ISSN 2458-8865 E-ISSN 2459-1505
www.fppc.com.tr
Family Practice & Palliative Care

Research Article

The retrospective analysis of 46,732 forensic cases admitted to an emergency department

Acil servise başvuran 46.732 adli vakanın retrospektif analizi

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Abstract

Introduction: Forensic cases are a significant problem in our country as in all over the world. This study aimed to examine the demographic characteristics, prognosis and related factors of forensic cases.

Methods: A total of 46,732 patients aged 0-97 years who presented to our hospital due to forensic events were enrolled in the study. Patients' demographics such as age and gender, the reason for admission, the time of admission, the clinics the patients were admitted to, the prognosis of the patients in the emergency department (ED) or in the clinics they were hospitalized were recorded. Patient information was obtained from ED patient records, hospital information management system and forensic reports, retrospectively.

Results: The mean age of the 46,732 patients was 31.77±16.68 years. Mortality occurred in 246 (0.5%) patients. The admissions were higher in July and August compared to other months. The most frequent presentations were in the evening hours. The cases between the ages of 20-29 were much higher than other age groups. The most common type of forensic cases was traffic accidents in 23,177 (49.6%) patients followed by assault in 8,521 (18.2%) patients, occupational accidents in 5,680 (12.2%), and 5,576 (11.9%) drug intoxication.

Conclusion: Traffic accidents take the first place in order of frequency in forensic incidents, which are observed 2.08 times more in men than in women. There is a need for further similar studies in order to develop standards, protocols and policies in prevention and management of forensic cases.

Keywords: Forensic cases, traffic accidents, occupational accidents, emergency department, poisoning

Öz

Giriş: Adli olgular tüm dünyada olduğu gibi ülkemizde de önemli bir sorundur. Bu çalışma, adli vakaların demografik özelliklerini, prognozunu ve ilişkili faktörleri incelemeyi amaçlamıştır.

Yöntem: Hastanemize adli olay nedeniyle başvuran 0-97 yaş arası toplam 46.732 hasta çalışmaya alındı. Hastaların yaş ve cinsiyet gibi demografik bilgileri, başvuru nedenleri, başvuru zamanları, hastaların başvurdukları klinikler, hastaların acil serviste (AS) veya yattıkları kliniklerdeki prognozu kaydedildi. Hasta bilgileri geriye dönük olarak acil servis hasta kayıtlarından, hastane bilgi yönetim sisteminden ve adli tıp raporlarından elde edildi.

Bulgular: 46.732 hastanın yaş ortalaması 31,77±16.68 idi. 246 (%0,5) hastada mortalite meydana geldi. Temmuz ve Ağustos aylarında başvurular diğer aylara göre daha yüksekti. En sık sunumlar akşam saatlerindeydi. 20-29 yaş arasındaki vakalar diğer yaş gruplarına göre çok daha yüksekti. En sık görülen adli vaka türü 23.177 (%49,6) ile trafik kazası, bunu 8.521 (%18,2) ile darp, 5.680 (%12,2) ile iş kazası ve 5.576 (%11,9) ile ilaç zehirlenmesi izledi.

Sonuç: Erkeklerde kadınlara göre 2,08 kat daha fazla görülen adli olaylarda sıklık sırasına göre trafik kazaları ilk sırada yer almaktadır. Adli vakaların önlenmesi ve yönetimine yönelik standart, protokol ve politikaların geliştirilmesi için benzer çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: Adli vakalar, trafik kazaları, iş kazaları, darp, acil servis, zehirlenme

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	https://doi.org/10.22391/fppc.1228105			

Key Points

1. Frequency of forensic case admissions, which have an important place in emergency services, increases in summer (July, August) and evening hours (19:00-20:00).
2. Traffic accidents take the first place in order of frequency in forensic incidents, which are observed 2.08 times more in men than in women and with a mortality rate of 0.5%.
3. The most common clinics of hospitalization were orthopedics and ICU.

Introduction

Forensic case is a condition that occurs as a result of external factors, leading to impairment of physical and mental health of individuals or morbidity and mortality. It is called a forensic case when a person becomes physically or mentally ill by another peoples' intent, negligence, carelessness or imprudence. Forensic cases include all kinds of assault, torture, traffic accidents, occupational accidents, firearm-explosive substance injuries, intoxication, burns, sexual assault and abuse cases, gunshot wounds, penetrating stabs, falls, suicide, murder, illegal substance use or sudden and unexpected suspicious deaths [1, 2]. These cases constitute an essential part of presentations to EDs.

Emergency departments (ED) are one of the most common places where the first occurrence of these damages caused by external factors are seen [3-5]. Since EDs are the initial place of presentation due to forensic events, they are also critical healthcare services for developing preventive interventions in order to detect forensic cases [6, 7]. These cases are a significant problem in our country as in all over the world.

Besides the responsibility of treating the patient, the physicians working in the ED also fulfill important functions such as reporting the traumatic lesions detected in forensic cases to the judicial authorities [8]. For this purpose, physicians are obliged to issue a forensic report accompanied by a guideline based on the practice of forensic medicine [9]. The forensic report is requested from the physician by the judicial authorities, and these reports are the official documents prepared in the content that will inform the opinion of the physician who has determined the medical condition of the person and answered the questions asked [10]. There is an increasing need for more data on forensic cases, which constitute a significant group among presentations to EDs and become more important when considering the additional work burden they impose on physicians, for developing standards, protocols, and training programs about approaches and precautions for forensic cases [11]. In many cases, death and injury investigations are aided by the use of medical records such as abusive head trauma in infants, and whether certain injury patterns are consistent with homicide versus suicide or occupant position of drivers or passengers in a fatal traffic accident [12]. Medical records can provide invaluable historical data for establishing trends in the incidence of forensic cases. Therefore, this study aimed to examine the demographic characteristics, relations with other clinics, prognosis and related factors of forensic cases, which have an important role among ED admissions, and to compare them with other studies in our country and in the world.

Methods

Before the beginning, the study protocol was approved by the local ethics committee of Diskapi Yildirim Beyazit Training and Research Hospital with the 17/12/2012 dated and numbered 06/37 decision. Informed consent was not needed as the study was retrospective in nature. The study was performed in accordance with the relevant ethical principles of the Declaration of Helsinki and later amendments.

This study was conducted in a tertiary training and research hospital with an average of 1000-1500 emergency room admissions per day. The study was planned on patients who presented to the ED of the hospital, which serves as a pediatric and adult trauma center in Ankara province of Turkey, between 01/01/2009 and 31/12/2012 as forensic cases. Since forensic cases other than pediatric trauma patients were referred to the pediatric emergency service, this patient group could not be included in the study.

A total of 46,732 patients aged 0-97 years who presented to our hospital due to forensic events were enrolled in the study. Patients whose records could not be fully accessed, those who were referred to another hospital for any reason, those who had erroneous or repeated admissions, and those who presented as a continuation of the previous forensic case were excluded from the study. The total 46,732 patients included 9,935 admitted to the ED in 2009, 11,003 in 2010, 11,646 in 2011 and 14,148 in 2012.

Patients' demographics such as age and gender, the reason for admission (occupational accident, traffic accident, gunshot, penetrating stab, assault, burn, carbon monoxide intoxication, falls, electric shock, drug intoxication, fungi, hanging and drowning), the time of admission (months and hours),the clinics the patients were admitted to, the prognosis of the patients in the ED or in the clinics they were hospitalized were recorded. Patient information was obtained from ED patient records, hospital information management system and forensic reports, retrospectively. The results obtained were compared with similar studies.

Statistical Analysis

Data obtained in this study were statistically analyzed using the SPSS 20.0 for Windows® (SPSS, Statistical Package for Social Sciences, IBM Inc., Chicago, IL, USA) software. Descriptive data are expressed with numbers, percentages, mean, standard deviation, median, minimum and maximum values. Normality of the variables was tested with the Kolmogorov-Smirnov method. The independent t test was used for comparison of normally distributed variables and Mann Whitney U test was used in comparison of non-normally distributed variables between two groups. Pearson chi-square test and Fisher's Exact test were used to compare categorical variables. $p<0.05$ values were considered statistically significant at 95% confidence interval.

Results

The median age of the 46,732 patients was 30 years with the age range of 0-97 years. Of all patients, 15,170 (32.5%) were female and 31,562 (67.5%) were male. While a total of 41,798 (89.4%) patients received outpatient treatment, 4,934 (10.6%) patients were referred to various clinics. Mortality occurred in 246 (0.5%) patients. The mean age of the survivors (47.25±23.43 years) was statistically significantly higher than the non-survivors (31.69±16.60) ($p<0.001$). The mortality rate was statistically significantly higher in males (0.6%) than female patients (0.4%) ($p<0.001$) (Table 1).

Table 1. Comparison of demographic data of patients according to mortality rates

		Survivor (n:46,486)	Non-survivor (n:246)	p value
Age		31.69±16.60	47.25±23.43	p<0.001
Gender				
	Female	15.103	67	p<0.001
	Male	31.383	179	
Type of forensic case				
	Occupational accident	5666	14	p<0.001
	Traffic accident	23016	161	
	Gunshot İnjury	584	15	
	Penetrating stab	1706	7	
	Assault	8510	11	
	Burn	106	6	
	Carbon monoxide	931	0	
	Falls	336	2	
	Electric shock	34	1	
	Drug intoxication	5548	28	
	Mushroom poisoning	31	0	
	Hanging and drowning	18	1	

When the months of the patients' presentations to the ED as a forensic case were examined, it was seen that the admissions were higher in July and August compared to other months (Figure 1). The most frequent presentations were in the evening hours. The highest time interval of presentations was found as 19:00-20:00 (Figure 2).

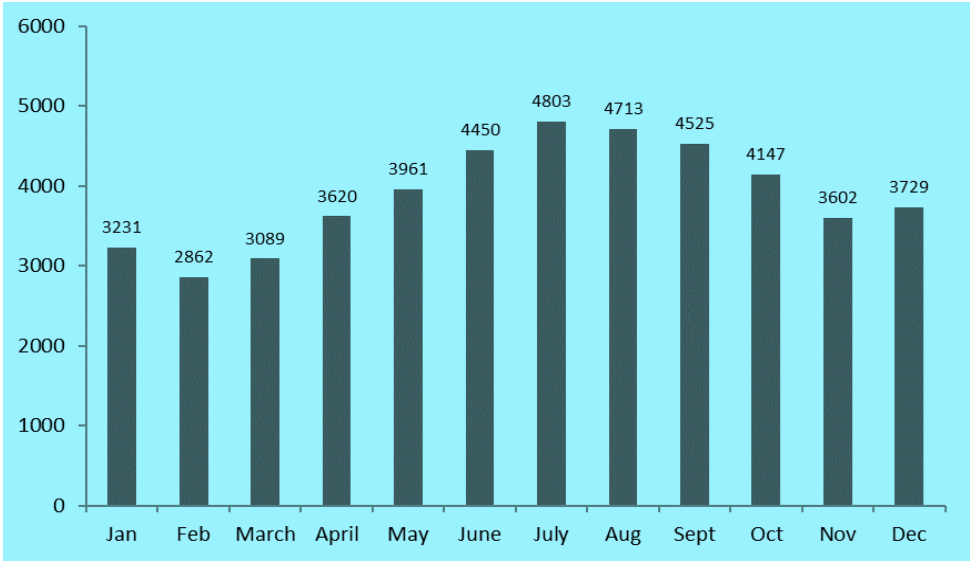

Figure 1. Distribution of forensic cases by month of presentation

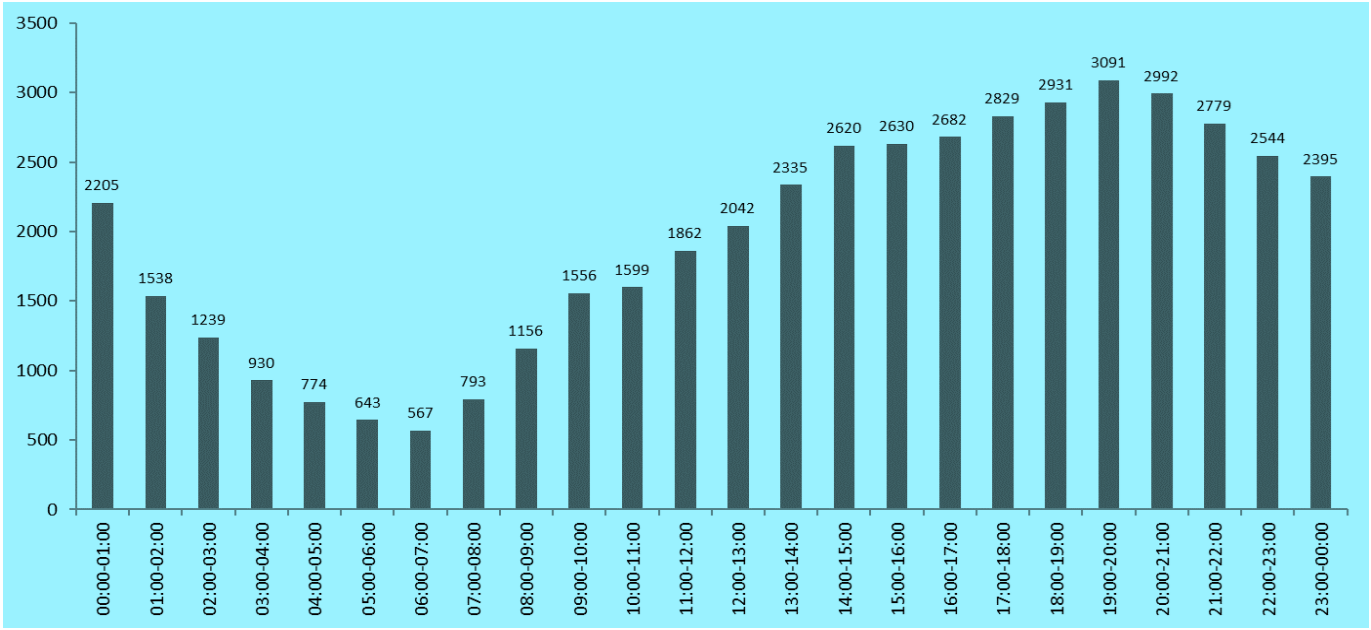

Figure 2. Distribution of forensic cases according to arrival times

When we divided the patients into age groups, it was observed that the cases between the ages of 20-29 were much higher than other age groups (Figure 3). The most common type of forensic cases was traffic accidents in 23,177 (49.6%) patients followed by assault in 8,521 (18.2%) patients, occupational accidents in 5,680 (12.2%), and 5,576 (11.9%) drug intoxication (Figure 4). Of the 4,934 (10.6%) inpatients, 1,518 (30.8%) were hospitalized in the orthopedics clinic and 1,416 (28.7%) in the intensive care unit (ICU) (Figure 5).

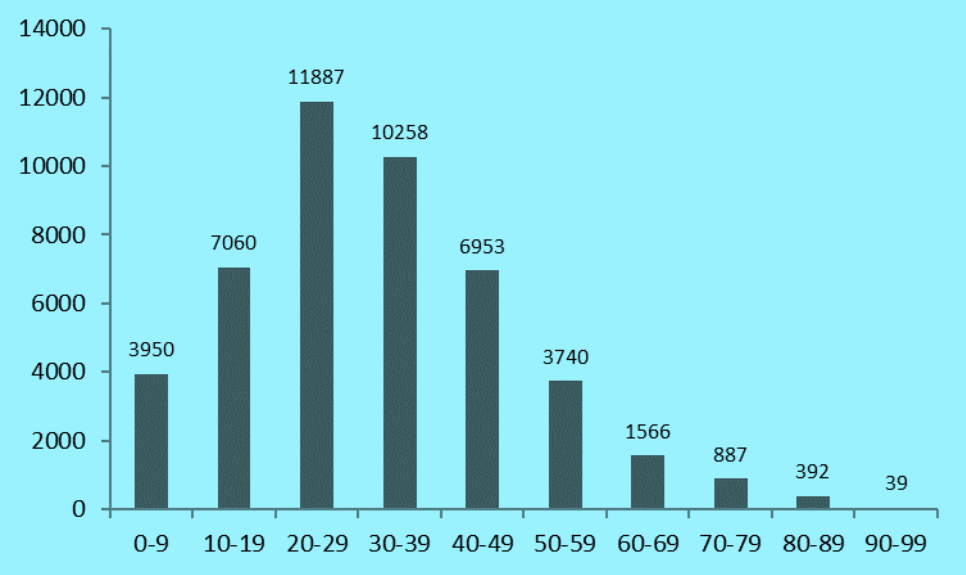

Figure 3. Distribution of forensic cases by age

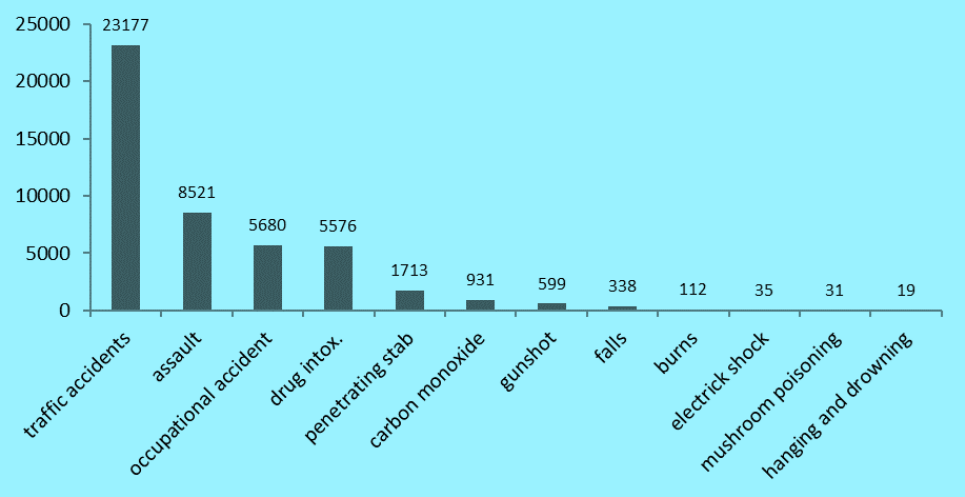

Figure 4. Distribution of the patients according to the type of forensic cases

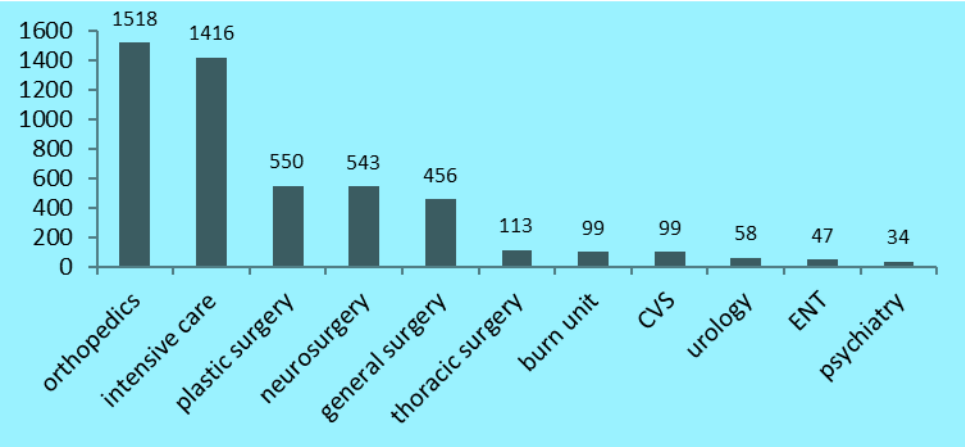

Figure 5. Distribution of patients by clinics of hospitalization

Distribution of demographic data according to the type of forensic cases is given in Table 1. While drug, carbon monoxide and mushroom poisoning were more common among female patients, male patients were affected more commonly in the other types of forensic cases. Since the center where the study was conducted was a pediatric trauma center, traumas such as traffic accidents, assault and falls were prominent in the group under the age of 18. Intoxication, burns, drowning, electric shock, etc. cases were referred to the pediatric emergency department. The presentation of 2474 women and 178 cases aged 0-9 years, of which we do not know how many domestic violence were, could be associated with violence against women and children.

The most common reason for hospitalization was burn cases followed by mushroom poisoning and gunshot injuries. The majority of ICU admissions were cases of drug intoxication. These cases were generally followed up in the primary care intensive care unit within the ED. Mortality rate was higher in gunshot injury cases than in other case types, as expected (Table 2).

Table 2. Distribution of the demographic data of the patients according to the types of forensic

	Occupational accident	Traffic accident	Gunshot	Penetrating stab	Assault	Burn	Carbon monoxide	Falls	Electric shock	Drug intox.	Mushroom poisoning	Hanging and drowning
Gender												
Male	4986	15257	467	1339	6047	100	318	238	26	2755	15	14
Female	694	7920	132	374	2474	12	613	100	9	2821	16	5
Age group												
0-9	0	3606	1	2	178	2	2	159	0	0	0	0
10-19	358	4253	30	452	1156	11	51	49	2	697	1	0
20-29	1461	4146	182	713	3648	34	252	31	12	1395	4	9
30-39	2620	4315	232	295	1405	30	261	32	6	1053	7	2
40-49	980	3303	131	155	1598	20	163	23	12	560	3	5
50-59	212	1771	15	75	362	12	96	24	3	1160	7	3
60-69	41	897	6	14	120	2	50	11	0	418	7	0
70-79	8	589	1	6	46	0	36	5	0	195	1	0
80-89	0	265	1	1	8	1	16	4	0	95	1	0
90-99	0	32	0	0	0	0	4	0	0	3	0	0
Outcome												
Outpatient	5104	21215	309	1379	8074	15	905	291	31	4444	18	13
Inpatient	576	1962	290	334	447	97	26	47	4	1132	13	6
Clinic of hospitalization												
Intensive care	46	132	28	23	24	1	24	5	3	1114	13	3
Neurosurgery	59	333	41	15	75	0	0	20	0	0	0	0
General surgery	30	195	19	170	36	0	0	6	0	0	0	0
ENT	6	25	1	5	10	0	0	0	0	0	0	0
Orthopedics	220	955	135	16	175	0	2	15	0	0	0	0
Plastic surgery	192	183	55	35	83	1	0	0	1	0	0	0
Urology	5	33	7	4	9	0	0	0	0	0	0	0
CVS	7	38	4	36	14	0	0	0	0	0	0	0
Psychiatry	2	0	0	5	6	0	0	0	0	18	0	3
Thoracic Surgery	9	63	0	25	15	0	0	1	0	0	0	0
Burn unit	0	4	0	0	0	95	0	0	0	0	0	0
Mortality												
Survivor	5666	23016	584	1706	8510	106	931	336	34	5548	31	18
Non-survivor	14	161	15	7	11	6	0	2	1	28	0	1

ENT: ear, nose, throat; CVS: cardiovascular surgery; intox.: intoxication

Discussion

In this study, we examined the forensic cases that were presented to the ED department of our hospital. The rate of male gender was found as 67.5%. In a study by Akgun et al. evaluating forensic cases applying to the emergency department, the rate of male patients was reported as 61% [12]. In a study by Turkmen et al., [13] the rate of male patients was found as 68.43%. In another study by Demircan et al., the rate of male patients was found as 58.23% [14]. Within this context, our finding is consistent with the previous studies. The male prominence could be explained by the fact that men are more commonly involved in risky behaviours and activities that could result in forensic cases.

In our study the mean age of all patients was 31.77±16.68 years. Similarly Akgun et al. reported the mean age as 32.57 ± 16.2 years [12]. The mean age of forensic patients was reported as 28.03±16.42 years by Demircan et al. [14], 28.7 ± 0.2 years by Turkmen et al. [13] and 33.75 ± 12.4 years by Seviner et al. [15]. In a study by Weng et al. evaluating confirmed illicit substance-using patients in the ED, the mean age was reported as 34.5 ± 10.0 years [16]. The reported mean ages were similar among the above mentioned studies and our study.

Age has an important place in experiencing forensic events. In the present study, the most common age group was 20-29 years. Aygun et al. reported the most common range of age as 20-29 years [12]. Demircan et al. stated that the most of the forensic cases were in the 20-29 years of age group [14]. Similarly, Guven et al. reported the most common age range as 20-29 years [9]. This was attributed to the fact that the young people work more commonly in high-risk sectors, are involved more in social life and traffic, resulting in forensic events [17]. In addition, individuals in this age range constitute the most active group in the general population.

Traffic accidents have emerged as the leading cause of morbidity and mortality worldwide Traffic accidents are among the leading causes of morbidity and mortality worldwide [18]. These accidents are among the most common causes of presentations to EDs. In the current study, the vast majority of forensic cases were traffic accidents by 49.6%. Although the percentages may differ, numerous studies also reported the most common reason for forensic events as traffic accidents in our country [4, 14, 17, 19]. The fact that traffic accidents take the first place among the types of forensic incidents reveals the fact that traffic accidents are experienced very intensely in our country and the number of related injuries is high [10, 20]. Our higher rate of traffic accidents among the other reasons for forensic cases might also be associated with the location of our hospital. On the other hand, in most Western countries, traffic accidents are not considered forensic cases. In our study, traffic accidents were followed by assault (18.2%), occupational accidents (12.2%) and drug intoxication (11.9%). In the study by Akgun et al., traffic accidents were followed by occupational accidents, blunt force injuries and falls [12]. In another study by Turkcuer et al., traffic accidents were followed by penetrating swab, intoxication and assault as the etiologies of forensic cases presented to the ED [20]. In a study by Seviner et al. traffic accidents were followed by intoxication and to be beaten [15]. As is seen, although etiologies of forensic cases differ among the studies, traffic accidents ranked first in all studies, suggesting intensity of this type of forensic events in our country.

Admissions to EDs due to forensic causes may show differences among seasons and months of the year. In the present study, the admissions were higher in July and August compared to other months. In the study by Turkcuer et al., the most common months of admissions to the ED were June, July and August [20]. Similarly, in another study by Yavuz et al., the most common admissions to the ED due to forensic events were made in June, July and August [5]. Altin et al also reported that forensic cases increased in the summer season [21]. This situation has been attributed to the increase in people's activities and the higher incidence of traumatic forensic events with the prolongation of daylight hours in the summer months.

In our study, the most frequent presentations were in the evening hours. The highest time interval of presentations was found as 19:00-20:00. In the study by Turkcuer et al., [20] the most common time interval of presentations to the ED was found as 22:00-23:59. In another study, Ural et al reported that the incidence of forensic cases increased in the evening hours due to increasing traffic [22]. In a study by Gunduz et al., the most common time interval of admissions was reported as 16:00-24:00 [23]. Differences between the studies in time intervals of the most common admissions to EDs might be attributed to different time periods used in the studies. In our study, each time interval was considered as one hour.

In our study, 10.6% of the patients were hospitalized and the most commonly used clinics were orthopedics and ICU. Mortality rate was found as 0.5% in the present study. In the study by Akgun et al. 824 forensic cases were evaluated and 9.7% of these patients were hospitalized in the internal medicine or surgery clinics and 5% in the ICU. In the same study, the rate of mortality was found as 0.7% [12].

Limitations

The major limitation of this study is that forensic cases under the age of 18, excluding trauma, were not included in the study, because the center where the study was carried out served as a pediatric trauma center. A second limitation is that poisoning cases were mostly followed in the intensive care unit within the emergency department. Finally, the study was conducted in a single center, although the number of patients is quite high for such a study, as a strength.

Conclusion

Frequency of forensic case admissions, which have an important place in emergency services, increases in summer (July, August) and evening hours (19:00-20:00). Traffic accidents take the first place in order of frequency in forensic incidents, which are observed 2.08 times more in men than in women and with a mortality rate of 0.5%. The most common clinics of hospitalization were orthopedics and ICU. There is a need for further similar studies in order to develop standards, protocols and policies in prevention and management of forensic cases.

Conflict of Interest: The authors declare no conflict of interest to disclose.

Author Contributions		Author Initials
SCD	Study Conception and Design	SY, BV
AD	Acquisition of Data	SY, BV
AID	Analysis and Interpretation of Data	SY, BV
DM	Drafting of Manuscript	SY, BV
CR	Critical Revision	SY, BV

Funding: This study did not receive financial support.

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