



# The presence of risk factors in the home environment that influences the fall of people of the third age

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## ABSTRACT

**Introduction:** Aging is a natural, irreversible physiological process that depends on genetic, environmental, and lifestyle factors. Many physiological, biological, psychological, and other factors play a major role. According to the World Health Organization, falls are the second leading cause of unintentional injury death in the world and represent a major global public health problem. Falls are most commonly caused by intrinsic and extrinsic risk factors. A comprehensive assessment of fall risk is critical to the development of effective fall prevention programs. The screening protocol is brief, easy to use, and multifactorial and allows the identification of risk factors for falls. The aim of this study is to investigate the importance of the presence of risk factors in the home environment and the impact on increasing the risk of falls in people in the third age.

**Methods:** The study was conducted in the municipality of Podgorica. 109 elderly people from urban and rural areas were included in the study using the snowball method. The instruments used in our study are a standardized checklist for assessing risk factors in the home environment, inside and outside the home (HASSAT), and a self-assessment scale of one's own concern about a possible falls efficacy scale international. The survey was conducted from the end of October to the end of November 2023.

**Results:** There is a statistically significant difference in social and physical activities of daily living in the area of concern about falling. When analyzing the overall result of the fear of falling scale in relation to gender, a significant statistical difference is found. The analysis of the individual rooms in relation to the age of the respondents shows that there is a significant statistical difference.

**Conclusion:** The results obtained show that the high risk of falling is present in all rooms of the home environment for people in their 3<sup>rd</sup> year of life and that fear of falling increases with age.

**Keywords:** Risk factors; home environment; fall; fear of falling; elderly people

## INTRODUCTION

According to estimates by the World Health Organization (WHO), the proportion of over-60s in the global population will almost double from 12% to 22% between 2015 and 2050. By 2030, 1 in 6 people in the world will be aged 60 or over. By 2050, the global population of over-60s will double to 2.1 billion people. The number of people over 80 is expected to triple to 426 million between 2020 and 2050 (1).

Aging is a natural, irreversible physiological process that depends on genetic, environmental, and lifestyle factors. Many physiological, biological, psychological, and other

factors play a major role. Aging and old age are two completely different things. Aging is a natural and irreversible physiological process. Old age is a specific stage of life associated with chronological age (2). After chronological age, people over the age of 65 are counted in the third age group. The elderly category is divided into three groups: The youngest (65-74 years), the middle-aged (75-84 years), and the oldest old (85 years and over) (3). According to the WHO, falls are the second leading cause of death from unintentional injuries in the world and represent a major global public health problem (4). A fall is when a person comes to rest on the ground or at a lower level with varying degrees of impact but not as a result of the action of a conscious or external force (5).

The WHO has classified fall risk factors into four categories: Intrinsic, extrinsic, behavioral, and socioeconomic factors (4). Based on the available research, over 400 different risk factors for falling have been identified (6). Studies have shown that the highest rate of falls is caused by slipping

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on uneven or slippery surfaces, followed by tripping over obstacles, shoes, stairs, and pets (7). A professionally prescribed home hazard assessment and modifications for older adults with a history of falls resulted in a decrease in falls inside and outside the home (8). For seniors, home safety interventions can consist of educating individuals or caregivers about safe movement techniques, recognizing fall hazards, and home modifications (9). Many authors have shown that hazards in the home are one of the most common causes of falls. 80% of falls occur during everyday activities such as going to the toilet, walking around the home, walking the dog, returning from the supermarket, tying shoes, opening the front door, opening the mail, or going out onto the balcony to observe weather phenomena. An analysis of the US National Health Interview Survey from 1997 to 2010 found that 61.9% of all fall-related injuries in older women occurred indoors and 32.8% outdoors (10). The most common social problems experienced by people in their third age are depression, loneliness, social isolation, restricted activities of daily living and other mental health problems (11). Depression is the most common mental health problem among people in the third age and is often under-recognized or under-treated, which increasingly affects the quality of life of older people (12). The aim of this study is to investigate the importance of risk factors in the home environment and the impact on the increase in the risk of falls in people in the third age.

## METHODS

The study was designed as a prospective, observational, descriptive-analytical method that included all respondents who met the criteria for inclusion in the study. The study was conducted from the end of October to the end of November 2023.

The study included 109 respondents of both genders, aged 65 and over, living independently, with their spouse or family members. The survey was conducted on the territory of the Municipality of Podgorica (Montenegro). To collect as much data as possible, the so-called non-probability sampling method was used – “Snowball” sample. Before participating in the research, all respondents were informed in detail about the research plan and procedure. Then, if they agreed, they gave their written consent to participate in the study voluntarily.

The instruments used in the study are:

- A self-report scale on self-reported concern about falling, developed and validated by the Falls Prevention of Falls Network Europe, has been widely used to assess concern about falls. It consists of a total of 16 questions, which are rated on a four-point Likert scale from 1 (best) to 4 (worst), depending on how worried the person was.
- A standardized checklist for the assessment of risk factors in the home environment, inside and outside the home (HASSAT). The checklist consists of 67 questions completed by the examiner, i.e., the physiotherapist. The questionnaire contains nine subscales, with each question scored with one point.

The criteria for inclusion in the survey are persons of both sexes aged 65 years and over, persons in their third age,

living independently, with their spouse or family members in rural and urban areas, and persons who have given their consent to participate in the survey. Respondents younger than 65 years old, persons of the third age who lived in nursing homes, persons who did not give their consent to participate in the survey were excluded from the study.

Study is approved by Ethical committee of University of Sarajevo-Faculty of Health Studies, and the resolution of the Senate of the University of Sarajevo on the adoption of the report of the Commission on September 27, 2023 (number: 07-2-2311/23).

After data collection based on standardized questionnaires, a database was created in Microsoft Excel, part of the Microsoft Office 365 package. SPSS version 27.0 from IBM Corporation and Minitab 11 were used to statistically analyze the data. The results of the descriptive statistical analysis are presented with the following parameters: Categorical variables are represented by frequency (frequency) as an absolute number or percentage. The comparison of the frequency and distribution of respondents within and between groups was tested using the Chi-square test. If the expected values in the contingency tables were <5 in more than 20% of the cells or if the number “0” was present and there were <150 respondents in the groups, a modification of the test was used – Fisher’s exact test. Scalar data were tested to examine the data distribution, and medians and interquartile ranges were used for data that corresponded to a non-parametric data distribution. In this case, the Mann–Whitney test was used to examine the differences between two groups, i.e., the Kruskal–Wallis H-test was used to examine the differences between three or more groups. The results are presented in tabular or graphical form, and the accepted significance level of the difference is  $p < 0.05$ .

## RESULTS

A total of 109 people of both sexes in their 3<sup>rd</sup> year of life who met the inclusion criteria on the basis of methodological criteria took part in the study.

The analysis showed that of the total number of male respondents, 39.6% were between 65 and 74 years old, 43.8% between 75 and 84 years old, and 16.7% between 85 years and older. Among the female respondents, 54.1% were between 65 and 74 years old, 42.6% between 75 and 84 years old, and 3.3% between 85 years old and older. It was found that male respondents were significantly more likely to be over 85 years old ( $p = 0.040$ ) (Table 1).

No significant statistical differences were found for educational status between the genders ( $p = 0.401$ ). No difference was found for gender, with approximately 72% of participants of both genders living in rural areas. No significant statistical difference was found ( $p = 0.927$ ).

When analyzing marital status, it was found that 55.6% of respondents were married and 44.4% of respondents were widowed. In terms of gender, it was found that 55.7% of respondents were widowed and 29.8% of respondents were widowed. A significant statistical difference was found ( $p = 0.007$ ).

A significant statistical difference was found in the structure of the households in relation to the gender of the respondents ( $p = 0.021$ ). When analyzing concern about falling

in the household, it was found that 46.2% of respondents were not at all worried about falling when cleaning the house, and 44.2% of respondents were slightly worried (Table 2).

When dressing and undressing, 57.7% of respondents felt that they were not worried at all and 37.5% of respondents were somewhat worried. When preparing a simple meal, 65.4% of respondents felt that they are not at all concerned and a further 26.9% of respondents felt that they are somewhat concerned.

When bathing or showering, 9.6% of respondents are very worried about falling and a further 32.7% of respondents are somewhat worried. When shopping in stores, 22.1% of respondents are somewhat worried, 13.5% are quite worried, and 7.7% are very worried.

When getting up from a chair, 46.2% of respondents are somewhat worried about falling and 25% are very worried.

When going up and down stairs, 28.8% of respondents are quite worried, 36.5% are a little worried, and 19.2% are very worried.

When walking in front of and around the house, 40.4% of respondents are not at all worried about falling and 38.5% feel somewhat worried. When walking on a slippery floor, 27.9% of respondents are somewhat worried about falling, 30.8% of respondents said that they are quite worried, and 34.6% said that they are very worried.

There is no worry when visiting friends and family or walking through crowds. When walking on uneven ground, 36.5% of respondents are quite worried and 28.8% are very worried about falling.

When walking uphill and downhill, 41.3% of respondents are very worried. When going to a club, hanging out, or going to church, 49% of respondents are very worried about falling, 21.2% are fairly worried, and 16.3% are a little worried.

It was found that among respondents aged 65-74 years, the median anxiety score was 29 points (23.3-36.8) and among respondents aged 75-84 years, the median anxiety score was 36 points (31.8-43.0). At the age of 85 and over, the median score was 47 points, with an interquartile range of 40.8-50.3 points. With regard to gender, there is a significant statistical difference in fear of falling (Kruskal-Wallis  $H = 27.680, p < 0.001$ ) (Figure 1).

When analyzing the individual rooms in relation to the age of the respondents, it is found that there is no significant difference in the intensity of the risk of falling when approaching the front door, with the risk being highest among respondents aged 85 years and over ( $p = 0.257$ ) (Table 3).

When entering through the back or side door, no respondent has a low risk of falling, and all respondents aged 85 years and over have a high risk of falling ( $p = 0.436$ ). In the hallways, 20% of respondents under the age of 74 have a high risk of falling, 20.5% between the ages of 75 and 84, and 10% of respondents aged 85 and over ( $p = 0.413$ ).

There were no significant differences in the risk of falling in the living room ( $p = 0.184$ ), kitchen ( $p = 0.146$ ), or

**TABLE 1.** General information

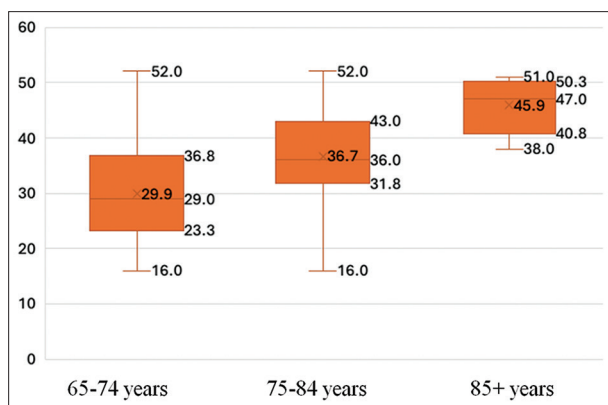
Variable	Male (%)	Female (%)	Total (%)	Chi-square <i>p</i>
n (%)	48 (44.04)	61 (55.96)	109 (100)	
Age				
65-74 years	19 (39.6)	33 (54.1)	52 (47.7)	6.442
75-84 years	21 (43.8)	26 (42.6)	47 (43.1)	0.040
85+years	8 (16.7)	2 (3.3)	10 (9.2)	
Education				
Elementary school	21 (43.8)	33 (54.1)	54 (49.5)	1.829
High school	25 (52.1)	24 (39.3)	49 (45.0)	0.4011
University	2 (4.2)	4 (6.6)	6 (5.5)	
Location				
City/Urban areas	13 (27.1)	217 (27.9)	30 (27.5)	0.008
Village/Rural areas	35 (72.9)	44 (72.1)	79 (72.5)	0.927
Marriage				
Married	33 (70.2)	27 (44.3)	60 (55.6)	7.240
Widow	14 (29.8)	34 (55.7)	48 (44.4)	0.007
Household structure				
Living alone	10 (20.8)	16 (26.2)	26 (23.9)	7.698
Living with spouse	23 (47.9)	14 (23.0)	37 (33.9)	0.021
Living with other family members	15 (31.3)	31 (50.8)	46 (42.2)	

**TABLE 2.** Falls efficacy scale international questionnaire

Social and physical activities of daily living	Not worried at all (%)	Somewhat worried (%)	Quite worried (%)	Very worried (%)
House cleaning	46.2	44.2	7.7	1.9
Dressing and undressing	57.7	37.5	3.8	1.0
Preparation of a simple meal	65.4	26.9	6.7	1.0
Bathing or showering	57.7	32.7	9.6	0.0
Shopping, going for groceries	56.7	22.1	13.5	7.7
Getting up from a chair	24.0	46.2	25.0	4.8
Walking up and down stairs	15.4	36.5	28.8	19.2
Walking around and outside the house	40.4	38.5	15.4	5.8
Reaching from the floor or a high shelf	24.0	32.7	27.9	15.4
Rushing to answer a landline phone call	48.1	33.7	14.4	3.8
Walking on a slippery floor	6.7	27.9	30.8	34.6
Visiting friends and family	36.5	42.3	7.7	13.5
Walking through a crowd, lots of people	26.0	46.2	16.3	11.5
Walking on uneven terrain	10.6	24.0	36.5	28.8
Walking uphill and downhill	7.7	18.3	32.7	41.3
Going out (club, socializing, going to church)	13.5	16.3	21.2	49.0

**TABLE 3.** Risk assessment for rooms in the home

Room	Risk assessment	65-74 years (%)	75-84 years (%)	85+ years (%)	Fishers exact <i>p</i>
Approach to the main entrance door	Low risk	0.0	0.0	0.0	0.257
	Moderate risk	21.6	31.9	10.0	
	High risk	78.4	68.1	90.0	
Entrance to rear or side doors	Low risk	0.0	0.0	0.0	0.436
	Moderate risk	19.4	22.6	0.0	
	High risk	80.6	77.4	100.0	
Hallway	Low risk	33.3	18.2	40.0	0.413
	Moderate risk	46.7	61.4	50.0	
	high risk	20.0	20.5	10.0	
Living room	Low risk	6.1	14.9	30.0	0.184
	Moderate risk	42.9	44.7	20.0	
	High risk	51.0	40.4	50.0	
Kitchen	Low risk	2.0	8.5	0.0	0.146
	Moderate risk	30.6	25.5	60.0	
	High risk	67.3	66.0	40.0	
Bedroom	Low risk	0.0	2.1	0.0	0.157
	Moderate risk	5.9	14.9	30.0	
	High risk	94.1	83.0	70.0	
Bathroom	Low risk	0.0	2.1	0.0	0.636
	Moderate risk	8.0	14.9	10.0	
	High risk	92.0	83.0	90.0	
Staircase	Low risk	0.0	3.8	0.0	0.414
	Moderate risk	14.3	26.9	37.5	
	High risk	85.7	69.2	62.5	
Laundry room	Low risk	0.0	0.0	0.0	0.658
	Moderate risk	18.8	26.5	14.3	
	High risk	81.3	73.5	85.7	

**FIGURE 1.** An analysis of the overall fear of falling score.

bedroom ( $p = 0.157$ ). In the bathroom, 92% of subjects up to 74 years had a high risk of falling, as did 83% of subjects between 75 and 84 years and 90% of subjects aged 85 and over ( $p = 0.636$ ). The analysis of the stairs shows that the majority of respondents have a high risk of falling, with no significant statistical difference in relation to age ( $p = 0.414$ ). The laundry posed a high risk of falling for about 80% of respondents in all three age groups ( $p = 0.658$ ).

## DISCUSSION

The subject of our research was the risk factors of the home environment for falling in older people and how they influence the worry about falling in older people. The research was conducted in the Podgorica area on a sample

of 109 people in their 3<sup>rd</sup> year of life, living in urban and rural areas.

The study conducted by Canever et al. showed that female subjects have a significantly greater fear of falling than male subjects. Women and men with fear of falling had a 2.14 (95% confidence interval [CI]: 1.11-4.13) and 2.62 (95% CI: 1.10-6.85) higher risk of falling, respectively, than female subjects (13).

In the results of the study by Wang et al., of a total of 336 elderly people, 153 (45.5%) elderly people visit a senior center daily. The falls efficacy scale international (FES-I) score of all subjects was  $30.65 \pm 13.892$ , while the scores of healthy seniors living at home in the community and attending senior centers were  $25.05 \pm 10.036$  and  $37.35 \pm 14.894$ , respectively ( $p < 0.05$ ). Seniors who visit a senior center daily had a low risk of falls and should receive more attention in fall prevention. Targeted health promotion activities were necessary for older adults to improve their fall frequency and achieve healthy aging (14).

In the study by Helbostad et al. evaluating the 16-item FES-I scale, all response categories were used for all items. Thirteen items had a mean score of 1, walking on slippery surfaces and uneven surfaces had a score of 2, and going out to a social event had a score of 3. The item preparing simple meals had the lowest mean score and walking on slippery surfaces had the highest mean score. Cronbach's alpha was 0.95 and the mean correlation between the items was 0.54. The correlations between the items ranged from 0.33 (walking on a slippery surface and going out to a social event) to 0.77 (walking on a slippery surface and



walking on an uneven surface). For the FES-I with seven items, Cronbach's alpha was 0.89 and the mean correlation was 0.54, with correlations ranging from 0.44 to 0.68. The results of Helbostad et al. are consistent with our research (15).

The study by author Camargos et al. found that bathing or showering, walking on slippery surfaces, and walking on uneven terrain were major concerns for potential falls. When the other topics were examined, no significant statistical difference was found in the concern about a possible fall. The results obtained are consistent with the results of our study on walking on slippery surfaces and walking on uneven terrain (16).

In a study entitled "Evaluation of the risk of falling in a group of older adults" by Barreira and De Sousa, the data showed that 8/15 (53.7%) subjects had a low risk of falling, while 7/15 (46.7%) were categorized as high risk of falling. The FES-I scale showed that the majority of respondents 10/15 (66.7%) had a mild limitation in terms of fear of falling during activities of daily living. This indicates that these individuals are moderately anxious or occasionally think about the possibility of falling but are still able to carry out their activities without major impairment due to anxiety. For people in the third age who have experienced a fall, several factors play a role, suggesting the need for constant changes in the environment in which the older person lives, as well as broad and comprehensive prevention by themselves and their family members. The results of the aforementioned research are consistent with our findings (17).

Belloni et al. studied older people living in the community. Prevalence rates for fear of falling ranged from 21% to 85% in those with a history of falls and 33-46% in those without a history of falls. Fear of falling can be seen as a protective reaction, as it encourages individuals to be more aware of their surroundings. On the other hand, it can affect a person's physical and psychosocial well-being if it is inappropriate and exaggerated because it leads to limiting or avoiding activities. Fear of falling is associated with a number of negative outcomes, including impaired functionality and social interactions, increased risk of depression, poor health-related quality of life, and death from all causes (18).

The results of Bergen et al. show that the percentage of older people who fell increased with age ( $p < 0.01$ ), from 26.7% in 65-74-year olds to 29.8% in 75-84-year olds and 36.5% in  $\geq 85$ -year olds. The percentage of older people reporting a fall injury also increased with age ( $p < 0.01$ ), from 9.9% in 65-74-year olds to 11.4% in 75-84-year olds and to 13.5% in  $\geq 85$ -year olds. The research findings of Bergen et al. correlate with our results regarding the age-related decline (19).

In the results of the study by Zulfiqar et al., the average age of the respondents was 69.33 years. The prevalence of fear of falling was 80%. Older age and female gender showed an independent correlation with fear of falling. Regarding gender, 57 (76%) men and 63 (84%) women reported fear of falling. 70 (83.3%) seniors aged 65 years and over had a high prevalence of fear of falling. Female gender and older age showed a strong association with fear of falling. Screening programs can help improve balance performance,

general health, and balance in activities of daily living. The results of Zulfiqar et al. correlate with our results (20).

Rao's study shows that 31% of respondents had a fall or slip in the past year that was attributable to the physical environment. The bathroom was identified as the most unsafe area in the home by 95.5% of third age individuals in the survey, but respondents were confident that there was no risk of falling in their home. The most common hazards are poor lighting, changes in floor level, and slippery floors. The results of the aforementioned study are consistent with our findings (21).

Authors Han and Park concluded that the lack of a handle next to the toilet or bathtub was the most common risk factor for a fall at 73.2; thresholds in the bedroom or kitchen at 68.9%; wearing socks, outdoor socks, or slippers when moving around the house at 59.5%; and the entrance to the front door at 55.5%. The results of the risk in the home environment showed that poor lighting in the home posed the highest risk of falling (odds ratio [OR]: 9.83, 95% CI: 3.75-25.71), followed by furniture that hinders walking around the house (OR: 7.07, 95% CI: 2.88-17.36) and poor kitchen lighting (OR: 5.13, 95% CI: 2.38-11.03). The group that had experienced falling had a significantly higher fall risk score in the home environment than the group that had not experienced falls. The results of the study by Han and Park are consistent with our study (22).

In the study by author Ramulu et al. of a total of 170 respondents, the mean age was 71.0 (7.6) years and 78 (46%) of the participants were women. Fifty-nine participants experienced a total of 83 falls at home, and most falls occurred on the indoor stairs ( $n = 24$ , 29%) and in the bedroom ( $n = 17$ , 21%). Neither the number nor the percentage of objects classified as dangerous was related to the rate of falls ( $p > 26$ ). Every 10-fold increase in room lighting was associated with 35% fewer falls in this region ( $p = 02$ ). The association between lighting and fall rate did not differ by degree of visual field loss ( $p > 3$ ), and a lower fall rate was found with better lighting even in participants with mild or no visual field loss ( $p = 0.01$ ). The results of the aforementioned study are consistent with our findings (23).

## CONCLUSION

Based on the research results and in accordance with the set objectives, we have reached the following conclusions from the research. A total of 109 people from urban and rural areas of Podgorica municipality participated in the study. Respondents are most concerned about falling when walking uphill and downhill and when going out to meet or attend a church service. In the home environment, going up and down stairs and reaching for objects from the floor or a high shelf are the main causes of concern. A high risk of falling in people in their third age was present in all rooms of the home environment, with fear of falling increasing with age. Through the research, we concluded that a high risk of falling was present in a large number of respondents in the third age group.

## DECLARATION OF INTERESTS

Authors declare no conflict of interests.

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