International Journal of Community Medicine and Public Health
*Joshi DS et al. Int J Community Med Public Health. 2023 Sep;10(9):3137-3142*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20232669

**Original Research Article**

# Practice of environmental modifications and identification of its barriers in homes of community-dwelling elderly with moderate to high risk of falls

**Disha S. Joshi[1], Radha R. Bhattad[2]*, Rachana P. Dabadghav[1], Ashok K. Shyam[3], Parag K. Sancheti[3]**

[1]Department of Physiotherapy, [2]Department of Neurophysiotherapy, Sancheti Institute College of Physiotherapy, Pune, Maharashtra, India
[3]Department of Orthopaedics, Sancheti Institute for Orthopaedics and Rehabilitation, Pune, Maharashtra, India

**Received:** 18 April 2023
**Revised:** 06 June 2023
**Accepted:** 31 July 2023

***Correspondence:**
Dr. Radha R. Bhattad,
E-mail: drradhabhattad@gmail.com



## ABSTRACT

**Background:** Age is one of the key risk factors for falls. The prevalence of falls in Indian older adults is seen to be 14 to 53%. The economic consequences of falls are critical to family, community and society. The main risk factors for falls are divided into four dimensions-biological, behavioural, environmental and socioeconomic factors. The risk of falling is increased by the interaction of biological with behavioural and environmental factors.
**Methods:** A cross-sectional study was conducted on 60 community-dwelling elderly with moderate to high risk of falls (0-40/56 on Berg Balance scale) and no history of upper or lower limb injury. Convenience sampling method was used. After taking their consent, elderly were assessed for their risk of falls on Berg Balance Scale. Participants fulfilling the criteria were presented with a self-made questionnaire about practice of environmental modifications and identification of its barriers.
**Results:** 31% of the elderly individuals experienced falls in the past one year with four being the average number of falls experienced. The study showed that the elderly are practising at least a few modifications in each domain. Lack of available information (95%) was the most perceived barrier.
**Conclusions:** The study showed that all the elderly are practising at least a few modifications in every domain. The barriers identified in the study need to be worked upon for an efficient practice of modifications thereby contributing to fall prevention.

**Keywords:** Barriers, Elderly, Environmental modifications, Falls, Practice

## INTRODUCTION

According to the law, a 'senior citizen' or community-dwelling elderly individual is any person being a citizen of India who has attained the age of sixty years or above.[1] Age is one of the key risk factors for falls. Falls are commonly defined as 'inadvertently coming to rest on ground, floor or other level, excluding intentional change in position to rest on furniture, wall or other objects.[2] The prevalence of falls in Indian older adults is seen to be 14 to 53%.[2] Falls may demonstrate a cascading risk pathway, as a single fall may elevate fear of falling leading to decreased physical activity, resulting in deconditioning and a subsequent greater risk of falls.[3] The resulting costs due to falls are divided into two aspects- 1) Direct costs which cover health care costs such as inpatient services

and the long-term costs for rehabilitation. 2) Indirect costs are the losses sustained in an individual's productivity as a consequence of falls.[4] Thus, the economic consequences of falls are critical to family, community and society.[5] Falls occur as a result of complex interaction of risk factors[4]. The main risk factors for falls involve various health determinants that directly or indirectly influence well-being[4]. They are divided into four dimensions-biological, behavioural, environmental and socioeconomic factors.[4] The risk of falling is increased by the interaction of biological with behavioural and environmental factors.[4,6]

Most fatal falls occur at home and home environment is considered a risk factor for falls.[3] Assessment of homes and surroundings is fundamental for determining risk factors leading to falls in older adults and also for the prevention of falls to promote independent living for as long as possible.[7] Appropriate home modifications can reduce falls, decrease fear of falls and the associated burden due to falls. They also reduce the risk of physical deconditioning, decrease care needs, increase independence, decrease depression, are suitable for older adults with complex medical needs and permit an older adult to age in place longer.[3]

Studies conducted in Mumbai and Navi Mumbai reported the presence of environmental hazards in homes of community-dwelling elderly.[7,8] A study performed for assessment of accident risk in domestic environment in Karnataka showed that there is limited knowledge about fall prevention in home health care.[9] A high prevalence of bathroom hazards in urban Indian community was concluded by a study done in Ahmedabad.[10] Various barriers are faced by the elderly in the process of implementing home modifications. There is a dire need to acknowledge and understand these barriers in an attempt to eliminate environment as a risk factor and further contribute towards fall prevention. Studies conducted in US identified some important barriers to procurement of home modifications as a part of fall prevention program following acute hospitalization.[6,11]

The current study aimed to determine the extent of practice of environmental modifications in homes of community-dwelling elderly with a moderate to high risk of falls and identify any barriers to their implementation.

## METHODS

### *Study design, set up, sampling technique and sample size*

The current study was a cross-sectional survey-based study conducted in community set up. The study was carried out at Sancheti Institute of Orthopaedics and Rehabilitation. Convenience sampling technique was used in the present study and sample size was taken as 60.

### *Inclusion criteria*

Community-dwelling elderly aged 60-85 years with a moderate to high risk of falls (0-40/56 on Berg Balance Scale) were included in the study.

### *Exclusion criteria*

Community-dwelling elderly who recently had an upper or lower limb injury were excluded from the study.

### *Procedure*

The Institutional Ethics Committee approved the study. Informed written consent was obtained from the subjects who were willing to participate. The Berg balance scale was used to assess their risk of falls. Participants fulfilling the criteria of moderate to high risk of falls (0-40/56 on Berg balance scale) were presented with a self-made questionnaire which was face validated by 3 experts in the field. The questionnaire was divided into three sections. The first section collected demographic data of participants including age, gender and residence. It also inquired about the number of falls experienced by elderly in the past year and any consultations made for the same. A final question of the section also asked about any advice received about environmental modifications. The second section included four questions about practice of various environmental modifications in specific locations. The modifications in the living room, bathrooms and washrooms, daily activities and lighting for the living space were asked about. The third section inquired about the barriers faced by elderly in implementation of modifications. The data was collected in an interview-based format. Any doubts or queries had been addressed and resolved and an explanation was provided for the same. No attempts were made to help the participants by implying answers directly. The responses were recorded and analysed. The study commenced in the month of April 2022 and was completed in the month of April 2023.

### *Data analysis*

Descriptive statistics were used to analyse the data acquired from the questionnaire. The recorded data was entered into a spreadsheet and the results were converted into percentiles. The results were illustrated using tables and graphs.

## RESULTS

A total of 60 subjects participated in this study with 42 female participants (70%) and 18 male participants (30%). The mean age of participants was 70 years with a standard deviation of 6.845. 90% of the elderly were at moderate risk of falls and 10% of the elderly were at high risk of falls. 31% of the elderly experienced falls in past year with four being the average number of falls

experienced. 42% of these elderly individuals consulted a physician for the recurrent falls.

***Modifications in living room***

The percentage of modifications practised in living room is demonstrated in Figure 1. The results show that immediate cleaning of spilled liquids was practised by all the elderly individuals. More than half of the elderly individuals stored their food, clothing, utensils within reach, kept their room clutter-free and had a proper height of the bed.

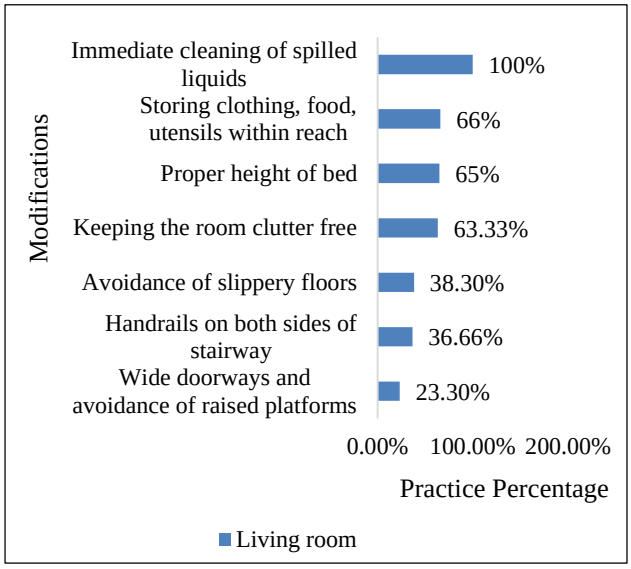


**Figure 1: Modifications in living room.**

***Modifications in bathrooms and washrooms***

Figure 2 shows the percentage of modifications practised in bathrooms and washrooms. Majority of the elderly individuals kept their toiletries within reach, had a raised toilet seat or one with armrests and a sturdy seat in the bathroom to sit on.

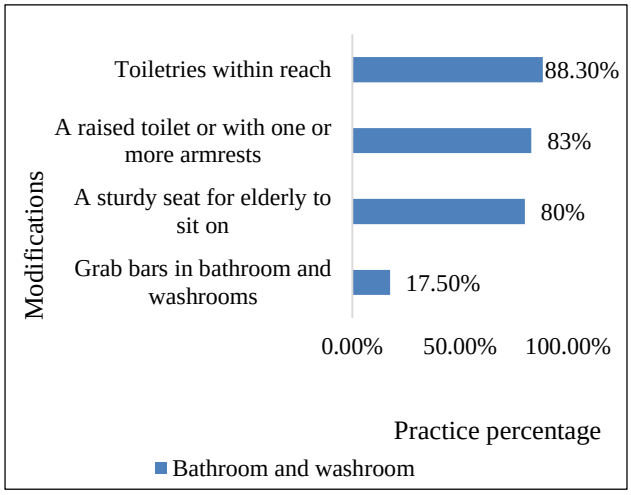


**Figure 2: Modifications in bathrooms and washrooms.**

***Modifications with respect to lighting for living space***

The percentage of modifications practised with respect to lighting for the living space are displayed in Figure 3. Placing night lights in bathroom, bedroom, hallways and clearing the paths to switches that aren't near the bed were majorly practised modifications. More than half of the elderly individuals placed flashlights or torches in easy to find places in cases of power outrage.

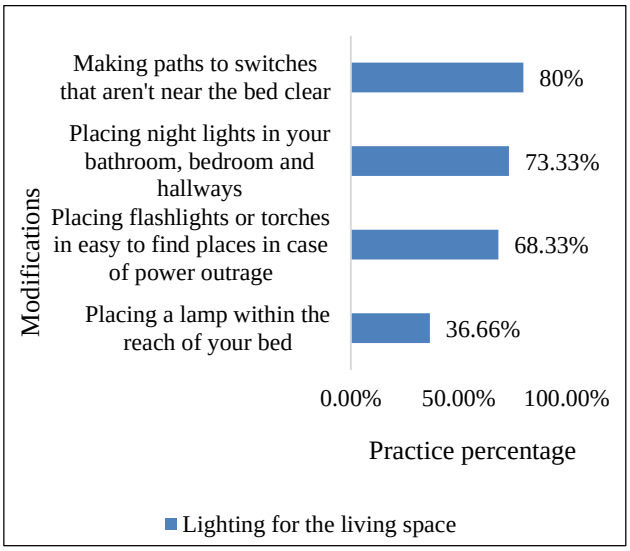


**Figure 3: Modifications with respect to lighting for the living space.**

***Modifications in daily activities***

Figure 4 demonstrates the percentage of modifications practised in daily activities which is found to be the least of all. Majority of the elderly individuals didn't use sturdy shoes or assistive devices in their daily activities.

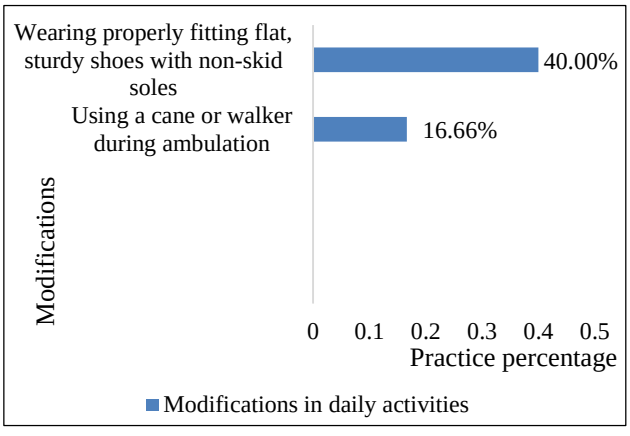


**Figure 4: Modifications in daily activities.**

***Barriers***

Lack of available information was the most perceived barrier followed by costs for modifications, a lack of

motivation, underestimation of risk of fall, requirement of presence of a caregiver and difficult access to sources. This is highlighted in Figure 5.

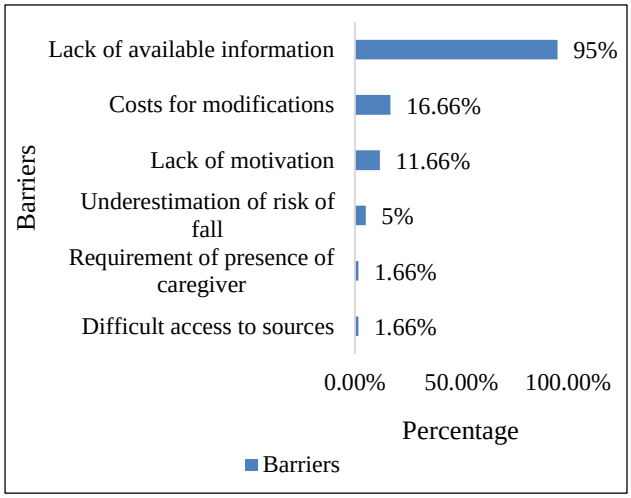


**Figure 5: Barriers to implementation of modifications.**

## DISCUSSION

The aim of the study was to determine the extent of practice of environmental modifications and identify the barriers to their implementation in homes of community dwelling elderly with a moderate to high risk of falls. 60 elderly individuals with a mean age of 70±6.845 participated in the study. 10% of the elderly were at high risk of falls and 90% were at moderate risk of falls. One third of the elderly experienced falls in last year with four being the average number of falls experienced. Forty-two percent of these elderly individuals consulted a physician for the recurrent falls.

### *Practice of environmental modifications*

The results show that all the community-dwelling elderly are practising at least a few modifications in each of the following domains: living room, bathrooms and washrooms, lighting for the living space and modifications in daily activities. There was a higher implementation of modifications in bathrooms and washrooms while a minimal use of modifications in daily activities was identified. This included the use of properly fitting shoes with non-skid soles and using a cane or walker during ambulation. The results reveal that immediate cleaning of spilled liquids was practised by all the elderly individuals. More than half of the elderly individuals stored their food, clothing, utensils within reach, kept their room clutter-free and had a proper height of the bed. Majority of the elderly individuals kept their toiletries within reach, had a raised toilet seat or one with armrests and a sturdy seat in bathroom to sit on. Placing night lights in bathroom, bedroom, hallways and clearing the paths to switches that aren't near the bed were majorly practised modifications. More than half of the elderly individuals placed flashlights or torches in easy to find places in cases of power outrage.

The present study found that handrails on both sides of stairway, raised platform at entrances and avoidance of slippery floors were less practised modifications in living room. S.E. Carter conducted a cross-sectional survey on 425 older people aged 70 and above living in a defined geographical region of Australia in which hazards relating to floor surface (62% had one flooring hazard) and absence of appropriate grab bars or handrails (60% had one or more hazards) were identified.[12] 1000 community dwelling elderly aged 72 years and older participated in this study conducted by Gill et al in which a room-by-room assessment for potential environmental hazards was completed by a trained research nurse using a standard checklist derived from pre-existing environmental assessment instruments. The study showed that when present, stairs were often hazardous, with nearly half of the homes having 2 or more of the hazards.[13]

Grab bars were found to be the least implemented modifications in bathrooms and washrooms. A study by Salian SC and Karia T assessed home safety in home bound older adults belonging to upper and middle socio-economic status. The results found that a major difficulty was faced by the geriatrics while getting in and out of beds and toilets. The difficulty was faced by the elderly because of unavailability or unawareness about grab bars. Majority had experienced falls in bathroom area due to slippery flooring and absence of grab bars.[7] Gill et al conducted a cross-sectional study on 1088 persons aged 72 years and older who had an environmental assessment at their homes. The study determined whether environmental hazards related to transfers, balance, gait are equally prevalent in homes of older persons with and without specific deficits in physical capabilities. With the exception of no grab bars in tub/shower, environmental hazards were equally prevalent in homes of participants with and without specific deficits in physical capabilities.[14]

Majority of the elderly didn't opt to keep a lamp within the reach of their bed. This finding is supported by a study conducted by Gill et al on 1000 community dwelling elderly aged 72 years and older in which a room-by-room assessment for potential environmental hazards was completed by a trained research nurse. The prevalence of most hazards was high varying from 11.6% to 22.1% for dim lighting to 61% for no grab bars in tub/shower.[13]

The use of modifications for fall prevention in daily activities was the lowest with very few elderly using assistive devices and properly fitting shoes with non-skid soles. 100 home dwelling elderly (50 males and 50 females) with age varying from 60-80 years participated in the study by Salian SC and Karia T which assessed home safety in home-bound older adults belonging to upper and middle socio-economic status. Majority of

participants didn't use any assistive devices while performing activities of daily living. Majority had difficulty in performing ADL which could be lessened if assistive devices were used.[7]

***Barriers for practice of modifications***

The present study identified that lack of available information was the most perceived barrier for practice of modifications followed by costs for modifications, lack of motivation, underestimation of risk of falls, requirement of presence of caregiver and difficult access to sources. Poor education about home modifications in health care settings might be one of the factors contributing to lack of awareness about some important modifications. The study conducted by Wiseman et al aimed to identify barriers to procurement of home modifications for older adults post-acute hospitalisation. The results of this study suggest that a barrier to implementing home modifications for older adults is finding a contractor willing to complete the project. Costs for the home modifications may also prove a considerable barrier for older adults which might be due to economic insecurity experienced by many of them. The amount of time required for installation of modifications could also be a barrier to receipt of home modifications by older adults. For elderly individuals with physical or cognitive impairments, it might be necessary for a caregiver, family member, or friend to be present during the installation, and this may further contribute to the scheduling difficulty.[3]

A scoping review was conducted by Huey-Ming-Tzeng to determine barriers and facilitators to older adults participating in fall-prevention strategies after returning home from acute hospitalisation. The capability-related barriers were identified as frailty due to advancing age, language and communication, education/literacy levels, and health-related problems. Lack of institutional support, lack of social and community support, fall-prevention strategies requiring additional designs and lack of access to intervention were identified as opportunity-related barriers. Lack of motivation to carry out or sustain involvement in the fall-prevention intervention post-hospital discharge or during hospitalization, self-denial of risk for falls, difficulty transitioning between daily living activities and fall-prevention strategies, and enthusiasm fatigue were identified as motivation-related barriers. Health staff were disinterested in promoting fall-prevention strategies due to heavy clinical workload and lack of understanding about the program.[15] Thus it can be inferred from the study that there is an inadequate practice of modifications in homes of community-dwelling elderly with some important modifications not being implemented. The barriers identified in the study need to be addressed in an attempt to achieve efficient practice of modifications thereby helping in fall prevention.

The findings of this study have to be seen in light of some limitations. The sample size was small for generalizing the practice of modifications in homes of community-dwelling elderly. The same study done on a bigger sample size would be more effective in getting a clearer picture about the practice of modifications. The sample size had uneven distribution of elderly individuals with respect to risk of falls. This might have created a bias on practice of certain modifications. The socioeconomic status of the elderly individuals was not taken into consideration.

## CONCLUSION

The study concluded that all the community-dwelling elderly are practising at least a few modifications in each of the domains considered. The major barriers identified for unimplemented modifications include lack of available information, costs for modifications and lack of motivation all of which need to be worked upon. Education of elderly individuals and their caregivers about the various environmental modifications is extremely important and should be undertaken in every way possible. This can be accomplished by health care professionals including medical doctors, nursing professionals, physiotherapists and occupational therapists. Apart from the clinical settings, this can occur at the group exercise classes, laughter clubs, caregiver agencies and exercise clubs. Cost-effective modifications should be given an emphasis which will lead to their increased implementation. Motivating the elderly by presenting them with the statistics about contribution of physical environment to falls can definitely help for enhanced practice of these modifications.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Vikaspedia. Senior Citizens-status in India, 2014. Available at: https://vikaspedia.in/social-welfare/senior-citizens-welfare/senior-citizens-status-in-india. Accessed 30 October 2022.
2. Dsouza SA, Rajashekar B, Dsouza HS, Kumar KB. Falls in India older adults: a barrier to active ageing. Asian J Gerontol Geriatr. 2014;9(1):33-40.
3. Wiseman JM, Stamper DS, Sheridan E, Caterino JM, Quatman-Yates CC, Quatman CE. Barriers to the initiation of home modifications for older adults for fall prevention. Geriatr Orthop Surg Rehabil. 2021;12:21514593211002161
4. Kalache A, Fu D, Yoshida S, Al-Faisal W, Beattie L, Chodzko-Zajko W, et al. World Health Organisation global report on falls prevention in older age. Geneva. 2007:4-6.
5. Heinrich S, Rapp K, Rissmann U, Becker C, König HH. Cost of falls in old age: a systematic review. Osteopor Inter. 2010;21:891-902.

6. Jindal HA, Duggal M, Jamir L, Sharma D, Kankaria A, Rohilla L, et al. Mental health and environmental factors associated with falls in the elderly in North India: a naturalistic community study. Asi J Psych. 2019;39:17-21.
7. Salian SC, Karia T. Assessing home safety in homebound older adults belonging to upper and middle socio-economic status. Ind J Gerontol. 2020;34(1):37-51.
8. Pitchai P, Dedhia HB, Bhandari N, Krishnan D, D'Souza NR, Bellara JM. Prevalence, risk factors, circumstances for falls and level of functional independence among community dwelling elderly population-A descriptive study. Ind J Pub Heal. 2019;63(1):21.
9. Aras RY, Narayan V, D D'souza N, Veigas I. Assessment of accident risk among community dwelling elderly in domestic environment: A cross-sectional study in rural south Karnataka, India. Ann Trop Med Pub Heal. 2012;5(6):565.
10. Joshi R, Dsouza S. Bathroom hazards among older adults in western India: a cross-sectional study. Asi J Jos Gerontol Commu dwell eld. 2015;10(2):83-91.
11. Tzeng HM, Okpalauwaekwe U, Lyons EJ. Barriers and facilitators to older adults participating in fall-prevention strategies after transitioning home from acute hospitalization: a scoping review. Clin Interv Aging. 2020;15:971-989.
12. Carter SE, Campbell EM, Sanson-Fisher RW, Redman S, Gillespie WJ. Environmental hazards in the homes of older people. Age Ageing. 1997;26(3):195-202.
13. Gill TM, Williams CS, Robison JT, Tinetti ME. A population-based study of environmental hazards in the homes of older persons. Am J Pub Heal. 1999;89(4):553-6.
14. Gill, TM, Robiso, JT, Williams CS, Tinetti ME. Mismatches between the home environment and physical capabilities among community-living older persons. J Am Geriatr Soci. 1999;47: 88-92.
15. Tzeng HM, Okpalauwaekwe U, Lyons EJ. Barriers and facilitators to older adults participating in fall-prevention strategies after transitioning home from acute hospitalization: a scoping review. Clin Interv Aging. 2020;15:971-89.

**Cite this article as:** Joshi DS, Bhattad RR, Dabadghav RP, Shyam AK, Sancheti PK. Practice of environmental modifications and identification of its barriers in homes of community-dwelling elderly with moderate to high risk of falls. Int J Community Med Public Health 2023;10:3137-42.