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Evaluation of forensic cases presented to the pediatric emergency department

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Abstract:

OBJECTIVE: Child forensic cases constitute an essential part of emergency presentations. The most crucial point is that the correct planning of protective and preventive activities depends on the correct analysis of the problem; therefore, there is a need for studies on childhood forensic cases. This study aimed to obtain data on the etiological characteristics of forensic cases presented to the pediatric emergency department. We believe that the collected data will guide the social measures in preventing forensic cases.

METHODS: This retrospective study consists of forensic cases aged from 1 month to 18 years and presented to the pediatric emergency service of Adana City Training and Research Hospital between January 1, 2018, and December 31, 2019. The general forensic examination report of the cases was surveyed.

RESULTS: For this study, 6577 general forensic examination reports were surveyed. 40% of the patients were females, and 60% were males. Traffic accidents were the most common (35.1%) cause of the emergency presentation, which was followed by assault (16.5%), fall from height (9.2%), accidental drug-caustic corrosive substance intake (7.8%), early pregnancy (7.4%), blunt or sharp force injuries (6.3%), electrical burn injuries (5.7%), suicide (5.1%), carbon monoxide-food poisoning (2.7%), and others that consisted of work accident, firearm injury, substance ingestion, suffocation, animal attack, sudden death, and missing child (4.2%).

CONCLUSIONS: This most extensive study with 6577 cases has several important implications. First of all, traffic accidents continue to be an important public health problem today. Second, cases presented to the emergency department due to assault and blunt or sharp force injuries constitute an important part of forensic cases, and children who are driven to violence and crime in childhood are a situation that requires immediate action. Our third yet most important result is that early pregnancy is a much ignored social problem despite its importance.

Keywords:

Child, childhood injury, forensic case, forensic report, pediatric forensic case

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Introduction

Forensic cases are extraordinary situations that occur due to external factors and consequently cause physical and mental disorders in the person's health. All kinds of assault, torture, traffic accident, firearm-explosive substance injuries, work accident, injuries, poisoning, burns, illegal

substance use, sexual assault and abuse cases, suicide, accidents, murder, or sudden suspicious deaths are considered forensic cases.^[1,2] Since the emergency service units are the initial place of presentation for forensic cases and intervention and treatment, they are also critical centers for developing preventive interventions for detecting forensic cases.^[3-5]

Children tend to continuously explore and discover their environment without being

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Box-ED Section**What is already known on the study topic?**

- Pediatric emergency units are the initial place of presentation for forensic cases and intervention and treatment
- Pediatric emergency units are critical centers for developing preventive interventions for detecting forensic cases.

What is the conflict on the issue? Is it important for readers?

- This study aimed to obtain data on the etiological characteristics of forensic cases presented to the pediatric emergency department. We believe that the collected data will guide the social measures in preventing forensic cases.

How is this study structured?

- This was a single-center, retrospective study that includes data from 6577 cases.

What does this study tell us?

- Traffic accidents continue to be an important public health problem today
- Cases presented to the emergency department due to assault and blunt or sharp force injuries constitute an important part of forensic cases, and children who are driven to violence and crime in childhood are a situation that requires immediate action
- Early pregnancy is a much ignored social problem despite its importance.

aware of the possible risks. It is commonly accepted that the prevalence of forensic cases can be reduced with preventive measures and that accidents in childhood are primarily due to preventable causes. The National Action Plan for Child Injury Prevention is an essential guide in preventing childhood injuries. As it can be understood from the guide, the most crucial point is that the correct planning of protective and preventive activities depends on the correct analysis of the problem; therefore, there is a need for studies on childhood injuries.^{6,7}

This study aimed to obtain the data on the etiological characteristics of forensic cases presented to the pediatric emergency department. We believe that the collected data will guide the social measures in preventing forensic cases.

Methods

This retrospective study consists of forensic cases aged from 1 month to 18 years and presented to the pediatric emergency service of Adana City Training and Research Hospital between January 1, 2018, and December 31, 2019. The general forensic examination report of the cases was surveyed, and demographic information,

reason for application, presence of a lesion, laboratory and radiological examinations, requested consultations, and hospitalization and outcomes were recorded.

The reasons for presentations were collected in 10 groups as follows: traffic accident, assault, blunt or sharp force injury, fall from height, suicide, carbon monoxide-food poisoning, accidental drug-caustic corrosive substance intake, early age (<18 years), pregnancy, electrical burn injury, and other: work accident, firearm injury, substance ingestion, suffocation, animal attack, sudden death, and missing child. If the situations such as falling or jumping from a height and taking medication were due to suicide, the case was included in the suicide group. Otherwise, they represented accidental cases. If the injury with blunt or sharp objects caused with the aim of attack by another person, the case was included to assault group. If the injury was caused by self-inflicted, the case was classified as suicide. If the event was accidental (injury with a broken object, cutting him/herself during cooking, crushing under a blunt object, etc.), the case was classified as blunt or sharp force injuries.

Approval for the study was obtained from the Adana Training and Research Hospital Clinical Research Ethics Committee on December 16, 2020, with the decision no. 1177.

Statistical analysis

The data were evaluated using the Statistical Package for the Social Sciences (SPSS 21.0 IBM Corp, Armonk, NY, USA) package program. Descriptive statistics for the categorical variables were provided in terms of "frequencies and percentages." Continuous variable, i.e., age, was assessed using Kolmogorov-Smirnov test and described as mean \pm standard deviation (minimum-maximum). A cross-table was created to observe the distribution of two different categorical variables relative to each other.

Results

For this study, 6577 general forensic examination reports were surveyed. The mean age was 126.40 ± 70.01 (2-216) months, and 40% of the patients were female. Traffic accidents were the most common (35.1%) cause of the emergency presentations, which was followed by assault (16.5%), fall from height (9.2%), accidental drug-caustic corrosive substance intake (7.8%), early pregnancy (7.4%), blunt or sharp force injuries (6.3%), electrical burn injuries (5.7%), suicide (5.1%), carbon monoxide-food poisoning (2.7%), and others that consisted of work accident, firearm injury, substance ingestion, suffocation, animal attack, sudden death, and missing child (4.2%) [Tables 1-3].

Table 1: Distribution of cases according to gender and age groups

Gender	Age group (months)					Total, n (%)
	1-44, n (%)	45-87, n (%)	88-130, n (%)	131-173, n (%)	174-216, n (%)	
Female	595 (9.0)	352 (5.3)	278 (4.3)	322 (4.9)	1084 (16.5)	2631 (40)
Male	752 (11.4)	546 (8.3)	524 (8.0)	698 (10.6)	1426 (21.7)	3946 (60)
Total	1347 (20.4)	898 (13.6)	802 (12.3)	1020 (15.5)	2510 (38.2)	6577 (100)

Table 2: Distribution of presentation reasons according to age groups

Reason	Age group (months)					Total, n (%)
	1-44, n (%)	45-87, n (%)	88-130, n (%)	131-173, n (%)	174-216, n (%)	
Traffic accident	323 (4.9)	473 (7.2)	432 (6.6)	413 (6.3)	668 (10.1)	2309 (35.1)
Assault	17 (<0.5)	59 (0.9)	123 (1.9)	270 (4.1)	613 (9.6)	1082 (16.5)
Blunt or sharp force injuries	64 (1)	44 (0.7)	41 (0.6)	64 (1)	202 (3)	415 (6.3)
Fall from height	250 (3.8)	116 (1.8)	79 (1.2)	69 (1)	93 (1.4)	607 (9.2)
Suicide	-	1 (<0.5)	9 (<0.5)	68 (1)	256 (3.9)	334 (5.1)
Carbon monoxide-food poisoning	34 (<0.5)	31 (<0.5)	45 (0.7)	46 (0.7)	24 (<0.5)	180 (2.7)
Accidental drug-caustic corrosive substance intake	396 (6)	93 (1.4)	16 (<0.5)	6 (<0.5)	5 (<0.5)	516 (7.8)
Early pregnancy	-	-	-	16 (<0.5)	468 (7.2)	484 (7.4)
Electrical burn injury	226 (3.4)	62 (1)	31 (<0.5)	28 (<0.5)	29 (<0.5)	376 (5.7)
Other causes	37 (<0.5)	19 (<0.5)	26 (<0.5)	40 (0.6)	152 (2.3)	274 (4.2)
Total	1347 (20.4)	898 (13.6)	802 (12.3)	1020 (15.5)	2510 (38.2)	6577 (100)

Table 3: Distribution of presentation reasons according to gender

Reason	Gender		Total, n (%)
	Female, n (%)	Male, n (%)	
Traffic accident	716 (10.9)	1593 (24.2)	2309 (35.1)
Assault	269 (4.1)	813 (12.4)	1082 (16.5)
Blunt or sharp force injuries	100 (1.5)	315 (4.8)	415 (6.3)
Fall from height	227 (3.4)	380 (5.8)	607 (9.2)
Suicide	252 (3.9)	82 (2.1)	334 (5.1)
Carbon monoxide-food poisoning	90 (1.35)	90 (1.35)	180 (2.7)
Accidental drug-caustic corrosive substance intake	240 (3.6)	276 (4.2)	516 (7.8)
Early pregnancy	484 (7.4)	-	484 (7.4)
Electrical burn injury	168 (2.5)	208 (3.2)	376 (5.7)
Others	85 (1.6)	189 (2.9)	274 (4.2)
Total	2631 (100)	3946 (100)	6577 (100)

As our results, 77.5% of the cases were treated as outpatient, 12.4% were hospitalized, and 4% were treated in the emergency department. Hospitalized patients were most frequently transferred to neurosurgery, burns, gynecology, and obstetrics units. Finally, 0.3% of the cases were already dead at the time of admission or died in the emergency department.

Discussion

Pediatric forensic cases constitute an essential part of emergency presentations. Although accidental injuries, considered forensic cases, are defined as preventable events, childhood accidents are still a serious public health problem worldwide.^[8,9] The American Center for Disease Control and Prevention defines drowning,

falls, burns, traffic accidents (in and out of vehicles, pedestrian, and bicycle accidents), poisoning, and asphyxia as accidental injuries. These events, all included within the scope of forensic cases, account for 44% of deaths of individuals aged between 1 and 19 years in the United States. Moreover, the death rate is two times higher in boys than in girls, and traffic accidents are the most common cause. It was also reported that 9.2 million children in the same age group are treated in the emergency department every year for nonfatal injuries, and the male gender is a risk factor. The most common cause of nonfatal injuries was falling from the height for children aged 1–14 years and assault for 15–19 years.^[7,10]

Similar results were observed in studies conducted in Turkey. Yazar *et al.*^[11] stated that 1.71% of the patients presented to the pediatric emergency department were forensic cases. Demir *et al.*^[12] observed that 66% of the cases were male, and the mean age was 8.8 ± 4.37 years. Korkmaz *et al.*^[13] reported that 21.6% of the cases presented to the pediatric emergency department were forensic, the mean age was 9.9 ± 5.5 years, and 61% of the cases were male. Congruent with the related literature, the frequency of male cases was higher in this study. In forensic cases, the male prevalence was attributed to the fact that the most common reasons for admission, such as trauma and assault, were relatively more common in males. This situation is thought to be due to boys being more active and growing up with a higher sense of freedom in society and becoming active parts of the workforce earlier.^[8]

In our study, traffic accidents were the most common presentation. As in the whole world, traffic accidents

are among Turkey's most important causes of death, resulting in severe injuries and disability. Furthermore, the population and the number of motor vehicles participating in traffic increase daily; statistical results show that traffic accidents are a significant socioeconomic problem. In search for prospective solutions to reduce traffic accidents, further support for the driver, passenger, and pedestrian training and continuously informing society through public service advertisements were presented. In addition, it will be helpful to evaluate the parameters affecting traffic accidents and arrange accident reports according to these parameters. It is also recommended that national road maintenance, operation, and accident information systems should be developed.^[14]

The literature reports that children are increasingly involved in the judicial process day by day.^[8,12,15,16] School absenteeism, spending time with problematic peers and ganging up, city life, low parental education, and low income are associated with juvenile delinquency. Among juvenile forensic cases, theft, injury, damage to property, sexual crimes, and substance use are the most common causes of crime.^[17] Based on the study's data, the cases due to assault ranked second, and the cases due to sharp-piercing-blunt instrument injury ranked sixth. In addition, these cases consisted of approximately one-fifth of all cases, and the results are important in drawing attention to the issue of children driven to violence and delinquency in childhood. Children's learning about violence at such an early age will affect their future life, relationships, and trust in society and prevent them from being an individual who can look to their future with confidence. Therefore, for societies to be healthy, it is imperative to care for every individual and grow them up in a society with health.^[18]

Fall from height is the third common reason for forensic cases in our study. Studies show an increase in suicidal jumping cases in adolescents and young adults.^[7] However, in this study, since jumping cases were included in the suicide group and accidental cases were included in the group fall from height, it was seen that 60% of the cases consisted of children aged between 1 and 87 months, and 62.6% of all were males. Kılıç *et al.*^[19] reported that falling accidents most frequently happen in balconies, windows, and trees, with 67.9% of male cases. Atmış *et al.*^[20] showed that 62.6% of the cases presented to the emergency department due to head trauma were male, 60.8% fell from the height indoors, and 25.4% fell from the height outside. Thus, falling in the preschool period is a significant cause of mortality and morbidity for children, and our results are in parallel with the literature. In this regard, it is recommended that parents increase their supervision of children and take necessary precautions, primarily at home.^[21]

According to the American Center for Disease Prevention data, poisoning is most common in males aged 1–4 years.^[10] In our study, accidental drug-caustic corrosive substance intake was the fourth reason for presentation (7.8%). It was observed that it was more common in males, and the cases were most common between children aged 1–87 months. The fact that poisoning resulting from the intake of such substances is observed frequently at young ages, particularly in boys, is attributed to children being more in contact with the environment and their curiosity about it. In addition, Children cannot distinguish if a substance is toxic, while also boys are generally more active than girls.^[11] Therefore, similar to previous studies, we suggest that parents should be more cautious about keeping and storing drugs and harmful substances.

According to our study, 7.4% of all cases were pregnancies under 18 years which was the fifth most common presentation in forensic cases. It was most frequently observed between children aged 174 and 216 months. In Turkey, adolescent pregnancy prevalence is associated with cultural reasons, lack of knowledge on birth control, low socio-cultural and economic level, low education level, and ethnic reasons. Early marriage and adolescent pregnancy is a significant public health problem in Turkey and worldwide, and we suggest that joint studies of sociology, psychology, and medicine should be supported, and preventive measures should be taken.^[22,23]

In our study, burn and electric injuries consisted of the seventh most common reason for emergency presentation, and it was observed most frequently between 1 and 44 months of age. Since such injuries mainly occur in the home, it is possible to prevent them with precautions to be taken at home. It is recommended that drug-corrosive substances and sharp tools such as scissors and knives be kept out of the reach of children; hot drinks should not be given to the child or given under parental control.^[9]

Cases presented to the emergency department due to suicide are in the eighth rank in the current study. They are also most frequently observed between 174 and 216 months and are more common among girls. Physicians have essential duties for this situation, a significant public health problem for young adults. It is recommended to contact the adolescent, be careful about mood disorders, depression, drug, substance use, risky sexual behaviors, inform the parents about these issues, and work together with the family in risky situations.^[7,24]

Excessive use of vehicles that produce carbon monoxide, the severity of the wind, and living in closed areas cause an increase in cases of poisoning with this substance

in autumn and winter.^[25] Carbon monoxide and food poisoning are the reasons for the application of 2.7% of forensic cases, and they can be prevented by raising awareness in society.

Forensic cases related to child abuse and neglect were observed between 1.2% and 5%. The low rates in cases of abuse and neglect are attributed to the tendency to hide such incidents due to the socio-cultural structure of the society.^[8,12,15] Our study observed a small percentage of abandoned children and child abuse. However, we claim that necessary studies on this subject should be strictly conducted since it is assumed to be observed more frequently in the community. After raising awareness in the society with the activities led by nongovernmental organizations and official institutions on child abuse, studies should be carried out to correct the behavior of families at home, teachers, and children at school. Effective policies should be developed against child abuse, including measures to prevent abuse, treatment and rehabilitation of the victim, and severe punishment of the perpetrator.^[26-28]

While the most common causes of hospitalization were suicide, firearm injury, fall from height, and traffic accidents, 0.4% of the patients lost their lives due to traffic accidents or fall from height.^[11,12,29] Duramaz *et al.*,^[30] when they examined the forensic cases followed up in the pediatric intensive care unit, showed that 71.8% of the cases were hospitalized for nontraumatic reasons and most frequently due to accidental drug intake (92.5%). Only 28.1% of the cases were followed up for traumatic reasons, with a mortality rate of 5%, and the most common cause of death was traffic accidents following fall from height. As a result, considering the hospitalization rates of centers that treat trauma and those that do not, the latter group has higher hospitalization rates in forensic cases. In addition, trauma patients have a higher mortality rate despite a low hospitalization rate. In our study, similar to the literature, 77.5% of the cases were treated as outpatients, 12.4% were hospitalized, and 4% were treated in the emergency department.

Limitations

The limitation of our study is that it is retrospective, and the details of the history, the way of the arrival to hospital, and arrival time are insufficient.

Conclusions

Our study has several important implications. First of all, traffic accidents continue to be an important public health problem today. Second, cases presented to the emergency department due to assault and blunt or sharp force injuries constitute an important part of forensic cases, and children who are driven to violence

and crime in childhood are a situation that requires immediate action. Our third yet most important result is that early pregnancy is a much ignored social problem despite its importance. Measures to be determined by social, cultural, medical, and legal studies need to be implemented more effectively. Finally, reminding and warning parents about injuries that can be prevented with simple precautions, most of which occur at home, will protect children from undesired situations. Physicians should have information about forensic cases that occurred in childhood and fill in the necessary forms and documents with being aware that reporting is a responsibility and a legal obligation when faced with a forensic case.

Author contributions

İA and KİD conducted the study concept and design, analysis and interpretation of the data, İA conducted drafting of manuscript, critical revision of the manuscript for important intellectual content, İA and KİD conducted the statistical analysis and acquisition of the data.

Conflicts of interest

None Declared.

Ethical approval

For the study, ethical approval was obtained from the Adana Training and Research Hospital Clinical Research Ethics Committee on December 16, 2020, with decision no: 1177.

Informed consent

Written informed consent was not obtained due retrospective nature of this study.

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