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Falls among the frail: A Sri Lankan trail

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ABSTRACT

Falls are a major cause of disability, dependency, and mortality among older adults. This article synthesizes four studies and oration findings to describe the burden, determinants, and prevention strategies for falls among older Sri Lankans. Data from multicentre surveys, a community scoping review, and functional screening validation studies show that one in three older adults experiences a fall each year, with functional dependency emerging as the strongest predictor. Pragmatic interventions including rapid screening tools, medication review, and the establishment of geriatric units and a national falls registry are proposed to promote healthy ageing.

Keywords: *Falls, Functional dependency, Older adults, Rapid screening tool, Risk factors.*

Summary Box

- **What is already known on this topic**
  - About one-third of older adults fall each year globally.
  - Falls cause significant disability and dependence in ageing populations.
  - In Sri Lanka, systematic evidence and prevention programmes have been limited.
- **What this study adds**
  - Demonstrates a 31% annual falls prevalence among clinic-attending older adults.
  - Identifies functional dependency and environment as consistent risk factors.
  - Validates rapid screening tools for functional status suitable for routine clinics.
  - Recommends national strategies integrating falls prevention into healthy ageing policies.

Introduction

Falls and fall-related injuries are common, particularly among older adults and those with physical disabilities. Around one-third of older people living in the community fall at least once a year, and about one sixth fall recurrently (1, 2). Approximately a third of older fallers sustain fall-related injuries, which require medical treatment (3). Falls result in fractures and they are seen mainly in hip, spine, arms, ankles, and legs (4). Following an injurious fall, a significant proportion of older adults are unable to return to their pre-fall activities. Apart from pain and disability associated with injuries, fear of falling, anxiety, depression, post-traumatic stress disorder, loss of independence and admission to residential care also contribute to these adverse clinical outcomes (5). Furthermore, falls in older people can cause disabilities, resulting increasing burden to their family, health sector, and the economy of the country (6).

Falls are associated with high and increasing demand on health and social care resources. Watson *et al.,* reported that older adults with fall-related injuries, particularly hip and other fractures, consume a disproportionate share of hospital resources compared to those who sustain injuries due to other causes, such as road trauma (5). In the United States, there are 2.7 million fall-related emergency department visits and 1.1 million in-patient visits per year, with a total annual average health cost of $22.9 billion due to falls in older adults (7). In the Netherland, fall-related injuries in the older population account for €675.4 million annually, with fractures being the main contributor to this healthcare cost (3). In Australia the national healthcare cost for falls among older adults is $66.1 million while in Italy, the cost of hospitalisation due to domestic falls is €395 million per year (8). According to the International Osteoporosis Foundation, there are 4.3 million fragility fractures in older adults, with health-care costs exceeding €56 billion annually in Europe (9).

The population of older adults has shown a rapid expansion worldwide, especially in Asia, during the recent past. According to the World Health Organization, by 2030, 1 in 6 people in the world will be aged 60 years or over. It is predicted that the proportion older adults, aged 60 years or more, will increase from 1 billion in 2020 to 1.4 billion. The world's population of people aged 60 and over will double (2.1 billion) by 2050 (10). The number of people aged 80 years, or more is expected to triple between 2020 and 2050. By 2050, 80% of the elderly will live in low- and middle-income countries (10). Asia makes up 60% of the world's population and is aging faster than any other region. The proportion of people aged 60 years or more in South-East Asia was 9.8% in 2017 and it is expected to rise to 13.7% by 2030 and 20.3% by 2050 (1). In Sri Lanka, the population over the age of 65 years was 9.67% in 2018 and it is expected to be tripled in 2050 (11).

Sri Lankan studies on falls and related factors are limited. A hospital-based study of older adults in the Colombo district found 23% of subjects to experience a fall in a year (12). Another community-based study reported fall incidence of 492 per 1000 person-years (95% CI 448-536) which is higher than the WHO reported 28%-35% fall incidence, worldwide (4). The same analysis found that the elimination of house risk level was effective in preventing 40% of falls among study subjects. Furthermore, a community-based study from Southern Sri Lanka revealed a 34.3% of prevalence of falls and 9.6% of recurrent falls among the community-dwelling older adults (13).

Older adults with chronic diseases have a higher tendency to fall and this is partly explained by prevalent co morbidities such as diabetes, hypertension, ischemic heart disease and heart failure and multiple medications used for such conditions (14). Among medications those increase the risk of falls (Fall risk increasing drugs: FRIDs), anticholinergic medications and polypharmacy are particularly associated with the increased risk of falls (15). Assessing the risk of falls and steps to minimise the risk should be an integral part of the management of the older patients with multiple comorbidity (2). Therefore, it is important to know the prevalence of recurrent falls among older adults with medical diseases since falls and medical diseases are related.

In Sri Lanka, geriatrics is not a well-established medical specialty at present, and as a result, older adults are managed in busy general medical clinics and wards, which are managed by medical officers who are not well trained to handle age-related disorders. Therefore, falls and other age-related medical problems are likely to remain undetected. The identification of falls, especially recurrent falls and factors that are associated with them among ambulatory clinic patients are imperative both for preventing further falls among them and highlighting the need of educating the health staff on assessing falls in older adults regularly.

Aims and objectives

The work presented in this oration was aimed to highlight the unreported falls in the elderly in Sri Lanka and the necessity for comprehensive geriatric assessment and focused interventions to ensure successful aging. The main objectives are to

1. Explore the burden of falls among the elderly in Sri Lanka
2. Determine the impact of medication on falls in elderly

3. Development of a valid, rapid screening tool for physical activities of daily living (pADL) in elderly in resource limited clinical settings

Following four studies conducted by the author and the research team are presented to fulfill the above-mentioned objectives.

Study 1: Undetected falls among attendees of medical clinics in four tertiary care centers in Sri Lanka; the need of a comprehensive geriatric assessment

Study 2: Incidence and risk factors of falls among community-dwelling older adults in Sri Lanka; a systematic review3

Study 3: Multimorbidity, polypharmacy, anti--cholinergic burden and falls risk increasing drugs among older adults attending medical clinics; a multicentre study from Sri Lanka

Study 4: Rapid screening for physical activities of daily living (pADL) in older adults in resource limited clinical settings.

Study 1:

Undetected falls among attendees of medical clinics in four tertiary care centers in Sri Lanka; the need of a comprehensive geriatric assessment

A multi-center cross sectional survey was conducted in medical clinics at four tertiary care hospitals situated in two districts in Sri Lanka. The four centers were Teaching Hospital Karapitiya, Galle (THK), Colombo South Teaching Hospital (CSTH), Colombo North Teaching Hospital (CNTH) and Teaching Hospital - Kotelawala Defense University medical unit (TH-KDU). Consecutive attendees of medical clinics for more than six consecutive months and aged $\geq$ 65 years were interviewed by trained data collectors between August 2021 and August 2022.

A detailed analysis of falls during the previous 12 months were done. Participants were identified as fallers if they had at least a single fall during the previous 12-months period (16). Recurrent fallers were identified if they had two or more falls during the previous 12-months period (17).

Physical dependency was assessed using the Barthel index (BI) (18) validated to local language earlier (19). The BI measures the degree of assistance required for 10 selected personal activities; feeding, personal toileting, bathing, dressing and undressing, getting on and off a toilet, controlling bladder, controlling bowel, moving from wheelchair to bed and returning, walking on level surface (or propelling a wheelchair if unable to walk) and ascending and descending stairs and the total score ranges from 0 (total physical dependency) to 100 (physically independent) (18).

Cognitive impairment was evaluated using the mini-cognitive test (*Mini-Cog*^{TM}) (20). It assesses cognitive domains including cognitive function, memory, language, comprehension, visual motor skills and executive functions and further provides a visible record of both normal and impaired performance. The total score of *Mini-Cog*$^{TM\ ranges}$ from 0-5. Score 0-2 indicates the higher likelihood of cognitive impairment while score $\geq$ 3 indicates lower likelihood of cognitive impairment (20).

Medical records were viewed, and current comorbidities and medications were identified. Further, presence of $\geq$ 2 diseases was considered as multi-morbidity (14) while use of $\geq$ 5 medications was considered as polypharmacy (21). The use of assistive devices for walking, use of aids for vision and hearing, use of animal protein, sleeping pattern and consumption of alcohol were also inquired. The materials used for the floor and the presence of steps within the house were also recorded.

Ethical clearance for this study was obtained from Ethics Review Committee, Faculty of Medicine, University of Ruhuna, Sri Lanka (Reference number; 2021.P.075).

Results

The mean (SD) age of the participants (total 704) was 72.5(5.5) years and 58.7% were females. Two hundred and twenty (31.3%) participants experienced at least one fall after the age of 65, and 12.8% (n=90) experienced recurrent falls (two or more falls within the last 12 months). Furthermore, the majority of fallers had injuries (75.9%, n=167). Falls were associated with gender, level of education, marital status, and physical dependence (p<0.01). For those who had at least one fall, multiple logistic regression (MLR) revealed being single (p=0.03, OR=2.12, 95% CI; 1.052 -

4.304), being widowed/ divorced/ separated (p=0.03, OR=1.47, 95% CI; 1.039 - 2.093) compared to living with spouse, presence of moderate (p=0.007, OR=1.72, 95% CI; 1.160 - 2.577) and severe (p=0.001, OR=2.98, 95% CI; 1.563 - 5.688) physical dependency compared to mild physical dependency as risk factors for falls. Having secondary education (p=0.01, OR=0.55, 0.350 - 0.876) was a protective factor for falls. For those with recurrent falls, MLR showed moderate physical dependency (p=0.001, OR=2.34, 95% CI; 1.442 - 3.821) compared to slight physical dependency as a risk factor (Table 1 and 2).

Conclusions

Approximately one-third of the older adults attending medical clinics have experienced at least one single fall, and one-eighth have had recurrent falls, which were mostly unrecorded and not clinically assessed. Physical dependency was the major contributing factor for falls and recurrent falls. Authorities should consider the need for a comprehensive geriatric assessment and health staff should be trained and rapid screening tools should be made available.

Table 1: Univariate binary logistic regression analysis of factors associated with falls (n=704)

Factor	B value	S.E.	Wald value	*P* value	Crude OR (95% CI for OR)
Gender					
Male	-	-	-	-	-
Female	0427	0.169	7.70	0.005	1.640 (1.510 - 2.231)
Marital status					
Married	-	-	-	-	-
Single	0.818	0.345	5.620	0.018	2.265 (1.152 - 4.413)
Widowed/ Divorced/ Separated	0.510	0.172	8.829	0.003	1.665 (1.189 - 2.330)
Level of education					
No schooling and up to primary education*	-	-	-	-	-
Up to G.C.E. Ordinary Level	-0.248	0.208	1.423	<0.001	0.780 (0.519 - 1.173)
Up to G.C.E. Advanced Level	-0.860	0.222	15.050	0.942	0.423 (0.274 - 0.653)
Degree or Diploma	-1.067	0.524	4.151	0.025	0.344 (0.123 - 0.960)
Physical dependency					
Slight dependency*	-	-	-	-	-
Moderate Physical Dependency	0.701	0.196	12.731	<0.001	2.016 (1.372 - 2.962)
Severe Physical Dependency	1.312	0.320	16.766	<0.001	3.713 (1.982 - 6.958)

OR = Odds Ratio, SE = Standard Error, CI = Confidence Interval, G.C.E. = General Certificate of Education
* Reference category

Table 2: Factors associated with falls (n=704)

Factor	B value	S.E.	Wald value	*P* value	Adjusted OR (95% CI for OR)
Marital status					
Married*	-	-	-	-	-
Single	0.755	0.359	4.415	0.036	2.128 (1.052 - 4.304)
Widowed/ Divorced/ Separated	0.385	0.179	4.719	0.030	1.474 (1.039 - 2.093)
Level of education					
No schooling and up to 5*	-	-	-	-	-
Up to G.C.E. Ordinary Level	-0.058	0.217	0.072	0.789	0.944 (0.617 - 1.442)
Up to G.C.E. Advanced Level	-0.591	0.234	6.382	0.012	0.554 (0.350 - 0.876)
Degree or Diploma	-0.661	0.536	1.520	0.218	0.516 (0.811 - 1.471)
Physical dependency					
Slight dependency*	-	-	-	-	-
Moderate Physical Dependency	0.547	0.204	7.218	0.007	1.728 (1.160 - 2.577)
Severe Physical Dependency	1.092	0.330	10.986	0.001	2.981 (1.563 - 5.688)

OR = Odds Ratio, SE = Standard Error, CI = Confidence Interval, G.C.E. = General Certificate of Education
* Reference category

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The findings of the initial study, which revealed a high prevalence of undetected falls among attendees of medical clinics in Sri Lanka, highlighted a significant gap in the routine evaluation and management of fall risks in older adults. This gap underscored the urgent need for a deeper understanding of fall incidence and the underlying risk factors within the broader community-dwelling elderly population. Consequently, the second study was conducted as a systematic review to comprehensively assess the incidence and risk factors of falls among community-dwelling older adults in Sri Lanka. This follow-up study aimed to provide a more detailed and wide-ranging insight into the issue, thereby reinforcing the necessity for comprehensive geriatric assessments in both clinical and community settings to effectively address and prevent falls.

Study 2:

Incidence and risk factors of falls among community-dwelling older adults in Sri Lanka; a systematic review

A systematic review was carried out following the recommendations for reporting systematic reviews and meta-analyses of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (The PRISMA Statement).

A systematic search was done following the PRISMA Statement using the terms "Falls", "Prevalence" or "Incidence" and "Risk factors" and "Elderly "or "Older adults" and "Sri Lanka. Searches were carried out in the PUBMED and Cochrane databases until 15th of July 2023, with no restriction on year of publication.

Original studies which were published in English language and the studies that had been carried out in the community settings were reviewed with the agreement of authors. The following search limits were established: research on humans, published in English, with the keyword in any field. Within the search results obtained, manual searches were then carried out on the bibliographic references cited within the articles and the search was expanded using

"Related publications" link and cross-references. Previous systematic reviews and meta-analysis were cross-checked to make sure the sensitivity of the search strategy. Review articles, meta-analyses and case-reports were excluded.

Subsequently for the identification of studies in the databases, duplicates were excluded, and the titles and abstracts of the remaining results were screened. All titles and abstracts were screened initially, and the original articles were perused when abstracts were inconclusive or had insufficient information. Duplicate publications were discarded, and the remaining publications were searched using pre-specified inclusion and exclusion criteria. The eligible articles were read in full and those that met all criteria were included.

Results

Total of 2010 community dwelling older adults aged ≥ 60 years have been studied. The prevalence was reported between 258/1000-yr to 508 (400-636)/1000-yr. The common risk factors emerged through the studies include falls in the previous year (OR=4.65), disability level (OR=2.04), house risk level (OR=1.68), old older age (OR=0.1 to 3.4), female gender (OR=2.1 to 3.0), being employed (OR=3.6), having diabetes mellitus (OR=2.7), having balance or gait problems (OR=4.2), use of antihypertensive medication (OR=0.2) and use of at least one long-term medication (OR=3.5) (Table 3).

Table 3: Risk factors of falls among community-dwelling older adults in Sri Lanka; summary results of the systematic review

Authors (year)	Study design	Population	Age/ Number of subjects	Prevalence / Incidence	Risk factors (OR)	Limitations
Ranaweera *et al.,* 2013	Community based cross sectional-study	Western Province	≥ 65 years/ 1200	Prevalence 258/1000-yr Incidence 492 (448-536)/ 1000-yr	Falls in the previous year (OR=4.19, 95% CI: 2.76 - 6.35) High disability level (OR=2.74, 95% CI: 1.77 - 4.22) High house risk level (OR=1.71, 95% CI:1.13 - 2.60)	Only older adults in Colombo district were included.
Gunawardene *et al.,* 2014	Community-based cross-sectional study	Western Province	≥ 60 years/ 510	Prevalence 508 (400-636)/1000-yr	Age >75years (OR=2.8, 95% CI: 1.2 - 6.7) Being a woman (OR=1.8, 95% CI: 1.0 - 3.0) Being employed (OR=2.6, 95% CI: 1.5 - 4.9)	Only the falls during the previous three months were considered
Gamage *et al.,* 2018	Cross-sectional household survey	Southern Province	≥ 65 years/ 300	Prevalence 343 (290-400)/ 1000-yr	Age (OR=0.1, 95% CI: 0.0 - 0.3) Gender (OR=3.0, 95% CI: 1.5 - 5.9) Diabetes mellitus (OR=2.7, 95%, CI: 1.2 - 6.3) Balance or gait problems (OR=4.2, 95% CI: 2.0 - 8.4) Use of at least one long-term medication (OR=3.5, 95% CI: 1.2 - 10.4)	Included 300 older adults from the Southern province.

Conclusions

Approximately every third older adult in the community has experienced at least a single fall while the female gender, disability, comorbidities and medications are significant contributory factors. These findings call for community-based multidisciplinary approaches encompassing healthcare professionals, caregivers, and community stakeholders to effectively address the complex issue of falls among older adults.

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Previous two studies have shown that one in three older adults experiences at least one fall after the age of 65. As they age, they are prone to developing multiple comorbidities, which often necessitates the use of multiple medications. The third study aims to examine the impact of multimorbidity, and medication use on falls in the elderly.

Study 3:

Multimorbidity, polypharmacy, anticholinergic burden and falls risk increasing drugs among older adults attending medical clinics; a multicentre study from Sri Lanka

Multimorbidity is defined as the presence of two or more co-morbid conditions (22). Older adults commonly have multimorbidity and complex diseases requiring multiple medications. It has been widely demonstrated that multimorbidity correlates positively with incidence and recurrence of falls (14, 23). It is inevitable to observe polypharmacy in patients who have multimorbidity. Use of five or more drugs is defined as polypharmacy (24). Moreover, many studies have described that the polypharmacy increases the incidence of falls (25). A systematic review reported that polypharmacy can cause 1.5 to 2 times higher possibility of recurrent falls (26). Certain medications such as antihypertensives, diuretics, antidiabetics, psychotropics, hypnotics, antihistamines and several cardiovascular drugs have been recognised as Falls Risk Increasing Drugs (FRIDs). It has been shown that the polypharmacy causes a significant risk in falls when two or more FRIDs are included in the prescription (27). Many medications used to treat chronic medical conditions of old age, have anticholinergic properties. These drugs exert adverse outcomes by increasing the anticholinergic burden (ACB) which is estimated by anticholinergic burden score. Polypharmacy predisposes higher anticholinergic burden score. Wong *et al.,* have shown an increased risk of falls per unit increase of anticholinergic burden score (28).

A study done in a tertiary care hospital in Sri Lanka investigated the modifiable risk factors for falls in the older adults and detected that the long-term use of multiple medications has significantly associated with hospitalisation due to falls (29). There are no local studies which have investigated association of FRIDs with the incidence of falls in older adult population. Moreover, there is no robust evidence on anticholinergic burden and its association with falls in this population in Sri Lanka.

Therefore, it is evident that the impact of polypharmacy, use of FRIDs and drugs with anticholinergic burden in older adults is not well investigated in Sri Lankan setting especially in patients attending ambulatory outpatient clinics. Magnitude of this problem remains unknown. Hence, it is important to explore the relationship of potential risk factors related to medications and falls in older adults with multimorbidity in the local context.

This study was also based on the muti-center cross sectional survey conducted based on medical clinics at four tertiary care hospitals in Southern and Western provinces as described in the first study. Multimorbidity were defined as the presence of two or more long-term (chronic) conditions while polypharmacy was considered as prescription of five or more drugs. Falls risk increasing drugs (FRIDS) are defined as any medication that increase the risk of such occurrence. These include antihypertensives, antiarrhythmics, anticholinergics, antihistamines, antipsychotics, antidepressants, opioids and non-steroidal anti-inflammatory agents. The presence of one or more were considered. We also considered the anticholinergic burden (ACB), or the anticholinergic activity of one or more prescribed medicines. The ACB score was calculated using the online calculator (www.acbcalc.com).

Results

The mean (SD) age of the participants were 72.6 (5.5) years and majority were females 58.7%. The mean (SD) BMI of the study participants was 23.2(4.2) kg/m^2. Mean (SD) Barthel Index and Mini Cog scores were 91.4(16.3) and 3.4 (1.6) respectively. After 65 years of age, 305 (43.5%) of older adults had fallen at least once, and 220 (31.3%) had fallen in the previous 12 months. Of those who have fallen in the past 12 months, recurrent falls have been experienced by 90 (12.8%) older people.

The distribution of comorbidities observed among older people were; 1 in 125 (17.8%), 2 in 237 (33.7%), 3 in 205 (29.1%), 4 in 86 (12.2%) and > 4 in 19 (7.3%). The prevalence of multimorbidity in the study sample was 546 (77.4%). Despite the high prevalence of multimorbidity in this study population no significant association was observed between multimorbidity and falls or recurrent falls after 65 years. Further, compared to those without multimorbidity, those with multimorbidity were not different with regards to BI or Mini Cog scores.

The distribution of number of current medications was; 1 in 75 (10.7%), 2 in 151 (21.4%), 3 in 181 (25.7%), 4 in 125 (17.8%), 5 or more in 367 (51.2%). Therefore, polypharmacy was seen among 367 (51.2%) older people in this study population (Table 4). However, there was no statistically significant association between polypharmacy and falls, recurrent falls, physical activity level, or cognitive level (p>0.05).

While 208 (29.5%) people were not on medications described under FRIDs others were on at least one medication of this category. *i.e.* 1 drug 368 (52.4%), 2 drugs 67 (9.5%), 3 or more drugs 60 (8.6%). There was no significant association between polypharmacy and any of the FRID categories (0,1, or >1). Further, no significant associations were found between the use of FRID medications and falls of any type. In this study sample, there was insufficient data to analyse the relationship between FRID categories and recurrent falls. Comparison of age, BMI, BI, and Mini Cog score between each FRIDs category revealed no significant difference.

Furthermore, the distribution of medications associated with ACB was 1 in 163 (23.2%), 2 in 57 (8.1%), 3 in 20 (2.8%) and >3 in 14 (2.6%). The total ACB (0, 1, or >1) did not show significant association with multimorbidity, polypharmacy, falls after 65 years, or falls within the last 12 months. There was no significant difference between the ACB categories in terms of age, BMI, BI, and Mini Cog score.

Conclusions

This study highlights a high prevalence of multimorbidity and polypharmacy among older adults in clinical settings. Despite the high rates of FRIDs usage and ACB, no significant associations were found between these factors and the incidence of falls in older adults. These findings suggest that while multimorbidity and polypharmacy are prevalent, their direct impact on falls may be less straightforward than anticipated. Future research should focus on longitudinal studies to further interpret the relationships between individual drug classes of FRIDs and ACB and adverse outcomes.

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The first two studies highlighted the prevalence of falls in the elderly, and the multicentre study found that events are often unrecorded and not clinically assessed. Falls are caused mostly by disability and physical dependency, among other factors. The requirement for comprehensive geriatric assessment, as well as the development of valid and rapid screening tools, are seen as essential steps in reducing falls in older adults. Therefore, the following study was planned with the objective of developing a rapid screening tool to assess the risk of falls in older adults.

Table 4: Descriptive data of 706 study participants

Characteristic	Subcategory	Mean (Standard Deviation) or frequency (%)
Falls related information		
Falls after 65 yrs		305 (43.5%)
Falls in the previous 12 months		220 (31.3%)
Recurrent falls		90 (12.8%)
Number of chronic health conditions	None	37 (5.3%)
	One	125 (17.8%)
	Multimorbidity (≥ 2)	546 (77.4%)
Number of current medications	None	83 (11.8%)
	One	75 (10.7%)
	Two	151 (21.4%)
	Three	181 (25.7%)
	Four	125 (17.8%)
	Polypharmacy (≥ 5)	367 (51.2%)
Number of Fall Risk Increasing Drugs prescribed	None	208 (29.5%)
	One	368 (52.4%)
	Two	67 (9.5%)
	Three or more	60 (8.6%)
Number of drugs with Anti-Cholinergic Burden prescribed	One	163 (23.2%)
	Two	57 (8.1%)
	Three or more	34 (5.4%)
Other Characteristics		***Mean (SD)***
Age (yrs)		72.6 (5.5)
Female Gender		414 (58.7%)
Barthel Index score		91.4 (16.3)
Mini Cog test score		3.4 (1.6)

Study 4

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

Introduction

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 (30). Previous studies (31, 32) have shown the ability to use much shorter versions of BI, consisting 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 (32) among Sinhala speaking older adults in Sri Lanka.

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 > 65 years or more, attending medical clinics for more than 6months due to chronic diseases were included in the study. They were assessed using the Sinhala versions of 10-item BI (19) and 6-item KI (33), validated previously. The performance of three shorter versions of BI; SV1, SV2 and SV3 (32) 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, the 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 5 and Figure 1 & 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.

Conclusions

SV2 and SV3, but not SV1, showed satisfactory psychometric properties that make them suitable tools to screen for pADL in older adults. They are more relevant in resource limited and busy clinical settings.

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Table 5: 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

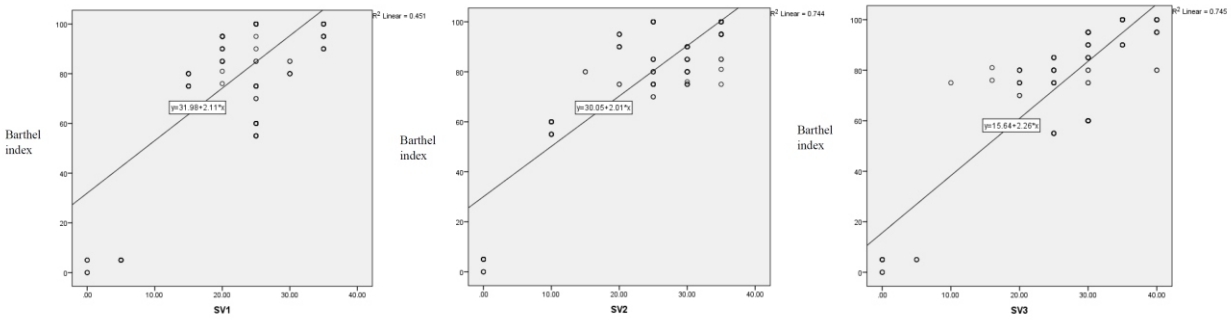

Figure 1: Correlation between shorter versions of Barthel index and 10-item Barthel index

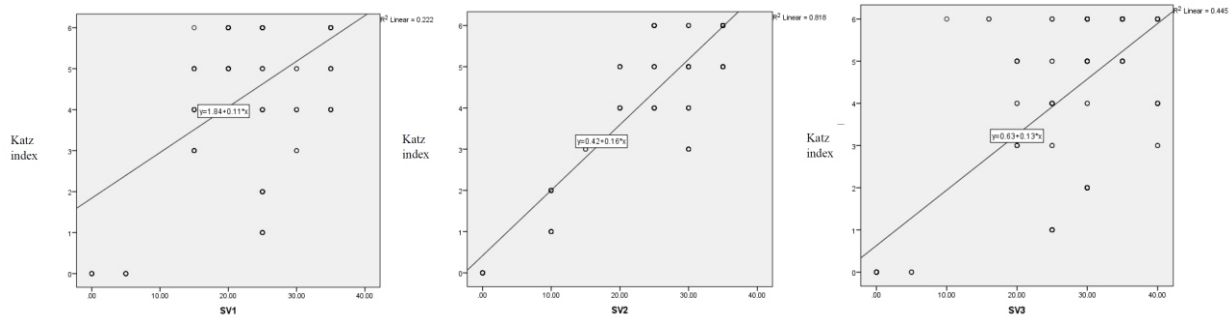

Figure 2: Correlation between shorter versions of Barthel index and 6-item Katz index

Overall conclusions:

Falls among Sri Lankan older adults are common yet preventable. Integrating rapid screening, medication review, and environmental modification into everyday clinical practices supported by national registries and specialist geriatric services can substantially reduce disability and promote healthy ageing.

The way forwards:

As we look to the future, it is imperative to build a robust framework for addressing the issue of falls among the elderly in Sri Lanka. To this end, many pivotal initiatives have undertaken:

1. Establishment of a Falls Registry

We have established a comprehensive Falls Registry at National Hospital Galle, National Hospital of Sri Lanka and Colombo South Teaching Hospital. This initiative aims to collect and analyse detailed data on falls, which will provide invaluable insights into the epidemiology, risk factors, and outcomes of falls among the elderly. By systematically gathering information on the circumstances of falls, clinical outcomes, and treatment received, we can identify trends and areas needing improvement. This evidence-based approach will guide the formulation of targeted interventions and inform policy decisions, ultimately enhancing the quality of care provided to the elderly population.

2. Overseas collaborations with the Asian Falls Network

A collaborative platform that brings together experts from South Asian countries to tackle the issue of falls in the elderly. Through this membership, engage in regional research collaborations, sharing and comparing data to uncover effective fall prevention strategies. Participating in regional conferences and workshops will allow us to stay abreast of the latest developments and innovations in fall prevention. Moreover, this collaboration will enable us to work towards the standardization of fall prevention protocols across the region, ensuring a cohesive and effective approach. By utilizing the collective expertise of the network, we aim to build capacity among healthcare professionals in Sri Lanka, equipping them with the knowledge and skills needed to better manage and prevent falls in the elderly.

3. Establishment of a Geriatric Unit and Clinic in professorial ward complex

To better serve our aging population, we have initiated a dedicated geriatric unit and clinic within the new professorial ward complex. This facility will provide comprehensive care tailored to the unique needs of elderly patients. By adopting a multidisciplinary approach, we will ensure that our patients receive holistic care from a team of physicians with special interest in geriatric medicine, nurses, physiotherapists, occupational therapists, and social workers. Additionally, this unit will serve as an educational hub, offering training opportunities for medical students and post graduate trainees, residents, and other healthcare professionals. Through community outreach programs, we will educate the public on fall prevention, healthy aging, and available services, fostering a supportive environment for our elderly population.

4. Accreditation for Geriatrics MD and Diploma Training

We aim to acquire accreditation of this unit as a training unit for the Geriatrics MD and diploma programs. By collaborating with PGIM and SLAGM, we will meet all necessary criteria and standards to achieve official recognition as a training unit.

Through these comprehensive and forward-thinking initiatives, we aim to create a robust framework for geriatric care and education in Sri Lanka. Together, these initiatives represent a comprehensive and forward-thinking approach to addressing falls among the elderly. Through data-driven insights and regional collaboration, we are committed to making meaningful strides in improving the health and well-being of our elderly population. Our efforts will ensure that older adults receive the specialized care they need, leading to a healthier and safer future for seniors in the county.

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