SERBIAN ARCHIVES OF MEDICINE Est.1872

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Paper Accepted* **ISSN Online 2406-0895**

Original Article / Оригинални рад

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Identification of elderly persons who are at risk of falling and have risk factors for falls in the general population

Идентификација старих особа са ризиком за пад и фактора ризика за пад у општој популацији

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Received: May 29, 2017
Revised: September 1, 2017
Accepted: September 4, 2017
Online First: September 15, 2017
DOI: https://doi.org/10.2298/SARH170529171I

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SUMMARY

Introduction/Objective The aim of this study was to identify the elderly who are at increased risk of falling and risk factors for the falls in the general population.

Methods This cross sectional study included a random sample of 400 people (164 men and 236 women) aged 75,04 (65– 94) years, selected from the Register of Health Primary Health Center Niš. Socio-demographic questionnaire, Elderly Fall Screening Test and Multi-factor Falls Questionnaire were used. Odds ratio [OR] was evaluated and adjusted for gender, age, marital status, education level, and self-assessment of health state.

Results The risk of falling and risk factors for falls were: age [OR=1.129, CI=1.067–1.196], health self-assessed as good [OR=0.365; CI=0.142–0.938], limitation of activities [OR=7.189; CI=3.559–14.522], walking problems [OR=2.153; CI=1.046–4.428], osteoporosis [OR=4.611; CI=1.231–17.265], female gender [OR=3.770, CI=1.648–8.624], vision problems [OR=2.719; CI=1.588–108.581], cognitive problems [OR=4.485; CI=17.721], arthritis [OR=6.524; CI=2.077–20.496] and urination problems [OR=2.511; *CI*=1.083–5.820].

Conclusion Risk factors for falls were: age, self-assessment of health state, walking problems, osteoporosis, female gender, vision problems, arthritis and urination problems.

Keywords: elderly; risk of falling, factors, assessment; general population

САЖЕТАК

Увод/Циљ Циљ овог истраживања био је да се идентификују старе особе са повећанимм ризиком за пад и фактори ризика за пад у општој популацији.

Методе У студију пресека укључено је 400 особа (164 мушкараца и 236 жена) просечне старости 75,04 (65– 94) година које су одабране случајно из регистра Дома здравља Ниш, у периоду јануар - јун 2014. За добијање података коришћени су: социо-демографски упитник, скрининг тест за пад код старих особа и Упитник за процену више фактора ризика за пад. Однос преваленција (*OR*) је процењена и прилагођена за пол и старост, брачно стање, степен образовања и самопроцену здравственог стања помоћу мултипле регресионе анализе.

Резултати Ризик за пад и фактори ризика за пад су: старост (*OR*=1,129, *CI*=1,067–1,196), особе које добро процењују своје здравље (*OR*=0,365; *CI*= 0,142–0,938), ограничење активности (*OR*=7,189; *CI*=3,559–14,522), проблеми са ходом (*OR*=2,153; *CI*=1,046-4,428), остеопороза (*OR*=4,611; *CI*=1,231–17,265), женски пол (*OR*=3,770, *CI*=1,648–8,624), проблеми са видом (*OR*=2,719; *CI*=1,588–108,581), когнитивни проблеми (*OR*=4,485; *CI*=17,721), артритис (*OR*=6,524; *CI*=2,077–20,496) и проблеми са мокрењем (*OR*=2,511; *CI*=1,083–5,820).

Закључак Фактори ризика за пад су: старост, лична процена здравља, проблеми са ходом, остеопороза, женски пол, проблеми са видом, артритис, проблеми са мокрењем.

Кључне речи: старе особе; ризик за пад, фактори, процена; општа популација

INTRODUCTION

The incidence of falls and the severity of complications due to the falls, is increasing after the age of 60 years [1]. Responsibility for the falls is attributed to risk factors of falling. Worldwide, in 2013, the proportion of people older than 80 years or the "oldest old" population of the elderly was 14% and it is expected that, in 2050, the percentage of elderly people older than 80 years will be increased to 19%. If this percentage of old people is reached, this means that there will be 392 million people aged 80 and older in 2050. According to data provided by WHO, women surpass men almost everywhere, because women are predisposed to live longer than men [2]. Based on the results provided by the Statistical Office, the fact that the population of Serbia is in the trend of progressive aging is confirmed [3]. The aging of the population is a global trend today. This actually means that people today are generally healthier and live longer. While global aging represents a triumph of health, social, economic and progress over the control of diseases, it also poses enormous challenges

[4]. In order for people to live longer and healthier than ever before, it is necessary to provide greater support and medical care as elderly are more demanding in the process of nursing care than young people are. The government needs to invest more time and money in the organization of health care in the population of elderly compared to other age groups. The aim to improve health and reduce functional disability of the elderly is conditioned by connecting simultaneous technological development with scientific knowledge of gerontology, in order to improve and make life easier for elderly [5]. These investments are related to covering costs which include admission to hospital, treatment, rehabilitation and home care and amounts to almost 19,440 euros for each old person who suffered injuries due to a fall, which is an extremely high cost. Generally, this is one of the reasons why it is important to direct more attention to prevention of fall rather than to treatment of the consequences of fall. It is also advisable to set the main focus more on risk factors for falls, instead of on only one risk factor [6].

METHODS

Research sample

The study included 400 respondents of both gender [164 male and 236 female]. All participants had residence in the city of Niš. As there was no relevant information in the Republic of Serbia on the subject that we were researching, in order to determine optimal sample size, we used the variability of the phenomenon of 50% [7].

Acording to the register of health care service of Primary Health Center in Nis, where a comparative overview was given for the year 2009, the overall number of people in the city of Nis amounted to 255.479. The number of people aged 65 and older was 44.378. Therefore, we concluded that the sample of 384 respondents would be sufficient. The random sample was used, thanks to the table of numbers from the Registry of the Primary Health Center Niš.

Inclusive criteria were: age of 65 and older, with residence in a house or apartment, being able to understand, comprehend and follow the instructions and being mobile (with or without mobility aid).

Study Design

The survey was conducted as a cross-sectional study during the period January - June 2014. The data was collected by using the survey method during the home visits by researchers in the presence of visiting nurses.

Instruments

General socio-demographic questionnaire contains eight questions relating: to age, gender, place of residence, marital status, education level, income satisfaction, assessment of health and number of household members.

Screening test for the falling of people aged 65 and older [Elderly Fall Screening Test - EFST] is designed to detect the level of risk for falling. It contains five items: history of falls and crashes, injuries due to falls, experience of near-falls and the current walking condition [assessed walking speed and walking pattern] [8]. The sensitivity of the test is 83% and the specificity is 69%, which was found in the study of Cwik and his colleagues [9]. The values of each question [0 points - no risk of falling or 1- there is an existing risk of falling] are summed, giving a total score. The score between zero and one refers to the category of persons with no or low risk for falls, while the score ≥ 2 refers to the category of persons with moderate or high risk for falls. In order to gain an insight into the disorders of health status, a questionnaire for the assessment of multiple risk factors for falls was used (Multi-Factor Questionnaire Falls) -MFQ [8]. The total MFQ result was calculated as the sum of results obtained in all groups of risk factors for falls. The risk of falls was dichotomized according to the total score: moderate risk (total score ≤ 3), and high risk (total score > 3) [8].

Independent variables

Basic socio-demographic data were as follows: gender, age, marital status, place of residence, education level, income satisfaction, health assessment and community life. The four age groups were set: 1) from 65 to 69 years, 2) from 70 to 74 years 3) from 75 to 79 years and 4) over 80 years. When it comes to health disorders, the following variables were evaluated: activity limitation due to falling, problems with vision, symptoms of cognitive problems, dizziness, problems with balance, problems with walking / mobility, arthritis, osteoporosis, orthostatic hypotension, the use of aids, the use of multiple drugs (three or more) and problems with micturition.

Statistical analysis of the data

Univariate and multivariate logistic regression analysis were used in order to determine predictive factors. The statistical hypothesis was tested at a significance level of $\alpha = 0.05$. Statistical calculations were performed using the SPSS version 16.

RESULTS

Our study included 400 participants 164 (41%) male and 236 (59%) female, aged 75.04±5.85 (in men 74.81±5.77, in women 75.20±5.91). The largest number of participants was married (66%) residing in a city (53.5%), while more than half reported that they lived alone (52.8%). Education level ranged from unfinished primary school, in the highest percentage (37.3%), up to a high school degree, in the lowest percentage [2.5%]. The health was assessed as bed (38.8%), average (45.8%) or good (15.5%). Most participants (79%) were not satisfied with their income, i.e. they pleaded that their revenues did not meet their needs.

In order to identify elderly individuals who are at risk of falling in relation to sociodemographic characteristics and health problems, several significant variables are singled out by univariate logistic regression analysis. These are the following variables: gender, age, marital status, residence, place of

residence, education level, number of household members, the satisfaction with income, health assessment, limitation of activity due to falling, problems with vision, symptoms of cognitive problems, dizziness, problems with balance, problems with walking / mobility, arthritis, osteoporosis, orthostatic hypotension, use of aids, the use of multiple drugs (three or more) and micturition problems (Table 1).

Table 1. Results of a univariate logistic regression of sociodemographic factors and health problems for the assessment of the risk for a fall according to EFST scale.

Variables		Without and low risk for a fall n (%)	Moderate and high risk for a fall (%)	OR	95% CI	*p*
Gender/Sex	**[male]**	70 (58.8)	94 (33.5)	/	/	/
	female	49 (41.2)	187 (66.5)	2.842	1.828–4.418	<0.001
Age (years)	**[65-69]**	42 (35.3)	43 (10.8)	/	/	/
	70 -74	41 (34.5)	55 (19.6)	1.310	0.729–2.356	0.367
	75-79	26 (21.8)	96 (34.2)	3.606	1.965–6.618	<0.001
	≤80	10 (8.4)	87 (31.0)	8.498	3.894–18.546	<0.001
Marital status	**[married]**	93 (78.2)	178 (63.3)	/	/	/
	single	0 (0.0)	1 (0.4)	0.001	0.005–0.002	0.998
	divorced	3 (2.5)	9 (3.2)	1.567	0.414-5.929	0.508
	widow/er	23 (19.3)	93 (33.1)	2.113	1.255–3.556	0.005
Residence	**[village]**	52 (43.7)	134 (47.7)	/	/	/
	city	67 (56.3)	147 (52.3)	0.851	0.553–1.311	0.465
Place of residence	**[house]**	108 (90.8)	253 (90.0)	/	/	/
	apartment	11 (9.2)	28 (10.0)	1.087	0.522–2.261	0.824
Level of education	**[primary school]**	60 (50.4)	208 (74.0)	/	/	/
	> primary school	59 (49.6)	73 (26.0)	0.357	0.228–0.558	<0.001
Numbers of members	**Household**	2.56±1.50	2.50±1.52	0.974	0.846–1.121	0.711
Satisfaction of income	**[yes]**	16 (13.4)	35 (12.5)	/	/	/
	no	91 (76.5)	225 (80.1)	1.130	0.596–2.143	0.707
	partially	12 (10.1)	21 (7.5)	0.800	0.318–2.015	0.636
Health Assessment	**[bad]**	17 (14.3)	138 (49.1)	/	/	/
	average	66 (55.5)	117 (41.6)	0.218	0.121–0.393	<0.001
	good	36 (30.3)	26 (9.3)	0.089	0.044–0.181	<0.001
Limitation of activity	**[no]**	104 (87.4)	99 (35.2)	/	/	/
	yes	15 (12.6)	182 (64.8)	12.746	7.037–23.088	<0.001
Problems with vision	**[no]**	101 (84.9)	141 (50.2)	/	/	/
	yes	18 (15.1)	140 (49.8)	5.571	3.204–9.688	<0.001
Cognitive problems	**[no]**	70 (58.8)	89 (31.7)	/	/	/
	yes	49 (41.2)	192 (68.3)	3.082	1.978–4.801	<0.001
Problems with balance	**[no]**	98 (82.4)	96 (34.2)	/	/	/
	yes	21 (17.4)	185 (65.8)	8.993	5.283–15.307	<0.001
Problems with walking	**[no]**	83 (69.7)	69 (24.6)	/	/	/
	yes	36 (30.3)	212 (75.4)	7.084	4.400–11.405	<0.001
Arthritis	**[no]**	89 (74.8)	165 (58.7)	/	/	/
	yes	30 (25.2)	116 (41,.)	2.086	1.294-3.361	<0.001
Osteoporosis	**[no]**	115 (96.6)	235 (83.6)	/	/	/
	yes	4 (3.4)	46 (16.4)	5.628	1.978-16.014	0.001
Orthostatic hypotension	**[no]**	99 (83.2)	189 (67.3)	/	/	/
	yes	20 (16.8)	92 (32.7)	2.410	1.402-4.140	0.001
Aids	**[no]**	114 (95.8)	196 (69.8)	/	/	/
	yes	5 (4.2)	85 (30.2)	9.888	3.897-25.086	<0.001
Problems with urination	**[no]**	70 (58.8)	140 (49.8)	/	/	/
	yes	49 (41.2)	141 (50.2)	1.439	0.933-2.220	0.100

[] – reference group

The univariate logistic regression analysis evaluated the probability of certain socio-demographic factors for the falls according to EFST scale. The results show that the probability of fall is 2.842 times higher in female [OR=2.586; p<0.001], and is significantly increased with age of 75–

80, by more than three times (OR=3.606; p<0.001) and in older than 80 years by more than eight times (OR=8.498; p<0.001). The chance of a fall is 1,737 times higher in widowers (OR=1.737; p= 0.005). Participants who have finished more than primary school have a lower risk of fall (OR=0.357; p<0.001). Participants who assessed their health as average (OR=0.227; p<0.001) or good (OR= 0.041; p <0.001) are less likely to fall compared to those who assess their health as poor.

All analyzed health conditions, except problems with urination, are independent predictors of the risk of falling: limiting activities [OR=12.746, p<0.001], vision problems [OR=5.571; p<0.001], cognitive problems [OR = 3.082; p <0.001], problems with balance (OR=8.993; p<0.001), stroke (OR=7.084; p<0.001), arthritis (OR=2.086; p<0.001), osteoporosis (OR=5.628; p<0.001), orthostatic hypotension (OR=2.410; p<0.001) and the use of aids (OR=9.888; p <0.001).

Table 2. Results of multivariate logistic regression factors to assess the risk for a fall according to the EFST scale.

Variables	OR	95% CI	*p*
Gender/Sex (Female)	1.551	0.830–2.896	0.169
Age	1.129	1.067–1.196	<.001
Marital status (widow)	1.317	0.665–2.608	0.429
Level of education	0.995	0.730-1.356	0.974
Health Assessment			
average	0.735	0.339–1.595	0.436
good	0.365	0.142–0.938	0.036
Limitation of activity	7.189	3.559–14.522	<0.001
Problems with vision	1.178	0.549–2.526	0.675
Cognitive problems	1.126	0.611–2.077	0.704
Problems with balance	0.941	0.427-2.076	0.880
Problems with walking	2.153	1.046–4.428	0.037
Arthritis	1.294	0.673–2.489	0.439
Osteoporosis	4.611	1.231–17.265	0.023
Orthostatic hypotension	1.773	0.857–3.665	0.122
Aids	2.431	0.779–7.589	0.126

Multivariate logistic regression analysis was performed to assess the impact of combined statistically significant factors with relation to fall according to the EFST scale (Table 2). The whole model, including all predictor is statistically significant (χ^2=182.134, p<0.001) and in explains 36.6% (R-squared coke and Snel) and 52.0% (R-squared Nagelkerkea) of variance of fall. Unique statistically significant contribution to the model is given by the following variables: age (OR=1.129, p<0.001], health assessed as good (OR=0.365; p<0.036), limitation of activities (OR=7.189; p <0.001), stroke (OR=2.153; p=0.037) and osteoporosis (OR=4.611, p=0.023).

By univariate logistic regression analysis, a probability was estimated for sociodemographic factors of falls according to the MFQ scale (Table 3). The results show that the probability of fall is 4,469 times higher in women (OR=4.469; p<0.001), and significantly increased with age from 75–80 years to grow almost three times (OR=2.862, p=0.005), as well as in elderly over 80 years (OR=2.628; p<0.001). Participants who live in the city have a 42.8% lower risk of fall compared to those who live in a village (OR=0.572; p=0.044), as well as those who live in an apartment (OR=0.375; p=0.009). Participants who have finished more than primary school have a 62.8% lower risk for a fall (OR=0.362; p<0.001). Participants who have assessed their health as average (OR=0.120; p<0.001] or good (OR=0.026; p<0.001] are less likely to fall compared to those who have assessed their health as bad.

Table 3. The results of the univariate logistic regression sociodemographic factors to assess the risk for a fall according to the MFQ scale.

Variables		Low risk of a fall n (%)	High risk for a fall n (%)	OR	95% CI	p
Gender/Sex	**[male]**	48 (70.6)	116 (34.9)	/	/	/
	female	20 (29.4)	216 (65.1)	4.469	2.532-7.889	<0.001
Age	**[65-69]**	23 (33.8)	62 (18.7)	/	/	/
	70 -74	19 (27.9)	77 (23.2)	1.503	0.751-3.008	0.249
	75-79	14 (20.6)	108 (32.5)	2.862	1.373-5.963	0.005
	≤80	12 (17.6)	85 (25.6)	2.628	1.216-5.680	0.014
Marital status	**[married]**	52 (76.5)	219 (66.0)	/	/	/
	single	0 (0.0)	1 (0.3)	0.000	0.000-0.000	1.000
	divorced	1 (22.1)	11 (3.3)	2.612	0.330-20.685	0.363
	widow/er	15 (19.3)	101 (30.4)	1.599	0.859-2.975	0.139
Residence	**[village]**	24 (35.3)	162 (48.8)	/	/	/
	city	44 (64.7)	170 (51.2)	0.572	0.333-0.985	0.044
Place of residence	**[house]**	56 (82.4)	305 (91.9)		/	/
	apartment	12 (17.6)	27 (8.1)	0.375	0.180-0.781	0.009
Level of education	**[primary school]**	32 (47.1)	236 (71.1)	/	/	/
	> primary school	36 (52.9)	96 (28.9)	0.362	0.212-0.616	<0.001
Number of members	**Household**	2.51±1.39	2.52±1.54	1.003	0.843-1.192	0.975
Satisfaction of income	**[yes]**	16 (23.5)	35 (10.5)	/	/	/
	no	46 (67.6)	270 (81.3)	1.130	0.596-2.143	0.707
	partially	6 (8.8)	27 (8.1)	0.800	0.318-2,015	0.636
Health Assessment	**[bad]**	4 (5.9)	151 (45.5)	/	/	/
	average	33 (48.5)	150 (45.2)	0.120	0.042-0.348	<0.001
	good	31 (45.6)	31 (9.3)	0.026	0.009-0.080	<0.001
Limitation of activity	**[no]**	59 (86.8)	144 (43.4)	/	/	/
	yes	9 (13.2)	188 (56.6)	8.559	4.107-17.835	<0.001
Problems with vision	**[no]**	67 (98.5)	175 (52.2)	/	/	/
	yes	1 (1.5)	157 (47.3)	60.109	8.247-438.083	<0.001
Cognitive problems	**[no]**	55 (80.9)	104 (31.3)	/	/	/
	yes	13 (19.1)	228 (68.7)	9.275	4.855-17.721	<0.001
Problems with balance	**[no]**	68 (100.0)	126 (38.0)	/	/	/
	yes	0 (0.0)	206 (62.0)	0.003	0.003-0.004	0994
Problems with walking	**[no]**	68 (100.0)	84 (25.3)	/	/	/
	yes	0 (0.0)	248 (74.7)	0.000	0.000-0.000	0.993
Arthritis	**[no]**	63 (92.6)	191 (57.5)	/	/	/
	yes	5 (7.4)	141 (42.5)	9.302	3.647-23.723	<0.001
Osteoporosis	**[no]**	65 (95.6)	285 (85.8)	/	/	/
	yes	3 (4.4)	47 (14.2)	3.573	1.079-11.837	0.037
Orthostatic hypotension	**[no]**	59 (86.8)	229 (69.0)	/	/	/
	yes	9 (13.2)	103 (31.0)	2.949	1.408-6.173	0.004
Aids	**[no]**	67 (98.5)	243 (73.2)	/	/	/
	yes	1 (1.5)	89 (26.8)	24.539	3.356-179.411	0.002
Problems with urination	**[no]**	53 (77.9)	157 (47.3)	/	/	/
	yes	15 (22.1)	175 (52.7)	3.938	2.135-7.266	0.011

[] – reference group

All analyzed health conditions, except problems with balance and problems with walking, are independent predictors of the risk of falling: limitation of activity (OR=8.559; p<0.001), vision problems (OR=60.109; p<0.001), cognitive problems (OR=9.275; p<0.001), arthritis (OR=9.302; p<0.001), osteoporosis (OR=3.573; p=0.037], orthostatic hypotension (OR=2.949; p=0.004], the use of aids (OR=24.539; p=0.002] and problems with urination (OR=3.938; p=0.011).

Multivariate logistic regression analysis was carried out to assess the impact of the independent factors, statistically significant compared with the fall according to the MFQ scale (Table 4). The entire model with all the predictor is statistically significant ($\chi 2$=180.582, p<0.001) and explains

Table 4. Results of a multivariate logistic regression factors to assess the risk for a fall according to the MFQ scale.

Variables	OR	95% CI	*p*
Gender/Sex (female)	3.770	1.648–8.624	0.002
Age	1.009	0.942–1.081	0.790
Residence	1.209	0.519–2.818	0.660
Place of residence	0.725	0.220-2.394	0.598
Level of education	0.871	0.585-1.297	0.496
Health Assessment			
average	0.461	0.128–1.656	0.235
good	0.140	0.036–0.545	0.005
Limitation of activity	2.719	1.002–7.381	0.050
Problems with vision	13.132	1.588–108.581	0.017
Cognitive problems	4.185	1.807–9.691	0.001
Arthritis	6.524	2.077–20.496	0.001
Osteoporosis	2.044	0.314–13.311	0.545
Orthostatic hypotension	1.498	0.537–4.127	0.444
Aids	2.837	0.307-26.235	0.358
Urination	2.511	1.083–5.820	0.032

between 36.3% (R-squared coke and Snel) and 60.7% (R-squared Nagelkerkea) variance for the fall. Unique statistically significant contribution to the model is given by the following variables: female gender (OR=3.770; p=0.002), health assessed as good (OR=0.038; p<0.001), limitation of activity (OR=2.719; p=0.050), vision problems (OR=2.719; p=0.017), cognitive problems (OR=4.485; p=0.001), arthritis (OR=6.524; p=0.001) and problems with urination (OR=2.511; p=0.032).

DISCUSSION

A fall can happen to anyone although older people are more susceptible to falls and injuries caused by falls. As a series of risk factors that may cause a fall, it also needs a common approach to identify the elderly person in whom these risks are present and then, based on the results obtained on a scientific basis, determine the specific interventions to be applied in the prevention of falls.

In our cross-sectional study majority of participants were female. This was in accordance with the data on gender distribution in people aged 65 and older as given by the Republic Statistacal Office [3]. Results of numerous studies indicated that the prevalence of falls was generally higher in women than in men [10-12]. In our study, we did not find that female gender was an independent predictor of the risk for fall [according to the results of the EFST]. However, we did find that female gender was an independent predictor in the differentation of the moderate and hight risk for falls [according to the results of the MFQ]. These results correspond with other other studies [10-12]. and show that women are three times more likely to fall than men are.

Age is one of the key risk factors for falls and risk of falling increases with age [13]. Another study, which included a large sample of elderly persons, found that probability of fall increased with age [14]. According to some studies that investigated the relationship between falls and risk factors associated with a fall, age was in a statistically significant correlation with a fall [15]. The frequency of falls increases with age [13,16]. Our findings are consistent with the results of aforementioned studies [13,15,16]. Subgroups of participants aged 75-79 and ≤ 80 years were at the highest risk for falls.

People aged 65 and older often have an unreal and over positive assessment of their own health status, which is the reason for risk of fall [17]. This is associated with a tendency of this population to distance themselves from stereotype of being "old" that could also mean "powerless". Although they believe that the fall is an important health problem that they need to prevent, they keep their suspicions to a minimum, often supporting the prevention of falls for others but not for themselves [17]. In contrary to the previous studies, the results of our study indicate that those participants who are aged 65 and older and have evaluated their health as average or well have a lower risk of falling. Such positive perception is a protective risk factor for fall.

Normal aging is associated with decreased functions of several physiological systems including the muscular, cardiovascular, visual, and vestibular system, as well as proprioception, coordination, slow postural response and cognitive function [2]. The decline in physiological functions of these systems increases the risk for a fall [2,18]. The change in the function of these systems i.e. medical conditions, could represent another significant predictor of falling. Many studies have shown that medical conditions such as visual impairment, arthritis, problems with urination, balance disorder, and walking or cognitive status were associated with the risk of falling [19,20]. Our study confirmed higher risk of falling in participants with activity limitations, vision problems, cognitive problems with balance and walking.We have found that the potential risks for falls in those participants who reported vision problems has increased thirteen times, in those who were restricted in their activities seven times, in those with arthritis six times, while the risk has increased four times in participants with cognitive problems. In addition, the results of our study have shown that the potential for risk for the falls in people with osteoporosis who are aged 65 and older has increased four times. This fact is supported by the evidence in earlier studies. More precisely, it was that osteoporosis associated with impaired balance during the performance of physical activity could have psychosocial consequences that could further increase the risk for a fall [21]. Elderly individuals have a higher chance to experience a fall if they are trying to overcome an obstacle while walking. However, recent studies have refuted the fact that people with osteoporosis are more unsable in challenging situations [21]. People older than 65 years have an increased chance to suffer a fracture during a fall due to the reduced bone density [22]. It is described that a fear of falling and a fall are not directly related, but are a result of the function of the basic mutual risk factors. These factors include sociodemographic factors [23], the history of falls [24] the health status e.g., arthritis [25], osteoporosis [26], visual problems [27], problems with urination [28], balance disorder and stroke [29] cognitive status [30], orthostatic hypotension [31]. Our results confirm these facts and suggest that many fall risk factors are directly responsible for developing of fear of falling [32].

Strengths of the study

The first strength of our study is a large number of participants. Secondly, we have provided a clear definition of a fall to all participants, which has helped them to differentiate whether a certain

event was a fall or not. Finally, another strength of our study lies in the fact that research regarding the risk factors for falls in elderly persons is scarce in our contry.

Limitations of the study

Our study had several limitations. The first limitation is the fact that we have collected information based on retrospective recalling of the elderly persons, so we have relied on their memory. Retrospective data collection for a period of 12 months can be considered a restriction [33]. Secondly, we have relied on subjects to self-report the falls and they were mostly not witnessed, so the reliability of these data could be questionable. Results in literature suggest that retrospective self-report of falls and injuries may be less accurate, mainly due to a lack of reporting [33].

CONCLUSION

Based on the results observed, we can conclude that the risk for falls in individuals older than 65 years is higher in women, individuals aged 75–79 and over 80 years, individuals who had a limitation of activities, arthritis, osteoporosis, balance disorder, abnormal gait, cognitive problems, problems with vision and urination. Assessment of health status as average or good proved to be a protective factor.

The results could contribute in directing policy and planning of public health programs and interventions for the prevention of falls.

NOTE

This work originated from the dissertation "Fall risk factors and functionality in elderly persons" by the author Suncica Ivanović.

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