

Evaluation Of Patient Characteristics And Outcome In Fall From Height

Yüksekten Düşmelerde Olay Yerine Göre Klinik Gidişat Farklılıkları ve Hasta Karakteristikleri

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ABSTRACT

Objective: Falls from height are the second leading cause of death from accidental injury in the south-east of Turkey. In this present study, we aimed to describe the patient characteristics and outcome differences according to scene of accident in fall from height.

Materials and Method: One-hundred and fourty patients who fallen from height were analyzed retrospectively based on demographic characteristics, transport distance, and mortality frequencies. Patients allocated into two groups. First group being by referred from city center and second group was by referred from the provinces. Chi-square test use to compare categorical variations and values were expressed as mean \pm SD. P values of 0.05 or less were considered statistically significant.

Results: Ninty-one (65%) of patients were males and the mean age of patients were 15.8 ± 14.7 years. Fifty-four (38.6%) of patients were in 2nd group. There was no significant sex difference between two groups ($p=0.373$). Pediatric age group was the majority of patients for both groups. 6 patients (4.3%) were accepted as cardiopulmonary arrest at first application. Sixty-four (45.7%) of total patients were treated and discharged from ED. The remaining 64 (45.7%) patients were hospitalized. Nine of patients were died while admitting to hospital. Mortality ratio was 14.06% in hospitalized patients, total mortality ratio was 10.71% ($n=15$).

Conclusion: We could not find any significant effect of scene of accident on mortality for fall from height patients.

Keywords: Epidemiology, falling from height, trauma

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ÖZET

Amaç: Yüksekten düşmeler Türkiye'nin güneydoğusunda kazara ölüm nedenleri içerisinde ikinci sırada yer almaktadır. Sunulan bu çalışmada, yüksekten düşmelerde olay yerine göre klinik gidişat farklılıkları ve hasta karakteristiklerinin tespiti amaçlanmıştır.

Yöntem ve Gereç: Acil servise sevk edilmiş 140 yüksekten düşme olgusu demografik karakteristikleri ve mortalite sıklıklarına göre geriye dönük olarak değerlendirilmiştir. Hastalar iki gruba ayrılmıştır. Birinci grup şehir merkezinden sevk edilenler, ikinci grup ise şehir merkezi dışından sevk edilenler tarafından oluşturulmuştur. Kategorik değişiklikleri kıyaslamak için ki-kare testi kullanılmış ve değerler ortalama \pm standart sapma olarak verilmiştir. P değeri 0,05 veya altında olanlar istatistiksel olarak anlamlı kabul edilmiştir.

Bulgular: Hastaların 91'i (%65) erkekti ve ortalama yaş $15,85 \pm 14,86095$ (95% GA) idi. Hastaların 54'ü (%38,6) ikinci grupta yer almaktaydı. Her iki grup arasında anlamlı cinsiyet farklılığı tespit edilmedi ($p=0.373$). Her iki grup içinde çocuk yaş grubu hastalar büyük çoğunluğu oluşturmaktaydı. 6 (%4,3) hasta ilk başvuruda kardiyopulmoner arrest olarak kabul edildi. Hastaların 64'ü (%45,7) acil servisten tedavi edilip, taburcu edildi. Kalan 64 hasta ise yatırıldı. Hastaların 9'u yatar iken öldü. Yatırılan hastalarda mortalite oranı %14,06, genel mortalite oranı ise %10,71 ($n=15$) idi.

Sonuç: Çalışmamızda yüksekten düşme olgularında olay yerinin mortalite üzerine anlamlı bir etkisini saptayamadık.

Anahtar kelimeler: Epidemiyoloji, Travma, Yüksekten düşme

Introduction

Falls from high places is frequently encountered in suicide, in some accidents and sometimes in homicides ⁽¹⁾. Falls from height are predominantly an urban phenomenon and represent an important form of blunt trauma ⁽¹⁾. After motor vehicle-related injuries, falls from height, especially from flat-roofed houses, are the second leading cause of death from accidental injury in the south-east of Turkey ⁽²⁾.

Accidental injury can occur anywhere at any time. The critically injured victim must reach definitive care within a short period of time, often called as "golden hour", to prevent from death or disability. Studies have shown that available coordination of the emergency medical resources in an area can result in a major decrease in preventable trauma death rates ⁽³⁻⁶⁾.

Study Aims

In this present study, we aimed to describe the patient characteristics and outcome differences according to scene of accident in fall from height.

Materials and Method

The patients admitted to a university hospital emergency department (ED) because of falling from height between 1st January and 31st December 2006 were retrospectively analyzed from the patient medical records and the police reports. One-hundred and forty patients were enrolled into study. Patients were analyzed based on demographic characteristics (such as age and sex), admission, disposition, and mortality frequencies. Patients have allocated into two groups. First group was being by referred patients from city center and second group was being by referred patients from the provinces by emergency medical system (EMS) and/or by their probabilities. The Statistical Package for Social Sciences computer program, version 11.5 was performed for statistical analyzes. Test was used to compare categorical variations and values were expressed as means \pm SD. P values of 0.05 or less were considered statistically significant.

Results

Characteristics of the Study Group

Of the 140 patients, 91 (65%) were male and 49 (35%) were female. The mean age of patients were 15.85 ± 14.86095 and ranged between 3 months and 60 years old (CI 95%). Ninety one (65%) of them were children and 60 (42.9%) of them were 6 years old and under. Patient characteristics have shown in *Table 1*.

Table 1. Patient characteristics

	Age Groups (years)							of Total
	Children 91 (65)		Adults 49 (35)					
	1-6	7-18	19-29	30-39	40-49	50-59	≥ 60	
Male	32 (22.9)	22 (15.7)	13 (9.3)	11 (7.9)	8 (5.7)	4 (2.9)	1 (0.7)	91 (65)
Female	28 (20.0)	9 (6.4)	7 (5.0)	3 (2.1)	1 (0.7)	1 (0.7)	0 (0.0)	49 (35)
of Total	60 (42.9)	31 (22.1)	20 (14.3)	14 (10.0)	9 (6.4)	5 (3.6)	1 (0.7)	140 (100.0)
Data had given n (%)								

Patient Characteristics and Scene of Accident Relation

Fifty-four (38.6%) of patients were admitted to ED from out of the city center. Thirty (21.4%) of them referred or transferred from different towns and 24 (17.1%) were from different villages. Most of them (61.4%) were become from the city center. Minimum transfer distance was nearly 3 kilometers while the maximum was 104 kilometers far to our ED (according to scene of accident).

Most of the patients were male who referred from the province and city center. Male to female ratio was 1.84 for the province and 1.86 for the city center. There was no statistically significant sex difference between two groups ($p=0.373$). Sex and scene of accident relation had shown in *Table 2*.

Table 2. Sex and scene of accident relation

	Sex		of Total
	Female	Male	
Group 1			
Town	17 (12.1)	13 (9.3)	30 (21.4)
Village	18 (12.9)	6 (4.3)	24 (17.1)
Group 2			
City Center	56 (40.0)	30 (21.4)	86 (61.4)
of Total	91 (65.0)	49 (35.0)	140 (100)
Data had given n (%)			

Thirty four (24.3%) of patients who were in pediatric age group were described as referred from the province. This ratio was 40.7% in ($n=57$) patients who were referred from the city center. Also in adults, it was found as 14.3% ($n=20$) for who were referred from the province and 20.7% ($n=29$) for who referred from city center. Either referred from province or city center, pediatric age group was the majority of patients. However, the ratio was 1.47 between pediatric age group patients who were referred from the city center to province. The ratio of pediatric patients who referred from the city center was significantly higher than referred from the province. The relationship between age and scene of accident was shown in *Table 3*.

Outcome

Sixty-six (47.1%) of patients, which were evaluated in ED, had life threatening injuries. Six (4.3%) of them were accepted cardiopulmonary arrest at first application and have no answer to cardiopulmonary resuscitation. Sixty-four (45.7%) of total

Table 3. The relationship between age and scene of accident

	Age Groups (years)							of Total
	Children 91 (65)		Adults 49 (35)					
	1-6	7-18	19-29	30-39	40-49	50-59	≥60	
Group 1								
Town	15 (10.7)	7 (5.0)	2 (1.4)	4 (2.9)	2(1.4)	0 (0.0)	0 (0.0)	30 (21.4)
Village	7 (5.0)	5 (3.6)	4 (2.9)	4 (2.9)	2(1.4)	2(1.4)	0 (0.0)	24 (17.1)
Group 2	38 (27.1)	19 (13.6)	14 (10.0)	6 (4.3)	5 (3.6)	3 (2.1)	1 (0.7)	86 (61.4)
of Total	60 (42.9)	31 (22.1)	20 (14.3)	14 (10.0)	9 (6.4)	5 (3.6)	1 (0.7)	140 (100.0)

Data had given n (%)

Table 4. Relationships among scene of accident, the patient outcomes and hospitalization ratios

	Scene of Accident			
	Town	Village	City Center	of Total
Outcomes				
Treated and discharged from ER	13 (9.3)	14 (10.0)	37 (26.4)	64 (45.7)
Referred to other tertiary hospitals	1 (0.7)	0 (0.0)	5 (3.6)	6 (4.3)
Accepted cardiopulmonary arrest at first application	3 (2.1)	0 (0.0)	3 (2.1)	6 (4.3)
Hospitalization				
Anesthesia and Reanimation ICU	1 (0.7)	1 (0.7)	11 (7.9)	13 (9.3)
Orthopedics and Traumatology Department	1 (0.7)	3 (2.1)	5 (3.6)	9 (6.4)
Pediatrics Department	1 (0.7)	1 (0.7)	0 (0.0)	2 (1.4)
Pediatric Surgery Department	1 (0.7)	2 (1.4)	6 (4.3)	9 (6.4)
Neurosurgery Department	8 (5.7)	2 (1.4)	15 (10.7)	25 (17.9)
Urology Department	0 (0.0)	1 (0.7)	0 (0.0)	1 (0.7)
General Surgery Department	1 (0.7)	0 (0.0)	3 (2.1)	4 (2.9)
Ear Throat and Nose Department	0 (0.0)	0 (0.0)	1 (0.7)	1 (0.7)
	13 (9.3)	10 (7.1)	41 (29.3)	64 (45.7)
of Total	30 (21.4)	24 (17.1)	86 (61.4)	140 (100)

Data had given n (%)

ICU: intensive care unit

Table 5. Patient outcomes and sex relation

	Sex		of Total
	Male	Female	
Outcome			
Treated and discharged from ER	43 (30.7)	21 (15.0)	64 (45.7)
Referred to other tertiary hospitals	4 (2.9)	2 (1.4)	6 (4.3)
Accepted cardiopulmonary arrest at first application	2 (1.4)	4 (2.9)	6 (4.3)
Anesthesia and Reanimation ICU	7 (5.0)	6 (4.3)	13 (9.3)
Orthopedics and Traumatology Department	7 (5.0)	2 (1.4)	9 (6.4)
Pediatrics Department	1 (0.7)	1 (0.7)	2 (1.4)
Pediatric Surgery Department	3 (2.1)	6 (4.3)	9 (6.4)
Neurosurgery Department	21 (15.0)	4 (2.9)	25 (17.9)
Urology Department	0 (0.0)	1 (0.7)	1 (0.7)
General Surgery Department	2 (1.4)	2 (1.4)	4 (2.9)
Ear Throat and Nose Department	1 (0.7)	0 (0.0)	1 (0.7)
of Total	91 (65.0)	49 (35.0)	140 (100)

Data had given n (%)

ICU: intensive care unit

patients were treated, observed and discharged from ED within 24 hour. Six (4.3%) were referred to other tertiary hospitals because of intensive care unit (ICU) requirement. The remaining 64 (45.7%) of patients were hospitalized in different departments and anesthesia and reanimation ICU.

Neurosurgery department was the leading service with 17.9% admission ratio, anesthesia and reanimation ICU was the second with 9.3%. Hospitalization ratios were 9.3% for patients who referred from town, 7.1% for referred from village and 29.3% for referred from city center. Relationships among scene of accident, the patient outcomes and hospitalization ratios have been shown in *Table 4*. Female to male ratio was 2 times higher in patients who were hospitalized to pediatric surgery department and also in which accepted cardiopulmonary arrest at first application. Patient outcomes and sex relation was shown in *Table 5*.

Nine of patients were died while admitting to hospital. We could not get any information about 6 patients which were referred to other tertiary hospitals. Five of these referred patients had been transported from city center. Mortality ratio was 14.06% in hospitalized patients (2 from pediatrics and general surgery, 2 from neurosurgery and 5 from anesthesia and reanimation ICU). Mortality ratio was 10.71% (n=15) with patients which were accepted cardiopulmonary arrest at first application and 93.3% of total deaths were under 50 years old and 53.3% were younger than 18 years old.

Discussion

Trauma is a disease of epidemic proportion. Each year, over 140.000 lives in the USA are ended, suddenly, unexpectedly, brutally, by this killer⁽³⁾.

Patient characteristics

In Author's study, male patient group intensity was found as high as concordant with other studies which performed on trauma in Turkey^(2,6,7) and/or in other countries^(3-5,8-10). This male intensity was reported similar in fall from height for children to^(11,12,13). This result can explain with to be more active of boys in childhood and to be more crowded of males in job life for Turkey.

However, Holbrook et al⁽¹⁴⁾ reported that to be female was an independent factor from injury severity and mechanism after major trauma. Also reported it causes more functional and psychiatric problems even males more frequently exposed to trauma due to motor vehicle and job accidents. Trauma is the leading cause of death under age 44, and the leading cause of disability for all people under 65 years old^(3-6,8-10). Our results on patient age were similar with the literature (42.9% for younger than 6 years and 89.3% for younger than 40 years old patients)^(1,2,6,7,11-13).

Outcome Differences and Mortality

Yagmur et al⁽⁶⁾ were reported that the trauma related mortality rate was 329/1.5 million per year in the most crowded city of southeast Turkey in their study. Also reported that fall from a roofed-flat of house is a major cause of deaths. In the same

study, 80% of deaths were under 40 years old and 51% were under 20 years old.

In this present study overall mortality rate was 10.71%. It is higher than 3.6% as in reported by Bulut et al⁽¹⁵⁾ and 5.8% by Yagmur et al⁽²⁾, but similar to 11.0% by Mosenthal et al⁽¹⁶⁾. Although, Mosenthal et al⁽¹⁶⁾ suggested that mortality rate can increase from %2 to 35% in adults.

Relationship between trauma application volume and mortality ratios was an important subjects that talking on is necessary. As a thesis, while trauma management capacity and patient load increase, trauma mortality can elevate. Contrary to this, level 1 trauma centers' patient care success was higher and mortality ratios were fewer than others, because of infrastructure. About subject, Demetriades et al⁽¹⁷⁾ was reported mortality ratios were less in biggest and patient application number highest trauma centers which serves multi-trauma care than in small centers. The hospital, which this study was performed, is a small trauma center. This can explain the reason of high mortality ratio for our study.

Scene of accident and transportation

Lots of studies submitted that the mechanism of falls from height was varied based on age of the patients⁽¹⁾ and frequently occurred respectively as fall from balconies, roofs, stairs, windows, donkey or horse, motor vehicle, in adults⁽¹⁾ and as fall from windows, balconies, and in home accidents (fall from armchair, bed or cradle) for children^(11,13).

In Turkey, prehospital emergency medical and trauma care systems are still developing. It was determined that 2/3 of the deaths occurred after arrival at hospital, with 1/3 were in prehospital setting. In other countries, which economically developed and having organized, advanced hospital care system, this ratio is reverse⁽⁶⁾. Similarly, in our report, 9 of 15 deaths were established in hospital setting to.

There is not enough study on prehospital transport period and mortality rate relation in trauma patients in our country yet. However, in their study, which performed on children who were fallen from height, Guzel et al⁽¹¹⁾ was suggested 44.1% of patients were arrive to hospital ED in first hour of accident and 62.8% of all had been come by their vehicle. In Wang et al⁽¹³⁾ study, this ratio was reported, to be 17.0% for transportation by their car or vehicle, while 70.0% by ambulance or other medical equipments.

Study Limitations

In our retrospective study, inefficient records of patient medical data did not let us for more detail evaluation. Can not determine of emergency service arrival period, transportation kind and appropriateness, and trauma scores of patients was affected negatively to describe of effective factors on mortality. Shortness of study period and relatively insufficiency of study group can caused to determine of mortality ratios more elevated than due. Also, minority of application number due to fall from height can be a result of authors' medical center is not alone center that serves to trauma patients in our region. In fall from height patients, by the severity of trauma, affected

systems and organ damages were quite effective on prognosis (11,13).

Early and appropriate interventions in trauma patients were usually a life saver factor (2,11,13). The management of accidental free-fall injuries is same as for any trauma. Rapid multidisciplinary assessment of patients and stabilization with particular attention to airway maintenance and haemodynamic resuscitation is the initial concern (6).

Conclusion

In our study, we could not find any significant effect of scene of accident on mortality for fall from height patients. We recommend further prospective investigations which perform with more crowded study group and in long time period. Also, adding some variables to new studies as severity of patient at the application, trauma mechanism, transportation kind, time, and interventions will be appropriate for increase the study reliability.

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