Rapid screening for physical activities of daily living (pADL) in older adults in resource limited clinical settings

Sarath Lekamwasam[1], Nirmala Rathnayake[2], Warsha de Zoysa[1], Dhammika Palangasinghe[1], Thilina Abeygunasekara[2], Harshani Dias[2]

(Key words: barthel index, older adults, physical activities of daily living)

Abstract

We evaluated the validity of 3-item shorter versions of Barthel index (BI) in older adults. Sinhala versions of 10 item-BI (BI) and 6-item Katz index (KI) were administered among older adults (≥65 years and n=200). The performance of three shorter versions of BI (SV1, SV2 and SV3) was examined considering the 10-item BI and 6-item KI, which are widely used tools to assess the physical activities of daily living (pADL), as the reference standards. These, when compared with the 10-item BI, the sensitivity and specificity of SV1 were 0.28 and 0.87. The corresponding values of SV2 and SV3 were 0.72, 0.66 and 1.0, 0.58. Compared to KI, the sensitivity and specificity of SV1 were 0.21 and 0.80. The corresponding values of SV2 and SV3 were 0.73, 0.84 and 0.87, 0.61. SV2 and SV3, but not SV1, showed satisfactory psychometric properties that make them suitable tools to screen for pADL in older adults. bi fruits are useful in the evaluation of kidney injury.

Background

Although South Asian countries have a relatively young population compared to Western populations at present, a rapid aging of South Asian populations is expected in coming years [1]. Among Asian countries, Sri Lanka, has a rapidly expanding older population. The expansion of older population will pose a considerable burden on existing health and social care services in Sri Lanka which are underprepared to meet the demands of older adults.

However, geriatric care services in Sri Lanka are not well established and the health needs of older adults are mainly provided by general physicians and nurses who have not received a formal training in geriatric care. A previous survey in Sri Lanka found only three geriatricians for the entire country listed under a private online health care provider [2]. In order to overcome these limitations, some have suggested using rapid screening methods to detect those who are at high risk of impaired physical functions and require comprehensive assessment [3].

The 10-item Barthel index (BI) and 6-item Katz index (KI) are widely used to assess physical activities of daily living (pADL) in older adults and it has been translated and validated in many populations. A previous study found a shorter version of BI consisted of five-items to have adequate psychometric properties to be used as a rapid screening tool to detect those at high risk of impaired pADL [4]. Previous studies [5,6] have shown the ability to use much shorter versions of BI, consisted of three items, as screening tools. These rapid screening tools will allow healthcare staff in busy and resource limited clinical settings to identify those who require comprehensive geriatric assessment (CGA). This study assessed the validity of three previously validated shorter versions of BI consisted of 3 items [5,6] among Sinhala speaking older adults in Sri Lanka.

Methods

Ethical approval for the study was obtained from the Ethical Review Committee, Faculty of Medicine, University of Ruhuna [Ref No: 2020.P.122 (22.10.2020)]. Consecutive 200 older adults, aged >65years or more, attending medical

Ceylon Medical Journal 2023; **68:** 135-138

DOI: https://10.4038/cmj.v68i3.9778

[1]*Faculty of Medicine,* [2]*Faculty of Allied Health Sciences, University of Ruhuna, Sri Lanka.*

Correspondence: SL, *e-mail: slekamwasam@gmail.com* *Received 15 May 2023 and revised version 18 July 2023 accepted 18 September 2023*

clinics for more than 6 months due to chronic diseases were included in the study. They were assessed using the Sinhala versions of 10-item BI [4] and 6-item KI [7], validated previously. The performance of three shorter versions of BI; SV1, SV2 and SV3 [5, 6] was examined considering the 10-item BI and 6-item KI as reference standards.

SV1 (items 2, 7 and 10); bathing, toilet use and climbing stairs

SV2 (items 4, 5 and 8); dressing, bowel functions and transfer

SV3; (items 1, 9 and 10) feeding, mobility and climbing stairs

Spearman correlations were assessed between the total scores of reference standards and three short versions. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of the three shorter versions were also examined. For this analysis, cutoff value of shorter versions was kept at 20 considering average mean of all three shorter versions.

Results

Mean (SD) age of the study participants was 74.3 (4.3) years and 58% were women. Nearly two thirds (65%) had more than three chronic diseases while 12% were on more than six medications. Correlations between the total scores of 10-item BI and SV1, SV2 and SV3 were 0.67, 0.86 and 0.86 and the corresponding values for KI were 0.41, 0.90 and 67 ($p<0.001$ for all) (Table and Figure 1 and 2). According to the 10-item BI, 107 were fully independent (score 90 or more) while 93 had impaired ADL, varying from mild to severe (total score <90). Based on the KI, 82 were independent (score of 6) and rest were dependent. Table below shows the performance of shorter versions of BI when total score of 20 was considered the cut point and the 10-item BI and KI were considered reference standards.

Table. Sensitivity, specificity, PPV and NPV of the three short versions of BI

Short versions of BI	*Sensitivity*	*Specificity*	*PPV*	*NPV*	*Kappa (p value)*
10-item BI as reference standard					
SV1	0.28	0.87	0.65	0.58	0.15 (0.009)
SV2	0.72	0.66	0.65	0.73	0.38 (0.009)
SV3	1.00	0.58	0.67	1.00	0.56 (<0.001)
KI as reference standard					
SV1	0.21	0.80	0.65	0.39	0.03 (0.66)
SV2	0.73	0.84	0.88	0.66	0.55 (<0.001)
SV3	0.87	0.61	0.78	0.74	0.49 (<0.001)

BI = Barthel index, KI = Katz index, PPV = Positive predictive value, NPP = Negative predictive value

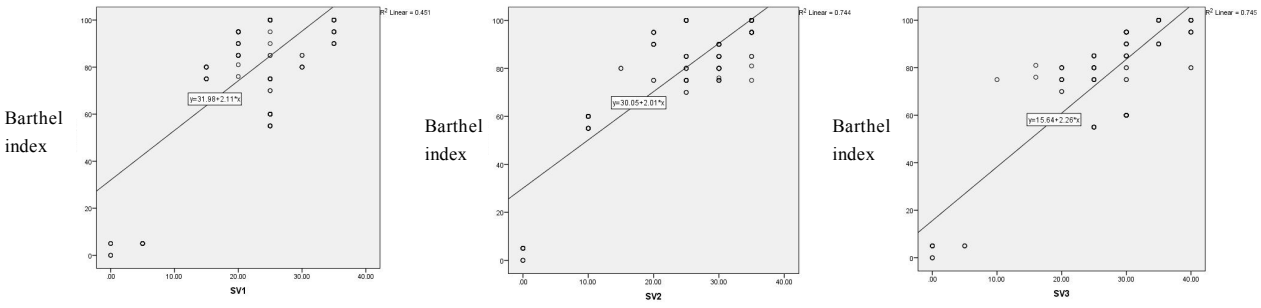

Figure 1. **Correlation between shorter versions of Barthel index and 10-item Barthel index.**

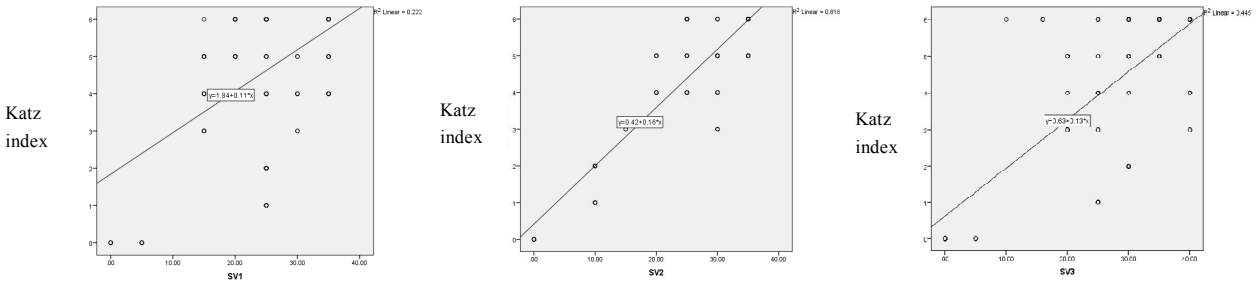

Figure 2. **Correlation between shorter versions of Barthel index and 6-item Katz index.**

Discussion

This analysis shows that the SV2 and SV3 have adequate psychometric properties to identify those at high risk of impaired pADL. SV1, however, showed poor sensitivity when compared with reference standards. Our results are comparable with those of published original validations [5, 6].

With rapidly expanding older adult population in Sri Lanka [8], age-related health and social issues that need multidisciplinary approach will be more prevalent. Siriwardena *et al* found the prevalence of frailty and pre-frailty among community-dwelling older adults in Sri Lanka to be 15.2% and 48.5%, respectively and these values are relatively higher than those reported from middle-income and high income countries [9]. Furthermore, Gamage *et al* in 2019 observed 34.3% prevalence of falls and 9.6% prevalence of recurrent falls among community-dwelling older adults in Galle district in Sri Lanka [10]. Hence, patient care services in the country needs to be aligned to meet this demand.

Shorter versions of BI will help medical and nursing staff in busy care settings to identify those at high risk of impaired pADL and refer them for CGA. The shorter versions we propose, can easily be incorporated to routine medical history to identify those who require further assessment. Although CGA gives a holistic picture of functional capacity of older adult in many domains, clinical set ups with high patient turnover and those not designed for care of older adults will not be able to fulfill this requirement. Due to this limitation, rapid geriatric assessment tools have been introduced [3].

This is a single center study conducted in a general medical clinic of a tertiary care hospital in Sri Lanka. The selection criteria with minimum exclusion criteria used in this study allowed us to include a diverse study sample. This will enhance the external validity of our results. We included on the Sinhalese people into the study, as this was a validation of Sinhala questionnaire. Hence this cannot be used as a self-administered questionnaire in patients not conversant in Sinhala language. We recommend conducting similar studies in other ethnic groups in Sri Lanka.

We conclude that the shorter versions of BI, particularly SV2 and SV3 can be used to identify those at high risk of impaired pADL and require further geriatric assessments. Also we propose to determine the performance of these short versions in a prospective study with a diverse group of older adults with varying disabilities.

Competing interests

Authors declare that they have no conflict of interests.

Ethics approval and consent to participate

Ethical clearance for this study was obtained from Ethics Review Committee, Faculty of Medicine, University of Ruhuna, Sri Lanka. All participants provided informed consent to participate, collected via an information sheet and consent form.

Funding

This is a self-funded study.

Data availability

The data used to support the findings of this study are available from the corresponding author upon request.

Authors contributions

SL, NR, WZ, TA, DP and HD involved in design of the study. NR involved in data collection. SL analyzed the data and drafted the manuscript. NR, WZ, TA, DP and HD contributed for manuscript revision. All authors read and approved the final manuscript.

Acknowledgements

Authors acknowledge all the participants of the study.

Abbreviations

BI – Barthel index

CGA – Comprehensive Geriatric Assessment

KI – Katz index

NPV – Negative Predictive Value

SV – Shorter versions

pADL – Physical Activities of Daily Living

PPV – Positive Predictive Value

References

1. Martin LG. The status of South Asia's growing elderly population. *Journal of Cross-Cultural Gerontology* 1990; **5**: 93-117. Available at: https://pubmed.ncbi.nlm.nih.gov/24390287/

2. Matthews NR, Porter GJ, Varghese M, *et al*. Health and socioeconomic resource provision for older people in South Asian countries: Bangladesh, India, Nepal, Pakistan and Sri Lanka evidence from NEESAMA. *Global Health Action* 2023; **31**: 16(1): 2110198. Available at: https://pubmed.ncbi.nlm.nih.gov/36537796/

3. Little MO. The rapid geriatric assessment: a quick screen for geriatric syndromes. Missouri medicine. 2017; 114(2):101. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6140035/

4. Lekamwasam S, Karunatilake K, Lekamwasam V. Physical dependency of elderly and physically disabled; measurement concordance between 10-item Barthel index and 5-item shorter version. *Ceylon Medical Journal*. 2011; **1**: 56(3). Available at: https://pubmed.ncbi.nlm.nih.gov/22164749/

5. Wright JG, Feinstein AR. A comparative contrast of clinimetric and psychometric methods for constructing indexes and rating scales. J Clin Epidemiol. 1992; **45**: 201-1218. Available at: https://pubmed.ncbi.nlm.nih.gov/1432001/

6. MacIsaac RL, Ali M, Taylor-Rowan M, *et al*. Use of a 3-item short-form version of the Barthel Index for use in stroke: systematic review and external validation. *Stroke* 2017; **48**(3): 618-23. Available at: https://pubmed.ncbi.nlm.nih.gov/28154094/

7. Rathnayake N, Karunadasa R, Abeygunasekara T, *et al*. Katz index of activities of daily living in assessing functional status of older people: Reliability and validity of Sinhala version. *Dialogues in Health* 2023; **2**: 100134. Available at: https://www.sciencedirect.com/science/article/pii/S2772653323000382

8. Siddhisena KA, DeGraff DS. A pace of its own: The demography of ageing in Sri Lanka. *Journal of Population Ageing* 2009; **2**: 77-99. Available at: https://link.springer.com/article/10.1007/s12062-010-9025-1

9. Siriwardhana DD, Weerasinghe MC, Rait G, *et al*. Prevalence of frailty in rural community-dwelling older adults in Kegalle district of Sri Lanka: a population-based cross-sectional study. *BMJ open*. 2019; **9**(1): e026314. Available at: https://pubmed.ncbi.nlm.nih.gov/30782757/

10. Gamage N, Rathnayake N, Alwis G. Prevalence and associated risk factors of falls among rural community-dwelling older people: a cross-sectional study from southern Sri Lanka. *Current Gerontology and Geriatrics Rresearch* 2019; **28**: 2019. Available at: https://www.hindawi.com/journals/cggr/2019/2370796/