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Evaluation of home accidents of forensic nature among children

■ Nusret Ayaz¹, ■ Kasim Turgut², ■ Muhammet Gokhan Turtay³, ■ Taner Guven⁴, ■ Mucahit Oruc⁵, ■ Osman Celbis⁵

¹Nigde Training and Research Hospital, Department of Forensic Medicine, Nigde, Turkey

²Adiyaman University Faculty of Medicine, Department of Emergency Medicine, Adiyaman, Turkey

³Inonu University Faculty of Medicine, Department of Emergency Medicine, Malatya, Turkey

⁴Malatya Training and Research Hospital, Department of Emergency Medicine, Malatya, Turkey

⁵Inonu University Faculty of Medicine, Department of Forensic Medicine, Malatya, Turkey

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Abstract

To examine the clinical and demographic characteristics of forensic home accidents and fatal injuries. Hospital and forensic records were examined and patients aged ≤ 16 years, referred to our hospital after a home accident, were included in the study. The age, gender, type of injury, injured body area, month of accident, outcome, and department of admission were recorded for each patient. Then, the forensic records were examined and the cases were divided into two groups as those with and without fatal injuries. The characteristics of the two groups were compared using the chi-square test, and the statistical differences were determined. In a three-year period, a total of 453 home accidents considered to be forensic cases were identified. The mortality rate was calculated as 1.8%, and according to the forensic reports, 33.3% of the cases had fatal injuries. While blunt traumas were most common with a rate of 54.1%, burn injuries were found to be most fatal ($p < 0.001$). The majority of injuries were seen in the head and neck, and the risk of fatal injuries was higher in multiple trauma cases in which two or more body systems were affected ($p < 0.001$). Pediatric home accidents are most seen in the age range of 3-6 years, and the risk of fatal injuries is higher in patients with burns and injuries affecting more than one system.

Keywords: Accident, children, fatal injury

Introduction

Home accidents are among the main causes of preventable injuries and deaths among children and young people. Although there are many definitions in the literature, WHO describes an accident as a sudden developing external force creating an unwanted physical or mental damage to the human body. This undesired situation occurring at home is referred to as a home accident [1]. Home accidents account for approximately half of all accidents and are increasing steadily. In a study conducted in Brazil, 42% of pediatric accidents occurred in the home environment [2]. In the United States, 7/100.000 deaths and more than 12 million injuries are reported annually due to home accidents [3].

Studies have shown that children and patients over 65 years of age are most affected by home accidents. For children, home accidents continue to be a serious problem for both developed and developing countries.

Twenty-six percent of all accidents between the ages of 0-19 years are reported to take place at home. In the USA, after traffic accidents, home accidents have been identified as the second most common cause of death in children [4]. It is stated that 40% of deaths between the ages of 1-4 years are caused by home accidents, and this rate is even higher than mortality caused by congenital diseases. The main reason for these accidents is that children spend a long time in their homes and are not aware of the environmental hazards and feel freer to act on their curious nature [5,6].

Drowning, burns, falls, poisoning, and penetrating objects are the main causes of seen in home accidents [7]. In an autopsy study of patients that died as a result of a home accident in Turkey, it was determined that the accidents were mostly due to poisoning, falls or blunt traumas, asphyxia, and burns [4]. In a study conducted in the UK, of the children referred to hospital after a home accident, 21% had small cuts, 19% had hematoma and ecchymosis, 13% had fractures, 12% had sprains, 12% had edema, and 6% had ecchymosis [8].

*Corresponding Author: Nusret Ayaz, Nigde Training and Research Hospital, Department of Forensic Medicine, Nigde, Turkey. E-mail: nusretayaz@gmail.com

Most home accidents occur in countries with a low to moderate income. However, there is not sufficient data reported from many

developing countries, which constitutes a significant gap in the literature [5]. This study aimed to investigate the demographic and clinical characteristics of the patients referred to the emergency medicine clinic after home accidents and determine the fatal nature of the injuries.

Material and Methods

Study Design and Setting

This descriptive retrospective study was conducted in the emergency medicine clinic of a tertiary hospital. In our hospital, pediatric patients (<18 years of age) presenting with trauma are admitted to the adult emergency medicine clinic, and those referred for non-traumatic reasons are admitted to the pediatric clinic. In this study, children aged 0-16 years who were admitted to our adult emergency medicine clinic due to unintentional home injuries between 2014 and 2016 were examined. The study was started after the approval of the scientific research and publication ethics committee of Inonu University (Ethics committee number: 2016/4-2).

Study Population and Protocol

Only pediatric patients with trauma injuries are admitted to our adult emergency medicine clinic; therefore, trauma patients aged ≤16 years are easily identified from the records of our emergency clinic. The forensic medicine records were examined, and child traumas were noted. These reports and hospital records were examined, and only forensic unintentional home injuries were identified. The age, gender, type of injury (blunt, penetrating or burn), body area affected by injury, month of accident, outcome, and whether the patient was hospitalized were investigated for each of the identified cases. In addition, the forensic reports written by the forensic physician were examined, and the presence or absence of fatal situations was noted. Based on this information, the cases were divided into two groups as those with and without fatal injuries. By comparing the previous recorded clinical and demographic characteristics of the two groups, the statistical differences were determined.

The forensic reports held at the hospital are the notes stating the expert opinion of physicians concerning an injury [9]. The basic information that should be included in these notes is whether a case is fatal or has resolved by a simple medical intervention. In Turkey, the presence of a fatal injury is determined following the guidelines for the forensic medicine evaluation of criminal injuries defined by the Turkish Penal Code prepared by the Forensic Medicine Institute of Ministry of Justice, the Forensic Medicine Experts Association, and the Forensic Medicine Association. According to these guidelines, fatal injuries include skull fractures, intracranial hemorrhages, major vessel injuries, more than 20% second-degree and more than 10% third-degree burns, and flail chest [10].

The current study did not include cases over the age of 16 years, injuries that occurred outside the home environment, non-traumatic presentations, such as poisoning and drowning, and cases with no forensic reports.

Statistical Analysis

SPSS program version 17.0 was used in the study. The compliance of the continuous data to normal distribution was determined

by the Kolmogorov-Smirnov test. Normally distributed data were analyzed by Student's t-test and the data that did not have normal distribution were analyzed by the Mann-Whitney U test. Quantitative data were shown as mean ± standard deviation. The chi-square test was used to compare qualitative data. Categorical variables were expressed as number and percentages. The percentages were rounded up if necessary. The values of $p < 0.05$ were considered statistically significant.

Results

In the three-year period, of the study, 1,594 children were admitted to our emergency medicine clinic due to trauma. Among these presentations, the number of cases due to home accidents was 538, of which 453 (28.4%) were also evaluated as forensic cases. The mean age of these 453 cases included in the study was 4.77 ± 3.55 (range 0-16) years. While 219 of the cases were treated at and discharged from the emergency medicine clinic, 226 were hospitalized and a total of eight patients died in the emergency or the department to which they had been admitted. Of the hospitalized patients, 23.2% were admitted to the burns unit and 13.5% to neurosurgery (Table 1). It was determined that the most common injuries occurred in June, August, and April (Figure 1).

Table 1. Characteristics of the sample

		n = 453	%
Outcome	Discharged	219	48.3
	Hospitalized	226	49.9
	Died	8	1.8
Services	Neurosurgery	61	13.5
	Orthopedics	21	4.6
	Burn unit	105	23.2
	Surgery	15	3.3
	Other	24	5.3

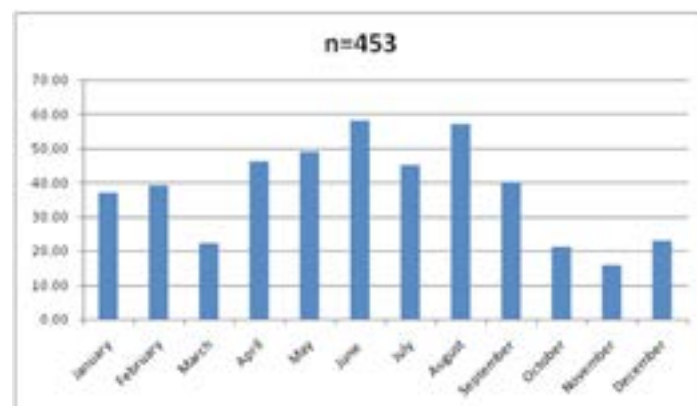


Figure 1. Distribution of cases according to months

Examining the types of injuries by age range, blunt traumas were more common in all age groups. In addition, blunt trauma and burns were most observed in the 3-6 age range, and penetrating traumas in the 7-11 age range. The rates of hospitalization and mortality were the highest for the 3-6 age range, and discharge from hospital was seen mostly in the 7-11 years group. Head and neck traumas were the most frequent injuries in all age groups. In addition, the highest number of head and neck traumas, limb injuries, and polytraumas were observed in the 3-6 age range (Table 2).

Table 2. Distribution of gender, injury characteristics, and outcome by age group

		0-2 years n = 29	3-6 years n = 177	7-11 years n = 157	12-16 years n = 90
Gender	Female	9 (31%)	81 (45.8%)	76 (48.4%)	43 (47.8%)
	Male	20 (69%)	96 (54.2%)	81 (51.6%)	47 (52.2%)
Injury pattern	Blunt	22 (75.9%)	86 (48.6%)	83 (52.8%)	54 (60%)
	Penetrating	2 (6.9%)	11 (6.2%)	26 (16.6%)	14 (15.6%)
	Burns	5 (17.2%)	80 (45.2%)	48 (30.6%)	22 (24.4%)
Outcome	Discharged	12 (41.4%)	83 (46.9%)	84 (53.5%)	40 (44.5%)
	Hospitalized	16 (55.2%)	90 (50.8%)	71 (45.2%)	49 (54.4%)
	Died	1 (3.4%)	4 (2.3%)	2 (1.3%)	1 (1.1%)
Injury site	Head neck	20 (69%)	72 (40.7%)	66 (42%)	39 (43.4%)
	Thorax	0	2 (1.1%)	0	0
	Abdomen	2 (6.9%)	5 (2.8%)	4 (2.6%)	3 (3.3%)
	Back	0	1 (0.6%)	5 (3.2%)	1 (1.1%)
	Extremity	3 (10.3%)	56 (31.6%)	50 (31.8%)	28 (31.1%)
	Polytrauma	4 (13.8%)	41 (23.2%)	32 (20.4%)	19 (21.1%)

The forensic notes kept at the time of presentation revealed that injuries in 151 of the patients were fatal and 302 were non-fatal. The majority of the patients were in the 3-6 (39.1%) age range, and the percentage of male patients was slightly higher (53.9%). Age and gender variables were not significant parameters in terms of determining the life threatening nature of an injury ($p > 0.05$). The most common cause of injury was blunt trauma (54.1%), followed by burns (34.2%) and penetrating trauma (11.7%). It was observed that the risk of fatal injuries was significantly higher in burn patients than in other types of trauma ($p < 0.001$). The head-neck area, extremities, and abdomen were the areas most affected by injuries. The fatal injury risk was found to be significantly higher in traumas affecting two or more body areas ($p < 0.001$) and in cases presenting with the involvement of three or more systems ($p < 0.001$) (Table 3).

Discussion

The home is a place where accidents occur most frequently among children [5]. The main reason for this is that the behavior of young children is different from that of adults. Children crawling on the floor, climbing on window sills, running from room to room, and trying to ride a bicycle at home can be involved in many accidents [11].

Although the incidence of home accident varies according to the country where the study is conducted and the demographic characteristics of the patients, the most common home accidents are reported to be falls, burns, penetrating traumas, asphyxiation, and poisoning [1,12]. Types of home accidents also vary according to the age of the children. While falls are most common among infants, burns are rarely seen in this age group. Falls and burns are more common under five years of age [6].

Table 3. Comparison of the age, gender, and injury characteristics between the fatal and non-fatal injury groups

		Total n = 453	Fatal injury n = 151	Non-fatal injury n = 302	p value
Age (years)	0-2	29 (6.4%)	13 (8.6%)	16 (5.3%)	0.291
	3-6	177 (39.1%)	60 (39.7%)	117 (38.7%)	
	7-11	157 (34.7%)	45 (29.8%)	112 (37.1%)	
	12-16	90 (19.9%)	33 (21.9%)	57 (18.9%)	
Gender	Female	209 (46.1%)	70 (46.4%)	139 (46%)	0.947
	Male	244 (53.9%)	81 (53.6%)	163 (54%)	
Injury pattern	Blunt	245 (54.1%)	69 (45.7%)	176 (58.3%)	<0.001
	Penetrating	53 (11.7%)	1 (0.7%)	52 (17.2%)	
	Burns	155 (34.2%)	81 (53.6%)	74 (24.5%)	
Injury site	Head neck	197 (43.5%)	58 (38.4%)	139 (46.1%)	<0.001
	Thorax	2 (0.4%)	1 (0.7%)	1 (0.3%)	
	Abdomen	14 (3.1%)	4 (2.6%)	10 (3.3%)	
	Back	7 (1.6%)	1 (0.7%)	6 (2%)	
	Extremity	137 (30.2%)	2 (1.3)	135 (44.7%)	
	Polytrauma	96 (21.2%)	85 (56.3%)	11 (3.6%)	
Number of affected systems	Monosystem	357 (78.8%)	66 (43.7%)	291 (96.4%)	<0.001
	Two systems	15 (3.3%)	12 (8%)	3 (1%)	
	≥three systems	81 (17.9%)	73 (48.3%)	8 (2.6%)	

Eldosoky et al. found the most common causes of home accidents among children aged 0 to 12 years as burns, followed by penetrating traumas [13]. In another study conducted with a sample aged 0 to 18 years, the most frequent home accidents were identified as falls and hitting/collision with an object [1]. In a study examining mortality due to home accidents, poisoning, blunt traumas, and burns were identified as the main causes of death [4].

In our study conducted with pediatric cases, the causes of home accidents in order of frequency were blunt trauma, burns, and penetrating traumas. Blunt traumas were the main form of injuries in all age ranges. Our hospital is well-equipped with a burns unit and accepts referrals of burn cases from other health centers, which may be the reason for the higher number of burn patients in the sample. In addition, referral patients often have a high burn percentage and a poor clinic condition. Therefore, mortality and morbidity rate is higher in our burn cases.

In the literature, it has been reported that the head was the most affected area of body in childhood accidents [1]. However, del Ciampo et al. found that the extremities were most injured in pediatric accidents [14]. Age can have a significant impact on which body area to be affected in an accident. In a study conducted in France, head and neck injuries were reported at a rate of 73% in home accidents among children under one year of age [15]. In their study evaluating home accidents among children aged under 18 years, Gad et al. reported that the rates of head and extremity injuries were 42.5% and 38%, respectively [12]. Consistent with the literature, we also observed head and neck and extremity injuries to be most common. In addition, we determined that the risk of injury being fatal was higher in multiple trauma cases with two or more organ injuries.

In traumas, mostly boys are affected [2]. This was also similar in home accidents [4,13,16]. In summer months when the weather is hot, more traumas are seen [14]. Khazaei et al. [17] reported that traumas among children mostly occurred in April, May and September while Shinsugi [18] stated that August was the month with the highest incident of pediatric traumas. Lacarra et al. [15] found that 10% of home accidents occurred in July, and Al Rumhi et al., who evaluated home accidents between January and June determined the month with the highest rate of accidents as January. In the current study, in agreement with the literature, we determined that mostly boys were injured, and the highest number of injuries were in June and August. The high rate of injury in the summer months may be related to the children being more active during this period. While 49.9% of our cases were hospitalized, the death rate was calculated as 1.8%. As a result of the high number of burn patients, the highest number of hospitalizations was seen in the burns unit, followed by the neurosurgery service.

Conclusion

We determined that blunt trauma was the most common cause of injuries in home accidents of forensic nature among children, but the risk of fatal injuries was higher in burn cases. The head and neck area was most affected by trauma in children, and the risk of injuries being fatal increased in cases of polytraumas. The highest number of deaths occurred in the 3-6 age group and mostly due to burns; therefore, parents should be aware of the danger to their children in this age group and take the necessary precautions in

their home against burns in order to reduce the risk of fatal injuries. In this way preventable child deaths will be slightly reduced. In addition, physicians should keep in mind that especially burns, head and neck injuries and polytrauma cases can be fatal.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

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Ethical approval

Ethics committee approval received from the Ethics Committee of Inonu University (Number: 2016/4-2).

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