How Fall-Safe is the Housing for the Elderly in Rural Areas? : A Cross Sectional Study using Fall Prevention Screening Checklist

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Abstract

Background: Certain risk factors present in the immediate housing environment may contribute to falls. Research shows one half to two thirds of falls occur in or around the house of elders. There is a need to keep the houses of elder's age friendly to prevent falls and enable them to do their daily routine comfortably.

Objectives: To assess the proportion of elderly (≥60 years) houses that comply with housing standards to prevent falls using fall prevention screening checklist.

Method: Observational checklist was prepared from recommended standards of home-safety for fall prevention and modified to screen the individual rooms in rural houses of elders. A total of 655 houses were screened for the study.

Results: Common housing risk for fall identified were poor lighting of living room (95%) and bedroom (94%) and absence of light switch near the bed (63%) in the bedroom. 73% of bathroom was located outside the house with 41% having uneven /slippery surface. Only 68.2% had personal toilet of which 66% was present outside the home, 98% had no handrail and absence of western toilet in 62%. Area surrounding the house had stones, leaves and other obstacles in 44% of homes.

Conclusion: Overall, using the fall-prevention screening checklist, almost all houses were found to be risky for fall with only very few houses being found to be fall-risk free. Further research has to be done to establish the validity of this tool or to recommend new standards for conditions peculiar to rural India that potentially appear to contribute to fall.

Key words: Elderly; Fall; Home-safety; Home screening; Handrails; Lighting

INTRODUCTION

All over the world, the ageing of population is one of the noteworthy trends in the 21st century. Current statistics shows 12.3% of global populations are those above 60 years of age. In other words, for every 8 people, there is 1 person aged more than 60. Even though ageing is a universal phenomenon, this growth in proportion of the aged is more drastic among the developing countries[1]. Globally, the percentage of aged (60 years and more) has increased from 9% in 1994 to 12% in 2014 and is expected to reach 21% by 2050[2]. Though considered as a great success of public health policies and socioeconomic development, it poses challenges of providing the elderly with proper health care and social security.

Growth in elderly population can be a positive experience only if it is accompanied by good health and social support. Keeping this in view, World Health Organization adopted the concept of "Active Ageing" in 2002, aiming to extend healthy expectancy and quality of life as people age. Maintaining autonomy and independence were key

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goals of "active ageing"[3]. Housing condition of elders contributes significantly in this aspect, and safe housing can prevent falls as well as make their daily living comfortable. It has been stated in a fall prevention report by WHO [4] that most of the falls among elders occur inside home and therefore it is critical to prevent them. The common risk factors for fall encountered at home were irregular sidewalks, presence of loose carpet in the living area, wires and other obstacles, inappropriate doorsteps, dim lighting, absence of handrails and grab bars in toilet etc. Poor home surrounding such as presence of leaves, weeds, stones or slippery pathways from rain or moss can also be dangerous. Even the chairs and bed used by elders should be of a height that enables them to sit and get up comfortably. Environmental risks are generally present in all homes[5,6] and very little attention has been made to remove the risks as people are not aware of them[7].

Various home screening assessment tools[8,9] for risk of fall are available that can be used by the elders themselves and initiate necessary modification[10]. There are also standard checklist like Safer Home v.3[11], WeHSA (Westmead Home Safety assessment)[12], Cougar[13] etc. which are validated tools that are used by trained professionals to identify potential risk for falls and suggest necessary changes in the home environment. Most of these checklists help assess risk of fall in each room and are more applicable to the western type of housing. Many developed countries under their fall-prevention program have prepared checklist to assess the safety of their homes in preventing falls that can be used by either specialist who visit the elder's home or by the elders themselves to enable them to initiate necessary changes in their homes to make them fall-safe.

There is paucity of literature on fall prevention housing standards for the elderly in the developing countries especially those that can be applied in the rural areas. The current study attempts to identify the extent of the problem of unsafe housing for the elderly in rural India by using a screening checklist compiled for application to housing as is commonly seen in rural areas for risk of fall using fall prevention housing standards available and used in developed countries. It is expected that the findings would generate the evidence needed to inform the policy makers and housing experts about the urgent need for action for ensuring fall-safe housing for the elderly in rural India.

METHODS

A community based cross-sectional study was conducted in rural area of Coimbatore. Prevalence of fall in a previous community based study[14] was used to calculate the sample size with 20% of non-response rate. Total 736 elders were selected by two-stage sampling method. Houses with elders aged more than ≥60 years and permanent residents for at least one year were included in the study. Locked homes on more two consecutive visits got excluded. Following the inclusion and exclusion criteria 655 elder's houses were assessed and included for the final analysis.

Home safety check list: Currently, in India, there are no housing standards available to assess the elderly person's home for presence of risk of fall in rural area for a fall prevention program among the elderly. Using review of literature, an observation checklist for home assessment for potential fall risk was prepared (see Annexure). Pilot study was done for content and construct validity. A total of 29 risks for fall were included in the list for the various rooms (i.e. living room, bedroom, kitchen, bathing room, toilet, path entrance to home and stairs.) All the houses were assessed using the checklist by the principal investigator during the months November 2015 to April 2016. A portable digital light meter was used to measure the lighting of rooms (living and bedroom) which was calibrated for its accuracy and precision. The measurement was done standing at the center of the room. Adequacy of lighting (including artificial) was judged against the cut off value of 300 lux as minimum standard for permissible illumination for elders as per recommended standards[15]. Floors were considered slippery if glossy or polished flooring material was used or slimy growth of moss/algae were present. Bed height was assessed for its adequacy if the elder was able to sit on the edge of bed with feet touching the ground. If a particular room was not present it was not included in the final analysis.

Statistical analysis: Data entry was made in the Microsoft Excel software in codes and analysis was done with SPSS-19 computer package. The risks for falls identified in each room were expressed in percentage or proportion.

Ethical approval was obtained from the Institutional Human Ethics Committee of PSG Institute of Medical Science and Research, Peelamedu, Coimbatore. Both written and verbal consent was taken from the participants.

RESULTS

Socio-demographic details are given in Table 1. The participants in the study were relatively financially better off with 60% belonging to class I, II & III and the remaining 40% belonging to class 4 and 5. The type and ownership of housing reflected this socio-economic distribution with more than half of the elders living in semi-pucca house (60.3%), 1/3rd stayed in pucca and only 2% in kutcha houses. Most (92.7%) of them had their own home with only 7.3% living in rented home.

Table 2 shows the distribution of homes of elderly not meeting fall prevention housing standards by type of rooms. Lighting was poor (below recommended fall-prevention standard) in 95% and 94.4% of living and bedrooms respectively. Uneven or slippery flooring (due to flooring material or algae) was seen mostly in the bathing room (41.6%) followed by toilet (15.3%). Very few living rooms (1.4%) and kitchen (1.2%) had things kept beyond reach height for it to be a potential risk for fall. Living room was found to have the maximum percentage of obstacles in the pathway (26.6%) followed by kitchen (16.3%) and bedroom (14%). Only 20% of elders with bedroom had inappropriate bed height but over 60% did not have a light switch near their bed.

Most of the houses had their bathing area/room (73%) and toilet (65.2%) outside their home. Overall 457 of the 655 elders had their own personal toilet (69.7%) the others use public toilets or practice open air defecation/urination. Almost half (44.1%) of elders did not have water supply inside the bathing room due to which water had to be either carried from outside or a pipe had to be connected from the public water source to their bathing room and thereby increasing the risk of fall. Most of the houses had door mat outside their bathroom with few not having it (36.1%). Majority of elders having toilet had Indian style of toilet with about 40% using western closet. Handrails were absent in 98.2% of the toilets.

Table 1: Socio-economic distribution of study participants and their houses

Socio-economic variables		Frequency (n=655)	Percentage
Socioeconomic class (Modified Prasad's classify-cation)	Class 1	72	11.0
	Class 2	160	24.4
	Class 3	161	24.6
	Class 4	207	31.6
	Class 5	55	8.4
By type of house	Kutcha	13	2
	Semi-pucca	395	60.3
	Pucca	247	37.7
By ownership of house	Owner	607	92.7
	Rent	48	7.3

The most common risk (44.7%) identified at the entrance/surrounding of home was the presence of stones, weed or other obstacles on the pathway to home. Around 30% of homes had open ditches present at the sides of entrance. Stairs which are often considered dangerous for elderly had safety provisions with only 5.5% of stairs not having handrails.

Table 2: Distribution of Homes of elderly not meeting fall prevention housing standards by type of rooms

Home fall risks in each room	LR[a] n= 655	BR[b] n=483	K[c] n=568	BR[d] n= 648	T[e] n=447	E[f] n= 655	S[g] n = 36
Poor Lighting (<300 lux)	622 (95%)	456 (94.4%)	-	-	-	-	-
Slippery/uneven floor	82 (12.5%)	44 (9.1%)	31 (5.4%)	270 (41.6%)	70 (15.3%)	-	0
Things kept beyond reachable height	9 (1.4%)	-	7 (1.2%)	-	-	-	-
Obstacles on pathway	174 (26.6%)	68 (14%)	93 (16.3%)	-	-	-	-
Bed height too high	-	97 (20%)	-	-	-	-	-
Switch not near bed	-	307 (63.5%)	-	-	-	-	-
Room not present inside house	-	-	88 (15.4%)	473 (73%)	298 (66.6%)	-	-

Home fall risks in each room	LR[a] n= 655	BR[b] n=483	K[c] n=568	BR[d] n= 648	T[e] n=447	E[f] n= 655	S[g] n = 36
Needs to carry water from outside	-	-	-	286 (44.1%)	-	-	-
Entrance elevation (>15 cm)	-	-	-	48 (7.4%)	43 (9.6%)	107 (16%)	-
Door mat not present	-	-	-	234 (36.1%)	-	-	-
Absence of western toilet	-	-	-	-	281 (62.8%)	-	-
Handrails not present	-	-	-	-	440 (98.4%)	-	2 (5.5%)
Slanting entrance	-	-	-	-	-	102 (15.5%)	-
Surrounding home any obstacles	-	-	-	-	-	293 (44.7%)	-
Open ditches	-	-	-	-	-	197 (30%)	-

a- Living room; b- Bedroom; c- Kitchen; d- Bathroom; e- Toilet; f- Entrance; g- Stairs

Table 3: Distribution of room/area with number of potential risks present for fall

Type of Room	No. of potential risk standards available	Number of houses with potential risks found (%)				
		0	1	2	3	>3
Living room (n=655)	4	18 (2.7%)	398 (60.8%)	228 (34.8%)	11 (1.7%)	0 (0%)
Bedroom (n=483)	5	4 (0.8%)	113 (23.4%)	246 (50.9%)	113 (23.4%)	7 (1.4%)
Kitchen (n=568)	4	361 (63.3%)	195 (34.3%)	12 (2.1%)	0 (0%)	0 (0%)
Bathroom (n=648)	5	83 (12.8%)	133 (20.5%)	179 (27.6%)	195 (30.1%)	58 (9%)
Toilet (n=447)	5	0 (0%)	101 (22.6%)	94 (21%)	176 (39.4%)	76 (17%)
Entrance of home (n=655)	4	111 (16.9%)	319 (48.7%)	199 (30.4%)	23 (3.5%)	3 (0.5%)
Stairs (n=36)	2	34 (94.4%)	2 (5.6%)	-	-	-

Table 3 shows the distribution of room/area with number of potential risks present for fall in each of the rooms within the house. Kitchen was found to be to be a relatively safer area with 63.3% of kitchens observed with no potential risk for fall, whereas 34.3% of the kitchen had one fall risk. For the living rooms, only 2.7% of them had no potential risk for fall but 60.8%, 34.8% and 1.7% of the living rooms had 1, 2 and 3 potential risk for fall respectively. For the bedrooms, only 0.8% of them had no potential risk but half of them (50.9%) had at least 2 risks. Most of the bathrooms (30.1%) and

toilets (39.4%) had 3 potential risk identified. None of the toilets in homes of study participants was safe since they had more than 1 risk identified with 17% of toilets had more the 3 risks.

DISCUSSIONS

In the literature from developed countries, as part of the fall prevention program there, much attention is given to fall-risk assessment for housing where the elders live. A study by Ferretti F. et al.[16] concluded that falls occurring among

elders at home is a public health problem which needs strategies to prevent it. A study by Carter S. et al.[7] in Australia found 20% of houses without any environmental risk for fall but unfortunately in our study none of the houses were without any environmental risk for fall. Other studies have however identified environmental risks in nearly all homes of elders living in the community[6,7,17] similar to our study. Review of literatures showed only few Indian studies on elderly home safety, mostly done in urban area[18, 19].

Overall, poor lighting was the commonest type of fall risk observed in the living and bedrooms of our study participants homes. Cornelissenet et al.[20] in their study found that elders were able to see more objects in living room with higher lighting level and this may have benefits in avoiding tripping and thus preventing falls at home. Horgas et al.[21] observed that older adults spend an average of 12 to 16 hours a day at their homes and therefore level of lighting is a critical area which needs to be addressed to make homes comfortable for elders from ambulation point of view. Obstacles in the pathway were seen in 26% houses which were similar to a study done by Aras R. et al[22].

Only 37% of houses had light switch present near their beds compared to a study in Karnataka[22] where 55.6% of houses had light switch at reachable distance from their bed. Presence of light switch at reachable distance is essential for elders especially when they have to get out of bed at night or early morning.

Kitchen was found to be one of the relatively safest rooms among our participants. Indian studies[18,22] have not specifically looked into the environmental risk for fall in the kitchen. Most of the home safety checklist for fall prevention[9,10] suggests the need to keep things in the kitchen at reachable height. This was followed by almost all of our study participants (98.8%).

Among those who had bathroom at their home, 64% had doormat present outside their bathroom which was higher than that of a study done in Karnataka [22] where it was 61%. Around 44% of elders had to carry water from an outside the house source which is considered as a risk for fall in a world-wide study conducted by WHO[23]. We identified algae growth and uneven floor at the bathroom which can cause a fall due to slip. Joshi et al.[19] in their study in western India developed 18 item bathroom hazard checklist. Hazards included in the list were inappropriate bathroom area, door width, poor illumination, absence of exhaust fan etc.

Only 70% of houses had an attached toilet within their home premises, the rest used either public toilet or practiced open air defecation. But in a study by Savita S. et al.[18] in Bangalore, all the houses had toilets; this is probably because it was an urban area. Hardly a few toilets (1.8%) in our study had grab-bars installed in their toilets, while in the study done in Karnataka by Aras R. et al.[22], 46% of elder's toilets had grab-bars installed. This finding shows that there is a need to create awareness on preventive measures to prevent falls among the elders in rural area. Moreover in our study we also identified around 10 elders sleeping outdoors near to the toilet to overcome the difficulty in ambulation during night time.

About 83% of home had environmental risk for fall present at the entrance and surroundings of their homes. The common risk for fall was presence of stones, leaves and others obstacles on pathway which was seen in 44% of homes. Savita S. et al.[18] found 94.5% of houses having uneven surface in the surrounding which is much more than our study. A study done in Karnataka [22] found only 28% with obstacles on pathway and 36% covered with leaves which was lesser than that found in our study but this could be probably due to the fact that these have been considered as two separate potential fall-risk factors but in our study it was considered together. We identified homes with slanting entrance (15%) in our study area which has not been observed as a risk in others study probably because houses elsewhere are not exposed to such a fall risk.

In our study only 5% of houses had stairs of which only 5.5% did not have a handrail. But other studies in India[18,22] have found between 20 to 46% of houses not having handrails. But the definition and location of handrail is different in these studies and so we are unable to compare our observation with these studies. Moreover only 36 houses had stairs among 655 houses that were investigated.

CONCLUSIONS AND RECOMMENDATIONS

Observational check list used to identify housing risk for fall was prepared from standards available from developed countries for urban setting which might not apply to the rural setting and so the tool needs to be validated.

In our study, almost all houses had fall-risk factors present in them that can contribute to fall with only very few houses that were found to be fall-risk free. Since the proportion of the elderly is increasing rapidly, urgent action is needed to initiate a fall-prevention program directed at screening the houses of the elderly to identify and

rectify the fall risk housing conditions. This will help elders live in a safer environment and prevent disability and mortality due to fall.

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CONFLICT OF INTEREST- None

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Annexure: OBSERVATIONAL CHECKLIST- HOME SAFETY ASSESSMENT FOR ELDERS

		Risk present	N/A
1.	**Living room**		
A	Lighting (<300)		
B	Floor slippery		
C	Things kept beyond reach height		
D	Wire, rug or clutter (chair, table etc) in the pathway		
2.	**Bedroom**	Risk present	N/A
A	Bed height (>1.5 feet)		
B	Lighting (<300)		
C	Switch not near bed		
D	Floor slippery		
E	Wire, rug or clutter (chair, table etc) in the pathway		
3.	**Kitchen**	Risk present	N/A
A	Not present inside the house		
B	Things kept beyond reach height		
C	Floor slippery		
D	Wire, rug or clutter (chair, table etc) in the pathway		
4.	**Bathing room**	Risk present	N/A
A	Not present inside/ within the house premises		
B	Floor (algae/uneven/slippery)		
C	Needs to carry water from outside source		
D	Entrance elevation (>15cm)		
E	Door mat not present at entrance		
5.	**Toilet**	Risk present	N/A
A	Not present inside the house		
B	Western type toilet not present		
C	Hand rails not present		
D	Floor (algae/uneven/slippery)		
E	Entrances elevation (>15cm)		
6.	**Path entrance to home**	Risk present	N/A
A	Step elevation (>15cm)		
B	Slanting entrance		
C	Area covered with leaves, stones, weeds, algae etc		
D	Open ditches present		
7.	**Stairs**	Risk present	N/A
A	Slippery material of stair		
B	No handrail		