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ORIGINAL PAPER

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# Relationship Between Home Safety and Prevalence of Falls and Fear of Falling Among Elderly People: a Cross-sectional Study

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## ABSTRACT

**Introduction:** Falls and fear of falling are considered as the major factors affecting the elderly's disabilities, so that most of these individuals often find their homes as a safe environment. **Aim:** The aim of this study was to evaluate the relationship between home safety and prevalence of falls and fear of falling among older adults. **Materials and Methods:** This cross-sectional study was conducted on 450 elderly people who lived in Bojnurd, Northeast of Iran, from December 2016 to July 2017 using cluster sampling method. A demographic characteristics questionnaire, Fall Efficiency Scale-International (FES-I) questionnaire, and Home Safety Checklist were employed as research instruments. **Results:** Out of the study population, 157 individuals (35.7%) had a history of falls in the past one year. The mean score for fear of falling in the elderly people examined was 29.14±11.07 and the same value for home safety status was equal to 11.31±4.17. The mean score for fear of falling was significantly correlated with history of falls in older adults ( $p < 0.0001$ ). There was also a statistically significant relationship between home safety status and prevalence of falls and fear of falling in the elderly ( $p < 0.0001$ ). Besides, the results of logistic regression analysis showed that fear of falling could be estimated by 29-51%, taking the history of falls in the last 12 months and home safety mean score into account ( $p < 0.0001$ ). **Conclusion:** Home safety status and demographic variables could have effects on falls and fear of falling in elderly individuals. Therefore, putting these factors together, older adults at the risk of further falls can be identified and provided with trainings through planning and appropriate interventions to prevent the incidence of falls and

their negative consequences among them.

**Keywords:** safety, accidental falls, fear of falling, elderly, aged.

## 1. INTRODUCTION

Falls are considered as one of the major factors affecting the elderly's disabilities (1) which can also cutback daily life activities in these individuals (2, 3). The prevalence rates of falls have been reported to be from 20 to 40% in different countries (4-8). Approximately 60% of older adults with a fall experience in the past one year have also fallen once again (2). Additionally, trauma is currently the fifth leading cause of mortality in the elderly and falls are considered as the most common cause of death from trauma (9). Therefore, falls not only affect an elderly person's life (10), they can heavily influence their families' health status, well-being, and quality of life (4). Direct costs incurred by the given falls and their resulting injuries also constitute 1% of total medical costs in the United States and more than 1.5% of expenditures in Europe (1). Moreover, older people experiencing falls repeatedly express more fears of falling compared to those who accidentally fall (4). Fear of falling is defined as a mental and restrictive state affecting physical activities (11). The prevalence rate of fear of falling in the elderly has been reported between 16-98% (12-16). Most elderly people also spend a long time at home and they usually find their homes as a safe place. But, lot of accidents may occur at home for these individuals. Therefore, attention to the living environment of the elderly is an important domain in terms of care for these people and its ignorance may lead to events such as falls among them (17).

In this regard, home safety may reduce the risks of falls and improve general performance in older adults (18, 19). It has been previously suggested that fall-related injuries could be more affected by environmental factors than individuals' inabilities (18), while the findings of another investigation suggested that loss of balance was the cause of most falls and environmental hazards accounted for only 7% of these accidents (4). As well, the results of the same study indicated no significant difference between intervention and control groups after 18 months of follow-up through the implementation of visits and home improvements in terms of falls and movement control (20). Due to the interference of several factors, preventing falls and their related injuries does not seem easy, considering the fact that the living environment of the elderly is an important domain in terms of care for these people. According to the review of the literature, the impact of living environment on prevalence of falls and fear of falling in the elderly had led to contradictory results. Given the differences in conditions and culture of the society in this study and lack of investigations conducted in Iran, the aim of this study was to investigate the relationship between home safety and prevalence of falls and fear of falling in elderly individuals.

## 2. MATERIALS AND METHODS

This cross-sectional study was conducted on 450 elderly people in the city of Bojnurd, Northeast of Iran from December 2016 to July 2017 using cluster sampling method. To have access to these older adults, multistage random sampling method was employed; in which, in the first stage, rural and urban areas were considered as categories with proportional allocation and, in the second stage and inside the categories, 450 individuals were included in the study through cluster sampling method based on the division of areas. Given the population of the elderly living in urban (63%) and rural (37%) areas, 290 older people from the urban area considering the gender ratio of the population (148 women and 142 men) and 160 elderly individuals from rural areas according to the gender ratio of the population (85 women and 75 men) were included in this study. Then, the elderly people's information was completed by attending their homes as the head of clusters considering the inclusion criteria of the study and then other samples were determined according to the right-hand rule. The inclusion criteria in this study were cases such as age of 60 years and over, willingness of the elderly to collaborate in the study, home residency, time and space awareness, ability to communicate verbally, no dependence on the bed, no history of Alzheimer's disease, diagnostic history of dementia, and no history of hospitalization for psychiatric disorders. After communicating with the elderly people and giving them the necessary explanations regarding the study as well as observing ethical considerations, the data were collected. In addition to the demographic characteristics questionnaire in this study, Fall Efficacy Scale-International (FES-I) and Home Safety Checklist were employed as research instruments. Thus, higher scores could mean more fear of falling or lower efficacy (21). The validity and the reliability of this questionnaire (Cronbach's alpha of 0.98 and Pearson correlation coefficient of 0.70) had been already approved in Iran (22). To assess home safety, Home Safety Checklist was used (23, 24). The questionnaire was submitted to 8 profes-

sors in the domain of Gerontological Care and its validity was confirmed using several tests. To determine the content validity of the checklist quantitatively, content validity ratio (CVR) and content validity index (CVI) were used whose values were calculated by 0.9 and 0.8; respectively. To determine construct validity and reliability, factor analysis with varimax rotation and Pearson correlation coefficient were employed. Cronbach's alpha was also used to calculate the internal reliability which was equal to 0.87. Provided that the older adults were unable to answer certain items for some reasons, they were asked to answer the items with the help of one of their relatives. After collecting the questionnaires, data were statistically analyzed using the SPSS Software (Version 24). To manage the missing data, the standard imputation method was used due to the fact that the amount of missing data in each item was less than 10% of the data. Chi-square test, Kruskal-Wallis test, Spearman correlation coefficient, Mann-Whitney U test, Fisher's exact test, and logistic regression analysis were employed to test the research hypotheses.

## 3. RESULTS

The results revealed that 450 elderly people participating in this study including 290 (64.4%) and 160 (35.6%) individuals were living in urban and rural areas; respectively. The mean age of the participants was  $70.46 \pm 8.17$  years. As well; 233 participants (51.9%) were women and 239 of them (54.3%) were illiterate, 303 individuals (68.2%) were married, 232 of them (55.8%) had normal BMI, 215 of these individuals (51.3%) were earning more than one million tomans (about 200 dollars), 184 elderly people (45.1%) had a history of taking more than one medication, and 242 participants (54.4%) were suffering from changes in their blood pressure. Based on the results of the present study, 157 (35.7%) of the older adults had a history of falls in the past one year; out of them, 68 individuals (15.5%) had experienced falls once and 89 of them (20.2%) had fallen twice or more. The locations of the falls among 82 individuals (53.3%) were at home and they were also reported in alleys and streets for 43 individuals (27.9%). Moreover, 29 elderly individuals (18.8%) had fallen in more than one place and the location of the falls in three cases had not been specified. The falls happened in alleys and streets among the elderly living in rural areas (52.8%) were reported with higher prevalence compared to those in older adults living in urban areas (41.5%). Among the elderly who had fallen, 50 of them (27.62%) were in need of hospitalization. As well, 64 of these elderly individuals (15.6%) had a fear of falling and 346 (84.4%) of them did not demonstrate such a fear. The mean (standard deviation) of fear of falling in elderly people was  $29.41 \pm 11.07$  and varied from 16 to 64. Among the items examined in the FES-I, the maximum fear of falling was associated with walking on a slippery surface (9/32%) and the least fear of falling was due to wearing or undressing clothes (1.3%). In this study, home safety status of the elderly individuals living in urban and rural areas was assessed by Home Safety Checklist. The mean home safety in elderly participants was  $11.34 \pm 4.17$  and also varied from 3 to 30. The given questionnaire had 10 items scored from 0 to 3 in which higher scores indicated a drop in home safety for an elderly person. Among the items; wearing unsuitable shoes ( $2.54 \pm 0.97$ ), slipping on uneven surfaces at commute sites

Demographic variables	History of falls				p-value	Test	Fear of falling				home safety score			
	Yes		No				Number	Mean & standard deviation	p-value	Test	Number	Mean & standard deviation	p-value	Test
	Number	Percentage	Number	Percentage										
Age	under 80 years old	139	36.3	244	63.7	354	28.28±10.17	p<0.0001	Mann-Whitney U	367	11.25±4.70	p=0.094	Mann-Whitney U	
	over 80 years old	17	33.3	34	66.7		51			35.25±14.99	50			12.52±4.97
Gender	female	103	45.8	122	54.2	207	31.50±11.40	p<0.0001	Mann-Whitney U	217	12.15±4.47	p<0.0001	Mann-Whitney U	
	male	54	25.2	160	74.8		202			26.71±10.21	205			10.55±4.84
Education	diploma and higher	6	12.2	43	87.8	47	23.06±6.38	p<0.0001	Kruskal-Wallis	45	9.28±3.91	p<0.0001	Kruskal-Wallis	
	middle school and high school	6	18.2	27	81.8		29			26.44±10.29	32			10.31±4.56
	primary school	33	29.2	80	70.8		108			28.65±9.74	113			11.07±5.11
	illiterate	109	46.2	127	53.8		217			31.28±12.03	224			12.18±4.54
Marital status	married	85	28.4	214	71.6	279	27.83±9.60	p=0.004	Mann-Whitney U	284	10.73±4.46	p<0.0001	Mann-Whitney U	
	unmarried	69	51.1	66	48.9		125			32.04±13.34	133			12.88±4.92
monthly income	more than 1 million tomans (about 200 dollars)	86	43	114	57	186	32.40±12.95	p<0.0001	Mann-Whitney U	194	12.32±5.03	p<0.0001	Mann-Whitney U	
	less than 1 million tomans (about 200 dollars)	56	26.7	154	73.3		198			26.44±8.41	203			10.34±4.23
Place of residence	urban area	84	29.6	200	70.4	261	28.68±10.11	p=0.646	Mann-Whitney U	269	10.88±4.59	p=0.004	Mann-Whitney U	
	rural area	73	46.8	83	53.2		149			29.96±12.57	154			12.28±4.81
Chronic disease	central nervous system	16	57.1	12	42.9	24	37.66±14.34	p=0.002	Mann-Whitney U	27	14±3.77	p=0.001	Mann-Whitney U	
	muscular-skeletal-motor	107	52.7	97	47.3		158			32.47±12.77	197			12.71±4.99
Regular medication use	sleep aids	20	52.6	18	47.4	33	31.81±11.20	p=0.083	Mann-Whitney U	38	13.86±4.72	P=0.001	Mann-Whitney U	
	analgesics	40	42.1	55	57.9		88			31.82±11.91	92			12.67±4.80
	cardiovascular	39	40.6	57	59.4		89			32.28±11.47	92			11.79±5.11
	more than one medication	77	42.3	105	57.7		167			31.85±11.68	172			12.09±4.89
BMI	26.30±3.83		26.16±3.92		p=0.791	Mann-Whitney U	Spearman correlation coefficient=0.034	p=0.505	Spearman correlation coefficient=0.045	p=367	Spearman correlation coefficient			

Table 1. Demographic variables and their relationship with falls, fear of falling, and home safety among elderly people

Home safety score	History of falls in the past 12 months			Fear of falling	
	No	Once	Twice or more	No	Yes
	9.71±3.67 n=264	13.17±5.01 n=64	15.36±4.59 n=86	10.41±4.13 n=329	15.80±5.30 n=61
Statistical test	Kruskal-Wallis p<0.0001			Mann-Whitney U test p<0.0001	

Table 2. Relationship between falls and fear of falling and home safety

(1.24±1.04), as well as reaching for objects in higher places (1.39±1.16) obtained the highest mean scores and resulted in the lowest safety status. Information on falls, fear of falling, and home safety among these older adults were illustrated in Table 1 in terms of demographic variables. The falls happened in alleys and streets among older people experiencing two falls and more (41%) was higher than older individuals who had fallen once (36.8%). The prevalence of falling in alleys and streets in the elderly living in rural areas (52.8%) was also higher than that among those living in cities (41.5%). Investigating the relationship between history of falling in the elderly and fear of falling, the results revealed that the mean score for fear of falling among elderly people with no history of falls (25.67±8.61) was significantly lower than those who had experienced history of falls (35.63±12.35) (p<0.0001). The results of the relationship between history of falls and fear of falling as well as home safety score obtained by these elderly people were presented in Table 2. The findings of the logistic

regression analysis also showed that fear of falling, taking the history of falls in the last 12 months and home safety score into account, could be estimated by 29 to 51% (p<0.0001).

#### 4. DISCUSSION

The results of this study suggested a significant difference between prevalence of falls and fear of falling and home safety mean score in older adults living in urban and rural areas. In this study, the findings indicated that 35.7% of the elderly had a history of falling which was consistent with several other findings (11, 25-28). In contrast with current study, another group has reported that, 17% of the older adults had a positive history of falls within the past one year (29). This difference seemed to be due to the fact that the given study was conducted only on the elderly living in urban areas and such findings in the present study also revealed lower prevalence of falls in urban areas than rural ones. Santosh et al. has also shown the prevalence of falls in the last 12 months was

reported by 16.4% which was in contrast with the results of the present study (30). This difference was assumed to be due to the fact that these findings were related to the 65-year-old age group and over and the falls had been also less reported given to the fact that not all cases had led to injuries. The mean score for fear of falling in elderly people in current study was 29.14%. However, there is a huge discrepancy about the ratio of fears of falling in different reports from 31.82% to 74.4% (11, 16, 31). It seems that the given difference would be due to the different ratios of the sexes in the elderly cases (16, 32-34). The results also demonstrated that the lowest home safety status for the elderly was related to wearing unsuitable shoes, existence of uneven surfaces, cracked surfaces, and slippery stairs. The results of this study were similar to those by Norazizan et al. stating that stairs had the lowest safety status as reported by the elderly (17). In the present study, the least reported safety problem for the elderly was in use of bathrooms which was not in consistent with the results of the study by Norazizan et al. who reported that the bathrooms and kitchens were the most common locations of injuries as reiterated by the elderly (17). The findings also showed that older people who were endowed with more home safety were less likely to fall, and home safety in older people who had fallen once was not the same as older people who had fallen twice or more. Our results were also in agreement with the reports of some other groups (35, 36). However, it was also reported that improving the home safety status was not significantly correlated with falls in older people (20). Moreover, environmental hazards also account for only 7% of the causes of falls (4). This difference seems to be related to the lack of falls examination in and out of homes. In the present study, home safety among older people who had fallen once did not differ significantly from those who had fallen twice and more. This could be because older people who had fallen two times or more had experienced falls outside home than those who had fallen one time. These results raised the importance of more attention to the safety of streets and pavements in terms of reducing falls among the elderly cases. Investigation of the relationship between the elderly's home safety and fear of falling showed that the higher home safety status for older adults decreases the fear of falling among them. The study results in this domain were in consistent with the findings of investigations by Perula et al. and Beauvais et al. (36, 37). Moreover, the results of this study revealed that elderly people who had a history of falling had also expressed more fear of falling and the elderly with two or more fall experiences had demonstrated further fear of falling. Several other reports have also observed similar results in line with the current study (1, 4, 11, 16, 22).

## 5. CONCLUSION

It was concluded that home safety status and demographic variables could have effects on falls and fear of falling in elderly individuals. Therefore, putting these factors together, older adults at the risk of further falls can be identified and provided with trainings through planning and appropriate interventions to prevent the incidence of falls and their negative consequences among them.

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- **Author's contributions:** Study conception and design: HM, MT, MT and MM. Acquisition of data: HM and MM. Statistical analysis and interpretation of data: MT. Drafting of the manuscript: HM, MT, MT and MM. Critical revision of the manuscript for important intellectual content: HM, MT, MT, and MM.
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