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Causes and Outcomes of Childhood Trauma with GCS Below 9

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Abstract

Background: Trauma, as one of the major public health challenges, was the leading cause of death and disability in most countries. Trauma was considered as the most common reason for emergency department admission. Children are the most susceptible group of society to trauma, so we designed a study to investigate the epidemiologic feature and outcomes of trauma in children under 18 years old. In light of these findings, we might be able to prevent trauma in children.

Materials and methods: We conducted a retrospective cross-sectional study during the spring season of 2019 (for 3 months). The study population was all children under eighteen years old with GCS below 9 (1814cases), referring to the emergency department of Tabriz Emam-Reza Hospital. Among 1814 patients, 1786 patients were included. For each included patient, the outcomes of the 24-hour follow-up have been recorded.

Result: In this study, 62.1% percent (n=1109) were males. The mean age of patients was 5.47 ± 3.1. There were 1271 (71.1%) head and neck trauma, 276 (15.5%) extremities trauma. Abdominal trauma (n=66, 3.7%) and spinal trauma (n=57, 3.2%) were the rarest types of mechanism. It was revealed that falling had the most incidence frequency (40.4%). Eventually, out of the entire study population, 1361 patients were discharged from the emergency department (75%), 5 patients transferred to the trauma ward (0.2%), 1 patient hospitalized in the intensive care unit (0.05%), 250 patients left the hospital against physician permission (14%), 110 patients referred to another center (6%), 59 patients escaped from the hospital (3%) and zero deaths.

Conclusion: Our study suggests that the head and neck were the most injured anatomic locations in children. Males were more susceptible to being exposed to trauma. Falling and traffic accidents were the most frequent mechanism of trauma that occurred in under eighteen-year-old children. Awareness of patterns of pediatric trauma may help the adoption of safety policies and develop prevention strategies. In this regard, training prevention strategies for parents and improving playground safety will be effective.

Keywords: Trauma, pediatric, children, injury, accident, epidemiology

Introduction

Trauma, as one of the major public health challenges, was the leading cause of death and disability in most countries(1). Trauma was considered as the most common reason for emergency department admission (2, 3). Children are the most susceptible group of society to trauma. Moreover, trauma is among the most common cause of their referral to the emergency department and the most common cause of child morbidity and mortality (4). It is estimated that trauma causes more than half of all child deaths in developed countries, which can have a profound socioeconomic burden on individuals, families, and societies (5, 6).

The literature revealed that one of every four children will sustain an unintentional trauma that warrants medical care each year (7). Iran Forensics Medicine Organization reported that trauma is recognized as the second leading cause of child death in Iran (8). In a study performed in Rafsanjan, trauma was characterized as the most frequent cause of child mortality at the age of 1 to 14 years (9). The leading causes of pediatric trauma are falls from heights, accidents, pedestrians, and sports injuries (5, 6). Furthermore, certain factors can affect increasing or decreasing childhood trauma. Nabian et al. found that the rate of childhood trauma during the covid-19 pandemic in 2020 has significantly decreased (10).

Although the general principles of trauma care in children and adults are the same, there are fundamental differences in the pattern and mechanism of injury in different age groups (11). Pediatric trauma requires special consideration based on specific injury patterns and trauma mechanism, diagnosis, and treatment due to different physiology, anatomy, and cognitive variability in children. In this regard, understanding the pattern of pediatric trauma and the epidemiology of trauma could provide helpful information to apply appropriate preventive

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measures (12). Moreover, Identification of risk factors and appropriate prior measures, e.g., training and enforcing driving rules, securing playgrounds, use of safety devices during driving, etc., could be useful to reduce the occurrence and mortality in children (13). This study aimed to investigate the epidemiologic feature and outcomes of trauma in children under 18 years old, referred to the emergency department of Tabriz Emam-Reza Hospital during the spring season of 2019 (for 3 months). In light of these findings, we might be able to prevent trauma in children.

Materials and Methods

We conducted a retrospective cross-sectional study during the spring season of 2019 (for 3 months). The study population was all children under eighteen years old with GCS below 9 (1814 cases), referring to the emergency department of Tabriz Emam-Reza Hospital. Among 1814 patients, 1786 patients were included. We excluded patients without a triage card and with incomplete documents.

For each included patient, a checklist including demographic information, kind of trauma, transfer system of the patient to the emergency department, injury mechanism (based on observations, examinations, and Forensic physician's report), anatomical location of the injury, and the organ involved, including the internal organs or bone involved (based on clinical examination findings and radiological findings), and the outcomes of the 24-hour follow-up of the patients have been recorded. The outcomes were considered as one of the seven states; discharge from the emergency department, hospitalization in a ward, hospitalization in the intensive care unit, leaving the hospital against physicians' permission, referring to another center, escaping from the hospital, and death.

The data were analyzed by descriptive statistical methods (frequency and mean ± standard deviation) using SPSS 22.0.0. Pearson / Spearman correlation coefficient was used to determine the correlation between quantitative/ qualitative variables. In this study, $P < 0.05$ was considered statistically significant. This research was approved by regional committee of research of Tabriz University of medical sciences with no.: IR.TBZMED.REC.1398.049.

Results

After applying inclusion and exclusion criteria, a total of 1786 traumatic children were included. Most (n=1109, 62.1%) were male. The mean age of patients was 5.47 ± 3.1. Demographic characteristics and detailed data regarding the mechanism of trauma, the injured body parts, and the outcomes are summarized in Table1.

There were 1271 (71.1%) head and neck trauma, 276 (15.5%) extremities trauma. Abdominal trauma (n=66, 3.7%) and spinal trauma (n=57, 3.2%) were the rarest types of mechanism. It was revealed that falling had the most incidence frequency (40.4%). Eighty-eight percent of patients were transferred to the hospital emergency department by EMS, and twelve percent were transferred by their family members. The injuries occurred most often between 7 P.M and 12 P.M.

Eventually, out of the entire study population, 1361 patients were discharged from the emergency department (75%), 5 patients transferred to the trauma ward (0.2%), 1 patient hospitalized in the intensive care unit (0.05%),

Table 1: Demographics characteristics of traumatic children

Variable		No.	Percent
Gender	Male	1109	62.1
	Female	677	37.9
	0-4	657	36.8
Age	4-8	544	30.5
	8-12	357	20
	12-18	228	12.7
	Falling	721	40.4
	Traffic Accidents	626	35.1
Mechanism of trauma	Sport injury	44	2.5
	Fight	48	2.7
	Others	347	19.3
	Head and neck trauma	1271	71.1
	Chest Trauma	73	4.1
Diagnosis	Abdominal trauma	66	3.7
	Spinal trauma	57	3.2
	Extremities trauma	276	15.5
	Others	43	2.4
	Discharge from emergency department	1361	76
	Hospitalization in ward	5	0.2
	Hospitalization in ICU	1	0.05
Outcome	Leaving the hospital against physicians' permission	250	14
	Referring to another center	110	6
	Escaping from hospital	59	3
	Death	0	0

Table 2: Frequency distribution of trauma in different anatomical parts of the body.

Anatomic area	Percent
Bone injuries	
Skull	54%
Femur	12%
Tibia	8%
Humerus	10%
Radius	5%
Others	11%
Organ injuries	
Brain	34%
Liver	17%
Spleen	5%
Spinal cord	13%
Skeletal injuries	%31

250 patients left the hospital against physician permission (14%), 110 patients referred to another center (6%), 59 patients escaped from the hospital (3%) and zero deaths.

Based on the results, 20.9% of head and neck trauma cases were treated by non-surgical methods. Also, 29% of extremities cases required surgical intervention. It was revealed that the most injured bone was the skull (54%). Brain (34%) damage was injury with the highest frequency among organ injuries. Table 2 shows the frequency distribution of trauma in different anatomical parts of the body. The most severe injury was chest and abdominal trauma.

Discussion

This present study assessed the epidemiology of pediatric trauma cases admitted to the emergency department of the trauma center in Tabriz, Iran during the spring season of 2019 (for 3 months). The results showed that falling (40.4%) and traffic accidents (35.1%) were the most frequent mechanism of trauma that occurred in under eighteen-year-old children, referring to the Emam-Reza Hospital. Discharge in the emergency department was the most frequent consequence of accidents. The head and neck were the most injured anatomic locations in children. Moreover, time of injury distribution revealed that most accidents occurred between 7 P.M and 12 P.M. Emergency medical services were the most common transfer method for patients.

Based on our results, most trauma injuries were related to males, which is consistent with the results of previous studies (14-17). This could be due to their greater tendency toward more risky activities (18).

This study suggests that falling was the most frequent mechanism of trauma, followed by traffic accidents, which is consistent with the results of previous studies in Iran (19, 20). Nevertheless,

Dolatabadi et al. (14) reported that the most common mechanism of trauma were traffic accidents and then falling. Child abuse, vehicle accidents, and drowning were reported by Peclet et al. (21), as the highest-evident trauma mechanism. In the study by Mobasheri et al. (15), stroke and falling were reported as the most frequent mechanism of trauma in children under six years old. Though it is difficult to sort out these inconsistent results, the differences in the incidence frequency of trauma mechanism may in part be explained by considering differences in the mean age of the study population (19).

In this study, the most injured anatomic locations were the head and neck, which is consistent with the results of previous studies (13, 14, 20). However, in another study by Khodayari Zarnaq et al. (19) the forearm and arm were observed with the highest frequency. The differences in the injured anatomic sites reported in this study could be caused by differences in the prevalence of trauma in the study population (19).

Based on our findings, The most severe injury was chest and abdominal trauma. In line with our results, Coulthard et al. (22) suggest that the high mortality rate was associated with thorax, abdomen, and spine trauma. Although, Inconsistent with this finding, Aoki et al. (23) reported that Head injury was the leading reason for death.

According to the results of the present study, the injuries occurred most often between 7 P.M and 12 P.M., which could be due to more children being on the playground during those hours (14). Similar results were reported in the previous studies (14, 24).

Our study showed that the most frequent transfer method was EMS. In this regard, Peclet et al. (21) reported that 42.5%, 37.8%, and 19.4% of their patients were transferred by ambulance, private vehicles, and helicopter, respectively. Moreover, Rahmani et al. (25) reported that most transfers during the morning were done by ambulance; however, the most common transfer method during the evening was the private vehicles of the patients' families. The difference between the transfer method in the mentioned studies could be due to cultural differences and facilities among the different populations (25).

To the best of our knowledge, the effect of the COVID-19 outbreak on pediatric trauma rates is poorly understood. In this regard, Nabian et al. (10) assessed the impact of the COVID-19 pandemic on the number of the pediatric trauma in Taleghani tertiary trauma center in Iran. They found that the rate of childhood trauma during the covid-19 pandemic in 2020 has significantly decreased, which could be due to lifestyle changes, quarantine, and School closures. This observation was also confirmed in the study by Sheridan et al. (26).

We found the following limitations of this study. The first one is the retrospective study design. The retrospective nature of the data collection restricted the ability to report detailed data due to missing some data and incomplete documentation and should be addressed in future prospective research aiming to evaluate the cause and outcome of pediatric trauma. The relatively small sample size and the lack of follow-up of patients after discharge were among the limi-

tations. Another limitation of this study was the uni-center study design. Future multi-center studies could shed more light on the epidemiology of pediatric trauma and develop prevention strategies.

Conclusion

In summary, our study suggests that the head and neck were the most injured anatomic locations in children. Emergency medical services were the most common transfer method for patients. Males were more susceptible to being exposed to trauma. Falling and traffic accidents were the most frequent mechanism of trauma that occurred in under eighteen-year-old children. Moreover, this study shows the warrant for attention to pediatric age group and pediatric vulnerability against trauma. Awareness of patterns of pediatric trauma may help the adoption of safety policies and develop prevention strategies. In this regard, training prevention strategies for parents and improving playground safety will be effective.

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