https://africanjournalofbiomedicalresearch.com/index.php/AJBR
Afr. J. Biomed. Res. Vol. 27 (September 2024); 1301 -1307

Review Article

Autumnal Hazards: A Study on Falls Among the Elderly in the Madinah Region—Prevalence, Risk Factors, and Consequences

Abdul Rahman H Ali,[1,2] Marwan M Aljohani,[1]Nouf H. Alkhamees,[3] Maryam Amran Anbarsiri[5], Abdullah Al-Shenqiti[1,4]

[1]*Department of Physical Therapy, College of Medical Rehabilitation Sciences, Taibah University, Madinah, Saudi Arabia*
[2]*Department of Bio-Informatics & Mechanics, Mahatma Gandhi University, Meghalaya, India*
[3]*Department of Rehabilitation, College of Health and Rehabilitation Sciences, Princess Nourah bint AbdulRahman University, Riyadh, Saudi Arabia*
[4]*Faculty of biology, Medicine and Health, University of Manchester United Kingdom. Marble clinic center, 42416, Madinah, Saudi Arabia*

Abstract
Objective: Our study aims to identify effective interventions and preventive measures to reduce falls among elder adults in the Madinah region. It seeks to offer recommendations for policymakers, community stakeholders and healthcare professionals to strengthen fall prevention and provide recommendations to improve their safety and well-being.
Methods: We conducted a cross-sectional study involving Saudi and non-Saudi residents aged 65 and elder in Madinah. We used questionnaire surveys to gather demographic information, fall experiences, and health status over the past year to evaluate fall incidence and related factors
Results: Among 189 participants, the study found a significant prevalence of falls, with 41.5% reporting falls within the past year. Of those who fell, 50.79% experienced multiple falls and post-fall injuries during the year period. The study identified potential preventable risk factors in participants' daily routines.
Conclusion: The high prevalence of falls among elder adults in Madinah highlights the urgent need for targeted interventions. While the study focused on identifying effective preventive measures, it also uncovered risk factors that contribute to falls, suggesting the need for tailored prevention strategies. Addressing these risk factors is crucial for improving the health and safety of the elderly population

Keywords: elder adults, prevalence, public health, risk factors, consequent injuries

***Author for correspondence: Email:** abrrahman@gmail.com

Received: 02/11/2024 Accepted: 11/11/2024

DOI: https://doi.org/10.53555/AJBR.v27i3.3708

Introduction:

Falls among the elder adults in Madinah, Saudi Arabia, present a significant public health challenge, affecting individual well-being and straining healthcare resources. As the elder adults population in Madinah is projected to increase to 21.8% (approximately 10 million individuals [1]) by 2050, understanding the epidemiology of falls becomes increasingly crucial. This demographic shift, influenced by factors such as extended life expectancy and urbanization, underscores the need

for targeted research and interventions tailored to local contexts. [2]

Madinah, although less densely populated compared to other major Saudi cities, experiences periodic surges in population during religious pilgrimages, placing additional stress on infrastructure and services. The city roads are generally well developed and connected with all streets but vary in elevation due to mountainous terrain, potentially posing challenge for elder adults' resident, during the crowded pilgrimage seasons. The elder adults' population in Madinah [3-5] faces multifaceted challenges related to falls, encompassing cultural, environmental, and healthcare system factors. Cultural norms and social practices may influence mobility patterns and access to healthcare among elder adults. Environmental factors such as uneven terrain and climatic conditions can increase the risk of falls. Moreover, the capacity of the healthcare system to respond effectively to fall-related incidents and implement preventive measures is critical for improving outcomes and reducing healthcare burdens.

Comprehensive research is essential to assess the risk factors, prevalence, and consequences of falls among the elder adults in Madinah. Our study is cross-sectional design to investigate the dimensions, examining demographic characteristics, clinical profiles, medication use patterns, and environmental hazards that contribute to fall occurrences. Furthermore, the study aims to explore the downstream effects of falls on healthcare utilization, functional independence, and overall elder adults quality of life in the region.

By elucidating these factors, healthcare professionals, policymakers, and community stakeholders can collaboratively develop targeted interventions and preventive strategies. These may include tailored exercise programs, environmental modifications, medication management protocols, and educational initiatives aimed at reducing risk of falls and enhancing the well-being of elder adult's residents in Madinah. Ultimately, the findings of this study seek to inform evidence-based practices that can not only improve public health outcomes locally but also serve as a model for addressing elder adults fall prevention in similar contexts globally. By adapting strategies to local contexts and leveraging interdisciplinary collaboration, significant strides made towards promoting improving quality of life and healthy aging for elder adults populations worldwide [6-8].

Materials and Methods:

Determine the fall rate among the elder adults population in Madinah. Pointing the risk factors related with falls, including age, gender, comorbidities, medication use, and environmental factors. Examine the consequences of falls, such as injuries sustained, healthcare utilization, and impact on quality of life. Explore potential interventions and preventive measures, considering both individual and environmental factors.

Study Design

Cross-sectional study design employed to assess falls among the elder adults population (aged 65 years and over) in the Madinah region. This design collects data at one point in time, a Structured Questionnaires, administered to gather direct information from study participants, Hospital Medical Record Reviews to collect data on healthcare utilization and injuries sustained.

Data Collection Instruments

Questionnaires: Demographics such as Age, gender, etc., Health Status: Comorbidities, medication use, Fall History: Incidence, circumstances, and outcomes of falls, Environmental Factors: Home safety, living conditions and Quality of Life: Influence of falls on daily activities and overall well-being. Medical Record Reviews: Healthcare Utilization: Hospital visits, treatments required, and Injury Details: Types and severity of injuries sustained from falls. Environmental Assessments: Home Safety Audits: Identification of hazards and unsafe conditions in living environments.

Measures

Primary Outcome Measure: Prevalence of falls, defined as unintentionally coming to rest on the floor, ground, or other lower level. Secondary Outcome Measures: Risk factors (e.g., age, gender, comorbidities, medication use, environmental hazards) and consequences of falls (e.g., injuries, hospitalizations, healthcare utilization).

Data Analysis

Performed statistical analysis and identified significant risk factors and summarize the demographic characters. Consequences Evaluation - Assessment of healthcare utilization and quality of life impacts. Intervention Analysis - Identification of effective preventive measures.

Expected Outcomes

To reduce falls among elder adults, it is essential to identify high-risk groups based on health-related factors. Understanding the impact of falls on healthcare resources and individual wellbeing highlights the need for effective prevention strategies. By using evidence-based recommendations, policymakers, healthcare professionals and community stakeholders can improve fall prevention efforts and enhance health outcomes for elder adults.

Significance

The finding from this study provides a comprehensive understanding of the fall-related challenges faced by the elder adults in Madinah. Inform the development of targeted interventions and preventive measures. Contribute to the enhancement of overall health outcomes and quality of life for the elder adults' population. Using IBM SPSS (v26) statistical software all data analyses were performed, and p-value=0.05 or less is set to be statistically significant.

Results:

Table-1: Participants Socio- demographic characteristics, with numbers of risk factors and respondents related with falls among the elder adults.

Characteristics	Description	Total n (Mean ± SD)	(%)	Falls			
				Yes		No	
		N		n	%	n	%
Age	Total	67.91 ±9.06					
	Male	68.72 ±9.45					
	Female	66.64 ±8.34					
Gender	Male	103	54.50%	41	39.81%	62	60.19%
	Female	86	45.50%	36	41.86%	50	58.14%
Marital status	Married	98	51.85%	51	52.04%	47	47.96%
	Widowed/single	67	35.45%	38	56.72%	29	43.28%
	Divorced	24	12.70%	10	41.67%	14	58.33%
Financial background	Self-employed	65	34.39%	28	43.08%	37	56.92%
	Wife/children	54	28.57%	24	44.44%	30	55.56%
	Others	37	19.58%	18	48.65%	19	51.35%
	Government/organization	33	17.46%	14	42.42%	19	57.58%
House owner	Own house	152	80.42%	74	48.68%	78	51.32%
	Rental house	37	19.58%	16	43.24%	21	56.76%
Caretaker	Yes	76	40.21%	42	55.26%	34	44.74%
	No	113	59.79%	56	49.56%	57	50.44%
Walking support	Don't use	114	60.32%	54	47.37%	60	52.63%
	Walking stick	38	20.11%	21	55.26%	17	44.74%
	Walker/frame	17	8.99%	11	64.71%	6	35.29%
	Wheelchair	20	10.58%	9	45.00%	11	55.00%
Daily medication	Don't use	33	17.46%	14	42.42%	19	57.58%
	1 to 3 tablets	66	34.92%	31	46.97%	35	53.03%
	≥ 4 tablets	90	47.62%	52	57.78%	38	42.22%
Smoking habits	Yes	21	11.11%	10	47.62%	11	52.38%
	No	168	88.89%	83	49.40%	85	50.60%
Physical activity	Not at all	136	71.96%	98	72.06%	38	27.94%
	Walking	28	14.81%	12	42.86%	16	57.14%
	Games	25	13.23%	9	36.00%	16	64.00%

Our research team interviewed 189 participants over the period of August 2023 to December 2023. Table 1 shows demographic data about the participants. All the participants were aged 65 or over with an overall mean age of 67.91± 9.06 years; for the male participants the mean was 68.72 ± 9.45 years, while for the females the mean was 66.64± 8.34 years. Males accounted for 54.49% of the participant group, while females accounted for 45.51%; there were slightly more male participants than females.

51.85% of the participants were married and living with their family, 35.45% were either single or widowed, and 12.70% were divorcees. In terms of their financial status, 34.39% were self-employed and 17.46% were government pensioners. 40.21% of the participants reported that they required care or support at home for their daily life needs, while almost 60% reported that they did not have any care needs in daily life. Only 17.46% reported that they were not using any medication, with most of the participants (47.62%) stating that they were using more than four different types of medication daily to help manage chronic diseases. In terms of their smoking habits, 11.11% of the participants were smokers. Walking aids were not used by most of the participants (60.32%), with the rest of the participants using either a walking stick or a wheelchair for daily mobility support.

Table 2: Fall prevalence, location, and risk factors reported by elder adults participants

Characteristics	Description	Total n	
		n	%
Experienced a fall within the last 12 months	Yes	96	50.79%
	No	93	49.21%
How many falls	1	105	55.56%
	2	32	16.93%
	3	26	13.76%
	4	19	10.05%
	5 and above	7	3.70%
Fracture case	Yes	60	31.75%
	No	129	68.25%
Fracture location	Hip	15	25.00%
	Lower limb	17	28.33%
	Upper limb	22	36.67%
	Spine	4	6.67%
	Other	2	3.33%
Fall location	Home indoors	82	85.42%
	Outside/outdoors	14	14.58%
Fall location at home	Bedroom	14	19.44%
	Bathroom	23	31.94%
	Stairs	19	26.39%
	Kitchen	11	15.28%
	Doorstep	8	11.11%
	Other	7	9.72%
Fall location outdoors	Masjid	4	28.57%
	Street	7	50.00%
	Mall	2	14.29%
	Other	1	7.14%
Environmental factors	Poor lighting	24	25.00%
	Inappropriate footwear	13	13.54%
	Pets	11	11.46%
	Uneven surface	32	33.33%
	Other	16	16.67%
Age-related factors	Gait impairment	27	14.29%
	Visual problems	41	21.69%
	Memory loss	17	8.99%
	Diabetes mellitus	143	75.66%
	Chronic pain	54	28.57%
	Cardiac disease	119	62.96%
Fall risk	At risk	68	35.98%
	No risk	121	64.02%

Table-2 describes that 50.79% of the participants had experienced one or more falls during the past year. The percentages of female participants who had fallen either at home or in other places were both higher than for males. Most of the

participants had fallen once (55.56%), with 16.93% falling twice, 13.76 % falling three times, 10.05% falling four times and 3.70% experiencing five or more falls.

The table shows that 31.75% of the participants who had fallen had sustained injuries. Upper limb fractures were the most common, reported by 36.67% of those who had sustained an injury as a result of a fall, followed by lower limb and hip fractures (reported by 28.33% and 25.00% respectively).

Most of the participants reported that they recovered with three to six months, but 45% were not able to return their normal life immediately after falling, needing a walking aid and severe injury recorded by 3.3% of the participants. Most of the participants were not involved in any physical activities, with only few of them taking part in walking or games.

Regarding the location of the participants' falls, we classed indoor locations as Home and other locations as Outside the home, i.e. either in the street or at the masjid or mall. Our results indicate that indoor fall cases formed the majority at 85.42%, with only 14.58% of falls occurring in outdoor or public places such as streets, at the masjid or in malls. Most of the falls at home happened in the bathroom (31.94%) or on the stairs (26.39%), with the rest happening in places like kitchens, doorsteps and bedrooms. Many falls occurred in the evening during times of poor lighting periods, and participants mostly fall face down to the ground comparatively back and sides.

There were no significant differences in fall rates based on age, gender, financial status, smoking, physical activity, or marital status. However, participants living in rented accommodation experienced falls more frequently than those living in their own homes (OR 1.2). Those who required help from a caregiver also reported more falls compared to those without a caregiver. Medication is not using elders were significantly related with falls is less (OR 0.52). Additionally, participants using walking aids reported more falls than those who did not, with those using walking frames facing a notably higher risk. Finally, the analysis found no association between stress levels and the rate of falls among elder adults.

In our study, most of the participants reported one or more comorbidities; heart disease and diabetes mellitus were the most common, at 62.96% and 75.66% respectively. However, other conditions such as hypertension, visual problems, gait impairments, memory loss and chronic pain also reported, although at lower levels.

Discussion

Falls among elder adults are increasingly common worldwide and are linked to various factors. Previous studies have identified many different risk factors [10-11], so it was important for us to understand the causes of falling from elder adults living in the Madinah region of Saudi Arabia. Our research program explores risk factors, as well as issues related to morbidity, mortality, hospitalization, and reduced mobility. Our study specifically to investigate the prevalence of falls and pointing the risk factors related with injuries from these falls.

Falls among elder adults are a significant global health concern, resulting in severe injuries, loss of independence, and even death. Contributing factors include age-related changes in vision, balance, and strength, as well as environmental hazards. To prevent falls, strategies typically include exercise programs, home modifications, medication management, and regular vision check-ups. Governments and healthcare systems worldwide are increasingly focusing on fall prevention to support healthy aging.

Our finding from this study is 50.79% of elder adult experienced at least one fall in the past year, which is within the 25% to 50% range reported in other studies. Alshammari et al.[9] found that most falls in Riyadh occurred at home, particularly in the bathroom.[17] The fall prevalence in Madinah is higher than in countries like England (28%) [11], Canada (34%) [12], Ecuador (37.4%) [13], and the USA (22%) [14]. In the Middle East, Egypt had a higher prevalence of falls (60.3%) [15], while Qatar reported 34%. [16]

The mean age of 67.91 years shows that our study mainly involved elder adults, though there was a broad age range. The slightly higher number of male participants might be due to differences in healthcare-seeking behaviors or gender-related risk of falls. Most participants were married and living with their families, suggesting good social support. However, the significant number of single, widowed, or divorced participants highlights the need to consider social isolation in fall prevention efforts.

Most falls occurred indoors, with 85.42% happening at home, particularly in the bedroom, bathroom, stairs, kitchen, and doorstep. Only 14.58% of falls happened outdoors, including on streets, at mosques (masjids), and in malls. The same pattern with findings from Almawlawi et al.[15] and Yeong et al.[16], though those studies found that falls were more common on stairs than in the bathroom.

Our study found that poor lighting, inappropriate footwear, pets, and uneven surfaces are common environmental factors contributing to falls. These factors were not identified in some other studies. Similar to other research, we observed that falls increase with age. However, we did not find a gender difference in risk of fall. In contrast, studies from Japan [19], Germany [20], and Nigeria [21] found different patterns: musculoskeletal pain and trips were linked to falls in Japan, more falls occurred among elder men in Germany, and female were more likely to fall than men in Nigeria. These differences may be due to unmeasured social, biological, or environmental factors.

Kumar et al. [22] highlight the importance of considering economic factors in fall prevention interventions. Our study found that many participants rely on caretakers, indicating functional limitations and healthcare needs. We also observed a high rate of medication use for chronic conditions, which emphasizes the need for careful medication management to prevent falls. Participants reported various age-related issues, such as gait impairment, visual problems, memory loss, diabetes, chronic pain, and cardiac diseases. Smoking was also prevalent, which can increase risk of fall due to related health conditions. Additionally, the limited use of walking aids suggests varied mobility needs and functional abilities among participants. [25]

A Malaysian study found that fewer married elder adults (4.9%) experienced injuries from falls at home compared to widowed or divorced individuals (8%) and those who were single (8%). The study also indicated that financial status did not affect fall prevalence among elder adults. In our study, 40.21% of participants needed a caretaker for daily activities, and 60.32% did not use any walking support, while others used walking aids, which are linked to a higher risk of fall in our findings, despite

general evidence suggesting walking aids reduce risk of fall. [23-24] Nearly half of our participants (47.62%) took more than four medications daily, reflecting a high rate of polypharmacy. Although stress factors were not widely reported in our literature review, a Korean study [26] found a higher risk of fall among stressed elder adults compared to those who were not stressed. Additionally, 11.11% of participants reported smoking. Overall, our findings provide valuable insights into the prevalence, frequency, consequences, and contributing factors of falls among the study participants. Understanding these factors is essential for developing targeted fall prevention interventions, and for improving the safety and wellbeing of elder adults. These findings also provide valuable insights into the demographic characteristics and health-related behaviors of the study participants, an understanding of which is essential in tailoring interventions to address risk of fall and improve the overall well-being of elder adults in the Madinah region.

In terms of interventions to decrease risk of fall, we note that dimly lit areas can obscure obstacles and increase the risk of trips and falls, especially at night. Those at risk should install brighter light fixtures, add nightlights in hallways and bathrooms, and ensure proper illumination on stairs and in outdoor areas. Wet or polished floors, especially in bathrooms and kitchens, can cause slips and falls, so the use of non-slip mats or rugs are recommended in high-risk areas, along with install grab bars near showers and toilets, and promptly cleaning up spills. Those at risk could also consider using a shower chair or bench for stability.

To prevent falls, address common tripping hazards like uneven or loose floorboards, carpets, and tiles by repairing or replacing damaged flooring and securing loose rugs with non-slip pads. Keep walkways clear of clutter. Install sturdy handrails on both sides of stairs and along corridors to prevent balance loss. Ensure furniture has rounded edges, secure any unstable pieces, and arrange furniture to create clear paths. Secure loose cords and organize belongings to reduce trip hazards. Additionally, fix uneven sidewalks, loose paving stones, and improve lighting in outdoor areas to further minimize risk of falls.

Elder adults should be encouraged to engage in regular physical activity, such as walking and gentle stretching, to improve strength, balance, and flexibility. Families and caregivers should regularly communicate with elder family members to stay updated on their health and mobility. Providing emotional support and companionship is important to reduce loneliness and isolation. Family members play a key role in supporting elder adults' well-being and helping to reduce risk of fall. Clemson et al. (2004) [27] conducted a randomized trial of a group-based education program, showing that fall prevention education reduced falls by 31% in the elderly population over a 12-month follow-up period. Ensuring adequate vitamin D and calcium intake can support musculoskeletal health, reducing the risk of falls and fractures [28].

Conclusion:

To effectively mitigate the risk of falls among older adults, it is essential to investigate specific risk factors in greater depth, explore innovative interventions, and conduct longitudinal studies to assess long-term outcomes. We highlight the critical need to address these risk factors to enhance the health and well-being of older adults. Future research should delve deeper into the relationship between demographic factors and fall risk, as well as evaluate the effectiveness of targeted interventions for specific subgroups within the broader older adult population. By offering a demographic profile of our participants, we provide valuable context for understanding fall risk and designing effective prevention strategies. Considering the diverse needs and characteristics of the study population will enable researchers and healthcare providers to develop comprehensive fall prevention strategies that tackle the unique challenges faced by older adults.

Acknowledgments: We would like to thank all the participants for their valuable contributions to this study. Special thanks to Medical Rehabilitation Hospital's staffs appreciate the support provided throughout the research process.

Author Contributions: AHA designed the study and led the research efforts, including data collection and analysis. MMA was responsible for the literature review and drafting the manuscript. NHA contributed to data interpretation and provided critical revisions. AHA & MAA handled the statistical analysis and managed the study's administrative aspects. All authors reviewed and approved the final manuscript.

Conflict of Interest: The authors declare no conflicts of interest.

Funding: No funding was received for this study.

References:

1. UNFPA and HelpAge. Ageing in the twenty-first century: A celebration and a challenge. 2012. https://www.unfpa.org/public/ home/publications/pid/11584
2. World Health Organization. WHO global report on fall prevention in older age. [Accessed: Jul 2020]. From: www.who.int/ageing/publications/Falls_prevention7March.pdf.
3. Oliver D. Development of services for older patients with falls and fractures in England: Successes, failures, lessons and controversies. Arch Gerontol Geriatr. 2009;49:S7–12. doi: 10.1016/S0167-4943(09)70005-6. - DOI - PubMed
4. Sekaran NK, Choi H, Hayward RA, Langa KM. Fall-associated difficulty with activities of daily living in functionally independent individuals aged 65 to 69 in the United States: A cohort study. J Am Geriatr Soc. 2013;61:96–100. doi: 10.1111/jgs.12071. - DOI - PMC - PubMed
5. Stel VS, Smit JH, Pluijm SM, Lips P. Consequences of falling in older men and women and risk factors for health service use and functional decline. Age Ageing. 2004;33:58–65. doi: 10.1093/ageing/afh028. - DOI - PubMed
6. Orces CH. Prevalence and determinants of falls among older adults in Ecuador: An analysis of the SABE I Survey. Curr Gerontol Geriatr Res. 2013;2013 doi: 10.1155/2013/495468. 495468. - DOI - PMC - PubMed
7. Janakiraman B, Temesgen MH, Jember G, Gelaw AY, Gebremeskel BF, Ravichandran H, et al. Falls among community-dwelling older adults in Ethiopia: A preliminary cross-sectional study. PLoS One. 2019;14:e0221875. doi: 10.1371/journal.pone.0221875. - DOI - PMC - PubMed
8. Gale CR, Cooper C, Sayer AA. Prevalence and risk factors for falls in older men and women: The English Longitudinal

Study of Ageing. Age Ageing. 2016;45:789–94. doi: 10.1093/ageing/afw129. - DOI - PMC - PubMed
9. Alshammari SA, Alhassan AM, Aldawsari MA, Bazuhair FO, Alotaibi FK, Aldakhil AA, et al. Falls among elderly and its relation with their health problems and surrounding environmental factors in Riyadh. J Fam Community Med. 2018;25:29–34. doi: 10.4103/jfcm.JFCM_48_17. - DOI - PMC - PubMed
10. Gale CR, Cooper C, Aihie Sayer A. Prevalence and risk factors for falls in older men and women: The English Longitudinal Study of Ageing. Age Ageing 2016;45:789–94.
11. Do MT, Chang VC, Kuran N, et al. Fall-related injuries among Canadian seniors, 2005–2013: An analysis of the Canadian Community Health Survey. Health Promot Chronic Dis Prev Can 2015;35:99–108.
12. Orces CH. Prevalence and determinants of falls among older adults in Ecuador: An analysis of the SABE I Survey. Curr Gerontol Geriatr Res 2013;2013:1–7.
13. Stevens JA, Ballesteros MF, Mack KA, et al. Gender differences in seeking care for falls in the aged Medicare population. Am J Prev Med 2012;43:59–62.
14. Fang X, Shi J, Song X, et al. Frailty in relation to the risk of falls, fractures, and mortality in older Chinese adults: Results from the Beijing Longitudinal Study of Aging. J Nutr Health Aging 2012;16:903–7.
15. Almawlawi E, Alansari A, Ahmed A. Prevalence and risk factors for falls among the elderly in primary healthcare centers (PHC) in Qatar. Qatar Med J 2011;20:1.
16. Kamel MH, Abdulmajeed AA, Ismail S-S. Risk factors of falls among elderly living in urban Suez, Egypt. Pan Afr Med J 2013;14:26.
17. Mancini C, Williamson D, Binkin N, et al. Epidemiology of falls among the elderly. Ig Sanita Pubbl 2005;61:117–32.
18. Yeong UY, Tan SY, Yap JF, et al. Prevalence of falls among community-dwelling elderly and its associated factors: A crosssectional study in Perak, Malaysia. Malays Fam Physician 2016;11:7–14.
19. Kitayuguchi J, Kamada M, Okada S, et al. Association between musculoskeletal pain and trips or falls in rural Japanese community-dwelling older adults: A crosssectional study. Geriatr Gerontol Int 2015;15:54–64.
20. Rapp K, Freiberger E, Todd C, et al. Fall incidence in Germany: Results of two population-based studies, and comparison of retrospective and prospective falls data collection methods. BMC Geriatr 2014;14:105.
21. Bekibele CO, Gureje O. Fall incidence in a population of elderly persons in Nigeria. Gerontology 2010;56:278–83.
22. Kumar A, Carpenter H, Morris R, et al. Which factors are associated with fear of falling in community-dwelling older people? Age Ageing 2014;43:76–84.
23. Graafmans WC, Lips P, Wijlhuizen GJ, et al. Daily physical activity and the use of a walking aid in relation to falls in elderly people in a residential care setting. Z Gerontol Geriatr 2003;36:23–8.
24. van Doorn C, Gruber-Baldini AL, Zimmerman S, et al. Dementia as a risk factor for falls and fall injuries among nursing home residents. J Am Geriatr Soc 2003;51:1213–8.
25. Dhargave P, Sendhilkumar R. Prevalence of risk factors for falls among elderly people living in long-term care homes. Journal of Clinical Gerontology and Geriatrics 2016;7:99–103.
26. Choi EJ, Kim SA, Kim NR, et al. Risk factors for falls in older Korean adults: The 2011 Community Health Survey. J Korean Med Sci 2014;29:1482–7.
27. Clemson L, Cumming RG, Kendig H, Swann M, Heard R, Taylor K. The effectiveness of a community-based program for reducing the incidence of falls in the elderly: a randomized trial. J Am Geriatr Soc. 2004 Sep;52(9):1487-94. doi: 10.1111/j.1532-5415.2004.52411.x. PMID: 15341550.
28. Bischoff-Ferrari HA, Willett WC, Wong JB, Stuck AE, Staehelin HB, Orav EJ, Thoma A, Kiel DP, Henschkowski J. Prevention of nonvertebral fractures with oral vitamin D and dose dependency: a meta-analysis of randomized controlled trials. Arch Intern Med. 2009 Mar 23;169(6):551-61. doi: 10.1001/archinternmed.2008.600. PMID: 19307517.