm$ 0.5	1.13 $\pm$ 0.3	91.0	0.651
Activities	1.71 $\pm$ 0.5	1.53 $\pm$ 0.5	95.0	0.819
BHAQ index	1.68 $\pm$ 0.6	1.70 $\pm$ 0.3	-	-

Table V: Correlation matrix\* for individual subscales of the BHAQ.

	Dressing	Arising	Eating	Walking	Hygiene	Reach	Grip	Activities
Dressing	1.000							
Arising	.734	1.000						
Eating	.702	.598	1.000					
Walking	.620	.751	.378	1.000				
Hygiene	.901	.796	.737	.715	1.000			
Reach	.726	.748	.737	.594	.790	1.000		
Grip	.730	.542	.772	.375	.703	.613	1.000	
Activities	.591	.759	.536	.775	.732	.704	.474	1.000

\* Values are the spearman's coefficients (RS) that are all significant at/  $p < 0.01$

Table VI: Correlation of the 20 items to the principal component.

Order of the items	Question number	Correlation
1 <sup>st</sup>	5.2	0.924
2 <sup>nd</sup>	5.1	0.920
3 <sup>rd</sup>	1.1	0.890
4 <sup>th</sup>	1.3	0.875
5 <sup>th</sup>	6.4	0.821
6 <sup>th</sup>	2.3	0.777
7 <sup>th</sup>	2.5	0.772
8 <sup>th</sup>	7.4	0.764
9 <sup>th</sup>	6.3	0.746
10 <sup>th</sup>	3.4	0.731
11 <sup>th</sup>	7.2	0.727
12 <sup>th</sup>	8.5	0.723
13 <sup>th</sup>	7.5	0.713
14 <sup>th</sup>	8.6	0.704
15 <sup>th</sup>	3.2	0.703
16 <sup>th</sup>	3.7	0.698
17 <sup>th</sup>	4.1	0.698
18 <sup>th</sup>	4.2	0.692
19 <sup>th</sup>	5.5	0.624
20 <sup>th</sup>	8.8	0.495

Table VII: Correlation of the eight subscales of the BHAQ to different disease activity parameters.

COMPONENT	ESR	TJC	SJC	MS	VAS
Dressing	0.254	0.425	0.558	0.136	0.633
Arising	0.173	0.330	0.465	0.086	0.477
Eating	0.210	0.441	0.581	0.153	0.657
Walking	0.140	0.221	0.362	0.082	0.431
Hygiene	0.295	0.348	0.491	0.153	0.580
Reach	0.249	0.438	0.482	0.186	0.597
Grip	0.215	0.372	0.385	0.170	0.567
Activities	0.229	0.294	0.398	0.106	0.468
BHAQ	0.258	0.429	0.515	0.437	0.451

- *ESR = Erythrocyte Sedimentation Rate*
- *TJC = Tender Joint Count*
- *SJC = Swollen Joint Count*
- *MS = Morning Stiffness*
- *VAS = Visual Analogue Scale*
- *BHAQ = Bengali Health Assessment*

### Questionnaire

All *P* Values For The Presented *R*s Were Significant At  $< 0.05$ .

### Translation and comprehensibility

Among the 20 items of the original HAQ, 13 questions required modifications to suit the Bengali culture. Questions 1.2, 2.1, 2.2, 3.1, 3.3, 5.3, 6.1, 6.2, 7.1, 7.3, 8.1, 8.2, and 8.3 have been changed to tackle some commoner activities among the Bangladeshi (Table-2). All questions were rated as quite comprehensible and extremely comprehensible.

(Grade 3 and 4) by all the 100 investigated patients. Table III shows that for all the questions, comprehensibility ranged from 99.0 % to 55.1% denoting that all the questions were well understood by the vast majority of the patients included in this study.

### Reliability

Table 3 shows the mean  $\pm$  S.D. of the test - retest results of the total Bengali HAQ (BHAQ) index and the eight subscales. Percentage agreement was ranged from 80.0 to 99.0 and Kappa statistic was ranged from 0.500 to 0.969 for the eight subscales.

Cronbach's alpha showed a strong reliability with a standardized alpha of 0.959 among the 20 items, while for the subscales it ranged from 0.823 to 0.955. The item with the highest correlation with the total instrument was the ability to take a bath ( $r = 0.924$ ). The item with the lowest correlation was the ability to pray in the usual manner ( $r = 0.495$ ). None of the 20 items significantly increased or decreased the standardized alpha if eliminated from the scale.

### Construct validity

Table 5 shows the correlation matrix of the eight subscales to each other. Although the eight subscales were significantly correlated with each other, pray in the usual manner



reported to have the lowest correlation with other activities ( $r = 0.495$ ) performed by the patient. About fifty seven percent (57.2%) of all variability was accounted for by the 1<sup>st</sup> principal component. All the 20 items had similar correlation coefficients with this principal component (range 0.495– 0.924) (Table VII). The thirteen revised items showed similar correlation to the first component as the other unchanged items.

#### *Disease severity variables*

ESR, tender joint count (TJC), SJC, MS, and VAS, all these variables were tested for psychometric correlation with the revised BHAQ. Table 6 demonstrated the correlation of the different subscales of the BHAQ with the different disease severity parameters. TJC, SJC, and VAS showed the highest values for  $R_s$  in all eight subscales. Taken together, these data show the correlation of the total BHAQ index with the six disease severity parameters.

#### **Discussion**

Disability measurement in patients with chronic illness has always been a subject of interest for all workers in this field. Invention of an international scale, upon which a clinician can rely on evaluation of disease progression and treatment effect, required the standardization of this tool for the results to be comparable among different studies in different parts of the world. This study is a trial for the standardization of the HAQ to suit the Bengali culture that is significantly different from other American, European, Asian, Arabic and African cultures.

The HAQ has been translated and modified into Bengali, adapted it to the Bengali culture, and tested it for reliability and validity. In the context of the Bengali culture, thirteen questions of the original HAQ were modified. These modifications were made keeping in mind the four areas (semantic, idiomatic, experiential and conceptual equivalence) to achieve equivalence between the source and

target versions. We believe that these modifications are important for cross-cultural adaptation. Similar modifications in the original HAQ have been done in other studies published from Arab, Korea and China<sup>17,18</sup> and it showed strong validity and reliability.

Factor analysis revealed the principal component that explains quite a good percentage (57.2%) of all variabilities. Either this questionnaire measures other aspects than the already described; this would be restored to the 42.8% of the remaining unexplained variability. The thirteen revised items showed a significant correlation with the first component being in the values ranging from 0.495 to 0.875: results that are comparable to other studies that showed values ranging from 0.66 to 0.81.<sup>17,18</sup>

Although the total HAQ index is a pooled expression of the eight different activities, correlation of the total index showed different levels of significant correlation with the eight subscales of the modified questionnaire, being the poorest with “rising” ( $r = 0.697$ ) and the strongest with “hygiene” functional expression ( $r = 0.809$ ).

The test-retest reliability of the Bengali-HAQ was comparable with previous reports. Test-retest correlation of the HAQ items in cross-cultural adaptation for Spanish, Portuguese, Swedish, French, Italian, British populations have reported from 0.87 to 0.99<sup>11</sup>. Results of this study reported values ranging from 0.91 to 0.99 that go with former results' reports, and also go with Arabic - HAQ value ranging from 0.978 to 0.989. Cronbach's alpha of 0.959, showed the internal consistency of the Bengali-HAQ that is very close to AHAQ which is 0.979. It is also to be similar to that reported in other studies; ranging from 0.86 to 0.95.<sup>11-18, 24</sup> A test that yields the same outcome under different conditions and on several performances ensures the consistency

and feasibility of this test, what was obvious in this modified questionnaire.

The modified questionnaire has shown a significant correlation to disease activity parameters namely: ESR, TJC, SJC, MS and VAS. TJC, SJC, and VAS were the strongest parameters related to the eight subscales. In the study done by Bae et al<sup>17</sup>, they reported no correlation between ESR and the majority of the HAQ subscales. On the other hand, Kon et al.<sup>18</sup> found this correlation significant in their work.

Correlation of Rheumatoid Factor (RF) to disease activity parameters (eight subscales) could not be found out because most of our patients RF were qualitatively (positive or negative) measured.

In conclusion, the Bengali-HAQ is a reliable and valid instrument that can be self-administered to Bengali RA patients to evaluate their functional disability. Its measurement properties were comparable to versions in other languages.

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