Comparison of Risk Factors for Falls in the Old and the Oldest Old Admitted to the Emergency Department

Acil Servise Başvuran Yaşlı ve İleri Yaşlılarda Düşme Risk Faktörlerinin Karşılaştırılması

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Abstract

Background: Falls can cause a wide range of consequences from a simple injury to life-threatening situations. As falls are a major cause of mortality and morbidity in older adults, it is important to identify risk factors. Our aim was to evaluate fall risk factors in geriatric patients presenting to the emergency department with fall and to evaluate the variability of fall risk factors in the group below and above 85 years of age (oldest old).

Materials and Methods: A total of 132 geriatric patients admitted to the emergency department of a university hospital due to falls were retrospectively analysed. Demographic characteristics and chronic diseases of patients, number of drugs, previous fall history, unintentional weight loss, depressive symptoms, anaemia, urinary incontinence, fear of falling, orthostatic hypotension were recorded. Edmonton frail scale, clock-drawing test and geriatric depression scale score was also evaluated.

Results: The mean age of our study population was 80.5 ±8.3. While 80 (60.6%) of the patients were below 85 years of age, 52 (39.4%) were aged 85 years and older. 62 (47%) of the patients were frail and orthostatic hypotension was found in 10 (7.6%) of the patients. Fear of falling was observed in 67 (50.8%) patients. Polypharmacy was present in 62 (47%) patients. Frequency of diabetes mellitus, frailty, fear of falling, walking aid usage and the need for a regular caregiver were significantly higher and clock-drawing test score was lower in the oldest old group (p<0.05, for all).

Conclusions: Falls are common in older patients. Our study clearly revealed the frequency of fall risk factors in the geriatric population admitted to the emergency department. The frequency of frailty was higher in the oldest old (over 85 years old) who presented with falls, and fear of falling was found in these patients even if there was no previous history of falling. Necessary precautions should be taken considering the negative consequences of falls.

Key Words: Fall, Geriatric, Emergency department, Risk factor, Oldest old

Öz

Amaç: Düşmeler, basit bir yaralanmadan hayatı tehdit eden durumlara kadar geniş bir yelpazede sonuçlara neden olabilir. Düşmeler yaşlı yetişkinlerde önemli bir mortalite ve morbidite nedeni olduğundan, risk faktörlerinin belirlenmesi önemlidir. Amacımız acil servise düşme ile başvuran geriatrik hastalarda düşme risk faktörlerini değerlendirmek ve 85 yaş altı ve üstü grupta düşme risk faktörlerinin değişkenliğini değerlendirmektir.

Materyal ve Metod: Bir üniversite hastanesi acil servisine düşme nedeniyle başvuran 132 geriatrik hasta geriye dönük olarak incelendi. Hastaların demografik özellikleri ve kronik hastalıkları, ilaç sayısı, düşme öyküsü, istemsiz kilo kaybı, depresif semptomlar, anemi, düşme korkusu, ortostatik hipotansiyon varlığı kaydedildi. Edmonton kırılganlık ölçeği, saat çizme testi ve geriatrik depresyon ölçeği skorları da değerlendirildi.

Bulgular: Çalışma popülasyonumuzun yaş ortalaması 80.5 ±8.3 idi. Hastaların 80'i (%60,6) 85 yaş altında iken, 52'si (%39,4) 85 yaş ve üzerindeydi. Hastaların 62'si (%47) kırılgandı, 10'unda (%7.6) ortostatik hipotansiyon vardı. Düşme korkusu 67 (%50,8) hastada gözlenmiştir. 62 (%47) hastada polifarmasi mevcuttu. Diabetes mellitus sıklığı, kırılganlık, düşme korkusu, yürümeye yardımcı cihaz kullanımı ve düzenli bakıcı ihtiyacı 85 yaş üstü grupta anlamlı olarak daha yüksek, saat çizme test skoru daha düşüktü (hepsi için p<0.05.

Sonuç: Yaşlı hastalarda düşmeler yaygındır. Çalışmamız acil servise düşme ile başvuran yaşlılarda düşme risk faktörlerinin sıklığını açıkça ortaya koymuştur. Düşme ile başvuran ileri yaş hastalarda (85 yaş üzeri) kırılganlık sıklığı daha yüksek olup, bu hastalarda daha önce düşme öyküsü olmasa bile düşme korkusu saptanmıştır. Düşmelerin olumsuz sonuçları göz önünde bulundurularak gerekli önlemler alınmalıdır.

Anahtar Kelimeler: Düşme, Geriatrik, Acil servis, Risk faktörü, İleri yaşlı

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Introduction

Old age is a period of life in which many physiological and pathological changes occur. In recent years, as all over the world geriatric population is increasing also in Turkey. Geriatric syndromes are becoming more important day by day due to the increase in the geriatric population in the world (1). Falling is one of the most important geriatric syndromes. It can cause a wide range of consequences from a simple injury to life-threatening situations. Falls are one of the major causes of mortality and morbidity in older adults. Especially in old age, when physical ability decreases and dependency increases, the risk of falls increases in individuals. Studies show that 20-30 % of the older adults fall at least once a year (2). Falls account for 14% of emergency department admissions in the geriatric population and are among the leading causes of hospitalisation. The cost of fall-related injuries alone is an interesting rate of 0.1% of all health expenditure in the United States of America and 1.5% of health expenditure in European countries (3).

According to the data of the behavioural risk factor surveillance system of the United States of America, 27.5% of adults aged 65 years and over have fallen at least once in the last year and 10.2% have fall-related injuries (4). Falls cause both physical and psychological trauma in patients and negatively affect their activities of daily living.

The main risk factors of falls are multi-factorial and they can be classified as intrinsic (patient-related) factors and extrinsic factors. The greater the number of risk factors, the greater the likelihood of a fall. With age, the processing and co-ordination of information from basal ganglia, regular muscle tone, vision, hearing, proprioception, which provide normal walking decrease. Wide-based walking, decrease in walking speed and stride length occur. In addition, increase in comorbid diseases, presence of a history of previous falls, polypharmacy, antihypertensive agents, psychotropic drug use, cognitive impairment, balance problems, depression, anaemia, orthostatic hypotension, osteoporosis, sarcopenia, frailty, decreased hearing and vision are associated with falls (5,6).

In our study, we aimed to evaluate the risk factors for falls in geriatric patients presenting to the emergency department with fall. In addition, it has recently been emphasised that the cognitive, functional, nutritional and physical status of the oldest old (aged 85 years and over) may differ from other age groups, so we also evaluated the variability of fall risk factors in the old (under the age of 85) and the oldest old.

Materials and Methods

Study population and design

This retrospective study was conducted at a university hospital located in a cosmopolitan city, İstanbul, Turkey. The study population consisted of 132 geriatric patients admitted to the emergency department with fall between January 1, 2022 and July 1, 2022. This study was approved by the Local Ethics Committee (Approval number 2023/0428). Demographic characteristics and chronic diseases of patients, number of drugs used, presence of previous fall history, the number of hospital admissions in the last 1 year, ≥1 overnight hospital stay in the last 6 months (excluding emergency department), unintentional weight loss, depressive symptoms, anaemia, urinary incontinence, fear of falling, orthostatic hypotension and some laboratory values including hemoglobin, sodium, glucose, blood urea nitrogen at admission were recorded from the patient files. Edmonton frail scale was used to assess frailty status. In Edmonton frail scale, a score between 0-17 is made and 0-5 points are accepted as 'not frail', 6-7 as 'vulnerable', 8-9 as 'mild frailty', 10-11 as 'moderate frailty' and 12-17 as 'severe frailty' (7). For the anaemia evaluation, a hemoglobin value above 13 g/dl was considered as no anaemia, between 11-13 g/dl as mild anaemia, between 8-11 g/dl as moderate anaemia and below 8 g/dl as severe anaemia in male patients. In female patients, Hgb above 12 g/dl was considered as no anaemia, between 11-12 g/dl as mild anaemia, between 8-11 g/dl as moderate anaemia and below 8 g/dl as severe anaemia. Orthostatic hypotension was diagnosed in the presence of a persistent fall in systolic/diastolic blood pressure of at least 20/10 mm Hg when standing minimum three minutes or when changing from a lying to a sitting position (8). The dehydration status was evaluated by the osmolarity value calculated by the formula: $2Na + glucose/18 + BUN/2.8$. If the calculated osmolarity was <295mOsm/kg, it was considered as no dehydratation, and ≥295mOsm/kg dehydratation (9). Physical performance was evaluated with self-reported difficulty in walking 400 metres. Difficulty in climbing one flight of stairs was also recorded to assess the clinical and functional status of the participants (10). Clock-drawing test was performed to screen for cognitive dysfunction. A score below 4 out of 6 was considered as impaired cognitive function (11). To determine the presence of probable depression, geriatric depression scale (GDS) was applied. out of 15 points, 5 and above were considered as possible depression (12). All of the tests were performed by the emergency medicine physician who evaluated the patient. Unintentional weight loss was considered to be a loss of 5% of body weight in one month or 10% over a period of six months or longer and was based on patients' or caregivers' verbal statements (13). Recent hospitalisation history was considered as hospitalisation for one or more nights in the last 6 months. Any problems with vision, need walking aid and the need for a regular caregiver were recorded according to the patient's or caregiver's verbal report.

Exclusion criteria

Patients under 65 years of age, who are unable to answer the questions, unstable patients in need of urgent treatment and patients with missing data were not included in the study.

Statistical analysis

Categorical variables were expressed as numbers and percentages. Continuous variables were
presented as mean ± standard deviation. Chi-square test was used for categorical variables. Students t-test was used for continuous variables. P value <0.05 was considered statistically significant. Statistical Package for the Social Sciences-21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) was used for the analysis of the clinical data.

Results

The mean age of 132 patients who presented to the emergency department with fall was 80.5 ±8.3. While 80 (60.6%) of the patients were below 85 years of age, 52 (39.4%) were aged 85 years and older. The majority of the patients (61.4%) were female (n=81). The most common chronic disease was hypertension (64.4%). In terms of fall risk factors, 63.6% (n=84) of the study population had a history of falls within the last 1 year and 36.4% (n=48) within the last 3 months. Polypharmacy was detected in 47% (n=62) of the patients. Orthostatic hypotension was found in 10 (10.8%) of 92 patients who could be evaluated. In terms of anemia, 35 (26.5%) of the patients had moderate or severe anemia. Of the patients 9.8% (n=13) were severely frail. According to the clock drawing test, 38.6% (n=51) of the patients had impaired cognitive functions and 29.5% (n=39) had possible depression according to the GDS. The characteristics, geriatric syndromes and risk factors of the patients are given in table 1.

Fatigue was present in 67 patients (50.8%) and involuntary weight loss was present in 20 patients (15.1%). 47 patients (35.6%) stated that they had great difficulty or could not climb one flight of stairs, 58 (43.9%) stated that they had great difficulty or could not walk 400 m. 50.8% (n=67) of the patients had fear of falling and 42.4% (n=56) were using a walking aid. 68 (51.5%) patients stated that they needed a regular caregiver to help with daily tasks. Of the patients who needed a caregiver, 49 (72%) were frail. For physical performance, hospitalization history, fall-related symptoms and support needs of fall patients see table 2.

In addition, the patients were divided into 2 groups, patients under 85 years of age and patients 85 years of age and older (oldest-old) and compared in terms of clinical characteristics and fall risk factors. For comparison of characteristics and fall risk factors of the patients under and above 85 years of age see table 3.

Frequency of diabetes mellitus, frailty, fear of falling, difficulty in walking 400 m, difficulty climbing one flight of stairs, mobility device usage and the need for a regular caregiver were significantly higher and clock-drawing test score was lower in the oldest-old group (p<0.05, for all). There was no significant difference between the two groups in terms of the frequency of chronic diseases except diabetes mellitus. Likewise, history of fall and hospital admission in the last one

year were not significantly different between the two groups (p=0.714; p=0.451 respectively). Comparison of physical performance, hospitalization history, fall-related symptoms and support needs of patients under and above 85 years of age is given in table 4.

Table 1. Characteristics, geriatric syndromes and risk factors of the patients presented to the emergency department with fall

	All patients (n=132)
Age (years), *	80.5 ±8.3
Age, groups, n (%) 65–74 75–84 ≥85	 42 (31.8%) 38 (28.8%) 52 (39.4%)
Gender Male (%) Female (%)	 51(38.6%) 81 (61.4%)
Number of chronic diseases*	2.0 ±1.2
Comorbidity n (%) Hypertension Diabetes mellitus Cancer Pulmonary disease Coronary artery disease Arrhythmia Chronic kidney disease Osteoporosis Cerebrovascular disease Dementia Parkinson's disease Benign prostatic hyperplasia	 85 (64.4 %) 40 (30.3 %) 5 (3.7%) 6 (4.5%) 39 (29.5 %) 22 (16.7%) 10 (7.6 %) 8 (6%) 7 (5.3%) 14 (10.6%) 5 (3.8%) 9 (6.8%)
Number of drugs*	4.3 ±2.5
Polypharmacy	62 (47%)
Urinary incontinence, n(%)	62 (47%)
Orthostatic hypotension No Yes Can not be evaluated	 82 (62.1%) 10 (7.6%) 40 (30.3%)
Anemia, n (%) No anemia Mild Moderate Severe	 57 (43.2%) 40 (30.3 %) 30 (22.7 %) 5 (3.8%)
Dehydratation status, n (%) No dehydratation Dehydratation	 100 (75.8%) 32 (24.2%)
Frailty status, n (%) Non-frail Frail	 70 (53%) 62 (47%)
Geriatric depression scale score *	3.6 ±2.8
Clock-drawing test score*	3.9 ±1.4

Data are shown as mean ±standard deviation (SD) or median (interquartile intervals).

Table 2. Physical performance, hospitalization history, fall-related symptoms and support needs of fall patients

	All patients (n=132)
Previous history of fall, n(%)	84 (63.6%)
Difficulty in walking 400 m, n(%)	
No	74 (56.1%)
Yes	58 (43.9%)
Difficulty climbing one flight of stairs, n(%)	
No	85 (64.4%)
Yes	47 (35.6%)
Fear of falling, n(%)	67 (50.8%)
Presence of hospital admission in the last year, n (%)	113 (85.6)
Presence of recent hospitalization history, n(%)	21 (15.9%)
Unintentional weight loss, n(%)	20 (15.2%)
Fatigue, n(%)	67 (50.7%)
Vision problems, n(%)	77 (58.3%)
Walking aid usage, n(%)	56 (42.4%)
The need for a regular caregiver, n(%)	68 (51.5%)

Table 3. Comparison of characteristics and fall risk factors of the patients under and above 85 years of age

	<85 years of age (n=80)	≥ 85 years of age (n=52)	p
Age (years), *	75.1 ±5.7	88.8 ±3.4	**<0.001**
Gender (Female)	51 (63.7%)	30 (57.7%)	0.584
Number of chronic diseases*	2.0±1.2	2.0±1.1	0.909
Hypertension, n(%)	55 (68.8%)	30 (57.7%)	0.264
Diabetes mellitus, n(%)	32 (40%)	8 (15.4%)	**0.003**
Coronary artery disease, n(%)	23 (28.7%)	16 (30.8%)	0.804
Arrhythmia, n(%)	11 (13.8%)	11(21.2%)	0.265
Pulmonary disease, n(%)	4 (5%)	2 (3.8%)	1
Chronic kidney disease, n(%)	5 (6.2%)	5 (9.6%)	0.514
Dementia, n(%)	7 (8.8%)	7 (13.5%)	0.390
Parkinson's disease, n(%)	4 (5%)	1 (1.9%)	0.646
Cerebrovascular disease, n(%)	5 (6.2%)	2 (3.8%)	0.703
Dehydratation, n(%)	16 (20%)	16 (30.8%)	0.158
Orthostatic hypotension, n(%)	5 (8.1%)	5 (16.7%)	0.214
Number of drugs*	4.3±2.6	4.2±2.3	0.742
Polypharmacy, n(%)	36 (45%)	26 (50%)	0.574
Frailty, n(%)	30 (37.5%)	32 (61.5%)	**0.007**
Geriatric depression scale score*	3.4±2.8	4.0±2.9	0.231
Clock-drawing test score*	4.2 ±1.3	3.5±1.5	**0.006**
Urinary incontinence, n(%)	33 (41.2%)	29 (55.8%)	0.102

Data are shown as mean ±standard deviation (SD) or median (interquartile intervals).
Note: Statistically significant P values are indicated as bold.

Table 4. Comparison of physical performance, hospitalization history, fall-related symptoms and support needs of patients under and above 85 years of age

	<85 years of age (n=80)	≥ 85 years of age (n=52)	p
Difficulty in walking 400 m, n(%)	26 (32.5%)	32 (61.5%)	**0.001**
Difficulty climbing one flight of stairs, n(%)	17 (21.2%)	30 (57.7%)	**<0.001**
Previous history of fall, n(%)	52 (65%)	32 (61.5%)	0.714
Hospital admission in the last one year, n(%)	67 (83.8%)	46 (88.5%)	0.451
Recent hospitalization history, n(%)	16 (20%)	5 (9.6%)	0.111
Fear of falling, n(%)	33 (41.2%)	34 (65.4%)	**0.007**
Walking aid usage, n(%)	19 (23.8%)	37 (71.2%)	**<0.001**
The need for a regular caregiver, n(%)	31 (38.8%)	37 (71.2%)	**<0.001**
Vision problems, n(%)	28 (35%)	27 (51.9%)	0.054

Note: Statistically significant P values are indicated as bold.

Discussion

Falls are an important geriatric syndrome with negative consequences. At the time of presentation after a fall in emergency departments, traumas related to the fall are generally focused on and the investigation of risk factors that may cause falls is overlooked. In our study in which we comprehensively evaluated the risk factors for falls in older patients, we showed that older individuals fell frequently, they may fall repeatedly and there are many risk factors that cause falls. We also evaluated the variability of fall risk factors and fall-related symptoms in the old and the oldest old. Our study is also important in terms of drawing attention to the clinical differences of the oldest old group.

In our study, we demonstrated that falls occur more frequently with increasing age. Advanced age is an important risk factor for falls (14). With increasing age, changes in the neuromuscular system, malnutrition, geriatric syndromes such as sarcopenia, and visual problems occur and cause falls (15). The majority of the study population had chronic diseases, and the most common diseases were hypertension and diabetes mellitus. Falls may occur due to medications in hypertension. In addition, impaired brain perfusion may also occur in hypertensive patients (16). Diabetes mellitus lead to the need for frequent urination. In addition, some oral antidiabetics may have caused urinary tract infection and thus pollacuria, and this may have caused the falls. Some pathologies such as Parkinson's disease, cerebrovascular disease is known to directly affect the balance. In Parkinson's disease, leg muscles rigidity, blood pressure lowering effects of drugs and cognitive impairment increases the risk of falls (17).

Savas S et al. found that the frequency of falls in older patients was 35.7%, the presence of a history of falls was 24.3% and the frequency of fear of falling was 20.3%, in their study (18). All of these rates were much higher in our study. This may be due to the higher average age and more fragile nature of our study population. The fact that the frequency of

walking aid use was much higher in our study also strengthens this hypothesis. It has already been observed in studies that the presence and degree of frailty is closely related to falls (14). We did not find a statistically significant difference between the old and the oldest old in terms of history of fall (p=0.714), while fear of falling was significantly higher in the oldest old group (p=0.007). This may suggest that even if they had not fallen before, patients may have developed a fear of falling due to conditions such as increased frailty and decreased physical performance with advancing age.

The cognitive, functional, and physical status of the oldest old may differ from other age groups (19). In our study, the physical performance of the oldest old group was significantly lower. This group was more frail and had significantly worse cognitive function compared to the group under 85 years of age. The frequency of walking aid use and the need for a regular caregiver were significantly higher in this group. Therefore, our results support that the oldest group is different from the other groups in many aspects.

Our study has some limitations. First, we would like fall patients to be diagnosed with sarcopenia and other geriatric syndromes with tests and further examinations as specified in the guidelines. Data on the timed up and go test, in which we can evaluate the risk of falls, could not be found. Again, we would have liked to have visual disorders diagnosed after the examination of the relevant branch physician rather than the patient's verbal statement, but it was not possible in the emergency department conditions. Another limitation was the small sample size. More comprehensive studies addressing this issue are needed.

In conclusion, falls are common in geriatric patients. Our study clearly revealed the frequency of fall risk factors in the geriatric population admitted to the emergency department. Age was one of the most important risk factors for falls. The

frequency of frailty was higher in the oldest old (over 85 years old) who presented with falls, and fear of falling was found in these patients even if there was no previous history of falling. Necessary precautions should be taken considering the negative consequences. Patients presenting to emergency departments with falls should not only be evaluated in terms of trauma, but also the underlying fall risk factors should be questioned. Afterwards, the fall risk of the geriatric patients should be re-determined at each visit. It should be kept in mind that the oldest old group should be evaluated more carefully, taking into account their clinical differences.

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