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Trauma and Related Factors in Iranian Children and Adolescents: A Systematic Review

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Abstract

Background: Childhood and adolescence are periods of the highest sensitivity in one's life. Thus, attention to the health of children and adolescents is of paramount importance. This study was, then, conducted to determine the prevalence rate of trauma types in these periods and its affective factors by systematic review.

Methods: This study is a systematic review of published articles in April 2000 to March 2020. The studies specified to trauma and its related factors under the age of 18 were included in the review. Prior to initiating the search, attempts were made to gather all the factors affecting trauma, based on which the key words could be selected. The Search and data extraction were based on the PRISMA checklist. All the selected articles were imported into the EndNote X8 software and the repetitive studies were deleted. Data extraction and quality analysis of the articles were done by two researchers, separately. The results were reported through descriptive and systematic review tables.

Results: The search was started with 1359 articles and after re-examination, 566 articles continued to the screening stage, in which 309 articles were excluded and 89 remained. Ultimately, through the eligibility assessment and quality synthesis, 46 and 23 articles were, respectively, removed; and 20 articles in the final stage were selected for the purpose of the study. According to the pooled findings, the causes of the created trauma were fall, collapse, direct hit, sports accidents, vehicle accidents, cycling, poisoning, animal attack, inanimate mechanical (cut and hit by object), burn and drowning. The places with the most trauma creation were found to be the street, and then the house, school and public places.

Conclusion: It is recommended that proper interventions and appropriate preventive measures be taken to reduce trauma due to factors affecting the trauma.

Key Words: Adolescents, Children, Trauma, Systematic Review.

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1- INTRODUCTION

Childhood and adolescence are among the most sensitive periods of life, and attention to the health of children and adolescents is very important in these period (1-3). In fact, children and adolescents are the future makers of society and maintaining the health of these groups can lead to the development of a healthy society (4). In childhood, and later in adolescence, biological, psychological and cognitive changes occur, which establish the basis of their physical, psychological, emotional, spiritual and social maturity (5, 6).

Various diseases affect the health of children and adolescents (7, 8). Trauma to children is one of the problems that has many psychological and physical effects on them (9). In fact, trauma is the first cause of death as well as one of the main causes of disability and handicap in developing countries (10-12). In this period, there are many accidents involving children or adolescents, such as road accidents (13), falls(14), drowning(15), Brain damage(16), and Orthopedic injuries(17). Such accidents and incidents can lead to disability in an individual, which is why it is necessary to pay attention to them(18). Head injury is one of the biggest causes of death and disability as a result of injury(19). These injuries include a wide range of mild and reversible, severe and life-threatening lesions that are very dangerous(20). Another type of trauma can be named road traffic accidents, which are of great significance (21). Considering that these incidents may lead to adverse consequences, such as psychological problems, desertion, and economic problems, by engaging people, so paying attention to the factors affecting them and the ways of reducing them are of special importance(22).

In Iran, various studies have been conducted on the prevalence of trauma in children and adolescents. For example A review study conducted on the incidence of road accidents in the whole country from 1993 to 2013, showed that during that 20 years the road incidence deaths has been on the downside trend, so that in the 1990s, this rate has been rising, and in the early years of the 2001, it has been increasing, and eventually in 2007 and thereafter, it has had a downward trend. However, the deaths from road accidents were 19086 cases in 2007, which is still a high rate (23). In the review of Agakhani et al., it was shown that in Iran, the second mechanism of causing injury to the head is falling, which is more prevalent in children in low ages and elderly people (19).

Due to the great importance of childhood and adolescence, one of the duties of the healthcare team is to pay attention to health and factors affecting health at this time. Regarding the necessity of considering the health of these groups as future makers of the country, as well as the lack of a systematic review in this field, this study was conducted to determine the prevalence rate of trauma types and its affective factors through a systematic review (SR).

2- PATIENTS AND METHODS

2-1. Study protocol

This systematic review study is written according to PARISMA Checklist (24). The initial search was carried out by two members of the research who were Assistant Professor of Pediatrics and a senior pediatric nurse. In case of any disagreement between the two, the search was confirmed by an Assistant Professor of Nursing.

2-2. Search strategy

The search was carried on trauma and its related factors in people under the age of 18, in April 2000 to March 2020; and it was conducted at the domestic sites of Iran (SID), Iran Medex, Mag Iran, Iran Doc, as

well as at international sites such as Scopus, PubMed/Medline, Embase, Web of Science (ISI), Cinahl, and ScienceDirect. The Google Scholar browser was also used to perform the search. Prior to initiating the search, attempts were made to gather all the factors affecting trauma, based on which the search key words could be selected. Accordingly, the keywords included "Injuries" [Mesh], "Pediatrics" [Mesh], "Disasters" [Mesh], "Accidents" [Mesh], "Adolescents" [Mesh], "Head Injury" [Mesh], "Epidemiology" [Mesh], "child" [Mesh], "fracture" [Mesh], and "trauma" [Mesh].

2-3. Inclusion and Exclusion criteria

2-3.1. Inclusion criteria

All Persian and English studies aimed at assessing trauma, under the age group of 18 in Iran, were included in this study. PICO in the study is, **P:** trauma under the age group of 18 in Iran, **I:** assessment of the prevalence and factors affecting, **C:** Trauma caused by all kinds of incidences such as accidents and other causes.

2-3.2. Exclusion criteria:

Systematic reviews, quality articles, case reports, and articles whose full file was not available were excluded from the study. In addition, articles examining trauma in age groups over 18 years or less than 6 years were excluded.

2-4. Data extraction

Data extraction was done, using a form containing information on the surname of the researchers, the year, time and place of the study, the research method, the sample size, and the main findings of the study.

2-5. Study selection

All articles were entered in the Endnote software, and articles with similar titles and abstracts were removed from the study. The full file of articles was, then, carefully reviewed by two members of the research team.

2-6. Statistical Analysis

After removing the repetitive articles and selecting those fit to the purpose of the study, the data extraction and quality analysis of the articles was done by two researchers, separately. And the data was, finally, reported through a descriptive report and systematic review tables. Due to the fact that the studies did not meet the necessary criteria for conducting a meta-analysis, the results of were reviewed systematically.

3- RESULT

3-1. Search results

The search was started with 1359 articles and after re-examination, 566 articles continued to the screening stage, in which 309 articles were excluded and 89 remained. Ultimately, through the eligibility assessment and quality synthesis, 46 and 23 articles were, respectively, removed; and 20 articles in the final stage were selected for the purpose of the study (**Figure 1**). The sample size in the 20 articles examined was equal to 36852 patients.

3-2. Measurement tools used in the selected studies

Some articles had been conducted in the form of a clinical examination, and in the others self-report and parental questions were implemented. For example, in the study by Aghakhani et al., (22) and the study by javadi et al., (23) trauma was identified through clinical examinations and in the study by Ghaderi et al., (30) questionnaires were used.

3-3. Trauma and Related Factors:

The extracted articles contained the same informational items including the patient's gender, the causes of the incident, the anatomical location of the incident, the location of the incident and the season of

the incident, which are fully described below.

In most of the studies that surveyed the incidence rate among people under the age of 18, most of the patients with traumatic disease were male (22, 27, 28, 31). There was just one study by Ghaderi et al. (2006) in which girls were more than boys (30). This difference might be related to its method of data collection; because most studies investigated traumatic patients who referred to hospital, and diagnosed through clinical examinations, while in Ghaderi et al., (2006), (30) the rate of trauma was identified through a questionnaire distributed among children aged 7 to 15 years old.

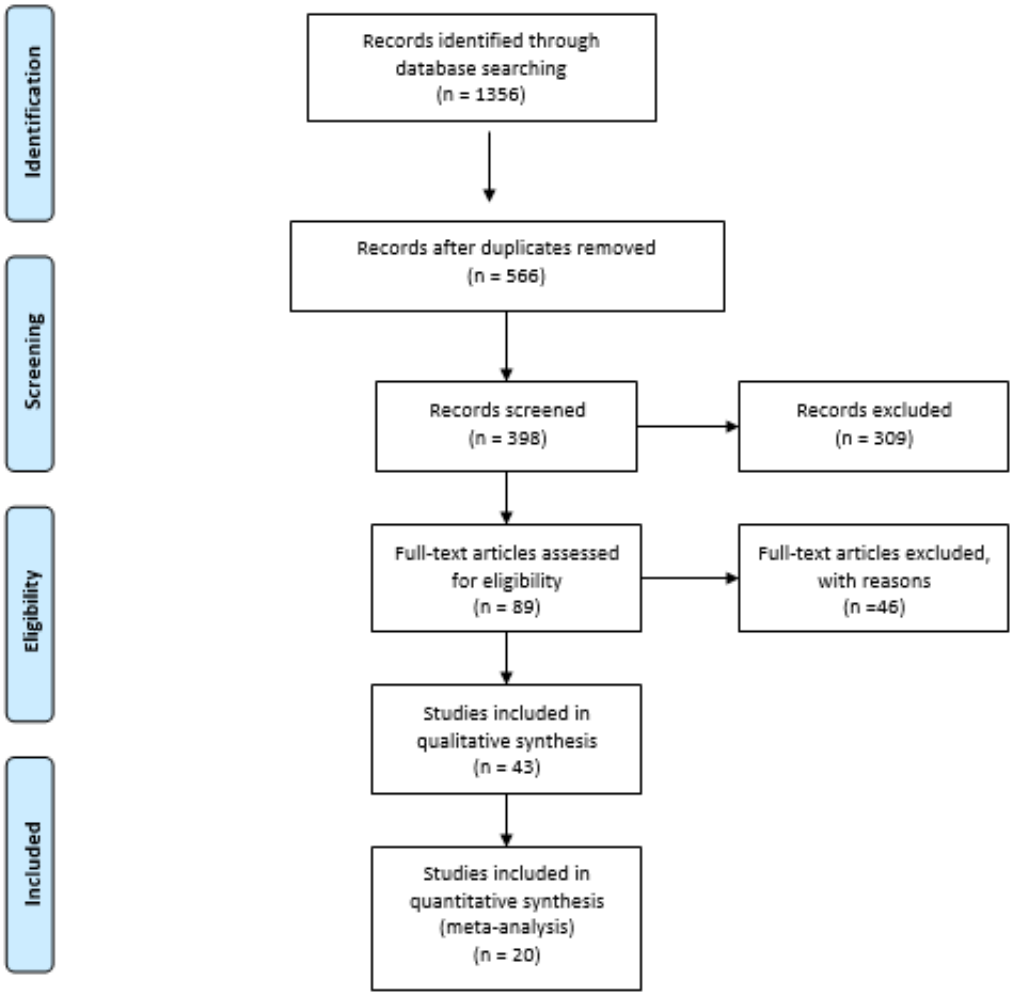

Fig.1: Flowcharts for Systematic Review

3-3.1. The patient's gender

3-3.2. Anatomical location of the incident

Anatomical location of trauma can be attributed to orthopedic fractures (23) and musculoskeletal damage (24), head injuries (25), injury to chest and the stomach or upper and lower limbs (25), spinal cord injury (25), stroke, and skull fracture.

3-3.3. Place of incident

The most important places of trauma can be found on the street. (25, 26) and then the house (25, 26), school (25) and public places (27).

3-3.4. Season Creating Incident

The seasons of creating trauma and events are summer, spring, autumn and winter respectively, though its incidences were created in all of these seasons.

3-3.5. Causes of the created trauma

The causes of the created trauma were fall, collapse, direct hit, sports accidents, vehicle accidents, cycling, poisoning, animal attack, inanimate mechanical (cut and hit by object), burn and drowning (22-37). The most important places of trauma can be found on the street. (25, 26) and then the house. (25, 26), school (25) and public places (27).

4- DISCUSSION

This study was conducted to determine the prevalence rate of trauma types and its affective factors by systematic review. Various diseases can affect one's health from infancy and childhood (37-39). Accidents and traumas may also endanger the health of these people, as trauma can lead to disability and death in patients, so care must be taken (40-42). According to the findings, gender has been effective in causing an incident, so that more incidents have been occured in boys than in girls. In the study by Falavigna et al., it has been shown that in the group of patients under the age of 18 years, more spinal trauma occurred in male subjects (28). Which is consistent with the results of this study.

According to the findings, most of the studied patients were male, which is consistent with the results of the study by azami et al. (43), Govindarajan et al. (44) and Kovács et al. (45). As the results of the present review revealed, the most important places of trauma can be the street, (25, 26) and then the house (25, 26), school (25) and public places (27). This result is consistent with those found by Dua and Norton and O'Connell, in Ireland(46), Dame´-Teixeira et al., in Brazil(47), Schuch et al., in Brazil (48).

One of the strengths of this study is the systematic review of trauma in the group of children and adolescents in Iran, which shows that this study is new. One of the weaknesses of this study is the lack of a meta-analysis study, which is suggested to be considered in future research.

5- CONCLUSIONS

In this study, the types of trauma and its affective factors were shown in children and adolescents. It is recommended that proper interventions and appropriate preventive measures be taken to reduce trauma due to the factors affecting it.

Conflict of Interest: The authors declare no conflict of interest.

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Table-1: Specifications of studies entered into a systematic review process

NO.	Author (years)	City	Aim	Type of study	Study population	Collect data	Result
1	Aghakhani et all (2015) (22)	Tehran	Epidemiology of orthopedic injuries in children and adolescents	Prospective descriptive	Under 19 years old	The data were collected prospectively by clinical orthopedic assistants, based on clinical treatment, radiology investigations and the findings of during surgery when the patient was hospitalized.	During the research, 3946 patients were admitted to the emergency department, of which 1081 (27.4%) were patients under the age of 19. From gender considering, 830 (76.8%) were male and 251 (23.2%) were female patients. Concerning the mechanism of injury, 48.5% of patients were injured by "falling", 7.1% of them by falling from the stairs, 3.8% due to fall from height, 12.2% due to direct hit, 5% due to exercise, 3.2 % due to vehicle accidents, 4.7% of patients due to pedestrian accident, 4.9% due to motorcycle accident, 1.4% by bicycle accident and 3.8% due to other cases. Considering the fracture part, 134 (15.3%) were in the supracondylar, 146 (16.7%) in the Radius Wavelnar, 73 (8.3%) in the finger joint, and 4 (4%) in the scaphoid part.
2	Javi et (23) all d	Tehran	Determine the number of injuries in children	Descriptive-cross sectional	Under 14 years old	One month from each season of the year was chosen, and during the four months, all people under the age of 14 who were injured by a vehicle were examined.	A total of 318 children and adolescents were studied, of which 72 were girls; and the age group of 5-10 years old in girls and 10-14 years old in boys were the most injured. There were 151 patients with skeletal musculoskeletal disorders, such as fractures, severe sciatica or hit, 136 cases of damage in areas other than musculoskeletal disorders, and 31 patients were not injured at any part of the body.
3	Khazaei et all (2016) (24)	Hamadan		Retrospecti ve			A total of 3,200 children were examined. Among the investigated disasters, 53.4% of them accounted for accidents, 12.6% were traumatic and 8.8% were related to fall from height. In terms of traumatic condition, in total, 403 (12.6%) patients were traumatized, of which 275 (11.6%) were boys and 128 (15.4%) were girls. Also, in the fall situation, 281 (8.8%) of the patients were traumatized, of which 196 (8.3%) were boys and 84 (10.1%) were girls.
4	Karbakhsh (2008) (25)	Tehran			Under 12 years old		Of the 8453 trauma patients referred to the hospital, 1281 cases were related to children with mean age of 3.25±7.35 and most of the patients, i.e. 885(69.1%) were boys. Also, 30.6% of patients were between 10

NO.	Author (years)	City	Aim	Type of study	Study population	Collect data	Result
							and 12 years old. Of these patients 1251(97.7%) cases were traumatic which in relation to injury causes according to findings, 648 (50.6%) cases were related to falls, 520 (40.6%) were related to road traffic accidents. Regarding the location of the damage, it was high in the street (45%) and then at home (38%). The most commonly traumatic mechanisms at the home were falls with 83.9% respectively.
5	Soori et all	Ahvaz	Cycling related trauma	Descriptive -cross sectional	Under 15 years old		A total of 22020 patients were examined. Of these, 1079 were related to bike cycling. The age range of trauma related to bike cycling was from 1 to 15 years, with an average age of 4.2 ± 7.9. The greatest number of injuries was observed in boys with 78.8% rate. In relation to the location of the damage, the highest proportion was related to the street with rate of 51.9% and then the home was 42.3%. The most important anatomical location that was damaged was a head with the rate of 55%. Among subjects under the age of 7 years, trauma related to head in boys were 74.9%. While the rate among the people aged 7-15 was 53.8% in boys.
6	SHahrokh et all			Descriptive -cross sectional	Under 14 years old		From a total of 3605 patients, 353 patients were aged less than 14 years old, 42.9% of whom were aged 1 to 5 years old. The most common cause of the trauma among the patients older than one year of age was accident and below the age of one was falls. About 77% of the patients were head injured.
7				Descriptive -cross sectional	Under 14 years old	The children under the age of 14 years were entered in the study by census method.	547 children were examined, of which 69.3% were male. In relation to the season of the trauma, in the summer, the rate was 169 (30.9%), in the spring, 158 (28.8%), in the autumn, 118 (21.7%) and in the winter 102 (18.6%), trauma occurred. Regarding the mechanism of trauma, the rate of 286 (52.3%) was for accidents, 227 (41.5%) for the fall. According to the findings of anatomic location, 217 (21.7%) of the patients suffered from head and neck injuries, 21 (3.8%) had injuries in chest and stomach, 76 (13.9%) in the upper limbs and 179 (32.7%) in Lower limbs, respectively. Moreover, out of total number of

NO.	Author (years)	City	Aim	Type of study	Study population	Collect data	Result
							studied patients, 537(98.2%) were discharged and 10 (1.8%) were dead.
8	Mobasheri et all(2016) (26)	Fasa	Toma Epidemiology	Descriptive -cross sectional	Under 15 years old	During one year, children who were referred to the emergency department were examined.	1245 disasters occurred in children between zero and 14 years old with an average age of 4.1±6.5 years. Boys with the rate of 772 (62%) disasters had the highest rate. In both genders, hit disaster (34.9%), fall (31.3%) and poisoning (16.1%) had the most rate of trauma. In relation to the time of the disaster, boys had 147 (19%) in spring, 176 (22.8%) in summer, 184 (23.8%) in fall and 265 (34.3%) in winter. While in girls, the rate was 85 (18%) in spring, 106 (22.4%) in summer, 126 (26.6%) in fall and 156 (33%) in winter.
9	Asadi (2014) (27)						641 cases with an average age of 4.16 ± 6.62 were studied, of which 62.1% were male and 37.9% were female. Most participants were in the age range less than 2 years old and also 2 to 4 years old. Concerning the traumatic mechanism, 35.1% were related to road accidents, 40.4% to falls, 2.5% to sports events, 2.7% to mistreatment and 19.3% to other factors. In relation to the location of the trauma, 49.6% had happened at home, 5.1% at school, 32.9% in urban streets, 4.5% in the outskirts, and 7.8% in other places. Also, in relation to the anatomical location of the trauma, 71.2% of them were in head and neck, 4.1% in chest, 3.7% in the stomach, 3.2% in the spine, 15.5% in the limbs and 2.2% in other members of the body.
10	Memarzade h et all (2011)(27)	Isfahan	Toma Epidemiology	Descriptive -cross sectional	Under 15 years old	All the files were studied by census method.	2300 children were examined, 1534 (66.7%) of which were boys and 766 (33.3%) girls. The mechanism of traumatic injury in 713 (31.1%) of cases was related to driving accidents, 736 (32%) to falling, 69 (3%) to cycling and 358 (15.6%) to motorcycles. The frequency of child mortality was 94 (4.1%). In terms of traumatic location, the most common parts of trauma were head and neck with the rate of 886 (38.52%); and multiple trauma with 789 (34.34%), limb trauma with 435 (18.91%), stomach trauma 133 (5.8%), chest trauma with 48% (2%), were the next common parts. The places of disaster included homes and schools with the

NO.	Author (years)	City	Aim	Type of study	Study population	Collect data	Result
							rate of 1035 (45%), urban streets 885 (38.5%), outskirts roads 291(12.6%) and other places 89 (3.9%). The most common seasons of traumatic occurrence were summer with the rate of 742 (32.3%), and then, spring with 648 (28.2%), autumn with 558 (24.3%) and winter with 352 (15.2%)
11	Hashemi et all	Tehran	Causes of death from trauma	Retrospecti ve	Under 18 years old	An autopsy was conducted to investigate people who died of trauma.	There were 760 children in the autopsy, most of whom boys with the rate of 497(65.4%). The age group of 15 to 18 years was created the most traumas with the rate of 325 (42.8%). In the traumatic patients, the main cause of death was due to stroke and fracture of the skull with the rate of 221 (49.7%). Among 444 (58.4%) cases of traumatic death, 257 cases were over 11 years old and 187 were 11 years old or younger.
12	Ghaffari et all (2018) (28)		Proliferation of trauma in children		Under 16 years old		525 patients were examined. According to the findings, adolescents between the ages of 14 and 16 with a rate of 22.9% had the most orthopedic damages and children under 2 years of age with the rate of 6.4% had the least. Also, 65.3% of boys and 34.7% of girls had orthopedic damage. Concerning the mechanism of injury, the findings showed that 42.3% of patients under the age of 16 were injured by falling, 21.3% by exercise, 7.4% by fall from the height, 3.2% by accident, 2.1% by cycling and 23.6% by other factors. In relation to the disaster season, the highest season of autopsy was 44.6%, then the spring was 34.1%, the most creating disaster season was autumn with the rate of 44.6%, then spring with the rate of 34.1%, next summer with the rate of 13% and finally winter with the rate of 8.4%. According to the findings, the locations of the incident were home with 38.9%, school with 26.1%, street with 14.5%, club with 10.1%, park with 5.3%, and the other places with 5.1% percentages of incidents.
13	Ghaderi et all (2006) (29)	Kermanshah	The prevalence of traumatic events in school-age children	Descriptive -cross sectional	7-16 years	A survey and randomized cluster study was conducted that disasters investigated by self-report and questionnaires.	A total of 475 students participated in this study, of which 113 (23.7%) were boys and 161 (33.8%) were girls. Of all students, the rate of 274 (57%) experienced at least one traumatic and painful event in their lives. The accident rate for boys and girls was equal to 54 (11.4%), which were

NO.	Author (years)	City	Aim	Type of study	Study population	Collect data	Result
							equal in this respect.
14	Vakili et all (2016) (30)	Yazd	The prevalence of trauma in children	Descriptive -cross sectional	Under 6 years old	Sampling was done by easy sampling of quotes from mothers referred to health centers	A total of 300 patients were examined, of which 156 (52%) were male and 144 (48%) were female. According to the findings, 78.4% of the total of children under the study were traumatized, among which 50.7% were traumatized by body injury, 15.3% by burn, 12% by falling, 11% by poisoning, 10.3% by traffic accident, and 7% by drowning. In relation to physical injury, 83 (53.2%) of boys and 69 (47.9%) of girls were injured, while 15(9.6%) of the boys and 21 (14.6%) of girls were traumatized by falling.
15	Hosseinzad ehet all (2017) (31)	Qazvin	prevalence of trauma		Under 5 years old		A total of 18184 disasters involved children under the age of 5 were that among the age group, the most disasters and incidents were related to children of 1 year old with the rate of 31.4% and the least rate of disasters were related to the children with the age of 5 with the rate of 14.4%. In connection to the months of the disasters, according to the findings, July with the rate of 12.1% and June with the rate of 11.3%, respectively (totally summer with the rate of 29.7%) were the most dangerous months of the year for disaster occurrence. The winter season, with the prevalence of 18% of the incidents, was also shown as the least dangerous season. Regarding the location of disasters and incidents, the findings showed that 46.5% of disasters occurred in children younger than 5 years old at homes and 32.1% of them in the alley and street. Also, 3% of the incidents occurred in public places, which had the lowest rate of incidents. Concerning the main causes of trauma, the hit with the rate of 31.8%, the fall with 15.6%, and accidents with the rate of 14.9% were the main causes of trauma.
16	Zargar et all (2004) (32)	Tehran	prevalence of trauma		Under 16 years old		A total of 400 patients with trauma were studied, of which 71 were under the age of 16 years. According to findings, out of these 71 patients, 44 patients were traumatized due to Traffic accidents, 27 with

NO.	Author (years)	City	Aim	Type of study	Study population	Collect data	Result
							Pedestrianism and 25 patients with fall cause.
17	Roudsari et all (2006) (33)	Tehran	prevalence of trauma	Descriptive -cross sectional			Traumatic incidents among a total of 417 patients were studied, of which 24 (% 6) were related to fall, 24 (6%) to poisoning, and 18 (4%) to Drowning. It should be noted that the traumas caused by accidents were 211 (51%)
18	Rezapur-Shahkolai et all (2009) (34)	Twiserkan		Descriptive -cross sectional	0-15 years		Among 21 people aged 0-15 years investigated, the rate 5 (23.8%) was to fall, the rate 4 (19%) was related to Traffic, 4 (19%) to animal attack 3 (14.3%) to burn, 3 (14.3%) to Inanimate mechanical incidents (cut and hit by object), and 2 (9.5%) was related to poisoning.
19	Karkhaneh et all (2008) (35)	-		Descriptive -cross sectional	5-14 years		The results of cycling showed that the most rate of damage among bike riders was related to the group age of 5 to 14.
20	Shamoham madi etall (2018) (36)	Tehran		Descriptive -cross sectional	The average age is 11.49 years		A total of 608 children were studied, of which 295 were males and 313 were females. Also, 20 of boys and 23 of girls were reported with trauma, with the prevalence of trauma equal to 7.1%.

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