

Evaluation of forensic cases admitted to the pediatric emergency department

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ABSTRACT

Aim: Pediatric forensic cases have an important share in pediatric emergency service admissions. These require immediate treatment as they can lead to pediatric morbidity and mortality. In this study, a retrospective analysis of pediatric patients admitted to the emergency department due to acute forensic events was performed, and it was aimed to contribute to the data collected in Turkey by evaluating the results along with the results of other studies.

Material and Method: All pediatric forensic cases admitted to the Pediatric Emergency Service of the Gülhane Training and Research Hospital between November 2016 and January 2018 were retrospectively analyzed. The demographic characteristics, forensic events, intoxication agents, hospitalization statuses and clinical follow-ups of the cases were recorded.

Results: Among the 819 pediatric forensic cases admitted to the Pediatric Emergency Service, 393 (48%) were male, and 426 (52%) were female. The cases were aged between 0 and 18, with a mean age of 7.75 ± 6.87 years. The majority of the patients were in the 0-2 age group ($n=349$, 42.6%). Case admissions were more frequent in winter months ($n=240$; 29.3%), and most admissions were made in December ($n=92$; 11.2%). The days of the week with the highest frequencies of admissions were Wednesday ($n=138$, 16.8%) and Monday ($n=134$, 16.3%). The hours of the day with the highest frequencies of admissions were between 18:00 and 24:00 ($n=309$; 37.72%). Drug intoxication (47.13%) was found to be the most frequently encountered reason for the admission of the cases. While 69.47% ($n=569$) of the cases were treated as outpatients, 29.42% ($n=241$) were treated as inpatients, and the mortality rate in the sample was 0.6%.

Conclusion: Most causes of pediatric forensic events are preventable. Therefore, a safe environment should be provided by taking effective protective measures, and strategies that include education in which families and children will actively participate should be developed.

Keywords: Child, intoxication, emergency, forensic event

INTRODUCTION

Forensic cases are important medical conditions that are very common in pediatric emergency departments. A forensic event is any external situation that intentionally or accidentally affects the physical or mental health of the patient, resulting in any health risk or death (1). Traumatic causes take the first place in forensic cases, while intoxication cases take the first place among non-traumatic causes. Forensic events, including intoxication cases, are among the leading causes of pediatric mortality (1). The Centers for Disease Control and Prevention (CDC) reported that in 2013, the most common cause of death in the pediatric age group was unintentional injury (2). The Statistical Institute of Turkey (TURKSTAT) stated in its reports of 2021 that external injuries and intoxication cases were the most common causes of

deaths in Turkish children in the age group of 1-17 (3). The aim of our study was to determine the profiles and analyze the outcomes of pediatric patients admitted to the emergency department due to acute forensic events. We also aimed to evaluate the variables that played a role in the admission of these cases to the pediatric emergency service.

MATERIAL AND METHOD

We retrospectively investigated the files and forensic incident reports of pediatric forensic cases, who were referred to the Emergency Department of Gülhane Training and Research Hospital, between November 2016 and January 2018. Cases whose medical records were not missing were included in the study. Cases with

missing data were excluded. The forensic incident form included questions developed to collect information on characteristics including age, sex of the patient, season, month, day, and time of admission, medical history, medical diagnosis, treatment, and prognosis. The study was carried out with the permission of Gülhane Training and Research Hospital Non-invasive Clinical Researches Ethics Committee (Date: 26.04.2018, Decision No:116). All procedures were carried out in accordance with ethical rules and the principles of the Declaration of Helsinki.

The statistical analyses were carried out using the IBM Statistical Package for the Social Sciences (SPSS) statistics software ([22]; IBM Corp., Armonk, NY, USA). The categorical data are presented with n and % values, and the numeric data are presented with mean ± standard deviation values.

RESULTS

During the study, 25,568 children presented to our department, and 819 of them were forensic patients (32.03 per 1000). Among these 819 patients, 393 (47.99 %) were males, and 426 (52.01%) were females. In this period, the total number of forensic cases including adults was 7513, and pediatric forensic cases constituted 10.9% of all forensic cases.

The mean age of the patients whose data were analyzed in this study was 7.75±6.87 years. While the mean age of the male patients was 6.78±5.23 years, the mean age of the female patients was 8.17±6.94 years. The majority of the patients were in the 0-2 age group (n=349, 42.6%). **Table 1** shows the demographic characteristics of the patients.

The admissions of forensic patients were more frequent in winter months (n=240; 29.3%), and most admissions were in December (n=92; 11.2%). The days of the week with the highest frequencies of admissions were Wednesday (n=138, 16.8%) and Monday (n=134, 16.3%). The times of the day with the lowest numbers of admissions were between 24:00 and 06:00 (n=104, 12.69%), while the highest numbers of admissions were found between 18:00 and 24:00 (n=309; 37.72%). The presentation times of the patients are shown in **Table 2**.

Table 2: Presentation times of the patients.

Variables	Time	Frequency	Percentage
Season			
	Winter	240	29.3
	Spring	184	22.46
	Summer	192	23.44
	Fall	203	24.78
Month			
	January	75	9.15
	February	73	8.91
	March	73	8.91
	April	58	7.08
	May	53	6.47
	June	51	6.22
	July	60	7.32
	August	82	10.01
	September	50	6.1
	October	75	9.15
	November	77	9.4
	December	92	11.23
Days			
	Monday	134	16.36
	Tuesday	107	13.06
	Wednesday	138	16.84
	Thursday	113	13.79
	Friday	113	13.79
	Saturday	113	13.79
	Sunday	101	12.33
	Total	819	100
Time period (Hour)			
	06-12	112	13.55
	12-18	294	35.89
	18-24	309	37.72
	24-06	104	12.69

It was determined that 511 (62.39%) of the patients presented to the pediatric emergency clinic by their own means, and 308 (37.61%) of them were brought by the emergency ambulance service. The mean time that elapsed between the occurrence of the forensic incident and their admission to the hospital was found to be 151.25±118.36 minutes (11-1050 minutes).

Drug intake was determined as the most common cause of presentation for the patients (n=386, 47.13%), and information on the types of intoxication cases such as accidental drug intake, oral corrosive substance

Table 1: Demographic characteristics of the patients.

Age group	Male		Female		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
0-2 years	192	55.02	157	44.98	349	42.61
3-6 years	89	53.3	78	46.7	167	20.39
6-10 years	29	53.71	25	46.29	54	6.59
10-14 years	28	33.34	56	66.66	84	10.25
14-18 years	55	33.34	110	66.66	165	20.14
Total	393	47.99	426	52.01	819	100

ingestion, carbon monoxide poisoning, food poisoning, suicidal drug intake, alcohol consumption, narcotic drug intake, inhaled gas exposure, trauma, and arrest are listed in **Table 3**. It was observed that nonsteroidal anti-inflammatory drugs were the most common among the cases of drug intoxication. We also present the forms of substance intake by the patients in **Table 3**. Oral intake was reported in 663 (80.9%) patients, whereas inhalation was reported in 135 (16.5%) patients. While 720 (87.9%) of toxic substance exposures occurred at home, 73 (8.9%) of them were in environments outside such as schools, dormitories, and shopping malls. Twenty (27.3%) of the aforementioned 73 patients obtained the substances from the street. Suicidal drug intake was observed in 75 (9.15%) of the patients, and 23 of them had consumed multiple drugs. Other substances taken with suicidal intent are presented in **Table 3**.

Table 3: Details of forensic cases and toxic substance types

	Frequency	Percentage
Complaint		
Drug intake	386	47.13
Corrosive substance oral intake	216	26.37
Carbon monoxide intoxication	124	15.14
Food poisoning	29	3.54
Alcohol consumption	24	2.93
Inhaled gas exposure	11	1.34
Trauma	16	1.95
Narcotics	8	0.97
Arrest	5	0.61
Total	819	100
Drugs		
NSAIDs	174	45.07
Multiple drugs	41	10.62
Anticholinergics	26	6.73
Vitamins	24	6.21
SSRIs	24	6.21
Antihypertensives	23	5.95
TCA	21	5.44
Psychotics	15	3.88
Antibiotics	15	3.88
Antiepileptics	9	2.33
Iron supplements	6	1.55
LT4	5	1.29
Other drugs	3	0.77
Total	386	100
Suicide		
Multiple drugs	23	30.66
NSAIDs	17	22.66
SSRIs	10	13.33
Psychotics	7	9.33
Alcohol	4	5.33
Vitamins	4	5.33
Antibiotics	4	5.33
Antihypertensives	3	4
Corrosive substances	3	4
Total	75	100

NSAID: Nonsteroid Anti-Inflammatory Drug, SSRI: Selective Serotonin Reuptake Inhibitor, TCA: Tricyclic Antidepressants, LT4: Levothyroxine Sodium

In clinical follow-up, 569 patients (69.47%) were treated as outpatients, 220 (26.86%) were hospitalized, 21 were (2.56%) referred to intensive care, 4 (0.48%) left against medical advice, and 5 (0.6%) died (**Table 4**). All intoxication cases were kept under observation, and the mean hospitalization period of the patients was found to be 31±19 hours. The patients who were transferred to the intensive care unit were unconscious and had low Glasgow Coma Scale scores, oral ingestion of a corrosive substance was found in 3, carbon monoxide intoxication was found in 2, and drug intoxication was found in the others. The patients who were reported to have died in our study were those who were brought to the emergency department as cardiac arrest cases and were found to have drug intoxication.

Table 4: Follow-up of the patients.

	Frequency	%
Outpatient	569	69.47
Hospitalized	220	26.86
Referred to intensive care	21	2.56
Left against medical advice	4	0.48
Died	5	0.61

DISCUSSION

In this study, we evaluated the incidence of forensic cases in children, the demographic characteristics of these children, and the factors affecting their admission to our emergency department.

In four different studies conducted in Turkey, the rates of pediatric cases among all forensic cases who arrived at the emergency department were reported as 18%, 21.6%, 31%, and 70% (4-7). In our study, we found a rate of 10.9 pediatric forensic cases per 100 all forensic cases admitted to the adult and pediatric emergency clinics of our hospital. This rate in our study may be related to the socio-economic and cultural characteristics of the region where we conducted our study. Our forensic case rate, which was 3.2% among all pediatric cases, was different from those reported in previous studies which found forensic case rates such as 0.67%, 7.4%, 0.70%, and 0.95% (1, 8-10). The rate that was found in our study was close to the average of the rates reported in previous studies. The difference in rates found in these studies may be due to multiple factors affecting admissions to emergency services (11).

The mean age of our patient sample was 7.75±6.87. The age group of 0-2 was the most frequently encountered group, followed by the age groups of 3-6 and 14-18, respectively. We showed that the majority of our patients were younger than 5 years old, and this result was compatible with the results of previous studies (10,12). Özdemir et al. (13)

showed that the major reason for drug intake in this age group was that their families did not store medications and harmful substances under suitable conditions. It was reported that the reason for the decrease in forensic events after the age of 6 and increase again after the age of 14 is the intake of drugs for suicide (6). It was stated that intoxication-related diagnoses at these ages include taking suicidal drugs, and this is related to the higher suicidal tendency in children at this age (7,12).

In terms of sex, many studies have shown that those forensic cases were more common in boys than in girls (1,4-6,10). However, it has been reported that the rates of suicide attempts increase during adolescence, and most of these cases are drug-induced poisoning cases (12,14,15); therefore, forensic events are more common in female cases (16,17). We showed that female patients were more frequently admitted than male patients among the forensic pediatric cases. The main reason for this was that our study included fewer trauma patients than other studies which reported that male patients were more prone to trauma than females (1, 4-6). In contrast with our study, Gündüz et al. (8) found that female cases were more frequent than male cases, and trauma was the main cause of this difference.

Our patients were admitted most frequently during winter months, and the month with the most frequent admissions was December. Gündüz et al. (8) stated that January was the month with most admissions. On the other hand, previous studies have stated that the most common period of the year for pediatric forensic cases is summer, since trauma is more common in summer (5,10,12,13). This may be because children play outside longer during the school holidays and summer months, and they are more exposed to trauma. In our study, we found that the children were injured more often in winter, when they preferred to stay at home instead of playing outside, and this was the result of their intake of toxic substances at home.

In our study, similar to some previous studies (8,10), we found that the times of the day with most admissions were between 18.00 and 24.00 hours. On the other hand, other studies (6,18,19) have shown the most common admission times between 12.00 and 18.00, and trauma was the main difference between the results of our study and those of the aforementioned studies.

The rate of admission to the emergency department by an ambulance in our study was similar to the rates in the literature (10, 20).

When the time elapsed between the occurrence of the forensic incident and the admission of the case to the hospital was examined, it was found that this time in our study was similar to those in the literature (10, 21).

Most of our forensic patients were medically treated, they were mostly non-traumatic cases, and the most common complaint of our patients was drug intake. As in our study, drug intake has been reported as the most common forensic event in pediatric forensic cases (7-10, 12,14,22). It has been stated that analgesics/antipyretics are the most common cause of drug poisoning (14,23). We observed that nonsteroidal anti-inflammatory drugs were the most common among the cases of drug intake in our study. On the other hand, these results differed from the results of previous studies that reported higher trauma rates among forensic cases admitted to pediatric emergency departments (1,13). Drug intoxication was the main cause of non-traumatic forensic cases in these studies, where trauma was reported to be the most common among all pediatric forensic cases (1,13). The reason why our pediatric forensic patients were at a lower rate among all pediatric patients compared to previous studies may be that only non-traumatic medical cases are treated in our pediatric emergency department, and traumatic patients are referred directly to the adult trauma emergency department in our hospital for treatment. The traumatic forensic cases that we report in our study, who were mistakenly referred to our pediatric emergency department, were first treated in our pediatric emergency department and then referred to the trauma emergency department of our hospital.

While suicidal poisoning rates were found to be low at 9.15% in our study, Araz et al. (21) found these rates as 19.6%, Özdemir et al. (13) reported it as 31%, and Şen et al. (10) reported a rate of 9.5%. The reason for this low rate in our study may be that the suicide cases in question may have presented to other hospitals that are located in more central parts in our region.

The rates of outpatient treatment, hospitalization, and intensive care referral in our study were close to the average of the rates reported in previous studies (6,10,13). While the mortality rate (0.61%) in our study was found to be lower than those in some studies including traumatic forensic events (1,13), it was similar to those in other studies (6,7,10,18).

The limitations of our study were that this study was conducted as a retrospective and single-center study and that traumatic patients were referred directly to the adult trauma emergency department in our hospital, and so, pediatric trauma patients were not included in the study. Additionally, since there is no pediatric intensive care unit in our hospital, the follow-up of the patients who were referred to the intensive care unit could not be determined.

CONCLUSION

Most traumatic and non-traumatic forensic cases in childhood are preventable health problems. To prevent forensic incidents, measures should be taken at home and outside, and the necessary arrangements should be made in the environment where children live and at home.

To raise awareness, regular training should be given to children and parents by educators and healthcare professionals within the scope of prevention programs. Since this is a medical problem that can always be encountered, it is necessary to have sufficient knowledge and equipment in terms of emergency services.

Because of the limitations of our study, further studies should be conducted in the pediatric population to develop effective preventive strategies for forensic problems.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Gülhane Training and Research Hospital Non-invasive Clinical Researches Ethics Committee (Date: 26.04.2018, Decision No:116).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The author has no conflicts of interest to declare.

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