Review

Addressing a Silent Epidemic: A Literature Review of Fall Risk Awareness and Prevention Strategies for Older Adults in Nigeria

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Abstract

Background: Falls among older adults have become a major public health concern due to their outcomes, which are often serious and may directly or indirectly affect patients, their families, carers, and the healthcare system. Although anyone may fall, older adults are more prone to falling, with associated higher rates of morbidity and mortality from the incidence when compared with younger adults. Understanding the risk factors associated with falls is crucial for developing effective fall prevention strategies tailored to the needs of the Nigerian older adult population. This review is focused on fall prevention among older adults.

Method: In this literature review, a comprehensive literature search was conducted using databases such as PubMed, Web of Science, African Journals Online (AJOL), Cochrane Library, and Google Scholar. Search terms included "falls," "falls risk," "falls prevention," "older adults," "elderly," and "Nigeria." Studies were included if they focused on older adults aged 60 years and above, addressed fall risk awareness or prevention strategies, and were published in peer-reviewed journals.; emphasis was on studies conducted in Nigeria and other developing countries. Data were extracted and categorized into epidemiology, risk factors, consequences, and prevention strategies.

Conclusion: By raising awareness about fall risk factors, promoting fall efficacy, and implementing evidence-based interventions, healthcare providers can help older adults stay safe and maintain their independence. Therefore, healthcare providers, policymakers, and community leaders should work together to develop and implement evidence-based fall prevention strategies that address the unique needs of the Nigerian population.

Keywords: Fall awareness, Behaviour, Efficacy, Prevention, Health Education, Older adults.

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Introduction

The outcomes of falls in older adults are a significant public health concern due to their serious impact on patients, their families, caregivers, and the healthcare system.[1] Defining falls can be challenging as different people may interpret the term differently. Generally, a fall is defined as an unintentional trip or stumble that causes someone to land against an object or on the ground.[2] It also refers to a person unexpectedly coming to rest on the floor, ground, or another lower level, excluding intentional changes in position.[3] For this review, a fall is defined as an unintentional trip, stumble, or sudden loss of balance that results in a person coming to rest on the ground, floor, or another lower level; falls caused by medical events like a stroke, seizure, loss of consciousness, or drug overdose are not included in this definition.[2,3] Older adults in the review also refers to individuals who are 60 years and above.[1]

Falling is a prevalent and significant concern among older persons[1]. Although falls can happen at any age, older people incur a disproportionate cost due to their increased susceptibility to catastrophic injuries from the event.[4] Hence, falls may be fatal or result in life-threatening conditions, making it one of the main causes of death among the elderly worldwide.[5] Unintentional falls are the fifth largest cause of death among the elderly and the world's second leading source of unintentional injury-related mortality, trailing only road traffic accidents.[6] Falls can also cause serious injuries, impairing the mental status and quality of life of older adults.[1] However, preventive interventions can reduce the prevalence and impacts from falls among older persons.[7] Therefore, it is crucial to develop effective strategies to prevent falls and lessen the harm they cause to older adults.[8]

Preventing falls can minimize the cost of care and reduce the time healthcare workers spend caring for patients with fall-related injuries.[9] While governments, health agencies, and academics in high-income nations have paid close attention to falls and fall-related injuries over the years, the same has not always been true in low-income countries.[8,10] The fact that most low-income countries do not care about the elderly's health may be evidenced by a lack of focus on problems such as falls and injuries caused by falls that afflict this population.[11,12] Most times well-organized health education programs can be used to raise fall risk awareness and help older adults adopt fall prevention behaviour. This is particularly important in sub-Saharan nations like Nigeria, where the population of older adults is on the increase.[12,13] This review therefore, evaluate the awareness of fall risks and fall efficacy among elderly individuals residing in Nigeria. The objective is to devise a framework for mitigating falls within this demographic by conducting a comprehensive literature review to identify effective fall prevention strategies and adapting them to the Nigerian context. This review encompasses an analysis of the epidemiology, causes, and consequences of falls among older adults as well as strategies for its prevention.

Method

This literature review combined existing research on fall risk awareness and prevention among older adults in Nigeria. To identify relevant studies, a comprehensive literature search was conducted using the following databases: PubMed, Web of Science, African Journals Online (AJOL), Cochrane Library, and Google Scholar. The search was limited to English-language articles published between 2000 and 2024. Core terms such as "falls," "fall risk," "fall prevention," "older adults," "elderly," and "Nigeria" were used as the foundation of the search. To broaden the search, synonyms, and related terms like "accidental fall," "slip and fall," "geriatric," and "senior citizen" were incorporated. Boolean operators (AND, OR, NOT) were used to combine terms and refine the search. Additionally, truncation (*) and wildcards (?) were employed to capture variations of terms, such as "fall*" to include "falling" and "falls." To ensure the quality and reliability of the evidence, we focused on peer-reviewed journal articles.

Studies were included if they met the following criteria: (1) focused on older adults aged 60 years and above; (2) addressed fall risk awareness or prevention strategies, (3) published in peer-reviewed journals; and emphasis were placed on studies conducted in Nigeria and other developing countries. Studies were excluded if they: focused on falls due to medical events such as strokes or seizures; or were not available in full text. Relevant data were extracted and organised into the following categories: (1) epidemiology of falls among older adults in Nigeria; (2) risk factors for falls; (3) consequences of falls; and (4) fall prevention strategies.

Discussion

The epidemiology of falls among older adults

The emergency department sees a significant number of older adults due to accidental falls, leading to substantial annual costs for fall-related injury care worldwide.[14] On a global scale, approximately 28.7% of community-dwelling older adults have reported falling, resulting in an estimated 29 million falls among this demographic. Of these falls, around 37.5% required medical treatment or restricted activity for a day or more.[7] In 2015, the U.S.

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alone had about 2.5 million older adults treated in emergency departments for non-fatal fall-related injuries, with over 734,000 of them requiring hospitalization.[9,14] The annual medical costs for treating older adults experiencing falls in the U.S. exceed $50 billion.[14]

The increasing proportion of older persons in the community is resulting in higher rates of fall-related emergency department visits and hospitalizations, posing a serious public health problem.[8] Falls become more common and serious as people get older. Fall frequency among those aged 60-70 years is roughly 28-35%, increasing to 32-42% for those aged 70-80 years, and potentially exceeding 50% for persons over 80 years old each year.[15,16] As a result of the world's ageing population, falls have become a growing public health concern not just in high-income countries but also in low- to middle-income countries, particularly Asia and Africa.[17] Several studies have found that falls are common among older persons in resource-constrained nations, where senior care is frequently overlooked. A recent study in Cape Coast, Ghana, indicated that the prevalence of falls among older persons aged 60 and older was 40.2%.[17] In Ekiti State, Nigeria, falls were reported by 25.3% of older individuals in rural regions and 41.3% in urban areas in the six months preceding the research.[12]

The magnitude of the problem of falls among older adults

Falling is a common geriatric condition, one of the geriatric giants that puts the lives and freedom of senior citizens at risk.[18] An estimated 28–35% of persons over 60 experience a fall at some point each year. For people over 70, this percentage rises to 32-42%.[5] The World Health Organization now recognizes falls among older adults as a persistent and expanding public health issue. Falls are linked to thousands of deaths and injuries worldwide.[4] The United Nations Sustainable Development Goals (SDGs) may be more difficult to achieve as a result of falls and fall-related injuries among the elderly.[19] This is because falls are one of the leading causes of illnesses and fatalities in the elderly; falls are estimated to afflict 20–35% of those over the age of 60 worldwide.[7]

As people age, falls often lead to injuries that pose significant public health challenges, requiring medical attention. Among older adults, 20–30% of falls result in mild to severe injuries, accounting for 10-15% of emergency department visits.[5] Falls are responsible for over 50% of hospitalizations due to injuries for individuals aged 65 and above[14]. Research indicates that hip fractures, traumatic brain injuries, and upper limb injuries are the primary reasons for hospital admissions following falls.[9]

Risk factors for falls among older adults

Frequently, falls happen due to a complex interplay of risk elements.[20] Given the intricate nature of the events and circumstances preceding a fall, it is essential to view them as a multi-dimensional occurrence.[21] The primary risk factors for falls in the elderly can be classified into four main categories: biological or intrinsic, behavioral, environmental, and socioeconomic factors.[22] Identifying these risk factors for falls is crucial in devising fall prevention strategies aimed at reducing the incidence of falls and preventing injuries and fatalities among older adults.[22]

The biological risk factors: The risk factors related to biology comprise elements that can be modified and those that cannot. These factors are age-related and contribute to declines in physical capacities such as sarcopenia and loss of balance, as well as vision, hearing, and cognition. Falls can also result from aging processes such as decreased emotional capacities and the coexistence of chronic illnesses.[22] Sarcopenia, which involves a reduction in muscle mass and function in older individuals, limits mobility, diminishes quality of life, and may ultimately lead to fall-related injuries.[11] Research has indicated that the percentage of older individuals experiencing falls rises with age as follows: 60–69 years (34%), 70–79 years (49%), 80–89 years (65.5%), and above 90 years (63%).[17]

Among older adults, visual impairment is widespread and poses a common risk factor for falls.[23] In a longitudinal study conducted in India by Singh and Maurya (2022), it was discovered that 34% of the individuals assessed had low vision (males: 30%, females: 38%).[23] Additionally, the overall health condition and emotional state, including the presence of depression, are significant components of fall risk among older adults.[22,23]

Behavioral risk factors: The risk factors for falls in older adults encompass behavioral aspects related to human actions, emotions, or daily decisions. These factors are changeable and involve risky behaviors like excessive alcohol consumption, drug misuse, particularly the use of multiple medications, and a sedentary way of living. Interventions aimed at promoting behavioral change can effectively modify these factors. For instance, a recent nationwide study in China conducted by Sun et al. (2022) indicated that regular alcohol consumption was linked to a higher risk of falls among middle-aged and older adults who were surveyed.[24] The

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use of multiple medications, known as polypharmacy, refers to the regular consumption of five or more medications is another risk factor that can be corrected through behavioural change. Research has demonstrated that polypharmacy is connected to an increased risk of falls among older adults.[25] In a longitudinal study conducted in England, Zaninotto et al. (2020) found that the rate of hospital admissions due to falls among older adults increased with the number of medications taken. This ranged from 1.5% for those not taking any medications to 4.7% for those taking 1-4 medications, 7.9% for those with polypharmacy, and 14.8% for those reporting heightened polypharmacy. Older adults with sedentary lifestyles, involving sitting or lying down for six or more hours, are susceptible to falling.[26]

Environmental risk factors: The risk factors for falls in older adults related to the environment involve a combination of the physical condition of individuals and their surroundings. These factors encompass the setup of a person's home and potential hazards in public places.[27] For example, falls among older individuals are attributed to slippery stairs, loose rugs, and insufficient lighting.[5] In various regions, poorly constructed and located buildings, slippery floors, uneven or damaged walkways, and inadequate public lighting have significantly heightened the risk of falls among older people.[5] Minor environmental signals such as lighting, visual and spatial design can all have an impact on an older person's stability.[27]

Socioeconomic risk factors: The risk factors for falls in older individuals related to their social and economic circumstances and the community's ability to address these issues include low income, limited education, inadequate housing, lack of social interaction, restricted access to health and social services, particularly in rural areas with insufficient community resources.[28] A study by Kim, Choi, and Xiong (2020) examined the occurrence of falls among elderly Koreans residing in the community. This research explored the associations between the epidemiology of falls and eleven socioeconomic factors, such as age, gender, housing arrangement, marital status, education level, current and past employment, income, wealth, number of offspring, and relationship contentment. The investigation uncovered statistically significant higher fall risks among older adults, females, unmarried or widowed individuals, those with lower relationship satisfaction, individuals with less education, and those who are unemployed.[29]

Pathophysiology of falls among older adults

The likelihood of falls rises as older adults age due to various factors.[30] Aging makes individuals more susceptible to chronic health issues and the use of medications that are associated with falls. These chronic health issues include conditions like hypertension, diabetes, cognitive impairments, and arthritis, which are prevalent among older adults.[20] Moreover, the physiological changes that occur with normal aging are believed to heighten the risk of falling in those over 60 years old.[31]

Age-related physiological changes have been linked to an amplified risk of falls in older individuals. According to Osoba et al. (2019), older individuals experience age-related declines in balance and gait, which are associated with a higher risk of falling.[32] Additionally, as people age, their vestibular, proprioceptive, and visual inputs diminish, which could impact their sense of balance.[33] Age-related declines in the capacity of lower extremity muscles to contract rapidly and effectively may also contribute to balance recovery issues in older individuals.[34]

Changes in blood pressure control may also increase the risk of falls in the elderly. As a person transitions from lying or sitting to standing, the blood pressure drops due to the reduced sensitivity of baroreceptors with age. This condition, known as orthostatic hypotension, affects some older individuals and may lead to falls, as the baroreceptors become less sensitive with age, causing a drop in blood pressure upon standing.[35] Dementia is also a strong predictor of falls irrespective of its cause, partly due to a lack of awareness of safety.[5,7] Osteoarthritis is also a prevalent chronic medical condition among older adults and it is associated with an increased risk of falling, since joint pain and stiffness are just some of the symptoms of the disease.[36]

The symptomatology of falls among older adults

Older adults are prone to falling when they slip, trip, or stumble on objects.[1] Their living environment and other conditions significantly influence the way they fall and the resulting injuries.[37] Less than half of the elderly who experience falls inform a doctor or healthcare professional about it, especially in developing nations where fall-related issues are not adequately addressed.[5,7] Studies indicate that 30% to 50% of falls in older adults result in minor injuries, while approximately 10% to 20% lead to major injuries like fractures and head injuries.[1,37] Elderly individuals who experience repeated falls face a significantly higher risk of injury, hospitalization, and personal danger.[1] In the United States, approximately one million elderly individuals are hospitalized annually for the treatment of fall-related conditions, with an additional 300,000 receiving treatment for hip fractures resulting from falls.[1]

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Fractures are a common consequence of falls in older individuals and an independent predictor of long-term morbidity and mortality.[1] Fall-related fractures, especially those involving the hip or spine, often require surgical repair and can have significant impacts. One to two percent of falls in older individuals result in hip fractures, which are associated with higher risks of morbidity and mortality. Older adults with hip fractures have a 27% chance of dying within a year, and those with proximal femur fractures have a 50% chance of functional deterioration within a year.[38] The older population's skeletal fragility makes them more susceptible to fractures from mechanical forces, in contrast to their younger counterparts with greater bone density, resulting in more severe injuries and fractures.[39] Head injuries from falls can occur suddenly or develop gradually, potentially causing convulsions, altered sensorium, and localized neurological impairments in older adults. Furthermore, falls in older individuals can lead to dementia due to subdural hematoma, which is bleeding within the brain. Falls are increasingly the primary cause of serious morbidity and mortality from traumatic brain injury among older individuals worldwide.[4]

The severity of an injury and its progression are more influenced by a person's frailty, which refers to their heightened susceptibility to poor homeostatic recovery after stress, rather than their age.[40] With age, many older individuals become frail or fragile due to a reduced physiologic reserve or strength. Therefore, a person's frailty index is a more accurate predictor of adverse events following a fall, rather than their age or injury severity score.[41] After experiencing falls, the quality of life for older individuals often declines significantly, primarily due to pain, the challenge of fully recovering use of the injured limb, and the fear of falling again. Consequently, this fear may result in reduced mobility due to a lack of trust, leading to further muscle weakening and joint stiffness, worsening the mobility issue.[42]

Approaches to fall prevention among older adults worldwide

Research has demonstrated that it is possible to prevent falls and fall-related injuries in older individuals.[7] Identifying populations at high risk of falling, particularly those with limited awareness of fall risk factors, is the first step in fall prevention, and this can be achieved through appropriate screening techniques and tools.[43] Recognizing older individuals at high risk of falling and engaging them in fall prevention programs is considered a crucial aspect of fall prevention, as many older adults and their caregivers may be unaware of their fall risk.[44] Based on the recommendations of the American Geriatric Society and the Centers for Disease Control and Prevention, screening for fall risk in older individuals should be conducted annually, focusing on modifiable fall risk factors.[7,43]

A framework for improving fall risk awareness, fall efficacy, and fall prevention in Nigeria

There is a high prevalence of falls among older adults in Nigeria with a recent publication by Isaq et al (2024) putting the figure at 41.4% among 300 older adults attending a general outpatient clinic in Kano State.[49] A similar study conducted among 624 community dwelling older adults in Ekiti State. Atoyebi et al., (2021) found the prevalence to be 25.3% among those living in the rural area and 41.3% among those residing in the urban area.[12] Despite high rates of falls among older adults in countries like Nigeria, their awareness of fall risk remains low or less than optimal.[48] While numerous studies and policies have addressed falls among elderly individuals in developed nations, there is a paucity of literature on the prevalence of falls, as well as awareness and prevention of fall risks among older adults in developing countries like Nigeria.[17] Some existing studies on fall risk awareness among older adults in Nigeria have primarily focused on clinical settings or specific geographic areas, limiting their generalizability to the wider population. However, a few studies have reported the knowledge and attitudes of healthcare workers (pharmacists and physiotherapists) toward falls among older adults.[50,51]
Factors influencing awareness of fall risk among older adults in Nigeria include socio-economic status, access to healthcare services, cultural beliefs, and environmental factors. Understanding these factors is crucial for developing effective strategies for fall prevention tailored to the needs of the older adult population in Nigeria.[12,48] Therefore, awareness of fall risk among older adults living in communities in Nigeria is an area of research with significant implications for public health policy and practice. By synthesizing existing literature and identifying knowledge gaps, this review emphasizes the need for further research to inform evidence-based strategies for fall prevention tailored to the unique needs and circumstances of older adults in Nigeria. Collaborative efforts involving researchers, family and public health physicians, policymakers, and community stakeholders are essential for addressing fall risk awareness and reducing falls among older adults in Nigeria.

The framework includes falls efficacy, which is the confidence an individual has in their ability to perform activities without losing balance or their ability to

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prevent falls.[52] Boosting falls efficacy can empower individuals to manage their fall risk and participate in fall prevention techniques. This can be accomplished through fall prevention programs that concentrate on enhancing confidence and self-efficacy, like the Otago Exercise Programme.[53] Numerous factors can affect falls efficacy in older adults in Nigeria, including socioeconomic status, healthcare access, and levels of physical activity. For instance, older adults with limited healthcare access may be less likely to get treatment for underlying health conditions that increase their risk of falling, thus lowering falls efficacy. Furthermore, physically inactive older adults may have weaker muscles and poorer balance, heightening their risk of falling and reducing their falls efficacy. To enhance falls efficacy among older adults living in communities in Nigeria, numerous interventions can be put in place. Exercises such as muscle strengthening exercises and balance training have been proven to enhance falls efficacy and lower fall risk.[54] Additionally, conducting home safety assessments and making modifications, like installing handrails and improving lighting, can decrease environmental hazards and enhance falls efficacy.[55] Healthcare providers also have an important role in enhancing falls efficacy by educating older adults about fall prevention and offering them with fall prevention tactics.

Implications of the findings of the Study

The high prevalence of falls among older adults in Nigeria underscores the urgent need for comprehensive fall prevention strategies. Policymakers should prioritize fall prevention as a public health issue and allocate sufficient resources to implement evidence-based interventions. This includes funding for training healthcare providers, community-based programs, and research. Collaboration between healthcare providers, policymakers, and community organizations is crucial to develop and implement effective strategies.

Healthcare providers should play a pivotal role in fall prevention. Routine fall risk assessment should be incorporated into the care of older adults, especially those with multiple comorbidities or cognitive impairment. Evidence-based interventions, such as exercise programs and medication review, should be implemented to reduce fall risk. Additionally, healthcare providers should educate patients and caregivers about fall risk factors, prevention strategies, and the importance of seeking medical attention after a fall. To further advance the field of fall prevention, future research should focus on several key areas. Longitudinal studies are needed to evaluate the long-term impact of interventions. Exploring cultural factors that influence fall risk and prevention behaviors in different populations is essential.

Strengths and Limitations of the Study

This review provides a comprehensive overview of fall risk and prevention strategies among older adults in Nigeria. By conducting a thorough literature search and synthesizing the available evidence, the review highlights the significant impact of falls on public health and identifies key risk factors and prevention strategies. However, the review is not without limitations. The number of studies included, particularly those conducted in Nigeria, was not very large, potentially affecting the generalizability of the findings. Additionally, the methodological heterogeneity of the included studies can make it challenging to draw definitive conclusions.

Conclusion

Preventing falls is crucial in the care of older adults, requiring a comprehensive approach that considers both awareness of fall risks and confidence in preventing falls to effectively reduce their occurrences. Healthcare professionals play a key role in increasing awareness of fall risk factors, promoting confidence in fall prevention, and applying proven interventions to help older adults maintain their independence and safety. Collaboration among healthcare providers, policymakers, and community leaders is essential in devising and executing evidence-based strategies tailored to the specific needs of the Nigerian population.

Declarations

Ethical Consideration: Ethical approval for the study was obtained from the Human Research and Ethics Committee, Federal Teaching Hospital Ido-Ekiti with Protocol no ERC/2023/12/14/1055A

Authors' Contribution: Conceptualization: ASM, LSA, SBT
Initial gathering of pieces of literature: ASM, AOA, AOC, AOJ, AA
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References

1. Vaishya R, Vaish A. Falls in older adults are serious. Indian journal of orthopaedics. 2020 Feb; 54:69-74.
2. Weijer RH, Hoozemans MJ, Meijer OG, van Dieën JH, Pijnappels M. The short-and long-term temporal relation between falls and concern about falling in older adults without a recent history of falling. PloS one. 2021 Jul 9;16(7):e0253374.
3. Aranyavalai T, Jalayondeja C, Jalayondeja W, Pichaiyongwongdee S, Kaewkungwal J, Laskin JJ. Association between walking 5000 step/day and fall incidence over six months in urban community-dwelling older people. BMC geriatrics. 2020 Dec; 20:1-1.
4. James SL, Lucchesi LR, Bisignano C, Castle CD, Dingels ZV, Fox JT, Hamilton EB, Henry NJ, Krohn KJ, Liu Z, McCracken D. The global burden of falls: global, regional and national estimates of morbidity and mortality from the Global Burden of Disease Study 2017. Injury prevention. 2020 Oct 1;26(Suppl 2):i3-11.
5. World Health Organization, World Health Organization. Ageing, Life Course Unit, Université de Genève. Centre interfacultaire de gérontologie. A global response to elder abuse and neglect: building primary health care capacity to deal with the problem worldwide: main report. World Health Organization; 2008.
6. Mulugeta H, Tefera Y, Abegaz T, Thygerson SM. Unintentional injuries and sociodemographic factors among households in Ethiopia. Journal of environmental and public health. 2020;2020(1):1587654.
7. Montero-Odasso M, Van Der Velde N, Martin FC, Petrovic M, Tan MP, Ryg J, Aguilar-Navarro S, Alexander NB, Becker C, Blain H, Bourke R. World guidelines for falls prevention and management for older adults: a global initiative. Age and ageing. 2022 Sep;51(9): afac205.
8. Zhang H, Zhao Y, Wei F, Han M, Chen J, Peng S, Du Y. Prevalence and Risk Factors for Fall among Rural Elderly: A County-Based Cross-Sectional Survey. International journal of clinical practice. 2022;2022(1):8042915.
9. Dykes PC, Curtin-Bowen M, Lipsitz S, Franz C, Adelman J, Adkison L, Bogaisky M, Carroll D, Carter E, Herlihy L, Lindros ME. Cost of inpatient falls and cost-benefit analysis of implementation of an evidence-based fall prevention program. In: JAMA Health Forum 2023 Jan 6 (Vol. 4, No. 1, pp. e225125-e225125). American Medical Association.
10. Biswas I, Adebusoye B, Chattopadhyay K. Health consequences of Falls among older adults in India: a systematic review and Meta-analysis. Geriatrics. 2023 Apr 18;8(2):43.
11. Veronese N, Smith L, Barbagallo M, Yang L, Zou L, Haro JM, Koyanagi A. Sarcopenia and fall-related injury among older adults in five low-and middle-income countries. Experimental gerontology. 2021 May 1; 147:111262.
12. Atoyebi OA, Elegbede O, Babatunde OA, Adewoye K, Durowade K, Parakoyi DB. Prevalence and risk factors for falls in urban and rural older adults in Ekiti State, Nigeria. Ghana medical journal. 2021 Dec 1;55(4):265-72.
13. Yang Y, Ye Q, Yao M, Yang Y, Lin T. Development of the Home-Based Fall Prevention Knowledge (HFPK) questionnaire to assess home-based fall prevention knowledge levels among older adults in China. BMC public health. 2022 Nov 12;22(1):2071.
14. Peterson C, Xu L, Florence C. Average medical cost of fatal and non-fatal injuries by type in the USA. Injury prevention. 2021 Feb 1;27(1):1-0.
15. Bhoomika V, Chandrappa M, Reddy MM. Prevalence of fall and associated risk factors among the elderly living in a rural area of Kolar. Journal of family medicine and primary care. 2022 Jul 1;11(7):3956-60.
16. Ye P, Jin Y, Er Y, Yin X, Yao Y, Li B, Zhang J, Ivers R, Keay L, Duan L, Tian M. Perceptions of facilitators and barriers to Implementation of Falls Prevention Programs in Primary Health Care settings in China. JAMA network open. 2022 Aug 1;5(8):e2228960-
17. Adanusa M, Pobee SK, Zaabaar E, Mawuko V, Asiedu K, Amuzu SK, Adubofour W, Bazayeya C, Senaya EE, Ofori DC, Kyei S. Prevalence and risk factors for Falls among older adults in a primary care facility in Ghana. Malawi medical journal. 2022 Dec 16;34(4):225-30.
18. Greenstein L, Abraham A, Tipping B. Treating complexity in the older adult-the role of the geriatric giants. South African Family Practice. 2019;61(6):10-4.
19. Shevelkova V, Mattocks C, Lafortune L. Efforts to address the Sustainable Development Goals in

Print ISSN: 0189-9287 Online ISSN: 2992-345X

older populations: A scoping review. BMC Public Health. 2023 Mar 8;23(1):456.
20. Appeadu MK, Bordoni B. Falls and fall prevention in the elderly. InStatPearls [Internet] 2023 Jun 4. StatPearls Publishing.
21. Smith ML, Ory MG. Multi-directional nature of falls among older adults: A rationale for prevention and management. Frontiers in public health. 2023 Feb 21; 11:1117863.
22. Lathouwers E, Dillen A, Díaz MA, Tassignon B, Verschueren J, Verté D, De Witte N, De Pauw K. Characterizing fall risk factors in Belgian older adults through machine learning: a data-driven approach. BMC public health. 2022 Nov 29;22(1):2210.
23. Singh RR, Maurya P. Visual impairment and falls among older adults and elderly: evidence from longitudinal study of ageing in India. BMC public health. 2022 Dec 12;22(1):2324.
24. Sun Y, Zhang B, Yao Q, Ma Y, Lin Y, Xu M, Hu M, Hao J, Jiang M, Qiu C, Zhu C. Association between usual alcohol consumption and risk of falls in middle-aged and older Chinese adults. BMC geriatrics. 2022 Sep 14;22(1):750.
25. Zaninotto P, Huang YT, Di Gessa G, Abell J, Lassale C, Steptoe A. Polypharmacy is a risk factor for hospital admission due to a fall: evidence from the English Longitudinal Study of Ageing. BMC Public Health. 2020 Dec; 20:1-7.
26. Garcia Meneguci CA, Meneguci J, Sasaki JE, Tribess S, Júnior JS. Physical activity, sedentary behavior and functionality in older adults: A cross-sectional path analysis. PloS one. 2021 Jan 29;16(1):e0246275.
27. Takase M. Falls as the result of interplay between nurses, patient and the environment: using text-mining to uncover how and why falls happen. International journal of nursing sciences. 2023 Jan 1;10(1):30-7.
28. Choi SD, Andrade EL. Multiple-Level Fall Risks Associated with Socioeconomic Factors Among Community-Dwelling Older Adults: A Systematic Review. Industrial and Systems Engineering Review. 2022 Dec 22;10(1):10-27.
29. Kim T, Choi SD, Xiong S. Epidemiology of fall and its socioeconomic risk factors in community-dwelling Korean elderly. PloS one. 2020 Jun 19;15(6):e0234787.
30. Srivastava S, Muhammad T. Prevalence and risk factors of fall-related injury among older adults in India: evidence from a cross-sectional observational study. BMC public health. 2022 Mar 19;22(1):550.
31. Amarya S, Singh K, Sabharwal M. Ageing process and physiological changes. InGerontology 2018 Jul 4. IntechOpen.
32. Osoba MY, Rao AK, Agrawal SK, Lalwani AK. Balance and gait in the elderly: A contemporary review. Laryngoscope investigative otolaryngology. 2019 Feb;4(1):143-53.
33. Wagner PP, Whittier DE, Foesser D, Boyd SK, Chapurlat R, Szulc P. Bone microarchitecture decline and risk of fall and fracture in men with poor physical performance—the STRAMBO study. The Journal of Clinical Endocrinology & Metabolism. 2021 Dec 1;106(12):e5180-94.
34. Angulo J, El Assar M, Álvarez-Bustos A, Rodríguez-Mañas L. Physical activity and exercise: Strategies to manage frailty. Redox biology. 2020 Aug 1; 35:101513.
35. Dani M, Dirksen A, Taraborrelli P, Panagopolous D, Torocastro M, Sutton R, Lim PB. Orthostatic hypotension in older people: considerations, diagnosis and management. Clinical Medicine. 2021 May 1;21(3):e275-82.
36. van Schoor NM, Dennison E, Castell MV, Cooper C, Edwards MH, Maggi S, Pedersen NL, van der Pas S, Rijnhart JJ, Lips P, Deeg DJ. Clinical osteoarthritis of the hip and knee and fall risk: The role of low physical functioning and pain medication. InSeminars in arthritis and rheumatism 2020 Jun 1 (Vol. 50, No. 3, pp. 380-386). WB Saunders.
37. Komisar V, Dojnov A, Yang Y, Shishov N, Chong H, Yu Y, Bercovitz I, Cusimano MD, Becker C, Mackey DC, Robinovitch SN. Injuries from falls by older adults in long-term care captured on video: prevalence of impacts and injuries to body parts. BMC geriatrics. 2022 Apr 19;22(1):343.
38. Schneider AM, Mucharraz C, Denyer S, Brown NM. Prolonged hospital stay after arthroplasty for geriatric femoral neck fractures is associated with increased early mortality risk after discharge. Journal of Clinical Orthopaedics and Trauma. 2022 Mar 1; 26:101785.
39. Migliorini F, Giorgino R, Hildebrand F, Spiezia F, Peretti GM, Alessandri-Bonetti M, Eschweiler J, Maffulli N. Fragility fractures: risk factors and management in the elderly. Medicina. 2021 Oct 17;57(10):1119.
40. Taylor JA, Greenhaff PL, Bartlett DB, Jackson TA, Duggal NA, Lord JM. Multisystem physiological perspective of human frailty and its modulation by physical activity. Physiological Reviews. 2023 Apr 1;103(2):1137-91.
41. Thakkar S, Srivastava S. Cross-sectional associations of physical frailty with fall, multiple

Print ISSN: 0189-9287 Online ISSN: 2992-345X

falls and fall-injury among older Indian adults: Findings from LASI, 2018. PLoS one. 2022 Aug 12;17(8):e0272669.
42. Birhanie G, Melese H, Solomon G, Fissha B, Teferi M. Fear of falling and associated factors among older people living in Bahir Dar City, Amhara, Ethiopia-a cross-sectional study. BMC geriatrics. 2021 Dec; 21:1-1.
43. Ong MF, Soh KL, Saimon R, Wai MW, Mortell M, Soh KG. Fall prevention education to reduce fall risk among community-dwelling older persons: A systematic review. Journal of nursing management. 2021 Nov;29(8):2674-88.
44. Heng H, Jazayeri D, Shaw L, Kiegaldie D, Hill AM, Morris ME. Hospital falls prevention with patient education: a scoping review. BMC geriatrics. 2020 Dec; 20:1-2.
45. Bergen G, Stevens MR, Kakara R, Burns ER. Understanding modifiable and unmodifiable older adult fall risk factors to create effective prevention strategies. American journal of lifestyle medicine. 2021 Nov;15(6):580-9.
46. Fernandes JB, Fernandes SB, Almeida AS, Vareta DA, Miller CA. Older adults' perceived barriers to participation in a falls prevention strategy. Journal of personalized medicine. 2021 May 23;11(6):450.
47. Ott LD. The impact of implementing a fall prevention educational session for community-dwelling physical therapy patients. Nursing open. 2018 Oct;5(4):567-74.
48. Oduoye MO, Adedayo AE, Javed B, Kareem MO, Joseph G, Karim KA, Fatima E, Akilimali A, Ajirenike RN, Ubechu SC. Falls among older adults in Nigeria; public health implications and preventive measures. IJS Global Health. 2023 Sep 1;6(5):e0305.
49. Ishaq MS, Umar ZA, Grema BA, Michael GC, Olawumi AL, Abiso MA. Pattern of fall and its determinants among elderly patients attending the general outpatient clinic of a tertiary hospital in northern Nigeria: a cross-sectional study. The Pan African Medical Journal. 2024 Jul 1;48(82).
50. Akande-Sholabi W, Ogundipe FS, Adisa R. Pharmacists' knowledge and counselling on fall risk increasing drugs in a tertiary teaching hospital in Nigeria. BMC health services research. 2020 Dec; 20:1-9.
51. Kalu ME, Vlachantoni A, Norman KE. Knowledge about risk factors for falls and practice about fall prevention in older adults among physiotherapists in Nigeria. Physiotherapy research international. 2019 Jan;24(1):e1742.
52. Soh SL, Tan CW, Thomas JI, Tan G, Xu T, Ng YL, Lane J. Falls efficacy: Extending the understanding of self-efficacy in older adults towards managing falls. J Frailty Sarcopenia Falls. 2021; 6 (3): 131–8. Epub 20210901.
53. Campbell AJ, Robertson MC, Gardner MM, Norton RN, Buchner DM. Falls prevention over 2 years: a randomized controlled trial in women 80 years and older. Age and ageing. 1999 Oct 1;28(6):513-8.
54. Sadaqa M, Németh Z, Makai A, Prémusz V, Hock M. Effectiveness of exercise interventions on fall prevention in ambulatory community-dwelling older adults: a systematic review with narrative synthesis. Frontiers in public health. 2023 Aug 3; 11:1209319.
55. Clemson L, Mackenzie L, Ballinger C, Close JC, Cumming RG. Environmental interventions to prevent falls in community-dwelling older people: a meta-analysis of randomized trials. Journal of aging and health. 2008 Dec;20(8):954-71.

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