

Causes of Trauma and Related Factors in Children Referred to the Emergency Department of Public Hospitals in Iran

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Abstract

Introduction: Given the importance of obtaining accurate information on the prevalence and causes of trauma in children, and the role of such data in informing health policy and prevention strategies, as well as the paucity of information on this topic in Qom province, this study aimed to investigate the causes of trauma and related factors.

Method: This descriptive-analytical cross-sectional study focused on children with injuries who visited the emergency departments of public hospitals in Qom, Iran. Data were collected using a standardized form and by reviewing the medical records of hospitalized children during 2019.

Result: In a study involving 1,447 children, 60.1% of the participants were boys. The most common cause of trauma was falling (46.5%), and the most common place of the accident for boys was outside the home (73%). There was a significant relationship between children's age and the cause of the trauma, so that the prevalence of traffic accidents was higher in older children ($P < 0.05$).

Conclusion: Considering that most of the patients referred to the hospital due to trauma were boys, the high prevalence of falls in children, and the increase in traffic accidents in children with increasing age, it is clear that there is a need for further research.

Keywords: Child, Trauma, Accident, Injury, Harm, Iran.

Introduction

From the view point of medical sciences, trauma is any type of wound or penetrating or impenetrable injury that occurred due to intentional or unintentional external factors and includes traffic injuries, poisoning, falling, drowning, etc. ¹. According to the reports, complications related to the trauma are one of the five leading causes of death in different age groups in developed and developing countries and have been reported as one of the most important causes of disability in developed countries. These injuries also lead to the loss of an

individual capable of working for millions of hours worldwide ².

The results of studies show that the most vulnerable age group to trauma is children ¹, and trauma in children is one of the most important health challenges and one of the avoidable causes of mortality in both developed and developing societies ³. So that one out of every six hospitalized children is referred due to trauma ⁴. Physiological limitations, degree of development, sensory and motor development, behavioral characteristics (exploration, adventure, risky

behaviors), and reaction capacity (lack of experience, need for education) predispose children to harm, along with other environmental factors such as unsafe environment and lack of parental supervision and care, which increase children's vulnerability. Accidents in various forms, including falling from heights, electric shocks, burns, injuries caused by corporal punishment, collisions of various vehicles with each other and pedestrians, and accidents caused by throwing stones or other objects at vehicles, have caused damage to children, the frequency of which is affected by the child's age ⁵.

Many countries have established trauma registry systems, although their use in some Iranian cities remains limited ¹. Due to inadequate documentation in these systems, researchers have undertaken studies on child injuries. Asadi's study in Rasht, Iran, showed that most injuries occurred at home (49.6%) or on city streets (32.9%), with falls (40.4%) and traffic accidents (35.1%) as the primary causes. Head and neck injuries were most common (71.2%), followed by limb injuries (15.5%) ⁶. In Mashhad, Iran, boys comprised 59.4% of cases, with two-year-olds most affected (20.8%); fractures predominated (59%), and the head was the most injured site ⁵. Al-Nasser's study in Saudi Arabia reported that 68% of injured children were male, with falls from heights (73%), burns (17%), and penetrating injuries (10%) as leading causes (63%) ⁷. A Japanese study showed boys (69%) sustaining more injuries than girls, with head injuries (44%) being most common and severe; traffic accidents were the primary mechanism (44%), and mortality was highest (15%) in those under one year ⁸.

Given that trauma-related injuries are the leading cause of death in children and adolescents, accounting for 12% of global disabilities, identifying influencing factors is critical ⁹. Recognizing the need for precise data on the incidence and etiology of pediatric trauma to guide health policy, prevention planning, and community health promotion amid a lack of comprehensive reports on trauma epidemiology in Qom province, this study was designed ¹. It examines trauma epidemiology among patients referred to Qom's pediatric treatment centers in 2019. It focuses on frequency by age and gender to inform healthcare professionals about patterns and causes, thereby aiding future prevention efforts.

Methods

This descriptive-analytical study targeted children under seven years of age who presented to the emergency departments of three hospitals in Qom, Iran: Shahid Beheshti (a general hospital), Khayierin Salamat (a trauma center), and Hazrat Masoumeh (a children's center). Based on Asadi et al.'s prior study ⁶, the minimum sample size was determined to be 1,300. Sampling involved selecting every fifth child from a list of 7,663 injured children who visited these hospitals in 2019.

Data were collected from selected samples and via telephone interviews with families of children meeting the inclusion criteria (age under seven years and trauma-related referral). Exclusion criteria encompassed incomplete medical records or parental non-consent/non-response.

The data collection instrument was a form comprising questions on demographic details and trauma-related variables, including cause, child's gender and age, injury site, parental status, and incident location. It was developed from a literature review and refined with expert input.

Following approval and an introduction letter from the Research Deputy of Qom University of Medical Sciences, researchers visited the hospitals from October to March 2020. They reviewed 2019 medical records of traumatised children via the hospital information system (HIS) to extract data. Missing information prompted telephone contact with families using recorded numbers; non-respondents were excluded.

Data were analysed using SPSS version 20. Categorical variables were reported as frequencies (percentages), and continuous variables as means \pm standard deviations. Normality was assessed with the Kolmogorov-Smirnov test. Chi-square tests examined associations between trauma's anatomical location and mechanism and gender and incident location. A P-value less than 0.05 was considered statistically significant.

Results

This study included 1447 children. The average age of the children was 34.30 ± 16.50 months, and 60.1% were boys. Limb injuries were the most common type of trauma (55.7%), and falling was the most common cause of injury (46.5%) (Table 1).

Compared to traumatized girls, the most common trauma location for boys was outside the home (73%). Head injuries were more frequent in boys (27.40%), while limb injuries were more common in girls (60.40%) (Table 2).

Traffic accidents (65.4%) and falls (24.8%) were the most serious injuries. Inside the home, however, falls were the leading cause of injury (58.1%), followed by incidents involving foreign objects (11.4%). We also see different patterns in the injuries themselves; outdoor accidents more frequently resulted in harm to the head and neck (29.2%) or injuries to multiple limbs (19%) (Table 3).

The frequency of trauma mechanisms across different ages is shown in Figure 1.

As observed, falls were the most common cause of trauma in children of all age groups. The indoor environment was the most common trauma location for children of different ages (Figure 2).

Figure 3 shows the average age of children on the mechanisms of trauma. According to this figure, the average age of children injured in traffic accidents was higher than that of other injuries.

Table 1: Demographic characteristics of the included children

Demographic characteristics		Mean (SD)	Number (%)
Age (Month)		34.3015 (16.51)	
Father's age (Year)		36.7006 (5.94)	
Mother's age (Year)		32.0561 (5.69)	
Gender	Boy		869 (60.1)
	Girl		578 (39.9)
Anatomical location of Trauma	Limbs		806 (55.7)
	Head and neck		352 (24.3)
	Abdomen and Pelvis		140 (9.7)
	Thorax		12 (0.8)
	spinal column		6 (0.4)
	multiple trauma		131 (9.1)
Nationality	Iranian		887 (93.4)
	Non-Iranian		63 (6.6)
Guardianship status	Parents		1425 (98.5)
	Other		22 (1.5)
Mechanism of trauma	Poisoning		82 (7.0)
	Fall		543 (46.5)
	traffic accidents		266 (22.8)
	Burns		27 (2.3)
	Impact with an unintentional foreign object		105 (9.0)
	Cut with a sharp object.		59 (5.1)
	The entry of a foreign object into the eye or other natural pores		53 (4.5)
	Other		33 (2.8)
Outcome	Uncomplicated recovery		1393 (96.3)
	With a permanent complication		54 (3.7)

Table 2: Trauma characteristics based on gender in traumatised children

Variable		Gender				P-value
		Boy		Girl		
		Number	Percent	Number	Percent	
Trauma location	indoor	581	66.9%	288	33.1%	0.013
	Outdoor	422	73.0%	156	27.0%	
Anatomical location of Trauma	Limbs	457	52.60%	349	60.40%	.014
	Head and Neck	238	27.40%	114	19.70%	
	Abdomen and Pelvis	86	9.90%	54	9.30%	
	Thorax	8	0.90%	4	0.70%	
	spinal column	2	0.20%	4	0.70%	
	multiple trauma	78	9.00%	53	9.20%	
	Mechanism of trauma	Poisoning	53	7.50%	29	
	Fall	311	44.00%	232	50.30%	
	traffic accidents	180	25.50%	86	18.70%	
	Burns	17	2.40%	10	2.20%	
	Impact with an unintentional foreign object	62	8.80%	43	9.30%	
	Cut with a sharp object	34	4.80%	25	5.40%	
	The entry of a foreign object into the eye or other natural pores	31	4.40%	22	4.80%	
	Other	19	2.70%	14	3.00%	

Table 3: Trauma characteristics based on the trauma location

Variable		Location				P-value
		indoor		Outdoor		
		Number	Percent	Number	Percent	
Anatomical location of trauma	Limbs	588	59.50%	218	47.50%	<0.001
	Head and Neck	218	22.10%	134	29.20%	
	Abdomen and Pelvis	128	13.00%	12	2.60%	
	Thorax	9	0.90%	3	0.70%	
	spinal column	1	0.10%	5	1.10%	
	multiple trauma	44	4.50%	87	19.00%	
	Mechanism of trauma	Poisoning	78	10.20%	4	
Fall		442	58.10%	101	24.80%	
traffic accidents		0	0.00%	266	65.40%	
Burns		23	3.00%	4	1.00%	
Impact with an unintentional foreign object		87	11.40%	18	4.40%	
Cut with a sharp object		53	7.00%	6	1.50%	
The entry of a foreign object into the eye or other natural pores		51	6.70%	2	0.50%	
Other		27	3.50%	6	1.50%	

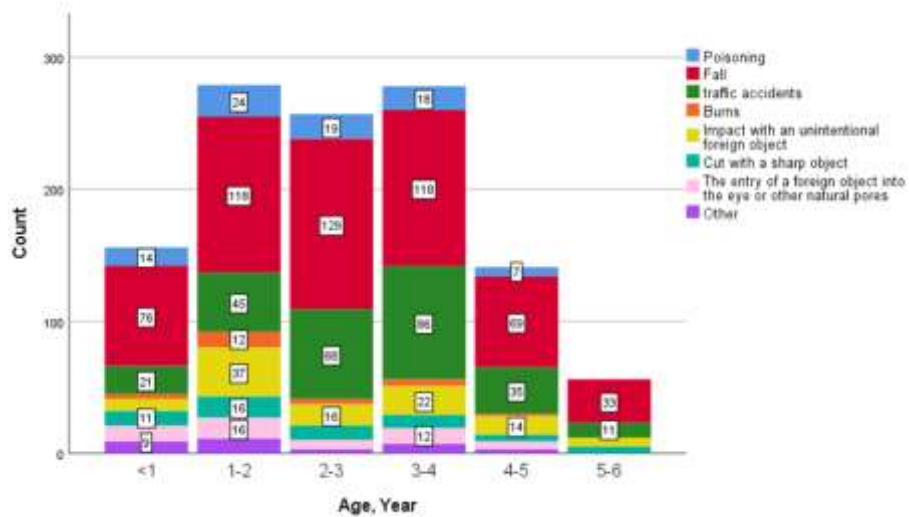


Figure 1: Frequency of the mechanism of trauma in different ages

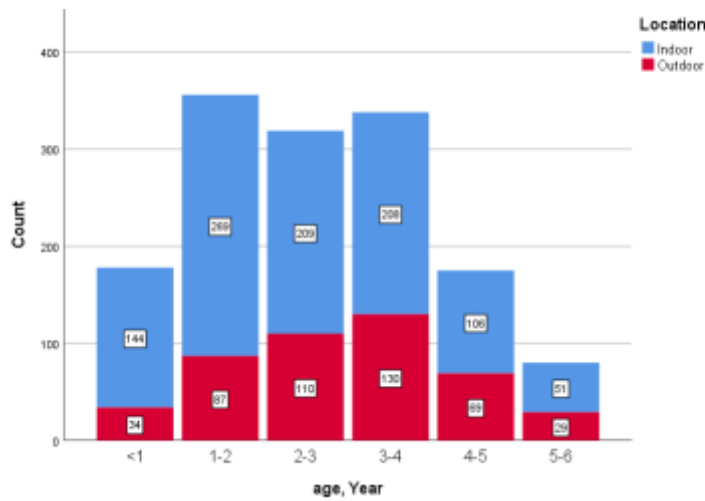


Figure 2: Trauma location in different ages of children

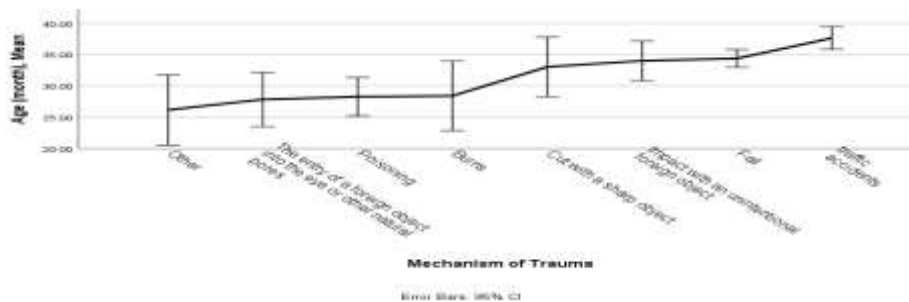


Figure 3: Children's average age based on the mechanisms of trauma

Discussion

The results of the current study demonstrated that boys

made up 60.1% of the children. The most common cause of trauma was a fall, which accounted for 46.5% of all

cases. Additionally, 73% of the boys suffered trauma outside their homes. The study also found a significant correlation between the children's age and the mechanism of injury, with older children exhibiting a higher prevalence of traffic accidents.

The results indicated that 60.1% of children referred to the hospital due to trauma were boys (60.1% vs. 39.9% for girls). Other studies showed that higher trauma incidence occurs among boys. Khorshidi et al. reported 67.8%¹⁰, Khodayari et al. 59.4%¹¹, Biparva et al. 59%⁵, Asadi et al. 62.1%⁶, Kundal et al. 69.86%⁹, Conradie et al. 72%¹², Bradshaw et al. 62%¹³. Similarly, a British cohort study by Cooper et al.¹⁴ found that fractures are more common in boys than girls. This pattern can be due to boys' specific behaviors and activities that expose them to more harm¹⁵.

In the present study, the most common mechanism of trauma among children was falls (46.5%). This finding is consistent with those of Khodayari et al. (44.3%)¹¹, Asadi et al. (40.4%)⁶, and Khorshidi et al.¹⁰, who also reported falls as the predominant mechanism. Bradshaw et al. reported that traffic accidents were the leading cause (42%) in low- and middle-income countries, and falls (55%) in high-income countries¹³. Kundal et al. identified falls during play, followed by street accidents, as the most frequent mechanisms⁹. The prominence of falls underscores the need for safer environments and heightened caregiver vigilance to prevent such incidents in children.

Boys in this study were more likely to experience trauma outside the home (73%), while girls more often experienced it indoors (33.1%). Outside, traffic accidents (65.4%) and falls (24.8%) were most common; inside, falls (58.1%) and foreign body aspiration (11.4%) were more frequent. Khorshidi et al. found that most traumas occurred at home, mainly from falls¹⁰. Asadi et al. reported home (49.6%) and city streets (32.9%) as primary locations, with falls as the leading mechanism⁶. Chadda et al. attributed 50% of cases to vehicle collisions and 19.4% to non-accidental injuries¹⁶. These findings emphasize the importance of enhancing child safety both indoors and outdoors.

A significant correlation was found between children's age and traffic-related injuries. Khodayari et al. observed peak rates at ages 4 and 5, and Kundal et al. reported increasing rates with age^{9,11}. These findings underscore a critical need: as children develop and explore more of the world outside the home, they

require vigilant supervision to keep them safe from traffic dangers.

Trauma frequency was highest among 2—to 4-year-olds compared to other age groups. Asadi et al. observed that most traumas occur in children under 4 years⁶, while Bradshaw et al. reported peaks at age 1 year in low—and middle-income countries and age 4 years in high-income ones¹³. Conversely, Kundal et al. found an increasing frequency with age⁹. As children grow more active with age, their limited cognitive development and self-care abilities heighten injury risks.

The current results showed that limb injuries comprised the majority (55.7%). Khodayari et al. reported fractures as the most common (66.9%), with the forearm most affected (22.7%)¹¹. Khorshidi et al. identified fractures (40.5%) and limbs as the primary site¹⁰. Biparva et al. showed that the most frequent injuries were fractures (59%) and head injuries (63.4%)⁵. The head and neck are the most common sites (71.2%), followed by limbs (15.5%)⁶. Bradshaw et al. found soft tissue injuries most prevalent globally (30%), with fractures leading in low- and middle-income countries (30%)¹³. Kundal et al. reported multiple limb injuries as the most common (26.48%)⁹. Conradie et al. noted 12% of pediatric cases with isolated splenic injury¹². Cervical spine injuries account for about 1.5% of all injuries¹⁷. Chadda et al. observed spinal injuries in 36 of 302 major trauma cases, mostly polytrauma; soft tissue injuries were most frequent (44.4%), followed by bone injuries (41.7%), with cervical spine involvement higher (9/36, 25%) than thoracic (5/36, 13.9%) or lumbar (3/36, 8.3%)¹⁶. Cooper et al.'s British cohort study showed that fractures comprise a quarter of childhood injuries¹⁴. Patella fractures were more common in boys than in girls¹⁵.

Limitations

The current study faced two primary limitations. First, we often found that patient medical records were incomplete or inconsistent. To fill these gaps, our team had to contact patients or their families by phone, a time-consuming and labor-intensive process. Second, some parents were unable or chose not to participate, which limited our sample size and may have affected the representativeness of our findings. These challenges underscore the importance of building more robust data collection systems and finding better ways to encourage participation in future studies.

Conclusion

The present study showed that the most of the patients referred to the hospital due to trauma were boys, and considering the high prevalence of falling in children and the increase in traffic accidents in children with increasing age; based on the findings It is recommended to plan for educating parents and caregivers of children to raise awareness and consider measures to pay more attention to caring for boys, providing security in children's living environment and preventing traffic accidents outside the home.

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Conflict of Interest Disclosures

On behalf of all authors, the corresponding author states there is no conflict of interest.

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Authors' Contributions

AMJ and AH contributed to the design and data collection, NE contributed to the design and draft of the research, revised the all data and wrote the text. MA contributed to accomplished the data analysis and revised the all data. MA contributed to the wrote the text. AA, ZSS and FGE contributed to the data collection. All authors approve and read the text version final.

Ethical Statement

This article is a part of a research project approved by the Research Deputy of Qom University of Medical Sciences. It has also been approved by the Ethics Committee with the code IR.MUQ.REC.1398.082. The principle of confidentiality of information has been strictly maintained throughout the study. When

contacting the study, the researcher introduced the questionnaire, followed by a detailed explanation of the study's objectives and the confidentiality of the information. Additionally, a team member randomly verified 10% of the collected data to ensure the accuracy of the data entry process.

Declaration of Generative AI and AI-assisted technologies

None.

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