Prevalence And Risk Factors for Falls Among Elderly Patients: A Review

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Abstract

Background: Falls represent a common and devastating problem among the elderly population, leading to significant morbidity, mortality, and healthcare utilization. With the global increase in the elderly demographic, understanding the magnitude of falls and their associated risk factors is crucial for implementing effective preventive strategies.

Method: This review was conducted to systematically evaluate the risk factors for falls in the elderly, with the aim of informing clinical practices to reduce fall risk in this population.

Results: The review identified a high global prevalence of falls. Major risk factors include advanced age, female sex, low socioeconomic status, use of psychoactive medications, urinary incontinence, visual impairment, cognitive impairment, and environmental hazards. Effective prevention and management strategies involve creating a safe environment, ensuring supportive caregivers, promoting regular exercise, and providing adequate eye and foot care.

Conclusion: A multifactorial approach is essential for reducing falls among the elderly. This includes addressing modifiable risk factors and implementing patient and caregiver education on fall prevention, which has been demonstrated to significantly reduce fall incidence.

Keywords: Caregivers, Elderly, Falls, Prevalence, Prevention, Risk Factors

Introduction

Falls have been defined as an episode in which a person unintentionally comes to rest on the ground, floor or other lower levels with or without injury or loss of consciousness.[1-3] This definition excludes event caused by acute disorder such as seizure, overwhelming environmental hazard or acute sudden paralysis like stroke as these factors can also cause falls in other healthy age group.[2,3] It also excludes intentional change in position to rest in furniture, wall or other objects.[1]

The definition of elderly is arbitrary and it actually coincides with the retirement age in many countries.[3] Most developed countries have accepted the chronological age of 65 years as a definition for the elderly. United Nations (UN) described elderly as someone equal to 60 years of age and above.[3] This is the agreed cut off for developing countries because of the lower life expectancy.[3] Elderly can be categorized into three (3) as young old (60-74years), older old (75-84 years) and oldest old (≥85 years).[3]

According to WHO data published in 2018, life expectancy in Nigeria is 54.7 years and 55.7 years for male and female respectively while total life

expectancy is 55.2 years which gives Nigeria a World Life Expectancy ranking of 178th and this is below 60 years.[4] The more traditional African definitions of an elderly correlates with the chronological ages of 50 to 65 years, depending on the setting, the region and the country.[3] The elderly are addressed in various societies with different terminologies such as seniors, senior citizen or older person. Based on level of frailty, elderly are categorized as young old which is 60-74, older old 75 to 84 and oldest old which is 85 and above.[5] Within the elderly population, further classification like oldest old (normally those 80 years and above) and centenarian (100 years and above) and even super-centenarian (110 years and above) are also made.[6]

Results

Prevalence of Falls in the Elderly

The prevalence of falls in the elderly varies from country to country as well as different regions. Sigueria et al, in a countrywide study involving about one hundred towns and cities in Brazil, reported a prevalence of 38.4% which was a bit different from that reported by Cruz et al, who reported 32.1% in the same country but localized to southeastern Brazil.[7,8] In US a prevalence of 30.9% was reported by Camille et al.[9] However, a lower prevalence of 18.1% and 25.1% were reported for China and Japan respectively.[10,11] This may be due to ethnic differences in the susceptibility to developing frailty with age.[12] The prevalence reported in African studies were different from other developed countries. A community-based study done in Nigeria reported 23% of falls among community dwelling elderly, while Kalula et al, from South Africa gave a prevalence of 26.4%.[13,14] Viera et al, examined the ethnic or cultural differences relating to falling among elderly Europeans, Afro Americans, Afro-Caribbeans and Hispanics men, and Afro Caribbeans was observed to have the lowest prevalence than other ethnic groups and the reason for this could not be ascertained.[15] However, a study done by Karlson et al, among elderly men in US, Sweden and Hong Kong reported that the proportion of falls in Caucasian men was higher in the US than in Sweden and Hong Kong, while the proportion of fallers from different ethnic groups within the US was not significantly different.[16] The conclusion here was that the place of residence may be more important than ethnicity in the rate of fall.[16]

Increasing age had been observed in several studies to increase the chances of falling.[16-18] As one ages the organs responsible for maintaining gait and balance deteriorates and the risk of falls increases. Karlson et al, reported in a study where they observed an increasing prevalence among the elderly as follows; 16.5% for age 65 to 69, 24.8% for age 80 to 84 years, 43.2% for those greater than 90 years.[16]

Falls had been shown to be a major global cause of injury, death and disability for elderly living in the community as well as those in long term facility care. The prevalence of falls in the elderly varies from countries to countries as well as within different regions in the countries. Sigueria et al, in a countrywide study involving about one hundred towns and cities in Brazil, reported a prevalence of 27.6% with a regional variation ranging from 18.6% in the northern region and 30% in the southeastern region and a recurrent rate of as high as 21.2%.[7] This was comparable to Cruz et al, who reported 32.1% in the same southeastern region of Brazil where about 53% had single fall, with 59% occurring at home.[8] The slight difference observed between northern and southern Brazil may be due to sociodemographic differences and methodology.

In Ecuador which is a country within the same continent, Orces reported a similar prevalence of 34.7%.[19] In Canada the prevalence of fall reported by Sibley et al and another study were 19.8% and 20% respectively which are lower than those from Brazil.[20] This may be due to increased awareness and falls preventive measures in Canada as compared to Brazil. In contrast, the prevalence of 30.9% and 28.9% reported in USA were much higher than what was found in Canada.[9,21] This may be due to the target population, because America is a multi-racial country and differences exist between races with respect to intrinsic risk factors to falls.[22]

In Asia, varying prevalence was reported across different countries of the continent. Akahane et al in Japan reported a prevalence of 25.1% which is similar to what Woranpanwisit and colleagues in Thailand and Chacko et al in Coimbatore, a rural area of India who reported 26.1% and 26% respectively.[23-25] The reason for the similarity may be due to comparable sociodemographic characteristics and methodology.[25] In Singapore lower prevalence of 18% was reported by Dai et al.[26] The reason may be due to higher longevity among the study population, for instance the Singaporean has increased longevity, reducing

early onset of frailty making the risk of fall reduced.

In Africans not many researches had been done on falls among the elderly. However, Kamel et al in Egypt reported a very high prevalence of 60.3%, this high prevalence may be due to the definition of fall used for the study as well as the medical and sociodemographic characteristics of the study population.[27] In Nigeria, a prevalence rate of 23% was reported by Bekibele et al in Ibadan, southwestern part of the country which is similar to what was reported by Kakula et al in South Africa.[13,14] This similarity may be attributed to similar environmental factors as developing countries.

Risk Factors for Fall in the Elderly

Various studies had identified increasing age as a risk factor for falls among the elderly.[14-17] As one ages the organs responsible for maintaining gait and balance deteriorates and the risk of falls increases. And besides, co-morbidity as well as the adverse effect of their medications which affect gait and balance increases.[28] Karlson et al, reported in a study where they observed an increasing prevalence among the elderly as follows; 16.5% for age 65 to 69, 24.8% for age 80 to 84 years, 43.2% for those greater than 90 years.[16] Alshammari and colleagues in India also reported a similar observation in which the prevalence of fall per age category was 34% for 60-69 years, 49% for 70-79 years, 65.5% for 80-89 years and 68% for equal to or greater than 90 years.[29] Moreover, Rodrigue et al in Brazil reported age as a significant risk factor for those 80 years or greater.[30] This is similar with what de Jong et al in Netherland observed.[31] At variance with these findings is a study by Ghazi et al in Malaysia who observed that there was no relationship between age and falls.[32] The reason for this could not however be ascertained. Even though this study was among elders in residential long term care setting comprising of only 50 participants, so the setting, sample size and sampling may have contributed to these findings.

Females are more likely to fall compared to males.[7,8,10,11] This may be as a result of the fact that females are more likely to have a serious fall that will require medical attention and reporting, secondly the bigger thigh volume and more muscle bulk are protective in males and females are more likely to use higher number of medications with the resultant risk of falls.[10,11]

Some studies had looked at the association between socioeconomic status (SES) and falls with conflicting results being reported.[7,13,18] Sigueria et al, observed in their study that more subjects belonging to the low SES reported more falls than others.[7] This was similar to an Australian and Nigerian studies which associated low SES with increased risk of falls.[7,13] The reasons adduced in these studies included; poorer health status, more likelihood to live alone and possibly decreased level of physical activity among those belonging to the low SES. Other studies reported an inverse relationship noting that higher SES was associated with the risk of falls and their being more likely to have slippery furnishings, throw rugs, and more furnishing impediments were some of the reasons found.[18]

Falls occur as a result of interaction between intrinsic, extrinsic and situational factors.[1-3] Intrinsic factors include demographic and biological factors, which are age-related changes that affect balance and stability.[3] Postural stability is maintained in three phases; input, processing and output. The input includes; vision, vestibular apparatus and proprioception. Processing requires an intact central nervous system and output requires a motor system characterized by strength, flexibility, absence of pain and cardiovascular endurance.[33] Extrinsic encompasses environmental hazard and behavioural factors.[2,3] Environmental hazard could be indoor or outdoor and includes: poor lightening, slippery floor, furniture impediments, uneven landscape et cetera, while the behavioural factors are, smoking, alcoholism and sedentary lifestyle.[15] Situational risk factor had been identified as the activity being done which interact with other risk factors and increase the risk of falls, an example is rushing to urinate due to incontinence or nocturia.[3]

Viera et al, identify some intrinsic risk factors in their study and these included; age ≥75years, persistent swelling of the feet, taking anxiety medications, incontinence and back pain.[15]

Persistent foot swelling is one of the foot disorders that increase the risk of falls.[16] The relationship between foot swelling and fall may be due to decreased proprioception as a result of the compression of the neurovascular structures which ultimately lead to loss of balance.[16] Knee pain, low back pain and osteoporosis had been associated with increased risk of falling in the elderly especially among females.[34,35] This is possibly

explained by declining level of estrogen which affect the bone density and possibly muscle strength.

Taking anxiolytic medications have also been noticed to increase the chances of falling in the elderly.[15] The relationship between this medications and fall may be explained by the medication side effects and/or the anxiety itself.[15] Other medications that have been reported to increase the risk of fall includes; diuretics, anti-arrhythmics, antidepressants, oxicans, anti-obesity, quinine and sedatives.[34,35] And the risk factor increases with increasing number of medications.[33] Anxiety in elderly can result in more fear of falling, which increases the risk of falls due to activity restriction and deconditioning.[15]

Urinary incontinence and nocturia have also been reported as risk factors for falls.[8,15] The relationship between urinary incontinence and fall is likely related to the need to rush to the toilet possibly resulting in inattention to environmental hazard (slippery and wet floor, carpet edges).[8,15] This possibly also explains the relationship that exist between falls and nocturia.

Leung et al, examined the relationship between psychological factors and falls.[36] They observed that depression, fear of falling, a decline in social activities and living alone were significantly associated with fallers.

Various observations had been reported by different researchers concerning visual impairment and falls in the elderly. Bekibele et al, noted that visual impairment was not a significant risk factor for fall and that though those with visual impairment had more intrinsic factors for falls, they were less likely to engage in activities that will predispose them to fall.[1] This is however contrary to findings by Mignardot et al where impaired vision increases the rate of falls in the elderly.[37] This results in impaired balance, slow visual reaction time and poor vision, which in combination increases the risk of falls.[37]

Varying levels of cognitive impairment had been associated with falls in the elderly.[3,11,37] Cognitive deficit exacerbate and may even cause gait abnormality which result in falls.[38]

Other intrinsic factors that have been identified in a couple of studies that increase the risks of falls in the elderly includes; dizziness, vertigo, chronic illnesses (hypertension, diabetics, Parkinson's disease, stroke, congestive cardiac failure etc.).[3] The presence of chronic diseases in an individual

have been linked to increased risk of falls.[2,11] And the greater the number of chronic diseases, the higher the risk of falls. Diseases such as diabetes, hypertension, Parkinson's disease, cerebrovascular disease and condition resulting in orthostatic hypotension had been consistently identified to be related to increased falls.[2,11] Most of the chronic disease conditions pointed out increasing the likelihood of a fall may be via the side effect of the medications used or the disease[14]

Environmental factors play a very important role in the determining falls. These include both indoor and outdoor fallers. In the home, environmental hazards identified includes poor lighting, slippery floors, toilet without rails, improperly arranged rugs and other house furniture.[39] Lun et al, identified poor night light, obstacle from door sill as predictors of accidental fall while slippery floor especially in the bathroom as predictor for recurrent falls.[40]

Consequences of Fall in the Elderly

Falls could result to injurious or non-injurious incident. Although most falls produce no serious injuries, about 10 to 37.7% result in serious injuries involving head injuries, bruises, sprain, strain, laceration, fractures and dislocation.[5,41,42] The major consequence of non-injurious fall is fear of falling or post fall anxiety syndrome.[5,14] Fear of falling as characterized by self-imposed reduction in activities, which is associated with further increase in frailty and loss of independence, depression, low self-esteem, and loss of confidence are part of long term complications that can arise from falls in the elderly.[5,16] Falls are the leading cause of injury-related hospitalization of the elderly.[1,14] Among the fall related injuries fractures and head injuries are the commonest. Various studies reported hip fracture to be the commonest of all the fractures which can involve any part of the limbs especially in female.[13,41] The reason for it being more common in females is because in postmenopausal women the estrogen level declines which results in osteoporosis eventually increasing the risk of fall and fall related injuries, including the severity. Hip fracture represent approximately 25% of fracture, with about 95% of hip fracture arising from falls.[1,14] Other physical consequences of falls include pneumonia, pressure ulcer, and other infections arising from hospitalization.[1,14] Increased burden of care, loss of independence, social isolation, or reduced social participation can arise following an injurious fall.[14]

Injurious falls result in direct and indirect cost. Direct cost involves the monetary value to procure medical services, home care, and house modification, while the indirect cost includes; loss of income from not working or reduced productivity post fall morbidities, increased insurance premium, increased payment to beneficiary when an insured person is injured.[14,43] These are great burden to the elderly, family or caregiver as well as the community at large.[1]

Prevention of Fall in the Elderly

Most of the risk factors for fall in the elderly are correctible and prevention of falls is essential for instituting prevention of injuries. Unfortunately, no much study had been done on falls in the elderly in developing countries where a larger proportion of the elderly in the world reside. As a result of this no preventive interventions had been studied and instituted. In developed world, a lot of preventive interventional measures have been extensively researched and different outcomes have been observed. There is currently no ideal instrument or calculator for primary care doctors to decide who is at greatest risk of falls.[44] The best predictor for an increased risk of falls is a history of falls.[45] And it is important to distinguish fallers based on falls status because multiple or recurrent fallers are more likely to benefit from falls preventive strategies.[46] The US preventive service Task Force (USPSTF) had recently published recommendations for providing interventions to prevent falls in older adult.[44] The USPSTF recommends exercise to prevent falls in community-dwelling adults aged 65 years or older who are at increased risk of falls ("B" statement). It also recommends that clinicians selectively offer multifactorial interventions to prevent falls to community-dwelling adults aged 65 years or older who are at increased risk of falls ("C" statement). The USPSTF also recommended exercise because it provides the most benefit but recommended against vitamin D supplementation.[44,47] Vitamin D supplementation was found not to be effective at preventing falls. And there is also a potential harm of side effects such as kidney stones from high-dose vitamin D supplementation in older adults, but these are also rare. Lee et al reported a 25 to 40% decreased fall rate in community dwelling adult following multifactorial assessment and intervention.[45]

In 2010, the American and British geriatrics society released updated clinical practice guidelines.[45] These are: 1. Exercise and physical therapy aimed

at improving balance, gait and strength; 2. Withdrawing or minimizing psychoactive medication; 3. Management of orthostatic hypotension; 4. Management of foot and foot wears problem; 5. Use of hip protectors; 6. Modification of home environment; 7. Patient and care giver education; 8. Expedited cataract surgery (selected patient); 9. Vitamin D and calcium supplementation in patient with vitamin deficiency; 10. Dual chamber cardiac pacing (selected patients).

Falls intervention programs have 2 approaches which include; (i)single intervention strategy(ii) multifactorial preventive program which entails reduction and correction of the predisposing and situational risk factors.[14,46] A lot of studies had been done especially in developed countries to examine the effectiveness of these interventional program and had confirmed the greater effectiveness of multifactorial program.[46] But however, the interventional program component must be individualized to justify their effectiveness. The different interventional programs are evidence based and they fall within recommendation level of between A to E.[46,48]The multifactorial interventional strategies involves combination of any of the single components which depends on the targeted risk factors.

American geriatric society recommends that exercise should be part of all multifactorial interventions for community dwelling elderly which should include balance, gait and strength training such as tai chi (a Chinese traditional exercise that involves slow, gentle and precise movement with deep breath) or physical therapy.[49] They also pointed out that healthcare professional should perform environmental adaptation or modification as part of a multifactorial risk factor assessment and intervention for all older person who have fallen or who have risk factors for fall.[49] Cataract surgery on the affected eye should be expedited in older persons in which the surgery is indicated but not to be done as individual approach.[49] Medications reduction or withdrawal is stressed for all older person not just for only those taking $\geq$ 4 medications especially psychoactive medications.[49] Assessment and treatment of postural hypotension should be included as part of a multifactorial intervention, including heart rate and rhythm abnormality are effective in reducing fall rate.[49] Dual chamber cardiac pacing should be considered for elderly with cardioinhibitory carotid

sinus hypersensitivity who experience unexplained recurrent falls.[49] Vitamin D (800IU) is recommended as a daily supplement for all elderly at risk of falls. It is also recommended for all elderly with known vitamin D deficiency and should be considered for those suspected of vitamin D deficiency.[49] This is both effective as a single and a component of multifactorial intervention. This is contrary to recommendation by USPSTF, the difference could be due to difference sociodemographic characteristic between study populations.[44] Managing foot and foot wears problems eg bunion, toe deformities, ulcers or deformed nails is effective in reducing rate of fall in elderly with such risk factors.[44,49] Modification of home environment is effective is a component of multifactorial intervention.[49] Providing education and information to the patient and caregiver is more effective as a component of multifactorial intervention than as a single intervention.[49]

CONCLUSION

The review found a high prevalence of falls globally with increasing age, female sex, low socioeconomic status, use of psychoactive medications, urinary incontinence, visual impairment, cognitive impairment and poor environment as major risk factors for falls among the elderly. Prevention and management of falls in the elderly require a friendly environment, supportive caregivers, regular exercise, eye and foot care. Patient and care giver education on how to prevent falls has also been shown to reduce falls in the elderly.

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