Iranian Version of Barthel Index: Validity and Reliability in Outpatients' Elderly

Abstract

Background: Validation study of Barthel Index for elderly patients being attended in outpatient and rehabilitation clinics in Iran. **Methods:** Face-to-face interview with 395 out patients geriatric 60+ years was done in a cross-sectional study. The internal consistency Barthel-ADL was used to approve reliability. Criterion validity and factor analysis were used to verify validity. **Results:** Reliability the Iranian version BI was significant at 0.938. In criterion validity analysis, the high correlation tools included Functional Ambulation Category (FAC) and Foot and Ankle Ability Measure (FAAM-subscales ADL) at 0.947 and –0.945, respectively. In factor analyses, two domains obtained, the variance of 10 items achieved 69.79%; also, the Item Total Correlation (ITC) of each item was measured. **Conclusions:** The Barthel Index shows a good validity and reliability, and recommended to use in the Iranian geriatric outpatients in evaluating physical ability.

Keywords: *Barthel-ADL, elderly, geriatric outpatients, Iran, validity*

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Introduction

Older adults are vulnerable to functional impairments following chronic diseases; so, initial assessment and monitoring are needed to be done.[1] Functional assessment of older people is often ignored in busy clinics, especially in nonspecific units for elderly care.[2,3] In aging studies, the importance of ADL measurement as a physical function indicator is significant like as independent variables e.g., age and gender.[4] The specific ADL items like climbing stair, transferring, and mobility are common indicators in elderly health.[5] The Barthel Index (BI) is a practical instrument to assess ADL that evaluates a patient's capacity in different levels of independency to perform 10 daily tasks.[6] The Barthel-ADL Index was made to assessment of routine functional ability in elderly hospitalized and stroke rehabilitation clinics;[7] and often for frail elderly patients.[6] To improve clinical application in hospital acute setting, BI measures patient's functional ability to report clinical valid information about patient's status.[8] Since, settings (home, clinic, nursing home, and hospital), where Barthel-ADL is assessed, is important; it is essential to assess outpatients functional abilities in geriatric clinic.[8] We therefore, have aimed to translate and validated the Iranian version of the Barthel-ADL in outpatient setting and rehabilitation clinic.

Methods

Data collection

For sampling, at least 10 individuals for each Barthel items was gathered, by a convenience sampling size method.[3] In this cross sectional study, 395 older outpatients' ≥60 years old from Shariati clinics and Tabasom Rehabilitation Center were selected by face-to-face interview technique over 12-months from June 2017 to June 2018. After study protocol approval by the clinical research ethics committee, elderly participants with an Abbreviated Mental Test (AMT) Score less than 8/10 were excluded because they were unable to sign informed consent. Meanwhile, two occupational therapists observed, directly the potency to do specific visible tasks (climbing stair, transferring, and mobility) in each participant. Demographic data (age, sex, educational level, and economic status) were collected by interviewing. Medical past history of outpatient participants gathered based on Charlson Comorbidity Index. This study approved by the ethics committee of geriatric and gerontology department in Tehran University of Medical Sciences.

Functional assessment

Barthel index of Activity daily living (ADLs)

Measures the patient's functional disability in performance of 10 activities of daily living. These activities could be grouped according to self-care abilities (feeding, grooming, bathing, dressing, continence, and toilet use) and mobility (ambulation, transferring, and climbing stair).[6] The total score is in range of 0–100, higher scores indicate better physical functioning (completely independent) and zero score indicating complete dependence.[9]

Functional ambulation categories (FAC)

The FAC is a 6-point ordinal and hierarchical scale, regardless of having personal assistive device to evaluate ambulatory functions, walking status and level of caregiver's support for patients' needs.[10] Since, it provides only details about walking mobility, does not appropriate to measure level of disability.[11]

Foot and ankle ability measure (FAAM)

The FAAM is a 29-items tool divided in two subscales: Activities of daily living (ADL) with 21 items and SPORTS with 8 items. Each item is scored in a 5-point likert scale represented different levels of difficulty from "No difficulty at all" to "Unable to do". Total scores of the ADL and SPORTS are 84 and 32, respectively that are transformed to percentage for each subscale, which higher scores indicating high level functional status. The validity of the Iranian version of the FAAM was approved.[12]

Abbreviated mental test (AMT)

The test consists of 10 items with one score for each correct response. In community settings in this study, the AMT was performed to the home residents by a trained non-physician interviewer. Translation and validation of the Iranian version was carried out by Bakhtiyari *et al*. approved with cutoff AMT <8 score for the Iranian older population.[13]

SF-36 instrument

This is a general quality of life instrument[14] that measures the eight health related concepts: physical function (PF-10 items), role limitation due to physical problems (RP-4 items), body pain (BP-2 items), general health perceptions (GH-5 items), vitality (VT-4 items), social function (SF-2 items), role limitation due to emotional problems (RE-3 items), perceived mental health (MH-5 items), and a single item, indicating a perceived change in general health status in past 1-year. Translation and validation the Iranian version was carried out by Montazeri *et al*.[15]

Barthel-ADL translation

After approval by developer permission, the original version of Barthel-ADL was translated into the Persian language, based on modified protocol of International Quality of Life Questionnaire (IQOLA) by two individuals, independently from each other; a licensed translator, and a professional gerontologist in English and native in Persian language. Then, a translated version was delivered separately to the two Persian expert panel (a geriatrician and occupational therapist) to agree with the items translated.[14] To determine the difficulty of items, translated BI was given to ten informal caregivers, based on a 100-mm Linear Analog Scale Assessment (LASA) tool that indicating 0-100 from "Not at all difficult" to "Extremely difficult". The mean difficulty scores ≤30 was considered as an acceptable.[14] Then, another two translators have rated the quality of translation from 0 to 100, in terms of simplicity, common language applied, and the conceptual equivalence, with the acceptable quality scores ≥60 for each three domains.[14] Next, another translator performed a backward translation to English. Then, the back translation version compared and was reconciled with the original English version that ultimately a few linguistic words were changed.

Data analysis

Descriptive and analytical statistics were computed by the software SPSS version 20. Initially, descriptive statistics were calculated for the characteristics of the subjects, frequency and percentages for categorical data, mean, SD, and range for continuous variables. Next, Cronbach's a coefficient was analyses to examine reliability of the Barthel-ADL. Relationships between BI and all criteria (AMT, FAC, level of ambulation, and FAAM; Activities of Daily Living Subscale) presented significant correlation coefficients. Then, an exploratory factor analyses was performed, using principal components analyses as the estimation method, together with varimax rotation to analyze factor structure in the Iranian version of the Barthel-ADL. Finally, spearman correlation was carried out to assess the construct validity.

Results

Of 395 elderly outpatient participants, the majority were male (61.5%), with average 67.3 years old (SD = 6.04), with range 60–89 years. According to Barthel Index 163 (41.3%) elderly were fully independent and scored the maximum points (100), while 61 participants (15.4%) at least in one item were physically dependent. From viewing severity in physical function, our samples were in moderate level (Mean = 73.25, SD = 31.55). Average BI score were 85 for elderly outpatients with arthritis, score 67 for outpatients with stroke, 70 score for patients with falling, and 77 score for incontinence. Dependency in at least one ADL item were included in bathing (59%), climbing stairs (56%), dressing (41.9%), transferring (36.3%), feeding (25.9%), and 13% in toileting [Table 1]. The Functional Ambulation Categories (FAC) had the highest correlation and AMT had the lowest relationships [Table 2].

The BI with 10 items was tested to factor analyses. The Kaiser-Meyer-Olkin (KMO) measure obtained 0.914 at *P* < 0.001. Two factors emerged with Eigen values greater than 1 that accounted for 69.79% of BI score variation [Table 3]. The second factor obtained for personal hygiene and incontinency (bowel and bladder) and the first factor included the other items. For test–retest reliability, BI analysis was repeated for 30 subjects. Intra-class correlation coefficient (ICC) between the two stages by one rater in test–retest obtained 0.936 (95% CI; 0.895-0.965). The internal consistency the Iranian version BI obtained significant (Cronbach's alpha = 0.938, *P* < 0.001). Even, removing none of the items BI did not improve the internal

consistency. The Item-Total Correlation (ITC) for bowel and urinary continence were 0.649 and 0.605, respectively, while Item-Total Correlation for the other components were at range 0.682 to 0.953 [Table 4].

Discussion

The Barthel Index is an effective measurement in clinical geriatric studies for functional ability monitoring in activities of daily living.[16] for showing recovery from acute status.[17] Our results had shown the Iranian version of BI has a good correlation with FAC, AMT, FAAM (Subscales of ADL), SF-36, and level of mobility in outpatient elderly population. The AMT score mostly be used in extended functional status in ADLs;[18] therefore, in our results the AMT had the lowest correlation because the BI has no item to assess mental skills and cognitive abilities.[19]

Since, BI is not reliable in cognitive impair patients by interviewing,[20] cognitive status can not a significant predictor for BI.[19] Therefore, the BI mostly is a valuable index of physical dependency and is not apply in cognitive function studies or depression.[8] Since, most previous studies were performed in hospital or rehabilitation centers, and assessing the correlations of FAAM and FAC scales, with BI together have not been studied;[18,21] in this study, we found a good correlation by applying those scales. To define level of disability, needs assessment, and details in walking mobility, the FAC is an appropriate ordinal scale.[8] Our result viewing participants and setting was similar to Brazilian study, and was different in FAAM and FIM usage to explore BI validity.[3] Regarding subjects rating in current levels of function during ADLs,[12] Martin *et al*. stated usefulness of FAAM-ADL subscale as an outcome instrument to measure physical function in individuals with diabetes and foot and/or ankle disorders.[22] According our analyses, the FAAM-ADL had relatively low correlation with mental health subscale SF-36 as a concurrent measure. There is a concurrent valid test, if a test is highly correlated with another test of the same variable, which was used at the same time.[23] Martin *et al*. stated that ADL subscale FAAM is more sensitive in physical status changing than mental function, and also, physical components score of SF-36.[22] According to our results in associations between physical subscale SF-36 and BI, also in a psychometric study of the Spanish version of the BI, the correlation of subscale MCS-12 was less than PCS-12.[24] In another study[25] similar results were found with higher correlation between the BI and SF-36 PCS

Table 1: Characteristics of the Iranian outpatients' elderly participants

Characteristics	Total sample (*n*=395)
Age (years) Mean±SD	67.30±6.04
Gender (*n*, %)	
Men	(243) 61.5%
Women	(152) 38.5%
Level of ambulation (*n*, %)	
Independent	(230) 58.2%
Functional ambulation category; FAC (*n*, %)	(195) 49.4%
Independent	
Total Barthel (Mean±SD)	73.25±31.55
FAAM -ADL (Mean±SD)	14.9±10.59
Total AMT (Mean±SD)	9.38±1.02
SF-36 (Mean±SD)	
SF36-PCS score	44.99±10.06
SF36-MCS score	47.52±10.53
Medical status (*n*, %)	
Arthritis	(193) 49.9%
Cerebral Vascular Accident	(72) 18.2%
Chronic pain	(76) 20.7%
Vision problem	(146) 39.7%
Hearing problem	(95) 25.8%
Economic Condition (*n*, %)	
Active	(24) 6.5%
Retired	(303) 82.3%
Retired and working	(40) 10.9%
Geriatric syndromes (*n*, %)	
Falling in last year	(51) 13.9%
Incontinence	(75) 20.4%
Dizziness	(87) 23.6%

Table 2: Correlations between Barthel-ADL with FAAM, Level of ambulation, FAC, SF-36, and AMT

Tool	FAAM (ADL) (95%CI)	Level of ambulation (95%CI)	FAC (95% CI)	SF-36 (95%CI)		AMT (95%CI)
				SF-36 PCS	SF-36 MCS	
Total Barthel	-0.945 (-0.954- -0.934)	0.895 (0.874-0.913)	0.947 (0.936-0.956)	0.567** (0.497-0.630)	0.545** (0.472-0.610)	0.535 (0.461-0.601)

AMT: Abbreviated Mental Test; FAAM: Foot and Ankle Ability Measure; ADL: Activity of Daily Living; FAC: Functional ambulation category; ** Correlation is significant at the 0.01 level (2-tailed)

Table 3: Factor analysis for validity			
Items	Factor 1	Factor 2	Item-Total Correlation (ITC)
Bowels	0.231	**0.881**	0.649
Bladder	0.182	**0.904**	0.605
Grooming	0.476	**0.711**	0.754
Toilet use	**0.849**	0.273	0.812
Feeding	**0.774**	0.453	0.863
Transfer	**0.783**	0.524	0.925
Mobility	**0.795**	0.540	0.953
Dressing	**0.821**	0.337	0.827
Stairs	**0.857**	0.322	0.863
Bathing	**0.876**	0.033	0.682

Table 4: Reliability analysis of the Iranian version BI in geriatric outpatients	
Items	Cronbach's Alpha if Item Deleted
Bowel	0.936
Bladder	0.933
Grooming	0.932
Toilet use	0.924
Feeding	0.930
Transfer	0.924
Mobility	0.920
Dressing	0.928
Stairs	0.930
Bathing	0.931

subscale than mental subscale (SF-36 MCS). Based on our results, regarding a weak Item-Total Correlations (ITC) for bowel and bladder continence, Hobart and Thompson, also observed a relatively low Item-Total Correlations for bowel and bladder functions (0.34 and 0.42, respectively), while other items correlations were varied from 0.53 to 0.83[25] Similarly, in Sri Lanka survey all items, except bowel and bladder functions had high item-total correlations.[2] While in another study Duffy *et al.* reported a very good reliability for them.[26]

We obtained an excellent internal consistency, means a very high inter-correlation results between the items that was better from findings in Dutch results and the original BI study (Cronbach's alpha 0.87 for both of them).[27] Meanwhile, inter- class coefficients for the items of Iranian version BI were excellent, that were similar to the other studies.[28,29] In factor analyses for validity, we achieved two factors. Differences in the number of factors have observed by Laake *et al.* because of variety in population of study; but in a group of geriatric patients, they observed two-factor structure,[30] similar results observed in Sri Lanka study.[2] The major limit of our study was lack of success for expanding interviews with the participants from outpatient clinics to their home setting; where, the BI is most often used. Moreover, we could not identify the proxy respondents in a home environment.

Conclusions

In conclusion, the BI is a reliable and valid tool to apply in assessing of elderly outpatients. It could be used to follow up of patients who admitted to rehabilitation clinic, even can be administered by non-professional interviewers. Since, we have found a good correlation between BI and FAC to evaluate ambulatory functions, it seems for finding level of caregiver's support for patients' needs, both tools should be applied in admission or screening of geriatric outpatients.

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Conflicts of interest

There are no conflicts of interest.

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