REVIEW PAPER

Physiotherapy Quarterly (ISSN 2544-4395)
2025, 33(4), 1–8

Epidemiology of falls and fall prevention among older adults in Sri Lanka: a scoping review

DOI: https://doi.org/10.5114/pq/195205

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Abstract

Introduction. The term 'fall' is defined as the unintentional act of coming to a rest on the ground, floor, or any lower level, specifically excluding deliberate changes in position to rest on furniture, walls, or other objects. The World Health Organization has identified falls among older adults as a global health problem, and falls are likely to emerge as a significant public health problem in Sri Lanka. This study aimed to synthesise the literature related to the prevalence, epidemiology, and fall prevention programmes implemented to reduce falls among older adults in Sri Lanka.

Methods. Older adults over 60 years of age living in Sri Lanka were taken as the population. Falls among those living in community dwellings or institutionalised older adults were considered. Sri Lanka was used as the context. The Web of Science, PubMed, MEDLINE, Emcare, and CINAHL databases were searched via the EBSCOHost® platform, using 'older adult', 'older people', 'elderly', 'senior', 'geriatric', 'fall', 'accidental fall', and 'Sri Lanka' as keywords. The references identified through the searches were exported to Rayyan, and duplicates were removed. Two independent reviewers performed title, abstract, and full-text screening, and data extraction was also conducted independently by the same reviewers. A third reviewer resolved any disagreements between the two reviewers.

Results. 91 studies were identified and, finally, nine analytical observational studies were included.

Conclusions. The studies were mainly observational, with limited representation from diverse populations. The study highlights the research gaps in fall screening and prevention interventions among older adults in Sri Lanka.

Key words: falls, falls screening, fall prevention

Introduction

Ageing is a natural phenomenon [1]. It starts from the day of birth and ends with the cessation of life. Senescence is a hallmark of ageing [2]. Senescence affects all body systems, causing up to a 3% loss of function annually in 13 systems between the ages of 30 and 70 [3]. This process is accompanied by a decline in the physical function of an organism and an increase in age-related chronic diseases [4, 5]. Declining function, the prevalence of chronic disease, and associated medication increase the risk of falling [6].

In 2012, the proportion of older adults (over 60) in Sri Lanka was 12.4%. It is forecast that the percentage will be 25% by 2041 [7] and 35.6% by 2100 [8]. The term 'fall' is defined as the unintentional act of coming to a rest on the ground, floor, or any lower level, specifically excluding deliberate changes in position to rest on furniture, walls, or other objects [9]. The World Health Organization has identified falls among older adults as a global health problem, and falls are likely to emerge as a significant public health problem in Sri Lanka [10].

The prevalence of falls varies according to region. Every year, more than 30% of older adults aged 65 and above experience falls [6]. Falls can be caused by a combination of factors and also interaction among those factors [11]. The risk factors for falls can be classified in different ways. One classification categorises the risk factors as intrinsic and extrinsic. Intrinsic factors are patient-related and include age, sex, neurological and musculoskeletal issues, as well as visual, auditory, endocrine, gastrointestinal, genitourinary, and cardiovascular factors. Extrinsic factors, on the other hand, are environmental factors external to the patient. Cardiovascular risk factors for falls include arrhythmias such as atrial fibrillation (AF), postural hypotensive syncope, thyroid disorders, dyslipidemia, a history of acute myocardial infarction, previous stroke, systemic arterial hypertension [12], heart failure, and type 2 diabetes mellitus [13]. The neurological causes of falls may include age-related changes in the central nervous system and sensory system, and disease conditions associated with the nervous system [14]. The environmental factors contributing to increased fall risks are poor flooring, poorly designed bathtubs, poorly arranged furniture, inadequate lighting, and obstructed walkways [15]. Few studies have been conducted in Sri Lanka on falls among older adults [16, 17], and no systematic literature review has been conducted yet. Therefore, the objective of this study was to synthesise the literature related to the prevalence, epidemiology, and fall prevention programmes implemented to reduce falls among older adults in Sri Lanka.

Subjects and methods

The scoping review was conducted according to the guidelines provided by the Joanna Briggs Institute (JBI) for scoping systematic reviews [18] and Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) (Annexure-1) [19]. The references identified through the searches were exported to Rayyan, and duplicates were removed. Title, abstract, and

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Received: 04.06.2024
Accepted: 24.10.2024

Citation: Liyanage I, Liyanage E, Gunawardhana K, Nanayakkara SDI. Epidemiology of falls and fall prevention among older adults in Sri Lanka: a scoping review. Physiother Quart. 2025;33(4):1–8; doi: https://doi.org/10.5114/pq/195205.

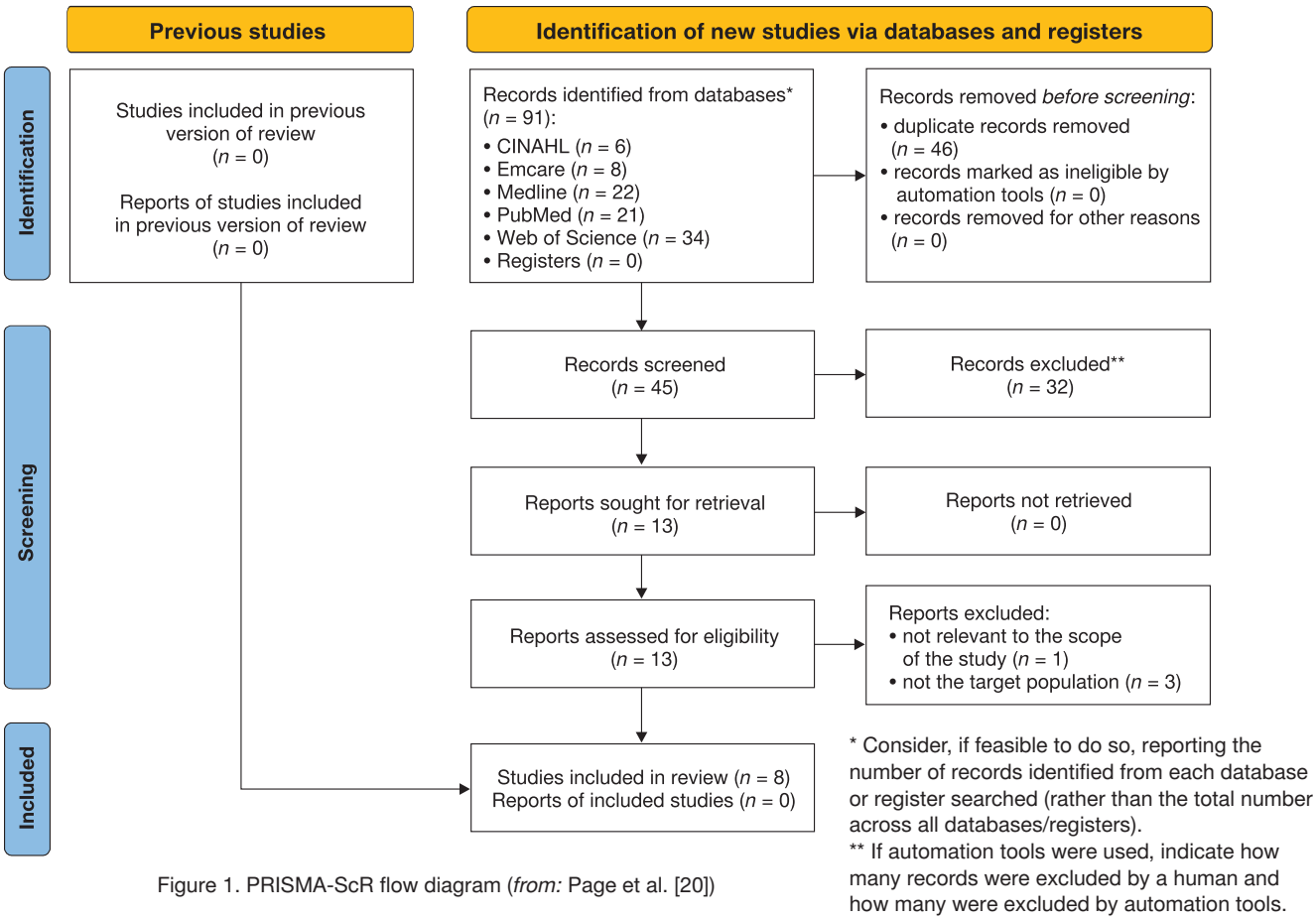

Figure 1. PRISMA-ScR flow diagram (*from:* Page et al. [20])

full-text screening were performed by two independent reviewers (I.L. and E. L.), and data extraction was also independent of the same reviewers. Any disagreement between the two reviewers was resolved with the involvement of a third reviewer (K.G.). The (PRISMA-ScR) [20] flow diagram is shown in Figure 1. This scoping review was registered with Open-Science Framework (osf.io/dqps2).

Objectives and research questions

The aim of this study was to achieve the following objectives: First, to describe how commonly falls occur among older adults in Sri Lanka. Second, to identify and summarise the risk factors that contribute to falls among older Sri Lankan adults. Third, to identify and summarise information about fall screening, assessment of fall-related parameters, and fall prevention programmes developed to reduce the risk of falls among older adults in Sri Lanka.

Inclusion and exclusion criteria

The research questions were formed by following the JBI and the PCC framework (population, concept, and context) [21], with older adults over 60 years of age living in Sri Lanka taken as the population, falls among older adults in communities and institutions as the concept, and Sri Lanka as the context. All articles encompassing research studies published in English and carried out within the geographical confines of Sri Lanka were incorporated. Articles that were not accessible in English were excluded. The assessment encompassed studies focusing on the incidence of falls among older individuals residing in the community with an age of 60 years or older.

Database search

The methodology employed in the exploration of the literature for the scoping review adhered to the identical three-step process advised in traditional JBI systematic reviews [22]. The databases that were examined included Web of Science, PubMed, MEDLINE, Emcare, and CINAHL via the EBSCOHost® platform, and the following keywords were used: 'older adult*', 'older people', 'elderly', 'senior*', 'geriatric', 'fall*', 'accidental fall*', and 'Sri Lanka'. Articles published up to the 22nd of May 2024 were included.

Data charting

The results were consolidated into prevalence rates, risk factors associated with falls, techniques, instruments utilised for detecting fall risks, and interventions aimed at decreasing fall incidents.

Results

A total of 91 studies were identified through a thorough exploration of the selected databases (Figure 1) after redundant entries were eliminated. Following the application of the predetermined inclusion criteria, nine studies met the requirements for inclusion in the comprehensive analysis. All studies under consideration were observational in nature, with a conspicuous absence of review or interventional studies.

Prevalence of falls among older adults in Sri Lanka

Five studies examined the prevalence of falls among older adults in Sri Lanka. The prevalence varies from 47.1% to 52% in institutionalised older adults, and among community-dwell-

Table 1. Prevalence of falls among older adults in Sri Lanka

Author	Type of study	Setting	Prevalence of falls
Gamage et al. [23]	cross-sectional study	community-dwelling, Galle district	34.3%
Ranaweera et al. [16]	cross-sectional nested case-control study	community-dwelling, Colombo district	38.4%
Thanthrige et al. [24]	cross-sectional	institutionalised older adults, Colombo district	52%
Weerasuriya and Jayasinghe [25]	cross-sectional study	hospital-admitted patients, Colombo district	23%
Ihalage et al. [17]	cross-sectional study	institutionalised older adults, Kandy district	47.1%

Table 2. Risk factors associated with falls among older adults in Sri Lanka

Author	Type of study	Setting	Risk factors for falls	Factors not associated with falls
Gamage et al. [23]	cross-sectional study	community-dwelling	age, sex, diabetes mellitus, balance or gait problems, use of antihypertensive medication, use of at least one long-term medication	environmental and socioeconomic factors
Ranaweera et al. [16]	nested case-control	community-dwelling	falls in the previous year, high disability level, high house risk levels	age, sex, ethnicity, education level, living arrangement, marital status, foot disorders, vision, cognitive status, presence of more than two chronic diseases, dizziness, mobility level
Thanthrige et al. [24]	cross-sectional study	institutionalised older adults with cognitive impairment	fall risk associated with balance, lower limb strength, cognitive function	not assessed
Wijerathna et al. [26]	cross-sectional study	patients admitted to hospital	age > 74 years, use of long-term multiple medications, fear of falling, cognitive impairment, depression, high-risk mobility, postural hypotension, reduced visual acuity	not assessed
Ihalage et al. [17]	cross-sectional study	institutionalised older adults	higher BMI, lower cardiovascular endurance, and lower flexibility in the lower body	body fat percentage, hand grip strength, lower body muscle strength and endurance, upper body flexibility

BMI – body mass index

Table 3. Tools used to assess fall-related parameters and fall prevention programme

Author	Year	Type of study	Balance assessment tool	Strength assessment tool	Gait assessment tool	Falls	Fall screening tool
Gamage et al. [23]	2019	cross-sectional study	self-rated balance problem	not used	self-rated gait problem	falls in last year	not been used
Ranaweera et al. [16]	2013	nested case-control	TUG	not used	TUG	falls in last year	not been used
Wickramarachchi et al. [27]	2023	cross-sectional study	four-stage balance test	handgrip strength for upper limb 30-second chair stand test for lower limb	stand up and go test	not used	hand grip strength and lower limb strength
Thanthrige et al. [24]	2014	cross-sectional study	FTSST	FTSST	not used	TUG	not used
Ihalage et al. [17]	2024	cross-sectional study	not used	handgrip strength for upper limb 30-second chair stand test for lower limb	not used	falls in last year	not used

TUG – Timed Up and Go test, FTSST – Five Times Sit to Stand Test

ing older adults it varies from 23% to 34.3%. Most studies were conducted in Colombo, the capital city of Sri Lanka, Galle, the capital city of the southern province, and Kandy, the capital city of the central province. Table 1 summarises the prevalence of falls among older adults in Sri Lanka.

Risk factors associated with falls among older adults in Sri Lanka

Five studies investigated the risk factors associated with falls among older adults. The risk factors that were identified bore similarities to those documented in other research studies; nevertheless, the findings displayed inconsistencies across the various studies. This discrepancy could be attributed to certain studies neglecting to assess all conceivable risk factors, thereby complicating the acquisition of a comprehensive risk profile. Two studies identified age and long-term medication use as risk factors [23, 26]. Table 2 summarises the risk factors associated and not associated with falls.

Tools used to assess fall-related parameters and fall prevention programme

The tools utilised in the studies were classified into the following categories: balance, strength, gait, and fall screening. Researchers categorised older adults into fallers and non-fallers based on the frequency of falls they experienced in the preceding year [16, 17, 23]. The Timed Up and Go test (TUG) is used to assess balance [16] and gait [27] and to categorise individuals as fallers or non-fallers [24]. Table 3 summarises the tools used and their respective roles in assessing falls in older adults.

Discussion

The global prevalence of falls varies from 20% to 33% [28]. A similar rate has been reported among community-dwelling older adults in Sri Lanka. However, a lower prevalence was reported among older adults in Japan (9% among males and 19% among females) [29], China (11%), and Malaysia (4%) [30]. This may be due to cultural differences between countries that affect activity levels, food habits, and environmental factors. A higher prevalence of falls has been reported among institutionalised older adults than among community-dwelling older adults in Sri Lanka. This is similar to studies conducted in other parts of the world, where institutionalised older adults report higher fall prevalences than their community-dwelling counterparts [31, 32]. This high prevalence is due to the psychological impact of separation from the family [33] and a lack of physical activity when they are institutionalised [34].

Risk factors associated with falls among older adults

The identified risk factors were similar to those reported in other studies; however, the results were not consistent across all studies. This may be due to the fact that some studies did not evaluate all potential risk factors, which makes it difficult to obtain a complete risk profile.

The prevalence of falls increases with age, with 28% to 35% of those over 60 and 32% to 42% of those over 70 experiencing falls [9], making age a known risk factor. Many studies in developed countries have identified age as a risk factor [35]. However, one Sri Lankan study did not identify age as a risk factor [16], while the others did identify age as a risk factor [23, 26]. Similar inconsistent results have been reported for Saudi Arabia [36, 37]. This may be related to unmeasured biological, social, or environmental characteristics [36].

Sex has been identified as a fall risk factor, with females experiencing more falls than males [38]. This disparity may be due to underlying pathological conditions such as lower bone density and lifestyle factors after menopause [39, 40]. Similar results were reported by one researcher, who stated that females tend to fall more than males in Sri Lanka [23], but others did not identify sex as a risk factor. Similar results have been identified in Germany, where the fall rate among males increases with age, but not among females [41]. This may be due to the multifactorial nature of falls.

According to the literature, multiple medications increase the fall risk if more than four [42]. Studies in Sri Lanka have reported similar results [23, 26]. Multiple medications can cause adverse reactions that affect balance and cognition in older adults, increasing their vulnerability to falls [43]. It is also believed that reduced metabolic capacity with advancing age reduces the elimination of drugs, leading to an increased fall risk [44].

Older adults with one or more chronic conditions tend to experience more falls [45]. Inconsistent results have been reported in Sri Lankans regarding chronic health conditions and falls. Older adults in Sri Lanka are more likely to experience falls if they have certain chronic health conditions such as hypertension, diabetes mellitus, arthritis, or ischemic heart disease. Additionally, depression and cognitive impairment have been associated with an increased risk of falls in older adults in Sri Lanka. These chronic conditions can lead to disability and an increased risk of falls [44, 46, 47], but [16] reported that chronic conditions were not associated with falls.

Educational status has also been associated with falls among older adults [48]. Older adults with higher education levels experience fewer falls, as their education increases their awareness of falls [49]. However, inconsistent results have been reported in the literature [50], similar to those of the Sri Lankan studies.

Balance deficits [51], gait abnormalities, and lower limb weakness [52] are commonly associated with falls. The Sri Lankan studies are also consistent with this finding, except for one study, in which mobility was not associated with the risk of falls.

Tools used to assess falls-related parameters and fall prevention programmes

The American Geriatric Society and British Geriatric Society recommend initial screening and multifactorial assessment to identify older adults at risk of falling, as well as multifactorial interventions [53]. These screening tools are mainly based on questionnaires. Many countries have cross-culturally validated screening tools [54, 55]. Many Sri Lankan studies used the single question 'Have you fallen during the period of the last twelve months?' to identify falls among Sri Lankan older adults [16, 17, 23]. Balance, gait, and fall risk are commonly assessed by researchers using the TUG test [16, 24] and FTSST [24]. However, no reported studies used validated screening tools or multifactorial fall risk assessment to identify falls among older adults in Sri Lanka.

Conclusions

This scoping review provides information related to the prevalence, risk factors, assessment methods, and prevention of falls among older adults in Sri Lanka. All studies conducted in Sri Lanka were descriptive or analytical observa-

tional. No interventional studies have been conducted in this area. Studies related to falls have mainly been conducted in the Western, Central, and Southern provinces. Studies covering diverse older adult populations in other districts and sectors, such as the urban, rural, and estate sectors, are lacking. No study has been conducted in the estate sector, where 4% of older adults live in very different socioeconomic contexts. Potential reasons for falls in older adults in Sri Lanka consist of age, sex, medications, chronic conditions, education, balance deficits, gait abnormalities, and lower limb weakness. The results are inconsistent due to variations in the evaluated factors and unmeasured biological, social, or environmental characteristics. No validated fall prevention or screening programmes have been reported in Sri Lanka, highlighting the need for such programmes to address the ageing population.

Limitations

This study was carried out using only a limited subset of the available databases and was limited to articles published in English.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

Funding

This research received no external funding.

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Annexure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist

Section	Item	PRISMA-ScR checklist item	Reported on page #
Title			
title	1	Identify the report as a scoping review.	#1
Abstract			
structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	#1 and #2
Introduction			
rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	#3
objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualise the review questions and/or objectives.	#3
Methods			
protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	#3
eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	#5
information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	#5
search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	#5
selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	#5
data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	#5
data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	#5
critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
synthesis of results	13	Describe the methods of handling and summarising the data that were charted.	#5 and #6
Results			
selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	#4

Section	Item	PRISMA-ScR checklist item	Reported on page #
characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	#6 to #9
critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	#6 to #9
synthesis of results	18	Summarise and/or present the charting results as they relate to the review questions and objectives.	#5 to #9
Discussion			
summary of evidence	19	Summarise the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	#9 to #11
limitations	20	Discuss the limitations of the scoping review process.	#11
conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	#11
Funding			
funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	#11

JBI – Joanna Briggs Institute, PRISMA-ScR – Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews, N/A – not applicable,
* Where sources of evidence (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.
† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with information sources (see first footnote).
‡ The frameworks by Arksey and O'Malley (6) and Levac et al. (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.
§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of 'risk of bias' (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).
From: Tricco et al. [19]