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Can we prevent falls in older individuals?

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Abstract

Falls are a major public health problem globally. Each year, 2.8 million elderly people (defined as those aged ≥65) are treated in emergency departments for fall injuries. A questionnaire containing 15 questions, prepared by researchers, was provided to patients who visited the emergency department due to falls and were aged ≥65. Patients who had fallen on the ground were included in the study group and were categorized using the following criteria: age, gender, education, socioeconomic status, life spots, falling location, chronic illnesses, previous falling episodes, cause of falls, medications used, hospital procedures undergone and the outcome of those procedures. A questionnaire was given to 159 patients that visited our emergency department as a result off all. When those patients that did not respond to the questionnaires, those who had high falls, and those who did not remember their traumas were excluded, there were 119 remaining. There were 83 female participants (69.7%) and 79.87 (SD, 7.98) were participants in the study. In our study, 21 (17.6%) patients were identified as having had previous falls. Age, gender, education status, living environment, number of drugs used, diseases and p values were compared according to old operative emoticons: 0.434, 0.855, 0.607, 0.502, 0.778, 0.324and 0.384, and there are no significant statistical differences between them. Despite the challenges mentioned above, educating people about the benefits of healthy ageing, and taking preventive measures will likely help to reduce negative outcomes in the future.

Keywords: accidental falls, aged, emergency service, healthy aging

1. Introduction

Falls are a major public health problem globally. Approximately 28%–35% of people aged >65 fall each year, increasing to 32%–42% for those with >70 years of age (1). Each year, 2.8 million elderly people (defined as those aged ≥65) are treated in emergency departments for fall injuries (2). Falls lead to 20%–30% of mild to severe injuries and are the underlying cause of 10%–15% of all emergency department visits. More than 50% of injury-related hospitalizations relate to elderly people (1). The major underlying causes for fall-related hospital admissions are hip fractures, traumatic brain injuries and upper limb injuries (1). According to data published in 2015 by the Centers for Disease Control and Prevention (CDC) in the United States (US), falls are the leading cause of fatal and non-fatal injuries among elderly people (2). The financial cost off all-related injuries are substantial. The average cost to the health system per fall injury in Finland and Australia is $3,611 and $1,049 respectively, regarding elderly people. Direct medical costs totalled $616.5 million for fatal injuries and $30.3 billion for non-fatal injuries in 2012, rising to $637.5 million and $31.3 billion, respectively, in 2015 (3). In 2004, the economic burden of injury in Canada was estimated at $19.8 billion, and the direct costs associated with falls among elderly people in Canada were estimated at over $2 billion. The cost of falls for Canadian seniors (per capita) was 3.7 times greater than that of individuals between the ages of 25 and 64 (4).

2. Materials and methods

2.1. Study groups

A questionnaire containing 15 questions, prepared by researchers, was provided to patients who visited the emergency department due to falls and were aged ≥65. Patients that responded to their questionnaire inappropriately or had fallen from a great height, and therefore, did not remember their traumas were separated from the study group. Patients who had fallen on the ground were included in the study group and were categorized using the following criteria: Age, gender, education, socioeconomic status, life spots, fall location, chronic illnesses, previous falling episodes, cause of falls, medications used, hospital procedures undergone and the outcome of those procedures. In the descriptive study, participants' demographics and responses to the scale questionnaire were objectively analysed. The clinical research protocol of this study was reviewed and approved by the Non-Interventional Clinical Studies Institutional Review Board of Katip Çelebi University Izmir, Turkey (Ethical Committee Number: 8, 21.01.2016).

2.3. Statistical analysis

The Statistical Package for the Social Sciences 20.0 program was used for statistical analysis of the data. In the data analysis, both explanatory and generic statistical methods were used to obtain the results. The demographic

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characteristics of the participants were analysed, and frequency distributions were established. The t-test was used to examine the relationship between the two groups of variables. A p value of <0.05 was considered statistically significant for all outcomes.

3. Results

A questionnaire was given to 159 patients that visited our emergency department because of all. When those patients that did not respond to the questionnaires, those who had high falls, and those who did not remember their traumas were excluded, there were 119 remaining. There were 83 female participants (69.7%) and 79.87 (SD, 7.98) were participants in the study. The demographic data of participants are shown in Table 1. A total of 91 participants (76.5%) were determined to have fallen at home. Detailed examinations according to fall location are given in Table 2. Only 21 (17.6%) of the participating patients indicated that they had fallen before, and only one of these had received medical support.

Table 1. Demographic data of participants

	Male	Female	Total
Study population	36 (30.3%)	83 (69.7%)	119 (100)
Age mean (SD)	76.97 **(**7.83**)**	81.13 **(**7.73**)**	79.87 **(**7.96**)**
Who lives with			
Alone	6	23	29 (24.4)
With his wife	24	16	40 (33.6)
With crowded family	6	43	49 (41.2)
With caregiver	0	1	1 (0.8)
Educational status			
Illiterate	7	64	71 (59.7)
Literate	12	4	16 (13.4)
Elementary school	16	15	30 (25.2)
Middle school	1	0	1 (0.8)
High school	1	0	1 (0.8)

SD, standard deviation

Table 2. Evaluation according to fall places

Fall from floor	Male	Female	Total (%)
Dwelling	21	70	91 (75.8)
Street	11	3	14 (12.5)
Garden	1	8	9 (7.5)
Mosque	1	0	1 (0.8)
Workplace	2	2	4 (3.3)
Dwelling fall	Male	Female	Total (%)
Toilet	2	14	16 (17.5)
Bathroom	0	7	7 (0.7))
Room	19	48	67 (73.6)
Kitchen	0	1	1 (0.1)

Information on the hospital process for each of the participants is given in Table 3. Our participants: 51 patients (42.5%) 1-3, 19 patients (15.8%) 4–5 and 29 patients (24.2%) using six or more drugs. Nineteen patients (15.8%) did not use any medication, and three patients (2.5%) used irregular or unknown drugs. One of the 19 medication-free patients had suffered vision loss, one had dementia and two had previously been operated on due to suffering a femur fracture. There were 14 patients with no diagnosed diseases or drug use.

Table 3. Information about the hospital process

Imagination	**Participant (%)**
Yes	117 (98.3)
No	2 (1.7)
Consultation	
Yes	85 (71.4)
No	34 (28.6)
Diagnosis	
Hip fracture	54 (45.4)
Soft tissue injury	38 (31.9)
Other*	18 (15.1)
Radius fracture	6 (5)
Pelvic fracture	3 (2.5)
Hospital outcome	
Admission	61 (51.3)
Discharge	56 (47.1)
Treatment rejection	2 (1.7)

Table 4. History of previous fall

Sex	**Previous fall**		**Total (%)**
	Yes (%)	**No (%)**	
Male	6 (5.0)	30 (25.2)	36 (30.3)
Female	15 (12.6)	68 (57.1)	83 (69.7)
Age			
65-69	4 (3.3)	14 (11.7)	18 (15.1)
70-79	4 (3.3)	29 (24.3)	33 (27.7)
80-89	8 (6.7)	47 (39.4)	55 (46.2)
90 and above	5 (4.2)	8 (6.7)	13 (10.9)
Educational status			
Illiterate	12 (10.0)	59 (49.5)	71 (59.6)
Literate	2 (1.6)	14 (11.7)	16 (13.4)
Elementary school	5 (4.2)	25 21.0)	30 (25.2)
Middle school	1 (0.8)	0	1 (0.8)
High school	1 (0.8)	0	1 (0.8)
Who lives with			
Alone	5 (4.2)	24 (20.1)	29 (24.3)
With his wife	9 (7.5)	31 (26.0)	40 (33.6)
With crowded family	7 (5.8)	42 (35.2)	49 (41.1)
With caregiver	0	1 (0.8)	1 (0.8)
Number of drug			
1-3	9 (7.5)	43 (36.1)	52 (43.6)
4-5	3 (2.5)	16 (13.4)	19 (15.9)
6 and above	5 (4.2)	24 (20.1)	29 (24.3)
No	4 (3.3)	15 (12.6)	19 (15.9)
Chronic disease			
Osteoporosis	6 (5.0)	15 (12.6)	21 (17.6)
Gonarthrosis	2 (1.6)	15 (12.6)	17 (14.2)
Osteoarthritis	0	1 (0.8)	1 (0.8)
Defect of vision	0	5 (4.2)	5 (4.2)
Arrhythmia	1 (0.8)	8 (6.7)	9 (7.5)
Epilepsy	1 (0.8)	2 (1.6)	3 (2.5)
Vertigo	1 (0.8)	9 (7.5)	10 (8.4)
Ht	10 (8.4)	29 (24.3)	39 (32.7)
SVD	2 (1.6)	9 (7.5)	11 (9.2)
DM	8 (6.7)	18 (15.1)	26 (21.8)
CAD	0	6 (5.0)	6 (5.0)
Anemia	1 (0.8)	7 (5.8)	8 (6.7)
Hypothyroidism	1 (0.8)	1 (0.8)	2 (1.6)
Cancer	0	1 (0.8)	1 (0.8)
CHF	0	3 (2.5)	3 (2.5)
Alzheimer	0	14 (11.7)	14 (11.7)
Previous operation			
Yes	3 (2.5)	8 (6.7)	11 (9.3)
No	18 (15.1)	90 (75.6)	108 (90.7)

In our study, 21 (17.6%) patients were identified as having had previous falls. The number of illnesses and drug use of these patients are given in Table 4. Age, gender, education status, living environment, number of drugs used, diseases and p values were compared according to old operative emoticons: 0.434, 0.855, 0.607, 0.502, 0.778, 0.324and 0.384, and there are no significant statistical differences between them (Tables 5 and 6).

Table 5. Comparison of previous fall history in terms of drug use, disease, and previous operation

Previous fall	Drug use	N	%	T	M	SD	t	p
Yes	1-3	9	42.9	21	2.19	1.209	.283	**.778**
	4-5	3	14.3					
	6 and above	5	23.8					
	0	4	19.0					
No	1-3	43	43.9	98	2.11	1.139		
	4-5	16	16.3					
	6 and above	24	24.5					
	0	15	15.3					
	Disease							
	No	12	57.1					
Yes	Osteoporosis. gonartrosis. Artritis	7	33.3					
	Visually	0	0.0	21	.6667	1.064		
	Arrhythmia	1	4.8					
	Epilepsy	1	4.8					
	Vertigo	0	0.0				.990	**.324**
	No	54	55.1					
	Osteoporosis. gonartrosis. Artritis	22	22.4	98	1.0102	1.509		
No	Visually	5	5.1					
	Arrhythmia	8	8.2					
	Epilepsy	2	2.0					
	Vertigo	7	7.1					
	Previous operation							
Yes	Yes	3	14.3	21	1.86	.359		
	No	18	85.7				.874	**.384**
No	Yes	8	8.2	98	1.92	.275		
	No	90	91.8					

Table 6. Comparison of previous fall history in terms of age, sex, education and living space

Previous fall		N	%	T	M	SD	t	z
	Age							
Yes	69 and under	4	19	21	2.66	1.06	.785	**.434**
	70-79	4	19					
	80-89	8	38.1					
	90 and above	5	23.8					
No	69 and under	14	14.3	98	2.50	.84		
	70-79	29	29.6					
	80-89	47	48					
	90 and above	8	8.2					
	Sex							
Yes	Male	6	28.6	21	1.71	.463	.183	**.855**
	Female	15	71.4					
No	Male	30	30.6	98	1.69	.465		
	Female	68	69.4					
	Education							
Yes	Illiterate	12	57.1	21	1.76	.944	.516	**.607**
	Literate	2	9.5					
	Elementary school	7	33.3					
	Middle school	0	0.0					
	High school	0	0.0					
No	Illiterate	59	60.2	98	1.65	.863		
	Literate	14	14.3					
	Elementary school	25	25.5					
	Middle school	0	0.0					
	High school	0	0.0					
	Living space							
Yes	Alone	5	23.8	21	2.43	1.207	.673	**.502**
	With his wife	9	42.9					
	With caregiver	0	0.0					
	With crowded family	7	33.3					
	Nursing home	0	0.0					
No	Alone	24	24.5	98	2.63	1.271		
	With his wife	31	31.6					
	With caregiver	0	0.0					
	With crowded family	43	43.9					
	Nursing home	0	0.0					

4. Discussion

Ninety-one of our participants (75.8%) were at home when they suffered their fall. In the study entitled Seniors' Falls in Canada: Second Report, it was reported that 50% of falls by individuals aged 65 or over occurred in the home and 17% took place in a residential institution. Rao states that one half to two thirds of falls occur in or around the patient's home (5). Masud et al. stated that 65% of women and 44% of men fell in their place of residence (6). Cambell et al. stated that falls are most common in the house and in oftenly used rooms (7). According to this study, it is evident that, of all the rooms in the house, the bedroom has the lowest frequency of falls, and the frequency of falls in bathrooms and toilets are also low. We found that falls at home often occur in the living room, as this is where the patients spent most of their time. Even if we accept that all falls in bathrooms and toilets occur on wet ground, it is evident from this study that the elderly mostly do not fall on wet ground, as the occurrence of these types of falls is much less than in other rooms frequently used. The environmental factors contributing to falls, as stated by Rubenstein et al. (8) included wet floors, bad lighting, and inconvenient bed height; however, these factors do not feature highly on the list of reasons for falls in our study. Rubenstein et al. also stated that the three most common causes off all in elderly patients were: accidents and environment-related factors; gait and balance disorders; and weakness, dizziness, and vertigo. Our studies found the above to be true.

In previous studies, having a history of falls was a risk factor for falling in the elderly. In the study by Rubenstein et al., it was reported that having a history of falls increased the future risk of falling three-fold. A study by Lord et al. showed that 67.7% of 341 participants did not fall during follow-up, and 39.3% had fallen at least once (9). In research by Talarska et al., 506 individuals were studied. Of these, 131 people were considered to tend to fall, according to set criteria, and it was found that 98 of those had already fallen at least once. The remaining 375 individuals were considered not to tend to fall, and it was found that 79 of those had previously fallen. In that study, therefore, 177 of the 506 participants had previously fallen, which is approximately 34% (10). In our study, however, only 21 of the participants (17.6%) had previously fallen; therefore, having a history of falls was not a serious risk factor in our experience.

Tinetti et al. concluded in their study that a multiple-risk-factor intervention strategy resulted in a significant reduction in the risk of falling among elderly persons in the community (11). In their study, patients with risk factors were evaluated; however, our study includes patients with no risk factors. In addition, our study has shown that, despite uncontrolled studies reporting the potential effects of intervention strategies on falls, preventive measures have not proven to be effective in controlled trials to date. These negative results were either too high or too low for a risk of falling because they were not intensive enough. Alternatively, falls among elderly persons may not be preventable (11). Prevention strategies should center around education, training, creating safe environments, prioritising fall-related research and establishing effective policies to reduce risk. As falling risk factors of elderly individuals; (three times), muscle weakness (four times), history of falls and walking-balance disorders (three times), use of assistive devices, vision problems, arthritis, decrease in daily activities, depression, cognitive disorders and over 80 years of age, colleagues pointed out that the balance and gait deficits in their collections in 2010 increased modestly (12). A systematic review found no evidence that refer to vision correction in older people being effective in reducing the numbers of people falling (13). The exercise program was not significantly reduced (14). In the present study, it was found that psychotropic medication significantly reduced the risk of falling, but the medication withdrawal was slow and difficult for the patient. Although some evidence supports the use of home environment assessment and intervention as a strategy to reduce falls, there are mixed reports (15). As regards the use of specific education for the elderly as a preventive measure, there is little evidence of any benefit; however, Duckham et al. did not affect bone mineral density in their randomized controlled trials (16). In a study conducted by Nilsonet al.in Sweden, (17) younger elderly (aged 65–79) were found to have a lower rate of fall-related injuries compared to the previous decade, whereas there was an increase in such incidents in the elderly (aged 80 or older), especially in males. Their study shows that elderly seniors in Sweden are increasingly hospitalized with fewer serious injuries, although more research is needed to fully understand the reasons for the differences between the sexes and different age groups. The change in nature of injuries is important to understand and to include in the future planning of health care and fall prevention.

The greatest challenge to developing countries regarding the prevention of falls in the elderly is the lack of relevant epidemiological data. In developed countries, the greatest challenge is the lack of information on the effectiveness of fall-prevention strategies. In a study in Canada, the issue is summarized as follows: "The research literature on risk factors for falls and on best practices in falls prevention reveals several research gaps (18). There is a lack of knowledge around the efficacy of falls prevention practices for subpopulations of Canadian seniors". In addition, there are several strategies that have been taken to reduce the risk of falling-related injuries among the elderly, but racial, socioeconomic and population disparities have created a knowledge gap and may limit generalizability (19).

In a 2012 report by the World Health Organization (WHO), risk factors for falling and falling injuries of elderly individuals were evaluated under four main headings: biological, socioeconomic, environmental, and behavioral. Biological risk factors, such as age, gender, race, chronic illnesses and decreases in physical cognition and affective

capacity seem to be unchangeable. In underdeveloped or developing countries, it is difficult to improve socioeconomic risk factors as they require material resources that may not be available. When we look at the environmental risk factors, we do not see the environmental factors mostly in the foreground because we deal only with ground depletions relative to our work. According to this report and our study results, the main factors that can be improved are the behavioral risk factors. These potential improvements include increased physical activity, healthy nutrition, proper and controlled regulation of medical treatments, and avoiding actions that could cause a fall. The preventive activities listed by the WHO include the following:

- Screening the living environment for risks;
- Clinical interventions to identify risk factors;
- Treatment of low blood pressure;
- Vitamin D and calcium supplementation;
- Treatment of correctable visual impairment;
- Home assessment and environment modification;
- Prescription of assistive devices to address physical and sensory impairments; and
- Muscle strengthening and balance retraining, incorporating fall prevention education and tai chi-type exercises or dynamic balance and strength training.

These items are discussed in terms of the socio-economic structures of countries, attitudes and behaviors of elderly individuals and their living environments. In Turkey, the greatest obstacles to the successful prevention of falls in the elderly are the lack of available care centers, the individual's desire to stay in their home, and the lack of financial resources to purchase the required equipment. These are perhaps the most common problems in all developing countries. There are also other obstacles, resulting from regional differences.

In conclusion, according to data from the CDC, there were 46 million people aged 65 or older in the US in 2014, with 29 million falls in that year. The elderly population is predicted to increase by 62% to 74 million by 2030, with a 68% increase in falls to 49 million. These data show that, despite all the preventive actions taken, it is not possible to prevent falls in elderly people (21). Despite the challenges mentioned above, educating people about the benefits of healthy ageing, and taking preventive measures will likely help to reduce negative outcomes in the future.

Conflict of interest

The authors declare no conflict of interest.

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