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ORIGINAL ARTICLE

Assessment of the risk of falls among elderly persons in primary care settings

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ABSTRACT

Aim To investigate the risk for falls in elderly patients treated in the Primary Health Care Centre Gradiška, Bosnia and Herzegovina.
Methods This study included 500 patients aged 65 and older. They were chosen randomly by 10 family physicians. Data collection took place every Wednesday and Friday, between January 2022 and July 2022. The patients' gait and balance assessment were performed using the Tinetti Gait and Balance Tool to assess the risk of falls. A supplementary questionnaire was created to record data about the patients' age, sex, chronic diseases, and drugs they take.
Results Among the included patients there were 266 females (53.2%) and 234 (46.8%) males, with the mean age of 75.25 years. The Tinetti test showed that the risk of falls was high for patients older than 75 years, 111 patients (69.8%), and 48 patients (30.2%) aged 65 to 74 (p=0.000). The risk of falling was higher for female, 93 (35%), than male patients, 66 (28.2%) (p=0.018). Considering chronic diseases, a high risk of falls was found in 32 (2.1%) patients with heart failure (p=0.029) and 19 (11.9%) patients with osteoporosis (p=0.000). Patients who used antihypertensive drugs had the highest risk for falls, 124 (78.0%) (p=0.757).
Conclusion About two-thirds of the examinees over the age of 75 had a high risk of falls, which indicates that family doctors should be more involved in fall prevention of elderly patients and constantly educate older patients and their families about it.

Keywords: elderly patients, fall prevention, family physicians

INTRODUCTION

According to the World Health Organization (WHO), a fall is defined as an event that results in a person coming to rest inadvertently on the ground or floor or other lower level. Injuries from falls can be fatal or non-fatal. Falls are associated with reduced quality of life and higher costs of health care. At older ages, the health effects and costs of falls are increasing significantly worldwide (1).

The annual prevalence of falls in people over the age of 65 is 28%, while 15% of people who fall are categorized as the so-called healthy elderly people (2). Post-fall morbidity doubles with each decade of life: 50/100 000 in people aged up to 65 and 150/100,000 up to the age of 75, as well as 529/100,000 in people older than 85 years. About 15% of falls result in hip fractures. According to the WHO global report on falls prevention in older age approximately 28-35% of people aged 65 and over fall each year and the percentage increases to 32-42% for those over 70 years of age (3).

Thirty percent of people over the age of 75 have difficulties walking up the stairs, 40% cannot walk for more than a kilometre, and 7% cannot walk without being helped by another person. On average, each year, about 30% of elderly people have at least one fall at home (2). The usual factors which contribute to falls are impaired

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vision, vertigo, circulatory disorders, a sudden decrease in arterial blood pressure, heart blocks, and musculoskeletal disorders related to difficulties in walking, the use of psychotropic medications, insufficient physical activity, and inadequate living conditions (4).

An appropriate policy to create adequate living environments for the elderly, such as proper lighting of the house and avoiding total dark in the house, use of bath chairs and toilets, use of appropriate shoes, not walking after taking sleeping pills, regular eye examinations, not carrying heavy equipment, making the phone available, and installing handles in different parts of the house, can help prevent falls in the elderly (1).

Out of 104 articles submitted for systematic review and meta-analysis with a sample size of 1,741,613 people, 48 studies were conducted in Asia, 16 studies in Europe, 2 studies in Africa, 32 studies in America, and 6 studies in Oceania. According to the results the prevalence of falls in the world's older population was 26.5% (5,6). According to some studies, those who do not walk at home or out of the house, or walk less, and those who cannot meet their daily needs, have a higher risk of falling than other people, as well as those who have at least one chronic disease, or people with physical and mental impairment, or people with lower quality of life (7).

Elderly people who have fallen once have a risk of it happening again within one year. The fear of falling can lead to depression and limitation of movement (8). A meta-analysis which included a total of 1,093,270 participants aged ≥65 years showed frailty as a significant risk factor for falls in older adults (9,10). Recently, many studies have been conducted on this topic worldwide (11), as well as in Bosnia and Hrezegovina (BiH) (2). The topic is currently relevant considering the aging of the population and the increasing number of patients with the problem.

This study aimed to investigate the risk of falls in elderly patients treated in Family Medicine Clinics of the Primary Health Care Centre Gradiška, BiH, and to investigate the influence of chronic diseases and the use of medications on the risk of falls.

PATIENTS AND METHODS

Patients and study design

This prospective study included 500 patients aged ≥65 years old, treated in the Primary Health Care Centre Gradiška (BiH). The patients were randomly chosen. The study was conducted by 10 family doctors, who examined and interviewed patients aged 65 and older, who had come for medical examination every Wednesday and Friday between January 2022 and July 2022.

The Tinetti Gait and Balance Tool (12–14) was used in the study as a questionnaire to assess gait and balance, while data found in medical charts of the patients regarding the presence of chronic diseases and the use of drugs that can cause falls, was recorded in a supplementary questionnaire.

All patients included in the study gave their written consent for their participation in the study. Research was approved by the Ethics Committee of the Primary Health Care Centre Gradiška.

Methods

The Tinetti Gait and Balance Tool consisted of a Balance section and a Gait section. The Balance section has nine questions: 1. Sitting balance (the patient is seated on a hard, armless chair); 2. Rises from the chair; 3. Attempts to rise; 4. Immediate standing balance (first 5 seconds); 5. Standing balance; 6. Nudged (subject at the maximum position with feet as close together as possible, examiner pushes lightly on subject's sternum with palm of hand 3 times); 7. Eyes closed, subject in the position as in 6; 8. Turning 360 degrees; 9. Sitting down. The Gait section consisted of seven questions. The patient had to walk across the room, first at her/his "usual pace", then at "rapid, but safe pace", using usual walking aid (cane, walker): 1. Initiation of gait (immediately after they were told "go"); 2. Step length and height; 3. Step symmetry; 4. Step continuity; 5. Path; 6. Trunk; 7. Walk stance. The score was obtained by summarizing points for Gait and Balance sections, or as the total Gait and Balance score. Scoring was done on a three-point scale with a range on each item of 0-2, with 0 representing the most impairment. The maximum score for the Gait section was 12 points, while the maximum for the Balance section was 16 points, with the total maximum score for the overall Tinetti questionnaire of 28 points. The lower score on the Tinetti test means the higher the risk of falling. When the Tinneti tool score is ≤18, the patient has a higher risk of falls, the moderate risk is at the score 19-23, and a low risk ≥24. Chronic diseases were analysed: cardiovascular diseases (hypertension, coronary artery disease, heart arrhythmia, heart failure), mental disorders and neurological diseases (anxiety disorder, depression, psychosis, cerebrovascular diseases, epilepsy, Parkinson's disease), musculoskeletal diseases (osteoporosis, osteoarthritis, and spine problems), diabetes mellitus, renal failure, cancer, prostatic hyperplasia, and impaired vision. Analysed drugs used by the patients included antihypertensive drugs and diuretics, antiarrhythmics, nitrates, antidepressants, antipsychotic drugs, benzodiazepines, antiepileptic drugs, antiparkinsonian drugs, insulin, oral hypoglycaemic agents, alpha-blockers and non-steroidal anti-inflammatory drugs (NSAIDs).

Statistical analysis

Descriptive analysis in the form of frequencies and percentages was used for a sample analysis. The difference between subjects was determined considering the risk of falls, socio–demographic variables (gender, age, number and type of used drugs) and chronic diseases by χ^2 test.

The difference between the risk of falls and the average number of drugs that subjects used was analysed by variance (ANOVA). Statistical significance of $p<0.05$ was used.

RESULTS

This study included 500 patients: 266 (53.2%) females and 234 (46.8%) males; 259 (51.8%) aged 65-74 and 241 (48.2%) >75 years. According to the gender distribution, an equal number of females, 116 (43.6%) and 116 (49.6%) males were at low risk of falling (p=0.862). Moderate risk of fall was recorded in 57 (21.4%) females and 52 (22.2%) males (p=0,097); 93 (35%) and 66 (28.2%), respectively were at high risk of falling (p=0.018).

The analysis the risk of falling in relation to the age groups of the patients showed a high significant difference between the age groups (p=0.000). In total, 111 (69.8%) patients aged ≥75 were at high risk of falling, as well as 48 (30.2%) patients between the age of 65 and 74 (p=0.000) (Table 1).

A statistically significant difference (p=0.000) between the presence of musculoskeletal disorder of osteoporosis and the patients with high, 19 (11.9%), moderate, 3 (2.8%) and low level of risk of falling, 7 (3.0%), was found. A statistically significant difference (p=0.029) was found between the cardiovascular disease of heart failure and the patients with high, 32 (2.1%), moderate, 10 (9.2%) and low level of risk of falling, 30 (12.9%) (Table 2).

A high risk of falling was found in 124 (78%) patients who used antihypertensive drugs, 85 (53.5%) who used diuretics (Table 3).

Table 1 Risk of falls according to gender and age distribution of patients

Risk for falls	No (%) of patients in the group		p	No (%) of patients in age group		p
	Female	Male		65-74	≥ 75	
Low	116 (43.6)	116 (49.6)	0.862	155 (66.8)	77 (33.2)	0.041
Moderate	57 (21.4)	52 (22.2)	0.097	56 (51.4)	53 (48.6)	0.041
High risk	93 (35.0)	66 (28.2)	0.018	48 (30.2)	111 (69.8)	0.000

Table 2. Risk of falls according to the presence of chronic diseases

Chronic diseases	N (%) of patients at risk of falls			p
	High	Moderate	Low	
Cardiovascular diseases				
Hypertension	117 (73.6)	83 (76.1)	174 (75.0)	0.889
Coronary artery disease	5 (3.1)	3 (2.8)	7 (3.0)	0.983
Heart failure	32 (2.1)	10 (9.2)	30 (12.9)	0.029
Heart arrhythmias	48 (30.2)	27 (24.8)	51 (22.0)	0.184
Mental disorders and neurological diseases				
Anxiety disorders	47 (29.6)	32 (29.4)	70 (30.2)	0.985
Depression	23 (14.5)	14 (12.8)	37 (15.9)	0.745
Epilepsy	6 (3.8)	4 (3.7)	3 (1.3)	
Stroke	7 (4.4)	3 (2.8)	5 (2.2)	0.435
Parkinson´s disease	1 (0.6)	1 (0.9)	4 (1.7)	
Musculoskeletal disorders				
Osteoporosis	19 (11.9)	3 (2.8)	7 (3.0)	0.000
Spondylosis	8 (5.0)	4 (3.7)	5 (2.2)	0.300
Knee osteoarthritis	5 (3.1)	3 (2.8)	8 (3.4)	0.943
Hip osteoarthritis	9 (5.7)	2 (1.8)	17 (7.3)	0.120
Other diseases				
Diabetes mellitus	43 (27.0)	30 (27.5)	48 (20.7)	0.233
Cancer	0 (0.0)	2 (1.8)	8 (3.4)	
Renal failure	0 (0.0)	1 (0.9)	1 (0.4)	
Impaired vision	12 (7.5)	9 (8.3)	14 (6.0)	0.715
Benign prostatic hyperplasia	26 (39.4)	19 (36.5)	44 (37.9)	0.950

Table 3. Risk of falls according to used drugs

Drug	N (%) of patients at risk of falls			p
	High	Moderate	Low	
Antihypertensive drugs	124 (78,0)	81 (74.3)	175 (75.4)	0.757
Diuretics	85 (53.5)	50 (45.9)	97 (41.8)	0.076
Antiarrhythmics	53 (33.3)	32 (29.4)	56 (24.1)	0.133
Nitrates	21 (13.2)	8 (7.3)	27 (11.6)	0.313
Benzodiazepines	53 (33.3)	31 (28.4)	69 (29.7)	0.644
Antidepressants	30 (18.9)	16 (14.7)	35 (15.1)	0.540
Antiepileptics drugs	8 (5.0)	5 (4.6)	3 (1.3)	0.077
Antiparkinsonian drugs	0 (0.0)	1 (0.9)	3 (1.3)	
Non-steroidal anti-inflammatory drugs	35 (22.0)	17 (15.6)	51 (22.0)	0.344
Oral hypoglycaemic agents	30 (18.9)	22 (20.2)	31 (13.4)	0.186
Insulin	21 (13.2)	12 (11.0)	29 (12.5)	0.864
Alpha-blockers	26 (39.4)	19 (36.5)	45 (38.8)	0.946

A high risk of falls was most frequently noticed in patients who used up to 4 drugs, in 114 (71.7%), but without statistical significance differences between the number of used drugs and the risk of falls (p=0.198) (Table 4).

DISCUSSION

Using the Tinetti questionnaire our study concluded that the highest (69.8%) number of patients who had a high risk of falls and treated at the primary care, were older than 75 years. About one-half (51.4%) of patients aged 65 to 74 years were at the moderate risk of falls, together with 48.5% of patients over the age of 75. According to the gender distribution, females were at higher (35.0%) risk of falls, in the comparison to (28.2%) males. The results of this study are similar to the results of the study conducted in Banja Luka, Republika Srpska (Bosnia and Herzegovina) in terms of age (>75 years) and gender (female) (2).

Developing a practical fall risk assessment tool to predict the occurrence of falls in the primary care settings is important, because investigators have reported deterioration of physical function associated with falls. Some of the tests can also be performed by family doctors in order to determine the risk of falling in their patients (15). The results of our research showed a significant impact of chronic diseases on increasing the risk of falling in the elderly. The most common chronic diseases that increase the risk of falling in our research are cardiovascular diseases, diabetes and osteoporosis. Similar results were obtained by other authors (16).

The connection of cardiovascular problems including low blood pressure, heart failure and arrhythmia with the risk of falls was reported (17–19). These results, as well as the results of our study, indicate the need to find potential areas for preventive interventions.

Elderly people with type 2 diabetes have a higher risk of falls (20), compared to non-diabetics, which was also proven in our research. The most important factor associated with a higher risk of falls was the use of insulin, while in our study no difference was observed with regard to the frequency of falls related to taking oral antidiabetics and/or insulin (17).

Reportedly, an inverse correlation between osteoporosis knowledge and risk of falls was found (21). Our research showed a significant connection between osteoporosis and the risk of falls compared to other investigated musculoskeletal diseases. It indicates the specific health promotion interventions for elderly at risk for osteoporosis.

Numerous studies have identified the most important risk factors for falls in the elderly (being female, older age, use of multiple medications, gait instability, fear of falling, and decline in activities of daily living) (22–24), which is similar to our research.

The results of our research showed that the patients who use drugs for cardiovascular diseases, diabetes, NSAIDs, benzodiazepines and those who use more than 5 drugs at the same time have an increased risk of falling. A study conducted in Sweden showed that patients who use drugs that affect the central nervous system have the

Table 4. Risk of falls according to the number of used drugs

Number of used drugs	No (%) of patients at risk of falls			Total
	High	Moderate	Low	
0	15 (9.4)	11 (10.1)	32 (13.8)	58 (11.6)
1-4	114 (71.7)	87 (79.8)	163 (70.3)	364 (72.8)
≥5	30 (18.9)	11 (10.1)	37 (15.9)	78 (15.6)
Total	159 (31.8)	109 (21.8)	232 (46.4)	500 (100.0)

highest risk of falling, while drugs for the treatment of cardiovascular diseases have a low risk of falling, which is different from the results of our research (25). One study showed that in relatively healthy community-dwelling elderly people, high doses of antihypertensive agents are not associated with an increased risk of falls (26). A study carried out by Liu et al. showed that male gender, usage of diuretics, and felt generalized weakness are the most important risk factors for falls in elderly (27). One meta-analysis showed that antipsychotics, antidepressants, and benzodiazepines are consistently associated with a higher risk of falls (28). In our study, more than a third of patients who used benzodiazepines and almost a quarter who used antidepressants, had a high risk of falling. The usage of several drugs in the same time, such as hypnotic and sedative drugs, opioids and diuretics, represented a significant risk factor for falls and it is a public health problem, with a greater impact on women (29). In our study, there was no statistically significant difference between the used individual drug and the risk of falling. Drugs with sedative properties are linked to reduced gait speed in the elderly, which leads us to conclude that additional caution should be exercised when prescribing drugs with sedative properties to older adults at risk of falls (30).

Additional factors that also contribute to the falls include a low level of education, polypharmacy, visual impairments, gait and balance disturbances, urinary incontinence, and the use of laxatives and antipsychotics (31). The recommendations from specific guidelines are: advising patients to wear safe and comfortable clothes and slippers and to walk on non-slip flooring, use lights during the night, get up slowly and in adjusted positions, regular prescription and OTC (over-the-counter) drug reviews performed by family doctors with the aim of reducing the number of drugs used or their dosage, which can contribute to fall-risk reduction (4,32).

In conclusion, the results of our research showed that the elderly patients (>75 years) with chronic diseases and patients using antihypertensive drugs (including diuretics and alpha blockers), benzodiazepines and antiarrhythmics had an increased risk of falling. This study showed a high prevalence of involuntary falls as well as its correlation with certain risk factors. Effective public health strategies need to be implemented to promote behavioural changes, and develop new fall prevention strategies to reduce future morbidity and mortality associated with falls among older adults. The role of a family physician in the prevention of falls lies in the continuous education of older adults and their families about their illness or condition, rational use of drugs, living conditions and prevention of complications.

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