



**ORIGINAL RESEARCH PAPER**

**Health Science**

**MULTIFACTORIAL RISK ASSESSMENT FOR FALLS AND INJURIES IN THE ELDERLY WITHIN THE COMMUNITY**

**KEY WORDS:** the elderly, falls, risk factors

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**ABSTRACT**

Falls are a leading cause of mortality and injury to the elderly. The aim of study is evaluation the risk of falls in individuals 65 years and older. A cross-sectional study was conducted on the sample of 200 respondents. The research instrument were used: Falls Risk for Older People-Community setting (FROP-COM) questionnaire and the questionnaire on the sociodemographic variables. The interdependent variables, statistically significant for the falls were: gender (p = 0.0001), age (p = 0.0001), financial status of the elderly (p = 0.003), adaptation of urban transport to the elderly and persons with disabilities (p = 0.047), giving up walking and moving for fear of falling (p = 0.0001) and a nurse's home visit for the purpose of assessing the risk factor for falling (p = 0.024). Risk factors identified as most influential in most elderly people are: medications, medical conditions, sensory loss, nutritional status, physical activity, function and history of falls.

**INTRODUCTION**

With the increase of age there are various changes in the body, changes in organs and organ systems, and as a result functional changes and aging of the organism. (1)

Falls are the leading cause of mortality and injury in the elderly, resulting in disability and immobility, which often requires ongoing medical care and high treatment costs. (2)

Falls account for 40% of all deaths, in 20-30% of cases leading to mild or serious injuries, soft tissue injuries and fractures. (3) Every third person over the age of 65 will experience a fall at least once a year, with approximately 5% of these falls resulting in a fracture, while 1-2% of the falls result in a hip fracture, and the value almost doubles in people over 75. (4,5,6)

Injuries due to falls have been on the rise in recent years, according to Injury Data Base (IDB), 73% of injuries occur at home. (7)

The main risk factors associated with falls fall into four categories: biological (gender, age, race, changes in vision and hearing, changes in gait and balance, changes in cognitive function and musculoskeletal system, influence of chronic diseases), behavioural factors (use of medicines, malnutrition, physical inactivity, alcohol abuse, etc., socioeconomic (low income, education, lack of social interaction, lack or absence of social support), and environmental factors (within and outside the home, community environment). (5)

The aim of this study is to evaluate the risk of falls and to evaluate the impact of various factors in individuals 65 years and older.

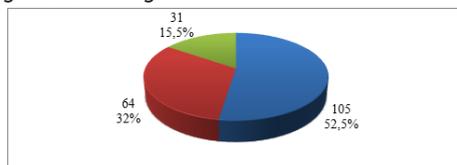
**RESPONDENTS AND METHODS**

The survey was conducted among users of services provided by JU Ilidža Health Center, and included 200 individuals over 65 years of age, selected by random selection, who voluntarily consented to the research. A cross-sectional study was conducted using a standardized FROP-Com (Falls Risk for Older People-Community) questionnaire and a modified questionnaire on sociodemographic variables and respondents' attitudes. FROP-Com consists of 28 questions assessing 13 risk factors for falls in the elderly in the community, the highest on a rated 0-3-point scale. The fall risk assessment is categorized into 3 categories, where persons with 0-11 points have mild risk of fall, moderate risk of fall is 12-18 points and high risk of fall is 16-60 points. (8)

**RESEARCH RESULTS**

Study included N = 200 subjects 65 and older, of whom 110 (55%) were women and 90 (45%) were men. The average age of the subjects was 71.8 ± 7.1 years. In the previous 12 months, 69 (34.5%) of the respondents had fallen, of which 27 (39.1%) had a recurrent decline.

Based on the results of the FROP-com questionnaire, the average risk assessment for a fall was 11 (5-16) points. Compared to the assessment of the risk of falls the largest number of respondents 105 (52.5%) had a mild risk of falls, a smaller number of respondents 64 (32%) had a moderate risk of falls, while the smallest number of respondents 31 (15.5%) had a high risk of falling.



**Graph 1. Fall risk assessment.**

**Table no.1. The relationship between the risk of decline and the characteristics of the respondents**

Variable		N	%	The risk of falling			test	
				Slight	Moderate	High	$\chi^2$	p
Gender	Male	90	45,0	64 (71,1%)	19 (21,1%)	7 (7,8%)	23,155	0,0001
	Female	110	55,0	41 (37,3%)	45 (40,9%)	24 (21,8%)		
Age	Mean $\pm$ SD	71,8 $\pm$ 7,1		70,25 $\pm$ 6,3	72,41 $\pm$ 7,24	76,06 $\pm$ 7,16	ANOVA=9,232	0,0001
Material condition	Bad	47	23,5	14 (29,8%)	22 (46,8%)	11 (23,4%)	15,815	0,003
	Average	107	53,5	63 (58,9%)	33 (30,8%)	11 (10,3%)		
	Well	46	23,0	28 (60,9%)	9 (19,6%)	9 (19,6%)		
	No	196	98,0	103 (52,6%)	62 (31,6%)	31 (15,8%)		
Adaptation of urban transport to the needs of the elderly, people with disabilities	Yes	54	27,0	35 (64,8%)	15 (27,8%)	4 (7,4%)	6,097	0,047
	No	146	73,0	70 (47,9%)	49 (33,6%)	27 (18,5%)		
Quitting walking and moving for fear of falling and getting hurt	Yes	88	44,0	18 (20,5%)	42 (47,7%)	28 (31,8%)	69,880	0,0001
	No	112	56,0	87 (77,7%)	22 (19,6%)	3 (2,7%)		
	No	118	59,0	61 (51,7%)	36 (30,5%)	21 (17,8%)		
Respondents' attitude regarding the need for a home visit by a nurse	Yes	123	61,0	58 (55,2%)	41 (64,1%)	24 (77,4%)	5,125	0,024
	No	77	39,0	47 (44,8%)	23 (35,9%)	7 (22,6%)		

The results of the Hi square test of the relationship between the risk of falling and the characteristics of the respondents indicate that the risk of falling and the gender of the respondents are interdependent ( $\chi^2 = 23,155$   $p = 0.0001$ ), where the female gender has a higher risk of falling. The age of the subjects in relation to risk is significant (ANOVA = 9,232  $p = 0.0001$ ), from which it was concluded that the higher the age, the higher the risk of falling. This study also showed that the risk of falling and the following variables are interdependent: the material condition of the elderly ( $\chi^2 = 15,815$   $p = 0.003$ ), the adaptability of urban transport to the elderly and disabled ( $\chi^2 = 6,097$   $p = 0.047$ ), giving up walking

and jerks for fear of falling ( $\chi^2 = 69,880$   $p = 0.0001$ ) and a nurse's home visit for the purpose of assessing the risk factor for falling ( $\chi^2 = 5.125$   $p = 0.024$ ).

An individual view of the risk factor versus mild, moderate, and high risk scorecards is shown in the tables, where the minimum values of zero represent no risk or minimal risk, and the increase in the value of the score increases the risk of falling, so that higher values indicate higher risk. The interquartile range is observed in percentiles 25 to 75 where the values below and above are not described and the mean is taken as a relevant indicator.

**Table no. 2 Display individual risk factor scores relative to mild fall risk**

		N	Mean	Std. Deviation	percentile		
					25th	50th (Median)	75th
Mild risk of falls	1. History of falls	105	,190	,62	,00	,00	,00
	2. Medicines	105	1,70	1,31	1,00	1,00	3,00
	3. Medical conditions	105	,70	,709	,00	1,00	1,00
	4. Sensory loss	105	,75	,690	,00	1,00	1,00
	5. Legs and Shoes	105	,40	,565	,00	,00	1,00
	6. Cognitive status	105	,18	,434	,00	,00	,00
	7. Continence	104	,28	,530	,00	,00	,00
	8. Nutritional status	105	,78	1,10	,00	,00	1,00
	9. Functional behavior	105	,04	,192	,00	,00	,00
	10. Function	105	,11	,525	,00	,00	,00
	11. Balance	105	,18	,387	,00	,00	,00
	12. Gait / Physical activity	105	,59	,730	,00	,00	1,00

105 subjects had a mild risk of falling. Within this category, medications, medical conditions, and sensory loss are singled out as the factors in which the subjects score the highest, with medicines leading the way with an average of 1, or between 1 and 3, while the other two risk factors are approximately 1.

**Table no. 3 Display individual risk factor scores relative to moderate fall risk**

		N	Mean	Std. Deviation	percentile		
					25th	50th (Median)	75th
Moderate risk of falls	1. History of falls	64	1,50	1,71	,00	1,00	3,00
	2. Medicines	64	3,14	1,11	2,00	3,00	4,00
	3. Medical conditions	64	1,52	,797	1,00	2,00	2,00
	4. Sensory loss	64	1,25	,713	1,00	1,00	2,00
	5. Legs and Shoes	64	,94	,614	1,00	1,00	1,00
	6. Cognitive status	64	,75	,690	,00	1,00	1,00
	7. Continence	64	,69	,710	,00	1,00	1,00
	8. Nutritional status	64	2,09	1,65	1,00	2,00	3,75
	9. Functional behavior	64	,28	,487	,00	,00	1,00
	10. Function	64	,47	,942	,00	,00	,00
	11. Balance	64	,95	,628	1,00	1,00	1,00
	12. Gait / Physical activity	64	1,34	1,23	,00	1,00	2,00

64 subjects had a moderate risk of falling. In this category as well as in the category of mild risk, medicines are singled out as risk factors that contribute to the highest risk score for a fall where the average is 3 (2-4), followed by nutritional status 2 (1-3,75), medical conditions 2 (1- 2) and sensory loss 1 (1-2).

**Table no. 4 Display individual risk factor scores relative to high risk of decline**

	N	Mean	Std. Deviation	percentile			
				25th	50th (Median)	75th	
High risk of falls	1. History of falls	31	2,87	1,74	1,00	3,00	4,00
	2. Medicines	31	3,77	1,17	3,00	4,00	5,00
	3. Medical conditions	31	2,19	,703	2,00	2,00	3,00
	4. Sensory loss	31	1,32	,702	1,00	1,00	2,00
	5. Legs and Shoes	31	,77	,497	,00	1,00	1,00
	6. Cognitive status	31	1,13	1,08	,00	1,00	2,00
	7. Continence	31	,58	,620	,00	1,00	1,00
	8. Nutritional status	31	3,68	1,83	2,00	4,00	5,00
	9. Functional behavior	31	,81	,703	,00	1,00	1,00
	10. Function	31	2,87	1,70	2,00	3,00	4,00
	11. Balance	31	1,77	,805	1,00	2,00	2,00
	12. Gait / Physical activity	31	4,23	2,29	2,00	4,00	6,00

The smallest number of respondents was in the high risk category for a fall of 31 (15.5%), which is a large percentage of the total number of respondents. The factor contributing to the highest risk score for a fall is gait / physical activity, and its average value is 4 (2-6). It is followed by nutritional status 4 (2-5), followed by medication 4 (3-5), function 3 (2-4), history of falls 3 (1-4) and medical conditions 2 (2-3).

**DISCUSSION**

As in our study, the authors found that women are at a higher risk of falling than men: Petrović N. et al. (2016), Matović J. et al. (2013) and Almalawi E. et al. (2011) (9,10,11)

The results of Verghese J. et al. (2009) proved that the greater age of respondents (RR 1.032, p = .02) was associated with an increased risk of falls, and the Cesari M. et al. (2002) study confirms the association between age and risk, where patients with a positive history of falls were older (p <0.001) (12,13), which also correlates with our study, where the oldest subjects had the highest risk of falling.

The material condition of the respondents in our study proved to be statistically significant in relation to the risk of falling p = 0.003, which is confirmed in the study by Rusac S. (2011). (14)

Older people who do not have sufficient monthly incomes are often forced to save on household expenses, which reduces the effect of maintaining healthy living habits and preventing acute and chronic illnesses. (15)

The correlation between the consent for a visit from a nurse, to assess the risk factors for a fall in their home and the risk of a fall are interdependent in our study ( $\chi^2 = 5.125$  p = 0.024), the importance of a home visit by occupational therapists was recognized in the study by Cesari M. et al. (2002), where they state that visits may prevent falls among older adults at increased risk of falls. (13)

The opinion of our respondents on the adaptation of urban transport to the needs of the elderly and disabled and the risk of falling is interdependent ( $\chi^2 = 6.097$  p = 0.047).

In our study, using the FROP-Com questionnaire, which identifies 13 factors, the most influential were the medications, medical conditions, sensory loss, nutritional status, function, balance, gait / physical activity, and history of falls.

In 105 low-risk subjects and 64 moderate-risk subjects, medications were identified as the most influential risk factors contributing to the highest risk score for falls, and ranked third in high-risk subjects.

A study by Tulumović A. (2002) found that the elderly may become particularly bothered by opioids which results in falls with catastrophic consequences and puts the elderly in the highest risk of falling. (16)

Filipović S. et al. (2013) state in their work that older people are burdened with a number of diseases; Many of these diseases (eg diseases of the circulatory system, diseases of the musculoskeletal system) are risk factors for falls. (17)

Almalawi E. et al. (2011) found in their study that walking disorders, balance disorders, heart disease, osteoarthritis, vision problems (47%), hearing problems (18.3%) and incontinence contribute significantly to falls, dizziness and depression. (11)

Given that the presence of chronic disease in our subjects was investigated within the category of medical conditions, it is the second most influential risk factor for falling in mild-risk subjects, the third among the moderate-risk subjects, while it ranks sixth among the high-risk subjects.

Sensory loss is the third risk factor for falls in mild-risk subjects, fourth for moderate-risk subjects, while it has not proven to be one of the most influential factors in high-risk subjects.

In his research Matović J. et al. (2013) confirmed that sensory loss is related to the risk of falls. (10)

Nutritional status proved to be the second riskiest factor for falls in subjects with moderate and high risk of falls, while it was not shown to be a prominent factor in subjects with mild risk.

Physical activity / gait in our study was identified as the most prominent factor in subjects at high risk for falls.

Maček Z. et al. (2016) in their paper state that physical activity has been proven to be very effective in preventing disease, maintaining health, maintaining cognitive and psychological functions, and in leading a quality social life. (18)

Due to insufficient knowledge of risk and protective factors for falls among the older population, most elderly underestimate their own risk of falling. (19)

**CONCLUSION**

The assessment of the risk of falls in the elderly in the community yielded the highest number of subjects with a mild risk of falls, followed by moderate and high risk of falls. Risk factors identified as most influential in most elderly persons are: medications, medical conditions, sensory loss,

nutritional status, gait / physical activity, function and history of falls.

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