

Original Article



Epidemiologic Feature and Diagnostic Outcome of Traumatic Pediatric Patients Referred to Emergency Department of Imam-Reza Hospital, Tabriz, Iran in 2016-2017

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Abstract

Introduction: Trauma has been recognized as the leading cause of mortality and morbidity among children in developed countries. Therefore, it is highly desirable to have a control program in this area. The aim of this study was determining epidemiologic feature and diagnostic outcome of traumatic pediatric patients referred to emergency department in 2016-2017.

Methods: This descriptive cross-sectional study was conducted at emergency department, Imam-Reza hospital of Tabriz University of Medical Sciences in 2016-2017 on a total of 518 traumatic children. Variables of interest were age, gender, location of trauma, mechanism of trauma, type of transfer to emergency department, time of trauma, and outcome of the incident.

Results: Among 518 traumatic children involved in the study, the most common age for trauma was 3-6 years, and 66.4% and 33.6% of the studied population were boys and girls, respectively. Falling (42.5%) was the most common mechanism of trauma, and the most of traumas occurred during evening (56.9%) and spring (38.8%) time. In additions, 75.5% of traumatic children were transferred to the emergency department by their family, and among them, only for two cases safety instructions had been considered.

Conclusion: In general, the results of this study demonstrated that boys with the age of 3-6 years are the most vulnerable group against trauma. Falling and traffic accidents are the main causes of trauma in children, whereas safety devices were not used in the majority of accident cases. Thus, it is highly recommended to use safety equipment for children inside vehicles.

Introduction

Children are a huge part of population in Iran, and trauma is one of the most important reasons of their referral to emergency departments. Trauma is among the most common causes of morbidity and mortality in children.¹⁻³ In addition, injuries made by traffic accidents are the leading cause of death, hospitalization and disability around the world.⁴

Trauma is the determining reason of death and morbidity among children in the ages of 1-14 years old in developing countries.⁵ In all age groups of children, intensive traumas are the main reason for ~15% of all admissions of pediatrics' ICU, ~25% of emergency visits, ~50% or even more of pediatric ambulance transfers, and ~20% of hospitalizations.⁶ Studies have shown that one

of every 4 children involved in accidents needs medical care, and about 60% of deaths caused by accidents are in individuals with less than 18 years old.⁷

Memarzadeh et al in their study on the epidemiology of traumatic children referred to Al-Zahra hospital, Esfahan, Iran concluded that falling and vehicle accidents are main causes of trauma among children, and they recommended that it is highly necessary to educate parents in this area.⁶ In the study by Bernardo et al, most of the traumas were reported during 4:00 PM-11:59 PM, which may be related to presence of children in playgrounds during these hours.⁸

Identification of risk factors and proper prior planning, e.g. securing playgrounds, training and enforcing driving rules, use of safety equipment during driving, shuttering

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children's bed, or etc., can reduce the occurrence and severe outcomes of traumas in children. It is clear that prevention costs of these accidents is much less compared to the treatment costs for individuals, their family, the society, and country's health system.^{6,9-13}

This study was designed and conducted with the aim of determining epidemiologic feature and diagnostic outcome of traumatic pediatric patients referred to emergency department in 2016-2017.

Methods

Study design and setting

This descriptive cross-sectional study was conducted at emergency department, Imam-Reza hospital of Tabriz University of Medical Sciences in the period of 2016-2017.

Participants

Among ~ 5000 patients (under 12 years old) referred to Imam-Reza hospital annually, 518 patients were determined as the study sample based on Morgan table and definitions of alpha/confidence interval of 0.05/0.95. The entire census was used to gather the data and reach the final sample size.

Inclusion/exclusion criteria

Inclusion criteria included traumatic patients under the age of 12 years old. Age of above 12 years old and dissatisfaction to participate in the research were among exclusion criteria.

Data collection

Written informed consent was obtained, and the details of the study were shared with the parents or the first-degree relatives of the traumatic patients. Demographic characteristics (age, gender, date of injury), time of injury (morning, evening, night), type of transfer (by ambulance or family), event location, mechanism of trauma, final diagnosis, sitting position of child, use of safety equipment, mortality at emergency department, hospitalization and discharge status of patients were obtained and recorded at researcher-made checklist. Patients were followed up and recorded until their discharge from the emergency department of the hospital.

Statistical analysis

In this study IBM SPSS (version 23) software was employed to conduct the statistical analysis. The Kolmogorov-Smirnov test was applied for analytical statistics in order to investigate the normality of the data. In case of abnormal distribution, for any quantitative data, median and first and fourth quartiles were used. Descriptive statistics, including frequency, mean and standard deviation, were used for qualitative data.

Results

After applying inclusion and exclusion criteria, a total of 518 patients, with demographic characteristics shown in Table 1, were selected. Table 2 depicts distribution (number and percentage) of the occurrences based on type of transfer (family or ambulance), the time of injury (morning, evening, or night), as well as location of the incidents (inside or outside city area). In addition, most of the referrals to emergency department were reported during morning, and ambulance was the most common transfer method for these patients; however, most transfers during evening were reported to be done by patients' family. Overall, family and ambulance were the most common transfer methods for traumas occurred inside and outside of city, respectively.

Figure 1 demonstrates distribution of location of trauma among different age groups. As it is shown in this figure, indoor traumas were less evident in higher age groups (9-12 years old). However, the frequency of traumas remained constant on roads and highways for different

Table 1. Demographics characteristics of traumatic children

Variable	No.	Percent	
Gender	Male	344	66.4
	Female	174	33.6
Age	0-3	120	23.1
	3-6	151	29.1
	6-9	136	26.2
	9-12	111	21.4
	Car-pedestrian	63	12.2
	Motor-pedestrian	34	6.6
Mechanism of Trauma	Car-car	66	12.7
	Car-motor	5	1.0
	Car-bicycle	8	1.5
	Motor-bicycle	2	0.4
	Rollover	1	0.2
	Fight	13	2.5
	Falling	220	42.5
	Falling of motor/bicycle	43	8.3
	Others	63	12.2
	Head trauma	217	41.9
Diagnosis	Spinal trauma	4	0.8
	Chest trauma	7	1.4
	Abdominal trauma	30	5.8
	Extremities trauma	110	21.2
Normal	150	29.0	

Table 2. Type of transfer and time/location of injury

	Family	Ambulance	Total
Time	Morning	30 (34.5%)	87 (100%)
	Evening	231 (78.3%)	295 (100%)
	Night	102 (75%)	136 (100%)
Location	Inside city	84 (18%)	466 (100%)
	Out side	44 (84.6%)	52 (100%)

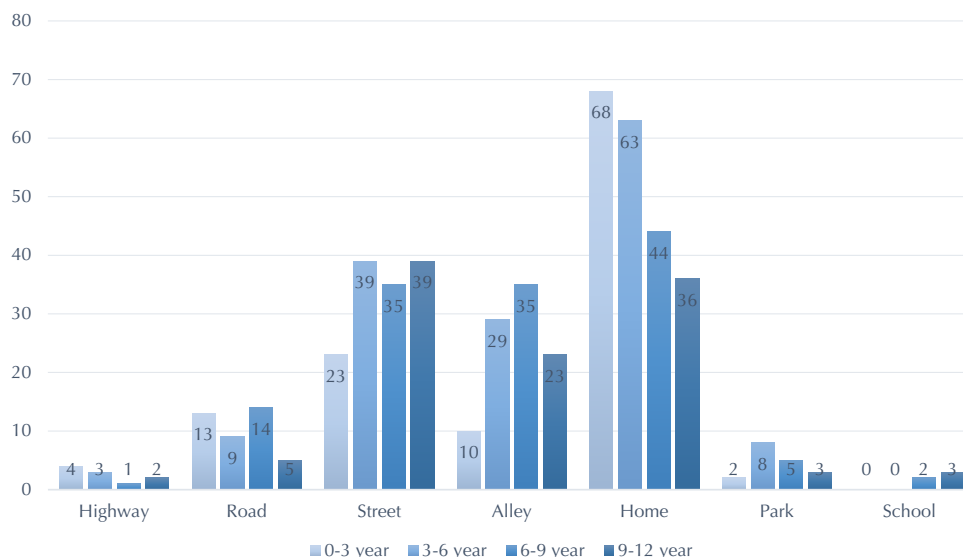


Figure 1. Distribution of location of trauma among different age groups.

age groups (in most of the cases, the occurrences were reported as accident between two cars).

Figures 2 and 3 illustrate the relation between gender and location and mechanism of trauma, respectively. These figures suggest that boys were more vulnerable in almost all categories of trauma mechanism compared to girls; however, there was high similarity between two genders regarding the sequence (i.e. overall probability) of mechanism of trauma. It is noticeable in Figure 2 that most of the traumas, regardless of gender, occurred at home.

In the traumas occurred inside car (e.g. accident between two cars, car overturning, falling out of moving car, or etc.), in 44.3% (31) and 55.7% (39) of the cases the patient was seated in the front and back seats, respectively. In traumas associated with vehicle accidents (227 cases), use of safety equipment in cars, e.g. fastening seat belt, use of baby seat, use of safety equipment on bikes or motorbikes, and holding parent’s hand during passing the street was only seen in 2 cases (0.9%), while 99.1% of the patients (225 cases) did not have any type of safety equipment.

Eventually, out of the entire study population 6 patients (2.1%) died at emergency unit, 372 patients (71.8%) were discharged, and rest of the patients were hospitalized (27%). Table 3 depicts the number of patients in the hospitalized, discharged, and dead categories for different trauma mechanisms. Falling was the main cause of 3 out of 4 deaths associated with traumas occurred inside city, and 2 traumatic children died as a result of out of city car to car accidents.

Discussion

A total of 518 patients were studied. Boys in the age of 3-6 years old were the most susceptible group against

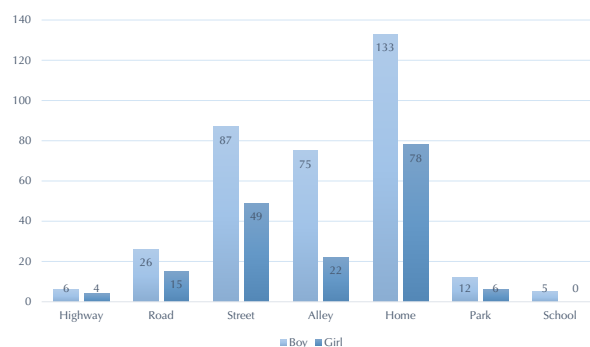


Figure 2. The relation between gender and location of trauma.

trauma. Most of traumas happened during evening and spring time. Falling was the most common mechanism of trauma, and death was more evident in the traumas occurred inside city.

Pediatrics traumas remain as one of the main health problems around the world, and according to a 2005 vital data recorded in Iran, trauma was the second reason of mortality among children, regardless of gender.^{1-3,6} As stated by United States National Disaster Control Center, 14110 trauma-related deaths were reported in children under 18 years old in the United States in 2003, in which 63% were due to vehicle accident; however, this country has acceptable control conditions and compliance in place. According to this report and similar to our observations, falling was the main reason of non-fatal pediatric injuries¹⁴.

In the study by Arhami et al, most of traumas occurred during 4:00pm-11:59pm, as children are more visible at playground during these hours.¹⁵ This observation was also confirmed in the study by Bernardo et al⁸ In the present study, most of the traumas happened inside the

Table 3. The outcome of traumatic children in emergency department by type of injury

	Car-Pedestrian	Motorbike-Pedestrian	Car-Car	Car-Motorbike	Car-Bike	Motorbike-Bike	Rollover	Fight	Falling	Falling of Bike/Motorbike	Others
Inside city											
Hospitalization	21	5	5	3	2	2	0	0	32	9	6
Discharge	40	24	17	1	6	0	1	10	170	32	51
Death	0	1	0	0	0	0	0	0	3	0	0
Out of city											
Hospitalization	0	-	26	1	-	-	-	-	1	0	0
Discharge	1	-	15	0	-	-	-	-	2	1	0
Death	0	-	2	0	-	-	-	-	0	0	0

city. Moreover, traumas were more evident at home, street and alley, as oppose to school, which had minimum trauma frequency. These findings were similar to the results of the study by Memarzadeh et al and Asadi et al.^{6,16} In the study by Peclat et al, 42.5%, 19.4%, and 37.8% of traumatic peditrics were transferred by ambulance, helicopter and private vehicles, respectively.¹⁷ The difference between this and our observations might be due to facilities as well as cultural differences among different countries.

This study suggests that boys are significantly more vulnerable against traumas compared to girls, which is consistent with the results of the previous studies.^{6,15,16,18-23}

Trauma was less evident among children under 3 years old, as they move less, and they are usually taken care of better. On the other hand, in the older ages, children can take care of themselves better, and they are less dependent to their parents which can explain the reduction of trauma cases among the children over nine years old. Similar to the results of study by Danseco et al,²⁰ by increasing the age of children, the number of trauma cases that occurred inside (outside) home were reported to be less (more) frequent, and this relationship was statistically significant. There was no statistically significant relationship between gender and location of trauma.

According to the results of the present study, falling, accident between two cars and accident between a car and pedestrian were highest-evident trauma mechanisms, with no statistical significance among genders. Similar results were reported in the previous studies.^{6,15,16,18,22} In the study by Peclat et al, vehicle accidents, child abuse and drowning were reported as the most common mechanism of trauma.¹⁷

Head trauma, injuries in extremities and abdomen were observed with higher frequencies compared to other organs of body.

Eventually, 1.2% of traumatic children died, and 27% of them were hospitalized for further medical interventions. Based on the present study, crash of motorcycle and bike, motorcycle and car, and accident between two cars resulted in the highest hospitalization ratio among all cases. Most of the deaths were associated with falling and accident of two automobiles with each other, which was statistically significant. However, there was no statistically significant relationship between use of safety equipment and hospitalization or death. In the study by Asadi et al, 1.7% of traumatic children died,¹⁶ and trauma led into death in 1.8% and 4.1% of cases in the studies by Arhami et al and Memarzadeh et al, respectively.^{6,15}

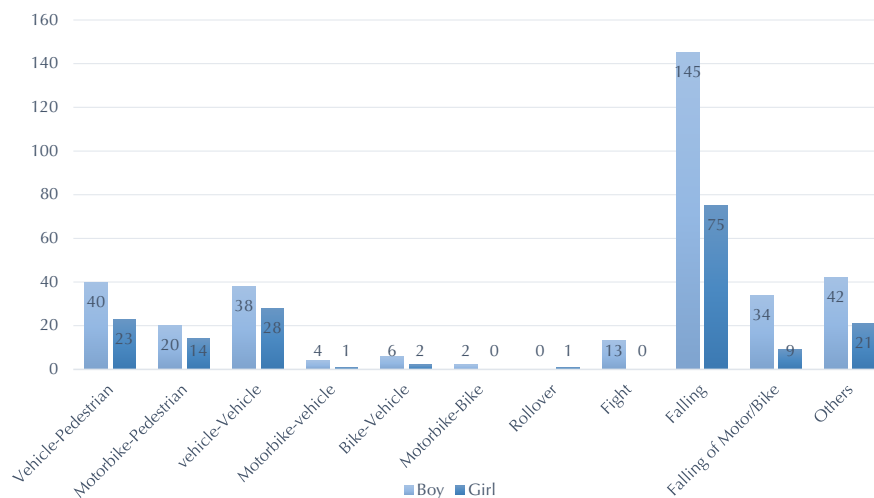


Figure 3. The relation between gender and mechanism of trauma.

Considering that the safety instructions were observed in only two cases of the present study, the relationship between failure to observe safety instructions and hospitalization or death cannot be invoked here. In the study by Abazarloo et al., the authors suggested that implementing various preventive educational programs for parents and children at home, school, work environment, public media, and social networks, along with first aid methods, proper use of equipment and home safety precautions can be effective in reducing the chance of trauma and the consequences of trauma in the community.²⁴

Limitations

Lack of resources to record the information of all traumatic children and lack of parental consent to participate in the study, which might be related to parents' stress level caused by the trauma, were among the limitations of the current study. Another limitation of this study was lack of access to hospitalized patients for following up with them.

Conclusion

In general, most of traumas occurred during evening and spring. The most common location of trauma occurrence was at home; however, with increasing age, the number of traumas happened outside home increased. Most of the traumas that happened inside and outside city were transferred to the emergency department by the patients' family and ambulance, respectively. Boys were more vulnerable to be exposed to trauma, which had increasing trend with age. The most common age for occurrence of trauma was 3-6 years old. Falling and traffic accidents were the two most frequent mechanisms of trauma, and most of the deaths were related to these two mechanisms. The most common injured body organs were head, limbs and abdomen. In the majority of cases, safety instructions were not respected. Considering the importance of pediatric age group and pediatric susceptibility against trauma, it is highly recommended to secure automobiles with proper safety equipment for children. In addition, media and the virtual world can play an important role in educating children and adults on how to use safety supplies in vehicles for children under 12 years old.

Conflict of Interest

The authors declare that there is no conflict of interest with respect to the research, authorship, and publication of this article.

Ethical Approval

This study was approved by Research and Ethics Committee of Tabriz University of Medical Sciences, Tabriz, Iran on 11/15/2014 (code: 7629).

Author's contributions

FR, ZP, HEB, SS and TH conducted data collection, literature review, and drafting of the manuscript; FR and ZP undertook the major parts of the study design and performed the statistical analysis and data interpretation.

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References

1. Cooper A, Barlow B, DiScala C, String D, Ray K, Mottley L. Efficacy of pediatric trauma care: results of a population-based study. *J Pediatr Surg.* 1993;28(3):299-303. doi: 10.1016/0022-3468(93)90221-6.
2. Forouzanfar MM, Safari S, Niazazari M, Baratloo A, Hashemi B, Hatamabadi HR, et al. Clinical decision rule to prevent unnecessary chest X-ray in patients with blunt multiple traumas. *Emerg Med Australas.* 2014;26(6):561-6. doi: 10.1111/1742-6723.12302.
3. Younesian S, Mahfoozpour S, Ghaffari Shad E, Kariman H, Hatamabadi HR. Unintentional home injury prevention in preschool children; a study of contributing factors. *Emerg (Tehran).* 2016;4(2):72-7.
4. Durkin MS, Laraque D, Lubman I, Barlow B. Epidemiology and prevention of traffic injuries to urban children and adolescents. *Pediatrics.* 1999;103(6):e74. doi: 10.1542/peds.103.6.e74.
5. McNicholl BP, Fisher RB, Dearden CH. Transatlantic perspectives of trauma systems. *Br J Surg.* 1993;80(8):985-7. doi: 10.1002/bjs.1800800815.
6. Memarzadeh M, Hoseinpour M, Sanjary N, Karimi Z. A study on trauma epidemiology in children referred to Isfahan Alzahra hospital during 2004-7. *Feyz.* 2011;14(5):488-93.
7. Galano GJ, Vitale MA, Kessler MW, Hyman JE, Vitale MG. The most frequent traumatic orthopaedic injuries from a national pediatric inpatient population. *J Pediatr Orthop.* 2005;25(1):39-44. doi: 10.1097/00004694-200501000-00010.
8. Bernardo LM, Gardner MJ, Seibel K. Playground injuries in children: a review and Pennsylvania Trauma Center experience. *J Soc Pediatr Nurs.* 2001;6(1):11-20. doi: 10.1111/j.1744-6155.2001.tb00114.x.
9. Alkon A, Genevro JL, Tschann JM, Kaiser P, Ragland DR, Boyce WT. The epidemiology of injuries in 4 child care centers. *Arch Pediatr Adolesc Med.* 1999;153(12):1248-54. doi: 10.1001/archpedi.153.12.1248.
10. Dedoukou X, Spyridopoulos T, Kedikoglou S, Alexe DM, Dessypris N, Petridou E. Incidence and risk factors of fall injuries among infants: a study in Greece. *Arch Pediatr Adolesc Med.* 2004;158(10):1002-6. doi: 10.1001/archpedi.158.10.1002.
11. Derakhshanfar H, Amini A, Hatamabadi H, Alimohamadi H. Pediatric traumatic brain injury management. *Healthmed.* 2013;7:115-21.

12. Khamalia A, Joshi P, Brussoni M, Raina P, Morrongiello B, Macarthur C. Risk factors for unintentional injuries due to falls in children aged 0-6 years: a systematic review. *Inj Prev.* 2006;12(6):378-81. doi: 10.1136/ip.2006.012161.
13. Mack KA, Gilchrist J, Ballesteros MF. Bunk bed-related injuries sustained by young children treated in emergency departments in the United States, 2001-2004, National Electronic Injury Surveillance System - All Injury Program. *Inj Prev.* 2007;13(2):137-40. doi: 10.1136/ip.2006.013193.
14. Mendelson KG, Fallat ME. Pediatric injuries: prevention to resolution. *Surg Clin North Am.* 2007;87(1):207-28. doi: 10.1016/j.suc.2006.09.016.
15. Arhami Dolatabadi A, Mohseninia N, Amiri M, Motamed H, Halimi Asl A. Pediatric trauma patients in Imam Hossein emergency department; an epidemiologic study. *Iran J Emerg Med.* 2016;3(1):4-8.
16. Asadi P, Asadi K, Rimaz S, Monsef-Kasmaie V, Zohrevandi B, Mohtasham-Amiri Z. Epidemiology of trauma in children admitted to Poursina teaching hospital. *Journal of Guilan University of Medical Sciences.* 2015;23(92):9-15. [Persian].
17. Pecllet MH, Newman KD, Eichelberger MR, Gotschall CS, Guzzetta PC, Anderson KD, et al. Patterns of injury in children. *J Pediatr Surg.* 1990;25(1):85-90. doi: 10.1016/s0022-3468(05)80169-1.
18. Aghakhani K, Ameri E, Ameri M, Mohtarami SA. Epidemiology of orthopedic trauma in children and adolescent in a referral center in Tehran: a prospective study. *Tehran University Medical Journal.* 2015;73(1):40-8. [Persian].
19. Cheng JC, Shen WY. Limb fracture pattern in different pediatric age groups: a study of 3,350 children. *J Orthop Trauma.* 1993;7(1):15-22. doi: 10.1097/00005131-199302000-00004.
20. Danseco ER, Miller TR, Spicer RS. Incidence and costs of 1987-1994 childhood injuries: demographic breakdowns. *Pediatrics.* 2000;105(2):E27. doi: 10.1542/peds.105.2.e27.
21. Javid M, Shah CGH, Abd EZLF, Ahmadi A, Farhadi A, Akasheh GA. Road Traffic Injuries in Children. *IJOS.* 2006;4:1-6.
22. Jiang X, Zhang Y, Wang Y, Wang B, Xu Y, Shang L. An analysis of 6215 hospitalized unintentional injuries among children aged 0-14 in northwest China. *Accid Anal Prev.* 2010;42(1):320-6. doi: 10.1016/j.aap.2009.08.012.
23. Tavakkoli L, Khanjani N. The demographic characteristics and factors related to fault in individuals deceased in city road crashes in Kerman province from 2012 to 2015. *Journal of Rafsanjan University of Medical Sciences and Health Services.* 2016;15(7):621-34. [Persian].
24. Abazarloo A, Rahmani F. Evaluation of deceased pediatric patients with burning injury admitted to Sina hospital, Tabriz, 2011 - 2016. *J Compr Ped.* 2017;8(4):e58197. doi: 10.5812/compreped.58197.