

THE EVALUATION OF PEDIATRIC FORENSIC CASES PRESENTED TO EMERGENCY DEPARTMENT

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ABSTRACT

INTRODUCTION: Pediatric age group serves as a preparation stage for the rest of the life. This age group has specific psychological, physiological and social conditions. This present study examined pediatric forensic cases aged between 0–18. Obtained parameters determined characteristics of pediatric age group forensic cases.

METHODS: 1624 pediatric forensic cases aged between 0–18 who were admitted to the emergency department at a tertiary healthcare service between the dates 31 October 2014 and 31 October 2016 were evaluated retrospectively. The cases were evaluated in terms of age, gender, nationality, admission time and season, reasons for presentation, radiological imaging techniques, consultation, intervention, treatment ward, clinical outcome and application of cardiopulmonary resuscitation.

RESULTS: Age average of the patients was $9,2 \pm 6,2$. Adolescent age group (49, 4%) was the most frequently admitted after traumatization. 61% of the patients constituted male patients. An association between age and gender was not detected. The most frequent reasons for admissions were assault (28,7%) and drug intoxication (22,4%). Assault, drug intoxication, traffic accidents, substance intake, penetrating stab wounds, falling down from the height and animal bites were frequently seen in adolescents whereas simple falling, corrosive substance ingestion and burn were highly seen in infants. Assault, penetrating stab wounds and gunshot injuries were detected to be frequent in males; drug and substance use was seen to be frequent in females. The patients (57%) were seen to be admitted to the emergency between the hours 16⁰⁰–24⁰⁰. 46.4% of the patients underwent radiological imaging. Trauma patients were seen to undergo radiological imaging more frequently. A consultation was required for 42.4% of the patients. The discharge rate of the patients from the emergency was 66.9%. Patients discharged from the emergency were seen to undergo radiography and computed tomography directly. This was found to be significantly high.

CONCLUSIONS: Pediatric forensic cases are seen in adolescence and school-age children more frequently. The most frequent forensic cases were assaults and intoxications. Forensic cases are more frequently seen in males. Assaults are more frequent in males whereas intoxications are more frequent in females. Most of the forensic cases are discharged from the emergency department. Patients discharged from the emergency undergo radiological imaging at higher rates compared to the other patients.

KEY WORDS: Trauma, child, forensic cases, radiological imaging

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INTRODUCTION

Pediatric age group has a specific physiology, pathology and sociology and serves as a preparation period for future. Although legal pediatric age groups are differently identified in many countries, UN declaration of the rights of the child describes pediatric age group as patients below the age of 18 years [1]. Healthcare staff should know that the pediatric age group is not a counterpart of adult patients. Pediatric age groups may display different behaviors, diseases, and stages. Traumatization mechanisms and surfaces show variations in those age groups [2]. This makes the management of this age group more difficult as it has various physiologies.

Every kind of problem which pediatric age groups encounter may affect their future life. This includes not only social and psychological problems but also health problems [3]. Predictably, social and psychological destructions in health problems are mostly seen in forensic cases [4]. A forensic case occurs when physical and psychological health problems are developed with the role of intent, negligence or inattention of another person [5]. Forensic cases are challenging so admission, notification, medical examination, protection and report of evidence necessitate a specific process [6]. Among the major forensic cases that doctors are obligatory to report are assaults, injuries, traffic accidents, labor accidents, intoxications, substance use, burns, electric shocks, asphyxia, omission and abuse, suicide, or other suspicious cases.

Forensic cases occupy a specific area in the pediatric age group. This situation bears specific difficulties in terms of both socio-physiological and medical aspects. The most frequent reasons for the death of children below 1 year in the USA are traumas. Gunshot deaths are the second cause after traumas in the pediatric age group in Turkey [7]. Mortal traumas are most frequently seen in skull area due to the anatomy of the pediatric age group. Those areas are respectively followed by the thorax and abdomen. Pediatric forensic cases reveal intoxications and involuntary exposures in curious and unaware pre-school children. Age group between 13 and 19 are seen to suffer from committing suicides. [8]. Pediatric age group is physically defenseless and dependent. For that reason, they are prone to be abused [9]. In addition to this, the rate of abuse is high in children called 'fragile child' anomaly, and victims of early period separation of mother and baby. Traumas of non-ambulatory children, mistakes that were done during toilet training, thermal burns resulting from

negligence, shaken baby syndrome are among the injuries that belong to the pediatric age group [10].

Most of the pediatric injuries and disease types enumerated above require admissions to any medical health center. Most of the other cases require admissions to the emergency, which unfortunately constitutes the leading reasons for daily emergency department admissions.

Pediatric forensic cases show varieties based on the region and the culture. In spite of many studies, a definite pediatric trauma classification could not have been done. By examining pediatric forensic cases, this present study aims to do situation analysis and enlighten emergency doctor about the difficulties that they may encounter.

MATERIAL AND METHOD

The study included pediatric forensic cases of patients who were admitted to a tertiary health care service between the dates 31 October 2014 and 31 October 2016. The parameters of the patients were examined through the computer database. Non-forensic cases and cases whose forensic reasons were not clarified were excluded from the study. The cases were evaluated in terms of age, gender, nationality, admission time and season, reasons for presentation, radiological imaging techniques, consultation, intervention, treatment ward, clinical outcome and application of cardiopulmonary resuscitation.

4759 forensic cases of patients who were admitted to the emergency department were considered and records of 2007 pediatric forensic cases were examined. 72 non-forensic cases and 311 cases whose forensic reasons could not be determined were excluded from the study. The study included 1624 pediatric cases.

Parameters were analyzed with Statistical Package for the Social Sciences (SPSS) 22.0. The distribution of the parameters was evaluated with Kolmogorov-Simonov test. Standard deviation (SD) was used for average in the demonstration of quantitative data. Case number (n) and percentile (%) were used in the demonstration of qualitative data. In the analysis of categorical parameters, Chi-square and Fisher exact tests were used. $P < 0,05$ was accepted to be significant.

FINDINGS

Age and gender parameters of the patients are displayed in Table 1. According to the age groups,

a difference in terms of genders could not be found ($p = 0,171$).

According to the reasons for being the forensic case, the age distributions of the patients are shown in Table 2.

According to the reasons for being the forensic case, the age distribution of the patients is displayed in Table 3.

Forensic cases were examined according to the admission time; assault, drug intoxication, falling, burn and substance intake are seen to be significantly high between the hours 08⁰⁰–24⁰⁰. Admissions due to animal bites were seen to be increasing between the hours 16⁰⁰–24⁰⁰. The frequency of CO intoxications was seen to occur between the hours 24⁰⁰–08⁰⁰ ($p < 0, 05$).

The frequency of radiological imaging techniques in forensic cases is presented in Table 4.

The study showed that frequency of radiological imaging was significantly high in cases of assaults, simple falling, falling from the height, corrosive substance ingestion, traffic accidents and gunshot injuries ($p < 0,05$). Cases of drug intoxications, burns and animal bites required a significantly low frequency of radiological imaging.

The association of patients' hospital status and forensic cases' types are shown in Table 5.

DISCUSSION

Forensic cases include all the factors that cause psychological and physical problems in individuals. Fo-

Table 1. The patients' age and gender situations

Patient group	n	%	Male n (%)	Female n (%)
Newborn (0–1 month)	7	0,4	5 (0,5)	2 (0,3)
Infant (1–24 month)	254	15,6	152 (15,4)	102 (16,1)
Preschool (2–6 years)	336	20,7	189 (19,1)	147 (23,2)
Schoolchildren (6–11 years)	225	13,9	149 (15,1)	76 (12)
Adolescent (11–17 years)	802	49,4	495 (50)	307 (48,4)
Total	1624	100	990 (100)	634 (100)

Table 2. The patients' forensic case type and gender distribution

	Gender		p
	Male n (%)	Female n (%)	
Assault	351 (75,3)	115 (24,7)	< 0,001
Drug intoxication	142 (39)	222 (61)	< 0,001
Simple falling	104 (58,1)	75 (41,9)	0,406
Corrosive substance ingestion	82 (62,6)	49 (37,4)	0,689
Traffic accident	74 (68,5)	34 (31,5)	0,096
Burn	70 (66,7)	35 (33,3)	0,215
Falling down from height	52 (59,8)	35 (40,2)	0,815
Penetrating stab wounds	43 (78,2)	12 (21,8)	0,008
Substance use	12 (35,3)	22 (64,7)	0,002
Electric shock	22 (64,7)	12 (35,3)	0,651
Animal bite	16 (66,7)	8 (33,3)	0,564
Asphyxia	9 (50)	9 (50)	0,338
CO intoxication	5 (50)	5 (50)	0,476
Gunshot injuries	7 (100)	0	0,034
Rape	1 (50)	1 (50)	0,751
Total	990 (100)	634 (100)	

Table 3. Age distributions of forensic case types

	%	Newbornn (%)	Infant n (%)	Preschool n (%)	School child n (%)	Adolescent n (%)	p	Total n(%)
Assault	28,7	0	2 (0,4)	17 (3,6)	80 (17,2)	367 (78,8)	< 0,001	466 (28,7)
Drug intoxication	22,4	1 (0,3)	44 (12,1)	141 (38,7)	16 (4,4)	162 (44,5)	< 0,001	364 (22,4%)
Simple falling	11,0	4 (2,2)	57 (31,8)	41 (22,9)	31 (17,3)	46 (25,6)	< 0,001	179 (11,0%)
Corrosive substance	8,1	1 (0,8)	58 (44,3)	43 (32,8)	10 (7,6)	19 (14,5)	< 0,001	131 (8,1%)
Traffic accident	6,7	0	7 (6,5)	15 (13,9)	31 (28,7)	55 (50,9)	< 0,001	108 (6,7%)
Burn	6,5	1 (1)	54 (51,4)	31 (29,5)	7 (6,7)	12 (11,4)	< 0,001	105 (6,5%)
Falling down from height	5,4	0	21 (24,2)	21 (24,2)	18 (20,6)	27 (31,0)	0,008	87 (5,4%)
Penetrating stab wounds	3,4	0	0	3 (5,5)	6 (10,9)	46 (83,6)	< 0,001	55 (3,4%)
Substance intake	2,1	0	1 (2,9)	1 (2,9)	2 (5,9)	30 (88,2)	< 0,001	34 (2,1%)
Electric shock	2,1	0	5 (14,7)	10 (29,4)	7 (20,6)	12 (35,3)	0,409	34 (2,1%)
Animal bite	1,5	0	0	5 (20,8)	9 (37,5)	10 (41,7)	0,007	24 (1,5%)
Asphyxia	1,1	0	3 (16,7)	6 (33,3)	3 (16,7)	6 (33,3)	0,636	18 (1,1%)
CO intoxication	0,6	0	2 (20)	2 (20)	4 (40)	2 (20)	0,142	10 (0,6%)
Gunshot injuries	0,4	0	0	0	1 (14,3)	6 (85,7)	0,347	7 (0,4%)
Rape	0,1	0	0	0	0	2 (100)	0,726	2 (0,1%)
Total	100	7	254	336	225	802		1624 (%100)

Table 4. The frequency of radiological imaging techniques in forensic cases.

	n	%
Radiological Imaging	754	46,4
Direct radiography	636	39,2
CT	239	14,7
Brain CT	187	11,5
Thorax CT	29	1,8
Abdomen CT	4	0,2
Vertebral CT	50	3,1
Orbita CT	6	0,4
Maxillofacial CT	36	2,2
Extremity CT	15	0,9
Multiple CT	88	5,4
USG	125	7,7

rensic cases are important health problems in terms of mortality and morbidity. It is apparent that any health problem which develops in the pediatric age group will result in both physiologic and psychological damages in the individual's future health. For that reason, pediatric forensic cases have an importance. Pediatric forensic cases largely vary from

country to country even from region to region at 18–43 %. In our study 42,17% of the forensic cases constitute pediatric forensic cases. This is compatible with the literature [11, 12].

The studies in which pediatric forensic cases were evaluated identified the age average as 8,2–9,1 years of age and defined that the frequency of getting injuries increased in preschool age children and school age children. This present study also showed that the age average was similarly $9,2 \pm 6,2$ and the occurrence of cases was the most frequent in children between 11–17 years of age and preschool children followed [13–15]. The fewest of the cases were detected in newborns. The reason for forensic cases being seen more frequently in this period is that exposure to every kind of environmental dangers increases at adolescence. Individuals of this age are also prone to acquire irresponsible — unthoughtful behaviors from their social environments. Parents may also behave irresponsibly, which will contribute to the negative development of individuals. Preschool children are unaware of the dangers around them, so they are more prone to forensic cases such as intoxications and traumas.

The studies conducted showed that even at different rates males constituted most of the forensic

Table 5. Hospitalization status of forensic cases' types

	Hospitalization status		P
	Discharge n (%)	Hospitalization n (%)	
Assault	463 (99,4)	3 (0,6)	< 0,001
Drug intoxication	104 (28,6)	260 (71,4)	< 0,001
Simple falling	160 (89,4)	19 (10,6)	< 0,001
Corrosive substance ingestion	47 (35,9)	84 (64,1)	0,005
Traffic accident	89 (82,4)	19 (17,6)	< 0,001
Burn	49 (46,7)	56 (53,3)	< 0,001
Falling from the height	45 (51,7)	42 (48,3)	0,002
Penetrating stab wound	43 (79,6)	11 (20,4)	0,071
Substance intake	17 (50)	17 (50)	0,034
Electric shock	22 (64,7)	12 (35,3)	0,780
Animal bite	23 (95,8)	1 (4,2)	0,003
Asphyxia	7 (38,9)	11 (61,1)	0,011
CO intoxication	10 (100)	0	0,026
Gunshot injuries	6 (85,7)	1 (14,3)	0,290
Rape	2 (100)	0	0,320
Total	1086 (100)	538 (100)	

cases. 61% of the cases were male in this present study, which was compatible with the literature. The main reason for this is that male children's plays mostly are based on physical power. Because of the paternalistic structure of our society, girls are less prone to spend time outdoors. Parents tend to monitor their girls more closely while they ignore their boys. For those reasons, trauma rates are higher in males [16].

When pediatric forensic cases were evaluated, male children by 14 years of age were seen to be in forensic cases more frequently. However, female children after 14 years of age were defined to be in more non-traumatic cases [17, 18]. In our study, similar to the literature traumas and drug/substance intake were more frequent in adolescents. Simple falling, corrosive substance ingestion and burn were higher in infants.

Although there were variations in the studies conducted, it was stated that pediatric forensic cases were mostly based on falling and traffic accidents, which were subsequently followed by assaults and intoxications [19]. Traumatization was stated to be more frequent in male children while intoxications were more frequent in female children [20]. In non-traumatic cases, committing intoxications were observed to be more frequent. Physi-

ological and psychological changes are intensive during adolescence. For that reason, experiences of lost or failures may increase the tendency towards committing suicide. In this study, the most frequent reasons for admissions were identified to be assault and subsequently drug intoxications. Assault, drug intake, traffic accident, substance use, penetrating stab wounds, falling from the height and animal bite were frequent at adolescents; falling, corrosive substance ingestion and burns were significantly high in infants. Hospital admissions were seen to be more frequent in males due to assault, penetrating stab wound, gunshot injuries whereas in females frequent reasons for admissions were drug and substance intake. We think that traffic accidents in the region were referred to pediatric trauma centers, so trauma rates were low, which was contrary to the literature. Hospital admissions were frequent for the age range 11–17 years of age. We think that at this period the male age group is prone to violence and girls commit suicide to raise attention of others. Infants are constantly in a struggle for walking or moving. However, their motor/balance functions are not developed well. For this reason, they are prone to falling during their struggle to move and walk. Additionally, cognition of this age group has not been developed yet. States associat-

ed with superego such as curiosity and fear have not developed. This can express in corrosive substance ingestion and animal attacks.

In the studies done, any unity could not be seen among the admission time of the pediatric forensic cases. In the studies where pediatric forensic cases were evaluated it was seen that admission frequency for traffic accidents was in the afternoon, falling cases were in the daytime, physical assaults were at night and committing suicides were after the midnight. Another study stated that male children were admitted to the hospital between the hours 16⁰¹–23⁵⁹ more frequently, and that was between the hours 08⁰⁰–16⁰⁰ for the females. In our study, it was seen that the most frequent admissions were between 16⁰⁰–24⁰⁰; assault, drug intoxications, simple falling, burn and substance intake was seen to decrease significantly; admissions due to animal bites were seen to increase between the hours 16⁰⁰–24⁰⁰; CO intoxications were frequent between 24⁰⁰–08⁰⁰. Considering the time that children stay at home and the heating that is provided with natural gas, solid-fuel and stove are on at night, it is usual to have admissions during the night [21]. Pediatric age groups are usually up during daytime; the ones whose parents work are under the supervision of their babysitters. Inattention of babysitters may cause traumas. Even though traumas develop during the day, fathers are waited for before admitting to a hospital, which delays the admissions to the evening or night hours. We think that daytime trauma frequencies increase since little children are out after school hours and adolescents (apart from school hours) are also out in the evening hours. Some traumas may be recognized late or late admissions may be done by parents after they return home. Committing suicides during the daytime and night may occur for the reason that individuals may have some familial quarrels during the day and night.

In many studies, head and neck traumas were seen to be the most frequent in pediatric trauma cases [22, 23]. Cases may be ignored for the reasons that head/body ratios of the pediatric cases are high, that their bone structures have not been totally developed, that their symptoms show variations, and that especially little children cannot utter their complaints. In a dissertation in which pediatric trauma cases were examined, it was stated that only in 1.7% of the patients any kind of radiological imaging techniques were not applied, the most

frequent radiological imaging was direct radiography (97%), subsequently USG (69%) and computed tomography (CT) (43%). In this study, it was seen that the ratio of demand for examination increased in the recent past and CT was demanded even in mild trauma cases (Glasgow Coma Scale: 14,15). In our study, it was seen that 46,4% of the cases underwent radiological imaging, the most frequent radiological imaging was direct radiography, the most frequent CT was brain CT and more than one tomography was taken in the 5.4% of the cases. The frequency of radiological imaging was more than trauma cases. Additionally, it was seen that direct radiography and CT imaging were done in the patients who were discharged from the emergency department. This can be related to the fact that the doctor may avoid malpractice and want to discharge the patient from the emergency department more quickly. It may also be associated with the fact that patients themselves and their relatives insist on radiological imaging. In order to exclude mediastinitis and aspiration of corrosive substance into the lungs, radiography may be required.

Some studies stated that the discharge frequency of pediatric forensic cases from the emergency department could reach the level of 90%, and 4,3%–45% of the patients were generally hospitalized [15, 24]. 10 % of the cases was referred to intensive care unit, 9% was hospitalized in surgical clinics. Hospitalization reason for the cases from the most frequent to the least were reported to be falling (52,7%), traffic accident (19%), burn (15,1%) [25]. In our study, it was seen that 67,6% of the cases was discharged from the emergency department, 22.7% was hospitalized in clinics, 9,1% was referred to the intensive care unit. Traumatic cases and CO intoxications were generally discharged from the emergency department because most of the traumas and CO intoxications were not severe. Intoxications, asphyxia, and burn cases were hospitalized. The reason for hospitalization can be to prevent any development of complications and to observe the patient. The ratio of hospitalizations in our study showed similarity with the ratios in the literature.

The studies reported that the mortality rate of the pediatric forensic cases at the emergency service was 0,14% [25]. The mortality rate in the cases hospitalized was 1.6–9%. They were reported to be traumatic cases [20, 25]. In another study conducted, even though life-threatening cases constituted 7.4% of the admissions, death was not reported

at the emergency department. Mortality rate at the emergency department was detected to be 0.1%. This data is compatible with the literature when only emergency department rates were taken into consideration.

Consequently, forensic cases are frequent in adolescents and school age children. The most frequent forensic cases are assault and intoxications. Forensic cases are more frequent among the males. Assault is frequent in the male group and intoxications are frequent in the female group. Most forensic cases are discharged from the emergency department. Radiological imaging is more frequent for those who were directly discharged from the emergency department.

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