



The Epidemiological Patterns of Childhood Injuries and Accidents among Iranian Children: A Systematic Review

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Abstract

Background: Injuries caused by accidents are the leading causes of disability, permanent deformities, and death among children. This study aimed to determine the epidemiological patterns of childhood accidents and injuries, as well as the associated factors affecting Iranian children.

Materials and Methods: In this systematic review, a comprehensive search of online databases (Medline, EMBASE, Scopus, Web of Science, Cochrane Library, CIVILICA, SID, Magiran, and Google Scholar) was conducted for relevant studies with no time limit up to June 2022, utilizing the appropriate MeSH keywords. Two reviewers evaluated the quality of eligible studies and performed the selection process.

Results: Nine studies (published between 2005 and June 2022) with a combined sample size of 20,591 were included in this review. Overall, 70% of accidents occurred in the home. The incidence of accidents among children ranged from 16% to 40% across the studies, and the mean age of accident victims was 2.5 ± 1.5 years. Boys accounted for the majority of victims (59.4%). The most frequent causes of accidents were traffic accidents (53.4%), followed by physical injury (50.7%), falls (44.3%), and swallowing foreign objects (22%). Furthermore, 93.3% of accidents occurred in urban areas. A significant association was found between accidents and gender, age, type of housing, location of the accident, higher parental education, season, and types of injury ($p < 0.05$).

Conclusion: The results indicated that 70% of accidents involving children occurred at home. The most common type of accident was traffic-related, followed by physical injuries, falls, and swallowing incidents. It appears that nearly all home accidents can be prevented through education. Therefore, developing educational and preventive policies is essential to improve road safety standards and reduce home accidents and injuries in Iran.

Key Words: Accident, Children, Iran, Injury, Patterns.

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1- INTRODUCTION

Children under five do not fully comprehend the dangers around them and are therefore more vulnerable. In the past, injuries were often viewed as mere accidents, with luck and fortune believed to play significant roles. Today, it is recognized that most injuries are preventable. An accident is defined as an unplanned event that can cause harm and disrupt the natural progression of an activity (work). Accidents occur due to unsafe actions, unsafe conditions (behavior-environment), or a combination of both. An incident has three key characteristics: a) suddenness, b) undesirability, and c) harmfulness (1, 2).

Throughout history, accidents and similar events have been among the primary threats to human health. With the introduction of industry and technology into human life, accidents have expanded, taken new forms, and caused various losses and damages (3, 4). Children and young people are the most vulnerable to accidents (5–7), and children under five are especially more vulnerable than adults due to their limited ability to assess risks (8, 9). According to the United Nations Children's Fund (UNICEF) report in 2018, accidents were the cause of 30% of deaths in the age group younger than 19 years (10). Additionally, according to the Centers for Disease Control and Prevention (CDC) (2018–2019), unintentional childhood injury rates were the highest among male children, babies under one year, and teenagers aged 15 to 19 years (11).

In Iran, accidents rank as the third leading cause of death across all age groups (12). Among children, accidents are the primary causes of injury, posing a constant threat to their health. However, these accidents are often overlooked due to factors such as a lack of awareness and the common misconception that they are random and unavoidable (13, 14). The incidence of

injuries tends to follow predictable patterns linked to children's physical and cognitive development, with certain types of injuries being more prevalent at specific ages (13, 15). Reducing injuries and accidents is an international health objective that necessitates cooperation among institutions, organizations, and various scientific disciplines. The vast majority of injuries, whether intentional or unintentional, are preventable (16), and there exist numerous strategies for accident prevention. Acquiring knowledge about the causes of injuries and methods for their prevention represents the most effective preventative measure (17). Given that accidents are a leading cause of mortality in children under five years of age (1, 9), the present study aimed to determine the epidemiological patterns of childhood accidents and injuries, along with their associated factors, among Iranian children.

2- MATERIALS AND METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (18) was used to guide this review.

2-1. Eligibility criteria

The Participants, Interventions, Comparators, and Outcomes (PICO) framework was used to formulate the objective and inclusion criteria.

2-1-1. Participants: Iranian children under six years old.

2-2-2. Interventions: The included studies were non-interventional; therefore, no comparison group was present.

2-1-3. Comparison: Since the included studies were non-interventional, there was no comparison group or intervention.

2-1-4. Outcome: Childhood injuries and accidents.

2-2. Included studies

Studies were included in the review if they met the following criteria: 1) contained a quantitative assessment, measurement, or evaluation of injuries and accidents in Iranian children; 2) were conducted within Iran; 3) included children under six years of age; 4) provided data on the frequency, rate, and causes of childhood injuries and accidents (e.g., poisoning, falls, traffic accidents, and drowning) in children younger than six; and 5) were published in English or Persian languages up to June 2022.

2-3. Exclusion criteria

The exclusion criteria included abstracts without full articles, studies focusing on age groups other than those specified, articles not written in English or Persian, review articles, meta-analyses, letters to the editor, editorials, short reports, case reports, theses, and briefs.

2-4. Information sources

A systematic search of electronic databases, including Medline, EMBASE, Scopus, Web of Science, Cochrane Library, CIVILICA, SID, Magiran, and Google Scholar, was conducted. The search was performed independently and in duplicate by two reviewers, with any disagreements resolved by the supervisor.

2-5. Search

The search terms combined the following keywords: (Children OR Infants OR Toddlers) AND (Injury OR Accident) AND (Prevalence OR Ratio OR Epidemiology OR Incidence).

2-6. Study selection

The database search yielded potential studies, abstracts were screened for eligibility, full-text articles were retrieved and assessed, and a final list of included studies was compiled. The references of the retrieved articles were then reviewed to identify further relevant studies as an additional source of records. This entire

process was conducted independently and in duplicate by two reviewers, with any disagreements resolved by a third reviewer. References were organized and managed using EndNote software (version X8).

2-7. Data collection process

All studies reporting on children's injuries and accidents were gathered based on pre-defined inclusion and exclusion criteria. Following quality appraisal, data were extracted and analyzed. A researcher-developed data extraction form was designed and finalized based on sample studies identified through an initial search. Two independent reviewers extracted information based on the following parameters: author names, publication year, geographical area, sample size, study population, and key findings. The two reviewers collected data independently. The collected data were then combined and compared for accuracy, with any discrepancies resolved through discussion or by a third reviewer.

2-8. Risk of bias in individual studies

The risk of bias was assessed using the STROBE (STrengthening the Reporting of Observational Studies in Epidemiology) checklist, a standard tool for evaluating the quality of observational studies (19). This checklist comprises 22 items, scored based on their relevance to the present study. The final checklist scores ranged from 15.0 to 30. The assessment was conducted independently and in duplicate by two reviewers, with any discrepancies resolved by a third reviewer.

2-9. Synthesis of results

A meta-analysis was not conducted due to significant heterogeneity among the included studies. Variations in study populations, with different age ranges (e.g., some studies focusing on children under one year and others on those under

six years), and diverse methodologies hindered comparability.

2-10. Ethical considerations

As this study analyzed only publicly available articles, approval from a research ethics committee was not required. Ethical standards were maintained by adhering to copyright laws and ensuring transparency in methods and sources.

3- RESULTS

The systematic search identified nine studies containing epidemiological characteristics of childhood injuries and accidents in Iran, encompassing a total population of 20,591. A flow diagram illustrating the literature search and study selection process is shown in Figure 1. The characteristics of the studies included in this systematic review are detailed in **Table 1**, as follows:

Table-1: General characteristics of included studies (n=9).

Author, Year, Reference	Area	Study population	Sample size	Main findings
Dehghani et al., 2015-2016 (20)	Yazd province	Children aged under 5 years	2489	The most frequent accident was falling (29.9%), followed by burns (21.8%) and trauma (19.9%).
Mirahmadizadeh et al., 2016-2017 (21)	Fars province	Children under 6 years	6000	The most common causes of accidents were burns (16%), falls (14%), and accidents involving objects (10%).
Nouhjah et al., 2011 (22)	Ahvaz	Children aged under 5 years	400	Four common causes of injury were falls (30.1%), swallowing (22%), burns (16.8%) and poisoning (11.4%).
Khodayari Zarnaq et al., 2015 (23)	Tabriz	Children aged under 5 years	1376	Falling, with a frequency of 44.3%, was the most prevalent accident, and the most frequent injuries were fractures (66.9%).
Khazaei et al., 2009-2015 (24)	Hamadan province	Children aged under 5 years	4523	The results showed that urban residents and boys had a higher number of injuries. Motor vehicle-related injuries were the most common type of injury.
Nekooee Moghadam et al., 2013 (25)	Kerman	Children aged under 5 years	1303	The main kinds of accidents were injury (39.67%), poisoning (20.56%), and falling (15.11%).
Khazaei et al., 2009-2016 (26)	Hamadan province	Children under one year	3200	In total, car accidents (53.4%), trauma (12.6%) and fall from altitude (8.8%) were the most frequently observed.
Sasan et al., 2005 (27)	Mashhad	Children aged 6-24 months	1000	The most common causes of accidents were falls 13.4%, suffocation due to aspiration of solids (12.8%), cuts (11.9%), burns (10.9%), and poisoning (3.9%).
Vakili et al., 2011 (28)	Yazd	Children aged under 6 years	300	Physical injury (50.7%), burn (15.3%), fall (12%), poisoning (11%), traffic accident (10.3%) and drowning (0.7%) were the reasons for children's accidents.

1. 1. A cross-sectional study aimed to determine the frequency of different types of accidents in children aged under five years living in Yazd province from 2015 to 2016. The results indicated that accidents occurred more frequently in boys (1460, 58.7%) than in girls (1029, 41.3%). The highest incidence of accidents was observed in April-May (n: 245, 9.8%) and

during winter (n: 693, 27.8%). Additionally, 93.3% of accidents occurred in urban areas, while 4.4% occurred in rural areas and 2.3% outside the city and villages. A total of 1743 accidents (70%) took place at home, with 495 (19%) occurring in alleys and streets. The most common type of accident was falling (n: 743, 29.9%), followed by burns (n: 543,

21.8%) and trauma (n: 495, 19.9%). The difference in accident types between various age groups was significant ($p < 0.001$).

2. A population-based cross-sectional study investigated the incidence of different causes of accidents in children under six years old in Fars province, South Iran, during the year 2016-2017. The annual incidence rate of accidents was found to be 16%, with a mean age of accident victims at 2.5 ± 1.5 years. Among the victims, 17.3% were male and 14.8% were female, with 25% of the children experiencing more than one accident. The most common causes of accidents were burns (16%), falls (14%), and those involving objects (10%). Multivariate analysis revealed that a higher number of male children in the family and a younger age significantly increased the likelihood of accidents ($p < 0.05$).

3. A cross-sectional pilot study assessed the prevalence of non-fatal home injuries and related factors among children attending health centers in Ahvaz in 2011 (22). Results indicated that the overall prevalence of injuries among children under five years was 40% (n = 156). The four most common causes of injury were falls (30.1%), swallowing (22%), burns (16.8%), and poisoning (11.4%). Logistic regression analysis revealed a significant association between injuries and the type of house (OR = 2.52; 95% CI: 1.34-4.76) and the age of the children (OR = 0.031; 95% CI: 0.01-0.81; $p < 0.05$) (22).

4. A cross-sectional study investigated the epidemiology of injuries in children younger than five years who were admitted to Tabriz Shohada Hospital in 2015 (23). The study found that the highest number of accidents occurred in boys (59.4%) and children aged four years (41.1%). Social security insurance was the most common type of insurance (50.3%). Falling, with a frequency of 44.3%, was the most prevalent accident, and fractures were the

most frequent injuries (66.9%). The forearm was the most commonly injured body part (22.7%). Significant relationships were found between children's age and the season in which accidents occurred, and between children's gender and injury types ($p < 0.05$) (23).

5. A cross-sectional study aimed to clarify the personal, spatial, and temporal patterns of injury among children aged one to five years in Hamadan Province from 2009 to 2015 (24). The results indicated that urban residents and boys experienced a higher number of injuries. Motor vehicle-related injuries were the most common type. A seasonal pattern was observed, with most cases occurring during the summer months. The lowest and highest incidence rate ratios (IRRs) were observed in January 2011 (IRR = 0.61, 95% CI: 0.31-1.18) and May 2014 and August 2013 (IRR = 6.78, 95% CI: 4.38-10.51), respectively. This study included 4523 injury cases (24).

6. A descriptive-analytical prospective study investigated the causes of accidents and injuries among children younger than five years in Kerman in 2013 (25). The results showed that among the 159 fatalities, 69% were girls. The most frequent types of accidents were injury (39.67%), poisoning (20.56%), and falls (15.11%). Accidents were more frequent among girls and children aged three to four years. While age, gender, and season of death showed no correlation with the type of accident, there was a significant correlation between accidents among children under five years and the season of death (25).

7. A cross-sectional descriptive-analytic study aimed to investigate the extent and distribution of accidents among infants under one year in Hamadan Province, Iran, from 2009 to 2016. The results showed that 3,200 accidents were registered among children younger than one year. The highest occurrence of accidents was 1,029

in the spring (31.15% of cases). Additionally, 1,890 (59.1%) of the accidents occurred in urban areas, while only 429 (13.4%) occurred in rural areas. Overall, car accidents (53.4%), trauma (12.6%), and falls from altitude (8.8%) were the most frequent types of accidents. There was a significant correlation between gender and the location of accidents with accident type ($p < 0.001$) (26).

8. A cross-sectional descriptive study investigated the rate and distribution of accidents in infants under one year in Mashhad in 2005. The average age of the study group was 13.8 ± 7.8 months. During the study period, 55% of children experienced at least one type of injury. The incidents, in order of prevalence, were falls

(13.4%), suffocation due to aspiration of solids (12.8%), cuts (11.9%), burns (10.9%), poisoning (3.9%), traffic accidents (1.5%), drowning (0.7%), and electrocution (0.6%) (27).

9. A descriptive-analytical study aimed to investigate accidents in children under six years of age in Yazd, Iran, in 2011. The results showed that the mean age of the children was 5.30 years, and 78.4% had experienced an accident. The causes of children's accidents included physical injury (50.7%), burns (15.3%), falls (12%), poisoning (11%), traffic accidents (10.3%), and drowning (0.7%). Children of employed fathers and parents with higher education experienced fewer accidents, and this difference was statistically significant ($p < 0.001$) (28).

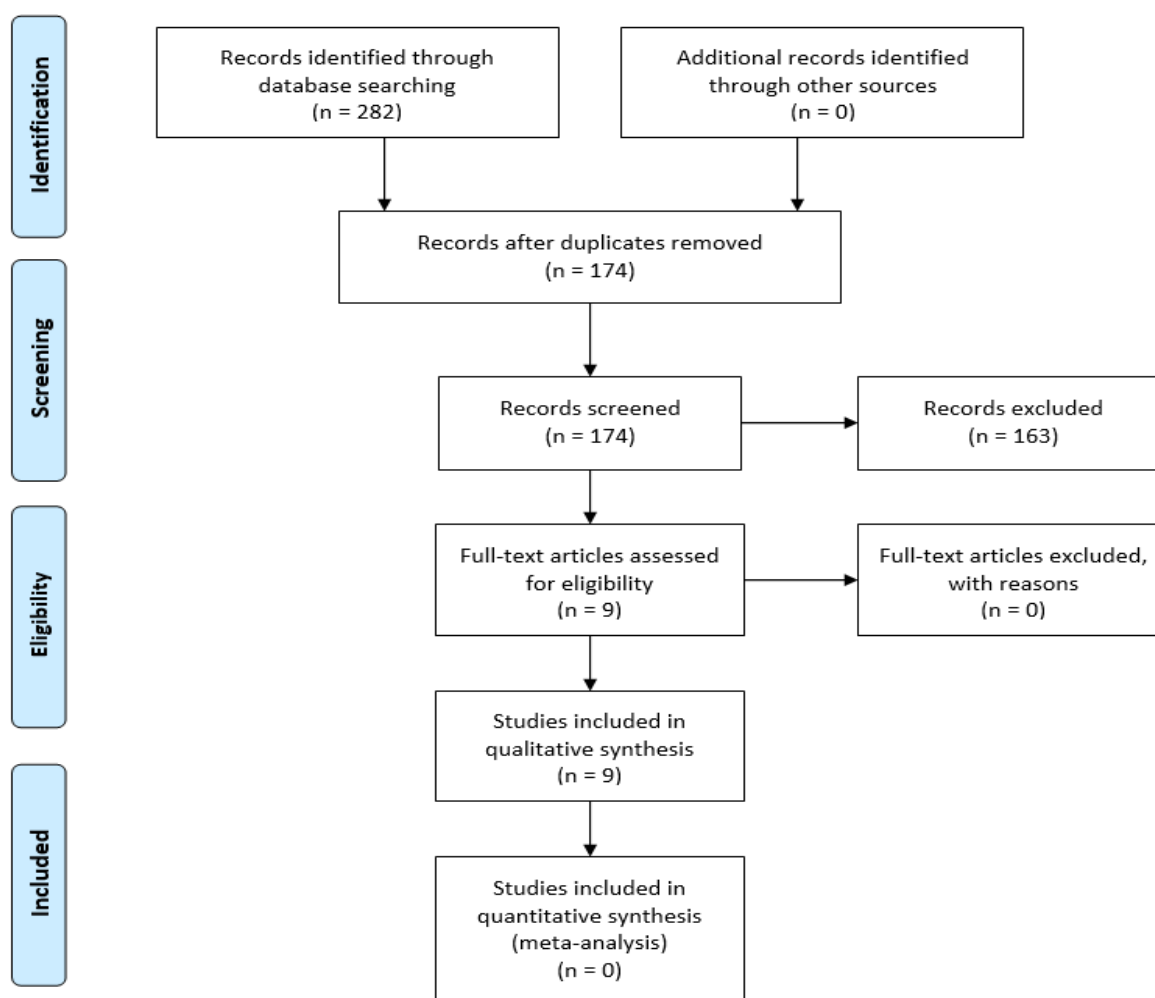


Fig.1: PRISMA flowchart.

4- DISCUSSION

This systematic review aimed to determine the epidemiological patterns of childhood accidents and injuries and their related factors among Iranian children. It summarizes these patterns as reported by nine studies conducted from 2005 to July 2022. Results indicated that 70% of accidents occurred at home. The incidence rate of accidents ranged from 16% to 40%, and the mean age of accident victims was 2.5 ± 1.5 years, with a higher rate observed in boys (59.4%). Based on the findings, traffic accidents (53.4%), physical injury (50.7%), falls (44.3%), and swallowing foreign objects (22%) were the most frequent types of accidents in children younger than six years. Additionally, 93.3% of accidents occurred in urban areas.

Accidents are defined as unplanned occurrences or events. They represent a significant and widespread public health concern globally and are a leading cause of mortality in children under five years of age (1, 9). Injuries resulting from accidents are a major source of disability, permanent deformities, and death in children. Annually, a substantial number of children are affected by accidents. A key factor contributing to these accidents is children's limited understanding of safety principles and injury prevention. Furthermore, potential hazards for children in and around the home are often overlooked (3, 5).

Children's injuries are preventable; however, in many regions of the world, the general public, policymakers, and healthcare providers pay little attention to this issue (2, 11). Prevention efforts are typically initiated only after an injury occurs, whereas injury and accident prevention should be integrated into daily life, particularly for children. Parents and caregivers must adhere to safety principles to effectively prevent injuries in children. The current decade has been designated as

the Decade of Accident Prevention (7). The most common home accidents occur in the age group of 2.5 ± 1.5 years, with 41% of incidents involving four-year-olds. Various studies indicate that children and young people are the most vulnerable age groups exposed to accidents (1, 2, 5, 29, 30).

In the present review, 93.3% of accidents occurred in urban areas, and 70% of accidents happened at home. Home accidents are a major public health concern due to their high frequency and potential for causing death and disability. Several studies have shown that more than half of all accidents in children under five years of age occur within the home (31-33). Therefore, providing appropriate training for parents is of substantial importance in preventing childhood accidents. This review also found that most accidents occurred in male children (62%), which is consistent with the results of other studies conducted in Iran (34-38) and similar studies in other countries (39-41). However, intentional and domestic injuries were significantly higher in girls ($p < 0.05$). The higher prevalence of home accidents in boys may be attributed to their increased activity levels and greater curiosity (42-44).

The results of the current study indicated that most accidents (33.8%) occurred in winter, which is consistent with the findings of Mobasheri et al. (35), but not with those of Asadi et al. (36) and Jalalvandi et al. (45). Equipping playgrounds with safety equipment and enhancing the safety of public spaces can help prevent injuries among children. The implementation of safety rules in homes is also highly effective. This study revealed that burns, traffic accidents, and falls were the most frequent types of accidents among children under six years of age. One study reported falls as the most common accident (40.4%), followed by

traffic accidents (35.1%) in another study conducted in Iran (36).

However, a study by Dolatabadi et al. (34) found that traffic accidents were the most prevalent (52.3%), followed by falls (41.5%). Mobasheri et al. (35) reported stroke and falls as accidents with high frequency in children. Another study indicated that falls and traffic accidents were the most frequent accidents among children under six years of age (45). In the study by Bayat et al., the most common causes of injury in children were falls from a height, poisoning, accidents, and burns (38). Mahfozi et al. identified accidents as the most frequent type of injury in children, followed by burns (46).

It should be noted that the mean age of children in this study was 2.5 ± 1.5 years, which is relatively different from other studies (ranging from 1 to 6.5 years). The results of the current review indicated that another significant type of injury among young children is poisoning, with most poisoning incidents (34%) occurring in the summer. Several studies have shown that the home environment and parenting characteristics are two important risk factors for poisoning in children (47).

Based on the results of this review, burns were found to be a frequent type of accident (66.5%). In comparison, the prevalence of burns in the study by Sasan et al. was 10.9% (27). Various studies indicate that up to 20% of burns caused by fire or hot liquids in children occur in the age group of less than one year (48-50). This review also showed that traffic accidents are a common cause of injuries in Iranian children. Road traffic crashes are predictable and preventable. Many countries have achieved significant reductions in the number of crashes and the frequency and severity of traffic-related injuries by addressing key issues. Effective interventions include those that address speeding, seat belt use, child restraints, helmet use, road design and

infrastructure, and emergency services (51). This review concludes that children of employed fathers and parents with higher education experience fewer accidents, and this difference is statistically significant ($p < 0.001$) (30).

Increased awareness among families regarding accident prevention strategies will undoubtedly lead to more diligent care of their children. Implementing educational programs at home, complying with traffic regulations, providing training through mass communication media such as television and radio, and strengthening monitoring systems on people's behavior are necessary and effective measures for reducing accidents in society (52, 53).

4-1. Study Limitations

- Due to the limited availability of information, this study could not provide a comprehensive review of the incidence of childhood injuries and accidents.
- Not all articles contained comprehensive and detailed data on all the elements reviewed.
- Considerable heterogeneity in the way studies reported their findings limited some of the comparisons made in this research.
- The reported results are specific to Iranian society and children under six years of age and may not be generalizable to other age groups or societies.
- Another limitation of this research was the lack of focus on child abuse, which is likely a common but underreported cause of physical injuries in children under six.

5- CONCLUSION

Based on the results, 93.3% of accidents occurred in urban areas, and 70% happened at home. The highest rate of accidents among children younger than

six ranged from 16% to 40%, and the mean age of accident victims was 2.5 ± 1.5 years, with the highest in boys. The most common causes of accidents were traffic accidents (53.4%), followed by physical injury (50.7%), falling (44.3%), and swallowing (22%). There was a significant relationship between gender, children's age, and gender, type of house, place of accident, parental higher education, and season of the accidents with injury types. Increasing public awareness and education is necessary to decrease the incidence of these potentially catastrophic injuries. Because childhood accidents, in addition to death, also result in a high rate of disability, and many children are forced to spend the rest of their lives with disabilities due to injuries from accidents.

6- CONFLICT OF INTEREST: None.

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