

## Review Paper

# Scoping Review of Interventions for Preventing Incidents in Children Under 5 Years of Age



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## ABSTRACT

**Background:** One of the main causes of injury and death in children under 5 years of age is accidents. Lack of awareness about preventive measures against these accidents and having a belief that these accidents are inevitable are major issues in Iran. This study aims to investigate and categorize the interventions recommended for preventing accidents in children under 5 years of age.

**Materials and Methods:** This scoping review was conducted in 2023. A search was conducted for the related studies in databases including Scopus, ISI, MEDLINE, Embase, Proquest, Cochrane Library, Emerald, MagIran, IranDoc, MoH thesis database and MoH articles database using the keywords “incident”, “accident”, “emergency”, “injury”, “disaster”, “road traffic”, “child”, “intervention”, “preparedness”, and “prevention.” The search was conducted on studies published in English or Persian, from 2000 to 2023. To assess the quality of the selected articles, the critical appraisal skills program (CASP) checklist was used. The data were analyzed using content analysis method in MAXQDA software, version 20.

**Results:** The initial search yielded 1495 articles. After removing duplicates and irrelevant articles, and reading abstracts, and full texts, 41 studies (3 theses and 38 articles) were selected for the review. We produced 234 codes, 45 for interventions to prevent man-made disasters, 157 for interventions to prevent domestic accidents, 18 for interventions to prevent burn and electrical accidents and 14 for interventions to prevent traffic accidents.

**Conclusion:** To prevent accidents in children under five years of age, there is a need for comprehensive efforts. Proper education for parents, teaching children about safe behaviors, installing appropriate safety equipment, and paying attention to the living environment of children can help reduce accidents in these children.

### Keywords:

Children, Accident, Prevention, Preparedness, Intervention

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## Introduction

**A**ccident prevention among children under 5 years of age is an important concern for parents, caregivers, and health care providers [1]. Accidents can be defined as an unplanned occurrence or event. For some people, the concept of accidents is viewed as part of God's plan. Accidents have endangered the lives of many children around the world, and is one of the main causes of death in children under 5 years of age [2, 3]. Children are prone to accidents due to the physiological limitations and special characteristics, such as tendency towards adventure seeking and risky behaviors [4], in addition to other factors such as the safety of the environment and parental monitoring and care [5]. According to the estimate of the [World Health Organization \(WHO\)](#), more than 6000 children die every day due to preventable accidents [6]. According to the statistics of the [Forensic Organization in Iran](#), accidents are the second cause of death in children. Accidents in children can be seen in different forms, including poisoning, falls, electrical accidents, suffocation, burns, injuries caused by physical punishment and collisions (collision of various vehicles with each other or with pedestrians, throwing stones or other objects, etc.). According to the age of the children, a certain type of accident happens more in them [7]. >25% of injuries leading to death in children occur in low- and middle-income countries. In addition to deaths, millions of children require hospital care following some types of accidents, most of whom suffer from disabilities and long-term complications. In Iran, the infant mortality rate in 2006 reached 30 per 1000 live births and the mortality rate of children under 5 years old reached 35 per 1000 children in the same year [8]. About 10% of Iran's population is made up of children under 5 years old. Due to the developmental and cognitive immaturity, these children do not have the ability to react quickly to the events around them and is very dependent on their parents. For this reason, parents' behavior, attitude and prognosis regarding their children's safety protect them from unpredictable events [8, 9]. One of the millennium development goals (MDG) of the [WHO](#) is to reduce the death of children under 5 years of age by 2028 [9].

Braga et al. examined the accidents related to children in the public hospitals of São Luís City in Brazil and recommended that, to reduce the accidents, preventive measures should be adopted [10]. Some preventive measures have been identified to reduce these incidents and protect children under 5 years of age from possible risks. These measures can include safety at home, safety in pediat-

ric centers and kindergartens, use of safety equipment, and the establishment of targeted rules and regulations to improve children's safety standards [1]. However, the lack of accurate knowledge of ways to prevent accidents in children and the belief that accidents cannot be prevented are one of the major problems of society, which can be solved to some extent by educating parents. The high global prevalence of accidents in children shows the importance of this issue and the need for parental education in this field [2, 3]. In addition, it is very necessary to identify the types of preventive measures for accidents in children under 5 years old to plan to reduce the amount of injury and death caused by accidents. The present study aims to identify these preventive interventions to reduce children's injuries by scoping review of related studies conducted in Iran and other countries.

## Materials and Methods

This is a scoping review study that was conducted in 2023. A search was first conducted in [Scopus](#), [ISI Web of Science](#), [MEDLINE](#) through [PubMed](#), [Embase](#), [Proquest](#), [Cochrane Library](#), [Emerald](#), [Magiran](#), [IranDoc](#), [MoH Thesis Database](#), [MoH Articles Database](#), for studies on the interventions to prevent accidents in children under 5 years old published from 2000 to 2023 in English or Persian. The articles, theses and chapters of published books were included in the search. The studies published in other languages and those with unavailable full texts were excluded. After findings records, they were entered into EndNote software, version X9. After removing duplicates, the titles and abstracts were read and irrelevant studies were removed. Then, the full texts of studies were read and the studies related to the study objectives entered into the study.

The obtained information was analyzed using the thematic analysis method in MAXQDA software, version 20. Thematic analysis was done in six stages: Becoming familiar with the data, generating initial codes, searching for themes, reviewing themes, defining themes, and creating the report. Also, the studies were evaluated using the critical appraisal skills program (CASP) checklist for qualitative studies, which assesses the parameters such as the study method, study samples, study objectives, and data analysis methods. A score of 1-5 was assigned to each of the articles based on each of these parameters. The articles whose total scores were  $\geq 25$  were confirmed in terms of quality and the rest were deleted. In this regard, 41 studies (3 theses and 31 articles) were finally selected for the scoping review. [Figure 1](#) shows the flow-chart of the study selection process.

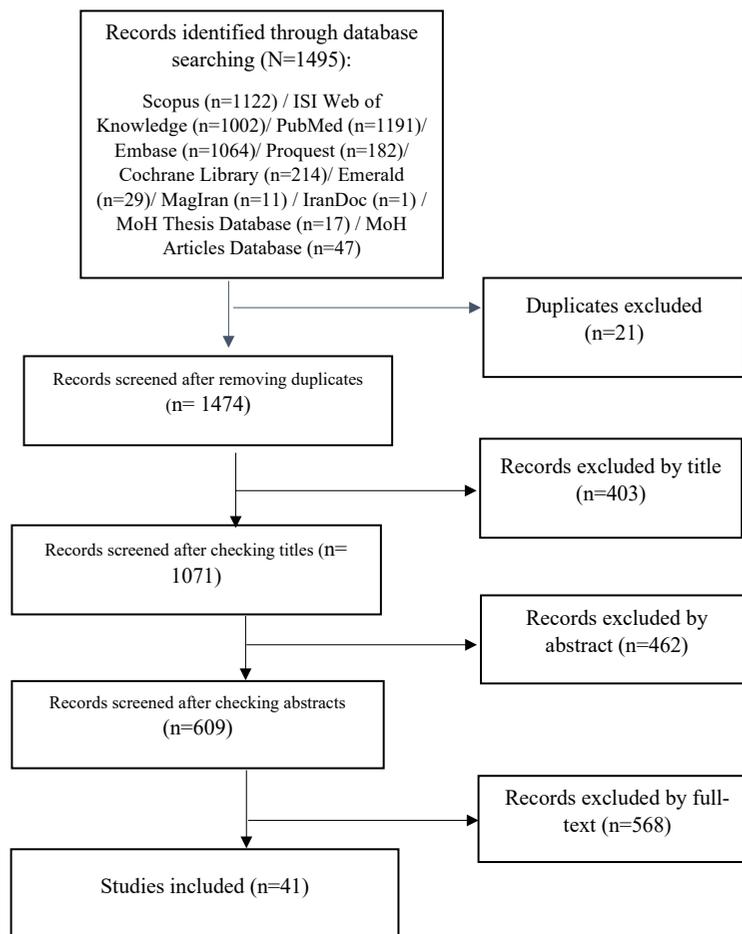


Figure 1. Flowchart of study selection process

## Results

Forty-one studies on preventive interventions against different accidents such as man-made disasters, domestic accidents, traffic accidents, burns and electrical accidents for children under five years of age with acceptable quality (moderate, good, or excellent) were reviewed in this study (Table 1). Most of studies were related to preventive interventions against domestic accidents (n=32). Table 2 shows the reviewed studies based on the type of accident. Regarding the written language, 10 studies were in Persian (25%) and 31 were in English (75%). In addition, most of the studies were quasi-experimental (n=18).

We generated 807 initial codes in MAXQDA software, version 20. Considering the frequency of codes, 234 codes were produced. Also, five main themes were defined, which included interventions to prevent domestic accidents (educational, evidence-based and health belief model-based), interventions to prevent man-made disasters

(collective and operational), interventions to prevent traffic accidents, interventions to prevent burns and interventions to prevent electrical accidents (Figure 2). In no study, interventions to prevent electrical accidents in children under five years old had been used separately, and less attention had been paid to this type of accidents. Of 234 codes, 45 were for man-made disasters, 157 for domestic accidents, 18 for burn and electrical accidents, and 14 for traffic accidents.

## Discussion

Taking care of preschool-age children can be challenging for parents. These children have a strong desire for independence and have very poor judgment about safety and appropriate behaviors. These little explorers should be carefully monitored so that their innate curiosity does not lead them into dangerous situations [11]. Since accidents are the leading cause of death in children under 5 years old, especially in middle and low-income countries, this scoping review aimed to investigate the preventive interventions

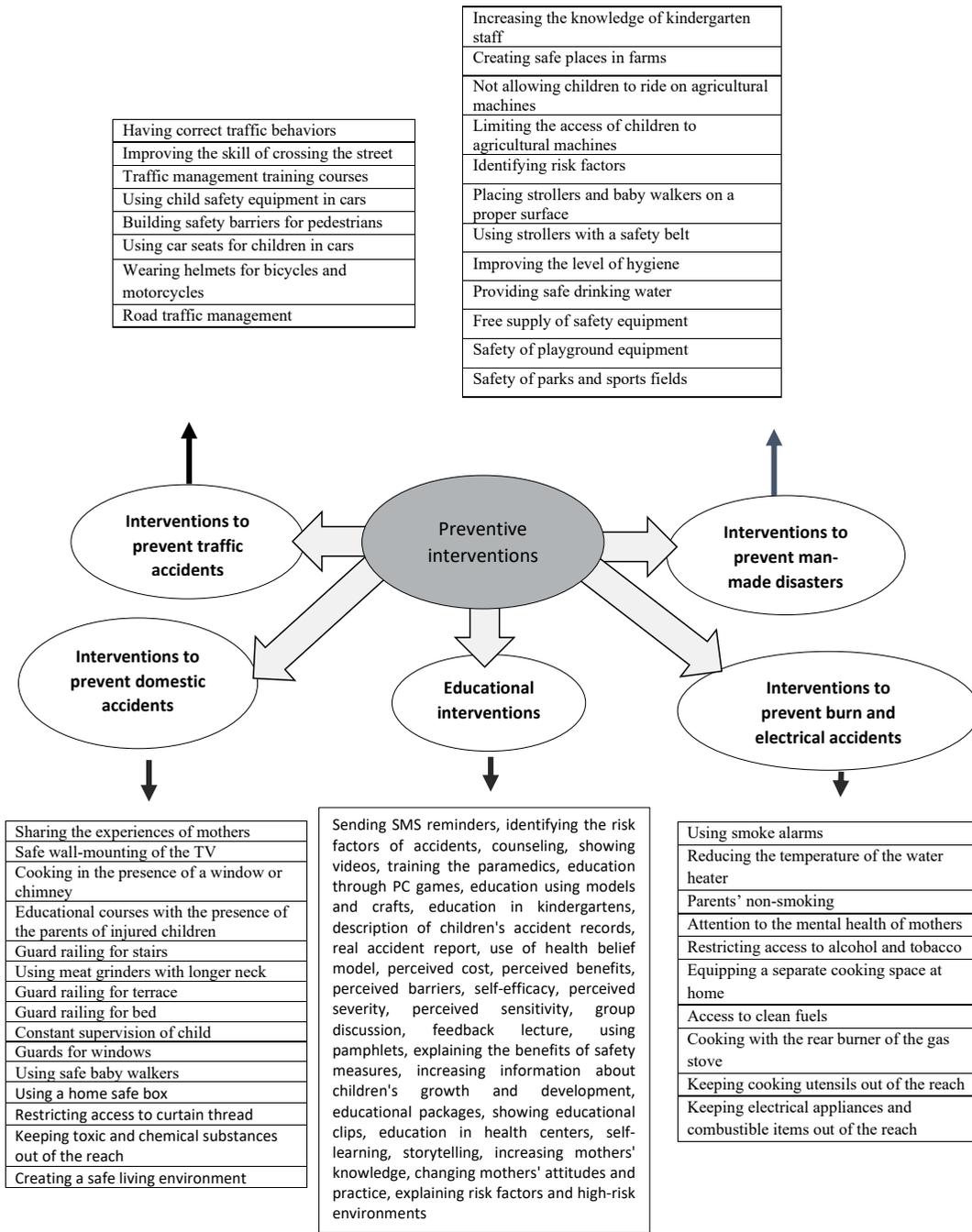


Figure 2. Different preventive interventions against different accidents for children under five years of age

against accidents for these children. The interventions were divided into four groups of interventions to prevent domestic accidents, man-made disasters, traffic accidents, and burns & electrical accidents. Most of studies were related interventions against domestic accidents. The reason can be the high presence of children in households. As a result, the presence of unsafe objects and devices at home increases children's exposure to accidents. These reports indicate the need to visit and check the safety status of homes. Accord-

ing to the statistics of the Iranian Ministry of Health and Medical Education, 64% of children's accidents are due to domestic accidents, and airway obstruction and drowning are the most common causes of death at home in children under 5 years of age [7]. Many studies have reported unsafe home environments, low socio-economic status, and lack of knowledge and inappropriate attitude of mothers as the most important risk factors for home accidents among children [11, 12-14].

Table 1. Specifications of the reviewed studies

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Heidar-ikia et al. 2020 [18]	Quasi-experimental	220	The HBM-based educational program was effective in improving mothers' beliefs and enhancing the safety behavior of mothers in preventing children's accidents.	The mean perceived sensitivity score of mothers increased significantly after the educational program in the intervention group. It seems that by reporting real events, arousing the mothers' emotions and increasing their awareness, it is possible to increase the sensitivity of mothers	Interventions to prevent domestic accidents	Feedback speech, group discussion, clip display and images
Keshavarz et al. 2019 [25]	Quasi-experimental	700	Protection motivation theory is a weak predictor of home accident prevention behaviors. The educational programs, by emphasizing on promoting self-efficacy and providing assistance to reduce barriers to creating safety at home, make it possible to reduce domestic accidents in children under 5 years of age	To increase preventive behaviors against accidents, mothers' perception of their ability to comply with safety precautions should be increased, which can be done by reducing barriers. Preventive behaviors against domestic accidents are only influenced by coping appraisal and perceived ability to deal with threat. By promoting self-efficacy and removing barriers.	Interventions to prevent domestic accidents	Increasing mothers' perceptions of the ability to comply with safety precautions, providing support to secure homes, involving other family members in child care
Afshari et al. 2017 [26]	Quasi-experimental	72	A model-based educational program for mothers with children under five years of age had a positive effect on the prevention of domestic injuries for children.	Providing a model-based educational program to mothers with children under five years of age is for improving the knowledge of mothers to prevent accidents.	Interventions to prevent domestic accidents	Informing mothers about possible accidents at home for their children and educating them to prevent accidents
Fathi Sheikhi, 2015 [27]	Quasi-experimental	261	The HBM-based educational program for mothers of children under 5 years of age along with active and interventional follow-ups can increase their performance regarding the prevention of accidents in children.	HBM-based education for mothers can prevent children's accidents. This training program must be accompanied by active follow-ups to be effective	Interventions to prevent domestic accidents	HBM-based education
Razi, 2014 [17]	Quasi-experimental	350	The HBM-based educational intervention was effective in improving mothers' performance regarding dangerous symptoms, respiratory infections, diarrhea, fever and convulsions in children.	Educational intervention based on the HBM is effective in improving the behaviors of the mothers of children under five years of age.	Interventions to prevent domestic accidents	HBM-based education
Ebadi Fardazar et al. 2016 [7]	Quasi-experimental	190	The protection motivation theory based educational programs could promote accident prevention behaviors in mothers of children under five years of age	Considering the effectiveness of the protection motivation theory in promoting the accident prevention behaviors in mothers of children under 5 years of age. This model can be used in developing educational programs in health centers to change the attitudes and behaviors of mothers in the prevention of accidents in children	Interventions to prevent domestic accidents	Protection motivation theory-based education

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Vahdani Nia et al. 2015 [28]	Quasi-experimental	60	Both storytelling and self-learning methods significantly improved the ability of mothers in preventing accidents in children. Although there was no significant difference between the pre-test and post-test changes in the storytelling group, the mean score showed a significant change three months later.	Both educational methods were effective in improving the ability of mothers in preventing accidents in children, where storytelling was more effective	Interventions to prevent domestic, traffic and burn accidents	Storytelling and self-learning
Maiman-tabadi, 2014 [29]	Quasi-experimental	120	The HBM-based educational program had a positive effect on improving safety knowledge, changing attitudes and improving the practice of mothers regarding the prevention of injuries to children under 5 years of age.	Education of mothers based on perceived sensitivity, perceived severity, perceived benefits, perceived barriers, cues for action and self-efficacy can prevent accidents in children under five years old.	Interventions to prevent domestic accidents	Attend educational sessions
Tabibi, 2010 [30]	Systematic review		Children <5 years are more at risk of accidents such as burns, poisoning and falls, and children >5 years are more at risk of road accidents	Studies have shown that high-risk environmental conditions, parents' educational level, TV programs, parents, mass media, and education are related to children's accidents.	Interventions to prevent domestic, traffic, burn, and electrical accidents	Active and passive prevention methods; designing a safe place for commuting, education in kindergarten and using social media, using games and crafts to teach preventive methods
Onders et al. 2018 [31]	Descriptive-analytical	-	From 1990 to 2015, 16,827 window blind-related injuries among children under six years of age were reported in emergency departments in the United States. Most of the injuries were related to the neck and getting stuck by the window blind cord, and two-thirds of the entanglement cases led to the child's death.	Despite existing voluntary safety standards for window blinds, these products continue to pose an injury risk to young children. Although many of the injuries were nonfatal, safety standard that eliminates accessible window blind cords should be adopted.	Interventions to prevent domestic accidents	Standardization of window blind cords, using blinds with invisible cords, moving the bed and baby chair away from the window blinds
Basak et al. 2020 [32]	Descriptive-analytical	780	Children under 5 years of age were the most affected. 53.2% of the injuries were related to tripping and 56.4% were related to falls.	The presence of siblings, group activities, the presence of an adult, and the child's emotional state can prevent injury in these children.	Interventions to prevent domestic accidents and man-made disasters	The presence of an active supervisor at home for care, preventing the child from doing risky activities as soon as the behavior is observed, giving warning to parents
Liu et al. 2019 [33]	Descriptive-analytical	-	Proximity of home and kindergarten to the road, not using seat belts and helmets in the car or on the motorcycle, and not having a driver's license by the driver were among the main factors of road accidents for children under 5 years old.	The living environment conditions of children under 5 years of age and the behavior of their parents/caregivers is related to the risk of road injuries in children. Increasing awareness at the family and kindergarten level is a suitable solution to prevent accidents.	Interventions to prevent traffic accident	Increasing the knowledge of parents and child caregivers, Improving and expanding road safety facilities, creating suitable areas for children's activities away from the road

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
O'Hara et al. 2019 [34]	Systematic review	-	A review of 22 articles from Europe and two North American countries with 1889 samples showed that showing videos of parent-child relationship memories to parents of children under five years of age increases parents' sensitivity to safety tips and prevention of future accidents in children	Showing videos of parents interacting with children makes parents more sensitive to possible accidents in children under five years old. It should be noted that the children often had problems such as hearing or visual n disorders and suffered from the consequences of insufficient communication with their parents.	Interventions to prevent unexpected events	Showing a parent brief moment of their interaction with their child
Rostami-Moez et al. 2019 [35]	Systematic review	-	11 out of 15 articles were about using educational approaches for cultural adaptation to prevent injuries caused by domestic accidents in children under five years old	If cultural strategies are taken into consideration in interventions, they will have a change in domestic accidents in children under five years old	Interventions to prevent domestic accidents	Using linguistic, socio-cultural strategies for accident prevention education
Rezapour Shah Kalaei et al. 2008 [36]	Quasi-experimental	580	There was a strong correlation between mother's behavior regarding the prevention of poisoning in children under five years of age and child injury.	Educational programs for mothers with children under the age of five should focus on strengthening the morale of mothers and increasing their self-awareness and self-efficacy to prevent various accidents for their children.	Interventions to prevent man-made disasters	Education to strengthen morale and self-efficacy in the prevention of child poisoning
Wang et al. 2019 [37]	Quasi-experimental	-	Suffocation during sleeping is the most common cause of death in children aged 1-4 years and is due to the use of heavy blankets or gas leaks.	The assessment of suffocation in children under five years old in China indicates that suffocation in these children occurs mostly in cold seasons due to the use of unsafe or very heavy and thick heating equipment, which should be prevented.	Interventions to prevent domestic accidents	Using blankets suitable for the age and weight of the child while sleeping, using safe heating appliances, checking the condition of the child at night
Brito et al. 2017 [38]	wQuasi-experimental	344	Factors such as the high height of the bed, the presence of stairs without handrails, passageways full of toys can cause falling in children under five years of age.	In Brazil, one of the customs of people with children is to use high-height beds or cribs without handrails, which leads to children falling in their sleep. Unguarded stairs and passages with equipment and toys also lead to children falling. These falls mostly lead to leg or head injuries in children	Interventions to prevent domestic accidents	Increasing the safety of the child's sleeping environment by using handrails for the crib and stairs, and keeping the dangerous toys and tools out of the child's way
Gaw et al. 2017 [39]	Quasi-experimental	-	Over a 21-year study, the majority of nursery product-related injuries were for strollers, baby carriers, cribs, and baby walkers, which resulted in serious head and neck injuries	From 1991 to 2003, the number of nursery product-related injuries declined, but increased since 2003.	Interventions to prevent domestic accidents	Installing safe care equipment in strollers, cribs and baby walkers, continuous care and supervision of children when using nursery products

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Ros-selli et al. 2017 [40]	Descriptive-analytical	-	The leading causes of death for children under five years of age in Colombia include drowning, traffic accidents, and homicide by gunfire.	Although the death rate of children under the age of five has decreased over the past decades, domestic accidents, burns, traffic accidents, and homicides are still considered to be the main causes of children's death.	Interventions to prevent domestic, traffic and burn, accidents	Restricting access to guns, increasing the use of safe gas stoves, raising awareness about safe driving on the road
Naz et al. 2016 [41]	Descriptive-analytical	-	Homes without separate kitchens in rural India are more prone to child death. Household air pollution due to the use of cooking oil in these houses is the cause of death in children under 5 years of age	Factors such as access to clean fuels, use of safe and healthy cooking equipment (stove), behavioral factors (mother's knowledge of keeping the child away from the cooking area) and structural factors (having a chimney and window in the cooking area) can prevent death caused by household air pollution in children under five years of age.	Interventions to prevent man-made disasters	Access to clean fuels for cooking, Improving household infrastructure, increasing mothers' knowledge of keeping children away from the cooking area while cooking
Shah et al. 2013 [42]	Descriptive-analytical	-	Burns with boiling water occurred in children aged 1-2 years, whose mothers or caregivers had little experience in the field of child care	The level of knowledge and experience of caregivers, nurses or parents plays an important role in preventing burn accidents in children.	Interventions to prevent burns	Use of medical counselors in child care centers, Constant supervision of the child when there is boiling water in the area, Limited access of the child to the place with a burning agent
Güloğlu et al. 2012 [43]	Quasi-experimental	42	More than 65% of the children were aged 1-3 years. Five children aged 2 years or younger, died in the hospital as a result of the TV-related injury,	In this research, only one type of domestic accident in children was addressed, and the proposed intervention is recommended for prevention	Interventions to prevent domestic accidents	Children's limited access to television, and increased care and supervision of children
Pourol-majal et al. 2012 [44]	Quasi-experimental	580	The results showed that the most common domestic accidents in children under 5 years of age were falls, burns, and poisoning and there was a positive relationship between knowledge and self-efficacy of mothers and preventive actions	Knowledge, self-efficacy, perceived barriers and familiarity with domestic accidents in mothers play an important role in preventing domestic accidents in children under five years of age, which should be included in educational programs to prevent various accidents in children.	Interventions to prevent domestic accidents	Education of mothers in relation to self- efficacy, cues of action, and necessary measures in case of an accident, and prevention measures against domestic accidents
Ingram et al. 2011 [45]	Systematic review	-	By reviewing 99 related articles, determined that the application of prevention approach, focused messages, minor changes, access to practical equipment and behavior change are among the important factors of interventions to prevent injuries of children under five years old.	This article is a systematic review of the studies in on domestic accidents in children <5 years, but many interventions were not described in detail.	Interventions to prevent domestic accidents	Making environmental and behavioral changes through education, Making non-recurring changes in interaction with and care of children, free provision of safety equipment at home, education to parents

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Phelan et al. 2011 [46]	Quasi-experimental	413	Installing safety tools in homes reduced the number of accidents such as falling, poisoning, swallowing objects, and smoke in children aged <4	The interventions related to the prevention of domestic accidents in children aged <4 depend on the type of household safety devices and equipment.	Interventions to prevent domestic accidents	Installation of stair guard rails, locks for cabinets and closets, and smoke detector
Awqati et al. 2009 [47]	Quasi-experimental		81.2% of the deaths in children under five years of age in Iraq are due to childhood diseases and 3.3% are related to accidents. Cough, shortness of breath and diarrhea are among the most common symptoms before the death of these children.	More than half of the deaths in Iraqi children are seen in children under one year of age. Control of diarrhea and birth conditions in these children is very important.	Interventions to prevent domestic accidents, and man-made disasters	Rapid diagnosis and treatment of children with infectious diseases caused by accidents, providing safe drinking water, establishing peace in the family
Nansel et al. 2007 [48]	Quasi-experimental	-	Providing coherent information about accidents in children to parents/caregivers could change their behavior and reduce harm to the child. This effectiveness was seen more in low-educated parents.	There was a relationship between the type of information received about children's accidents and the amount of information received by parents/caregivers.	Interventions to prevent domestic accidents, and man-made disasters	Providing accurate, coherent or comprehensive information to parents/caregivers about children's accidents
Brison et al. 2006 [49]	Quasi-experimental	-	The mortality rate of children aged 1-6 years in Canada due to agricultural work was reported to be 14.9 per 1,000 deaths. These deaths were due to agricultural machinery, falling from machines, and suffocation due to drowning.	Children under the age of six who grow up in an agricultural environment are exposed to serious injuries and high mortality. The main strategy in preventing accidents in these children is to limit their access to agricultural machines and use a child lock system for all agricultural machines	Interventions to prevent man-made disasters	Informing parents about agricultural accidents in the farm
Bruce & Grath, 2005 [50]	Systematic review		The review of 9 related articles showed that educational interventions using educational videos, group activities, cartoons, stories, puppetry, hymns, coloring, and games play a role in preventing accidents in children.	In this article, accidents in children under six years of age and preventive interventions against them were reported. These interventions were in a group format and no examples were provided individually for single-child families.	Interventions to prevent domestic accidents, and man-made disasters	Using audio-visual aids and the performing arts in teaching to justify the child
Alkon et al. 2000 [51]	Descriptive-analytical	-	Young children are more vulnerable to injuries. Girls are also at greater risk. The physical safety and emotional conditions of the child care center affect the extent of injuries to children.	Even physically safe environments can cause harm to children under five. Paying attention to social and emotional conditions in child care centers can prevent injury in children.	Interventions to prevent domestic accidents	Creating safe child-care spaces, hiring knowledgeable and accountable instructors
Ellsaber & Berfenstam, 2000 [52]	Descriptive-analytical	-	In these five countries, the most deaths of children due to domestic injuries and recreational accidents and drowning were among those aged 1-4 years. Traffic accidents were seen more in children over five years old.	In this article, the status and types of injuries that led to the death of children from 1980 to 2000 were investigated. Prevention programs for these accidents were investigated and reported in five countries, but the effectiveness of these proposed programs was not evaluated.	Interventions to prevent domestic accidents, and man-made disasters	Establishment of a well-equipped center for the care of injured children, Research and collaboration to implement prevention activities, improving and developing laws to control the production of safe products for children

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Khan et al. 2023 [53]	Descriptive-analytical	312 households	An injury prevention tutorial to caretakers of children supplemented with pamphlets could significantly decrease the incidence of falls, drowning, burns, poisoning, and cut injury hazards for children under 5 years of age in their homes in a low-resource setting.	This study described the long-term effects of two injury prevention educational interventions for caregivers—an educational pamphlet and an in-home tutorial guide—by comparing the change in the prevalence of home injury hazards before and after the interventions. The main outcome was the reduced risk of injury at home for children under 5 years of age.	Interventions to prevent domestic accidents, and man-made disasters	Educational pamphlet and an in-home tutorial guide
Bhatta et al. 2023 [54]	Qualitative and focus group discussion	47	Community people perceive injuries to be a normal part of childhood and, therefore, few prevention measures were considered. Parents were, however, able to identify ways to change their environment that made it safer. Changes included removing hazards or adding safety equipment, adapting the home or restricting access to potential hazards. Barriers to implementation included limited awareness about injury hazards and risk management.	Development of interventions to prevent injuries at home in pre-school children should reflect local context and culture; this is best achieved through engagement with parents.	Interventions to prevent domestic accidents	Adding safety equipment, adapting the home or restricting access to potential hazards.
Spering et al. 2022 [22]	Descriptive-analytical	268	It is more important to properly restrain children in their adequate car seats (i-size-norm) and additionally consider the age-related physiological and anatomical specific risks of injury	This article only measures motor vehicle accidents in children aged 0-5 years and the recommendations are limited.	Interventions to prevent traffic accidents	Using a child car seat according to the child's age
Moridi et al. 2021 [55]	Quasi-experimental	200	Mean score of knowledge, perceived sensitivity, perceived severity, perceived benefits, perceived self-efficacy, cues to action and accident prevention behaviors significantly increased three months after the intervention. This study showed the effectiveness of HBM-based educational intervention on accident prevention behaviors in mothers of children under 5-years of age.	The present study aimed to determine the effect of educational intervention based on the HBM on accident prevention behaviors in mothers of children under 5-years of age.	Interventions to prevent accidents	HBM-based educational intervention
Jaras et al. 2023 [56]	Descriptive-analytical	201	The health behavior of mothers in preventing childhood injuries was significantly influenced by the mother's understanding of the child's vulnerability and the benefits of taking timely and effective action to reduce possible risks.	The present study aimed to assess the factors related to the belief and performance of mothers in preventing injuries among children under five years of age using the HBM	Interventions to prevent burn and falls	HBM-based intervention

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Feng et al. 2023 [57]	RCT	-	Online-social-networks-based health education interventions could enhance communication among parents, and between parents and community childcare doctors and also shorten the social distance between them.	Online-social-network-based parental-health-education-intervention can be a feasible and generalizable means of preventing unintentional injuries among children.	Interventions to prevent domestic accidents, and man-made disasters	Online-social-network-based parental-health-education-intervention
Sampei et al. 2020 [58]	Descriptive-analytical	23394	Only 5.6% of municipalities implemented a child safety intervention. A municipality-level intervention taking a checklist-based approach at the 4-month health exam in Japan could promote certain child safety behaviors in parents with children around 1.5 years of age.	In this study, the role of municipality-level safety checklist implementation for reducing risky child-safety-related parental behaviors was examined.	Interventions to prevent domestic and traffic accidents	Keeping tobacco/ashtray and candy out of the reach of infants, using a car seat, having a lock on bathing room door
Damashek et al. 2022 [59]	Qualitative and focus group discussion	31	Caregivers gleaned important take-away messages from both the original and modified materials, including the idea that injuries can happen quickly and that caregivers can prevent injuries. Modifications to the intervention included increased diversity in the families represented in the videos as well as inclusion of U.S. injury statistics. Caregivers in both rounds of focus groups noted that the program messages were relatable and realistic and that the materials were impactful in increasing their awareness of children's injury risk.	Two rounds of focus groups were completed; feedback from the first round of focus groups was used to modify program materials prior to the second round. The authors could successfully modify the supervising for home safety program to be appropriate for low-income US. families while preserving the core program messages.	Interventions to prevent dog bite incidents and gun access	Preparation of educational videos vignettes according to the common accidents in US. and Canada and according to the race, culture and ethnicity of people.

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Jullien, 2021 [60]	Review	-	Preventive strategies for injuries in childhood are mainly based on surveillance data and the identification of risk factors. The key strategies for preventing unintentional injuries are a combination of environmental and behaviour modification, that can be achieved through engineering, enforcement and education.	Review of existing recommendations for preventing unintentional injuries in children under five years of age,	Interventions to prevent road traffic injuries, drowning, poisoning, thermal injuries, falls	<p>1- Correct use of the child restraint system, use of helmet, and safety education of pedestrians for preventing traffic road injuries;</p> <p>2- Installation of a four-sided isolation pool fencing, providing safe places away from water for pre-school children, removing or covering water hazards, use of life jackets and personal flotation devices, Setting and enforce safe boating, shipping and ferry regulations, swimming, close supervision, and providing immediate resuscitation for preventing drowning;</p> <p>3- Removing the toxic agent, packaging, poison control centers, and secure storage for preventing poisoning;</p> <p>4- Smoke alarms, control of hot water, non-flammable fabrics, fire sprinkler system, electrical safety, lighters, fireworks, having an escape plan, possession of a fire extinguisher, use of fire guards, keeping hot drinks/food out of reach of children, and storage of matches or lighters out of reach of children for preventing thermal injuries;</p> <p>5- Replace or modify unsafe products, safety equipment, protective equipment, playground, education, not using baby walkers, and supervision for preventing falls</p>

Author (y)	Study Design	Sample Size	Results	Finding/Objective	Relation With the Study Question	Recommended Protocol
Wells et al. 2022 [61]	Network meta-analyses	-	Complex intervention, including Education, Free/low-cost equipment, Fitting equipment and home safety inspection, was the most effective intervention at promoting accident prevention behaviours for both outcomes	In the appraisal of clinical interventions, complex evidence synthesis methods, such as network meta-analysis (NMA), are commonly used to investigate the effectiveness of multiple interventions in a single analysis. The results from a NMA can inform clinical guidelines directly or be used as inputs into a decision-analytic model assessing the cost-effectiveness of the interventions. However, there is hesitancy in using complex evidence synthesis methods when evaluating public health interventions.	Interventions to prevent domestic accidents	Education, free/low-cost equipment, fitting equipment and home safety inspection

The results of this study also showed that the most affected children were from urban areas. It can be explained that due to the closed and small living area in cities and the higher level of welfare and as a result, the high number of household appliances in homes, as well as the fact that most of mothers are employed, the risk of domestic accidents among children in urban areas is higher. Other possible reasons are the existence of more vehicles in cities and the outpatient treatment of people in rural areas and the lack of referral to urban medical centers.

Educational and operational interventions were also use in many studies to prevent various accidents in children under five years of age. Al-Abidi showed that the knowledge of mothers regarding the preventive measures of accidents in children improved after attending educational sessions [13]. In other studies, continuous training also had a significant role in reducing accidents and their complications in children [15, 16]. Considering that more than 90% of injuries caused by accidents in

children are predictable, education, especially for mothers as a key person in the family, is of particular importance. On the other hand, theories and behavioral models can be used to understand how to prevent accidents. One of these models proposed for education is the health belief model (HBM) [17]. This model is mainly focused on the prevention of diseases and the behaviors adopted to avoid the illnesses and diseases, and is among the important and accurate models used to determine the relationship between health beliefs and healthy behaviors [18]. Another theory is the protection motivation theory that focuses on the cognitive factors affecting protection against stressful life events [7]. Limited studies had been conducted using this theory to predict the effective factors on accident prevention behaviors of children under 5 years of age. According to the findings, performing preventive behaviors against domestic accidents is only influenced by coping appraisal, i.e. mother’s perception of the ability to cope with and avoid dangers. In the studies using the HBM, different constructs predicting the occurrence of accidents had been reported. In some stud-

Table 2. Frequency of articles based on the type of accidents

Accidents	Number of Articles	Ref. No.
Domestic	32	[1-11], [12], [13], [15-18], [21-26], [17-33], [37], [38]
Traffic	9	[7], [9], [7], [12], [18], [25], [31], [35], [37]
Man-made	11	[11], [12], [14], [19], [25-27], [28], [34], [36]
Burn & electrical accidents	7	[7], [9], [18], [20], [25], [7], [29], [31]

ies, perceived sensitivity was the predictor of preventive behaviors, while in another study, the construct of self-efficacy was the predictor of preventive behaviors. By improving self-efficacy and removing barriers, we can create a proper understanding of the ability to cope with the risk of accidents in mothers [20, 21].

A study reported the effectiveness of the protection motivation theory in promoting the accident prevention behaviors in mothers of children under 5 years old. This model can be used in developing educational programs in health centers to change the attitudes and behaviors of mothers in the prevention of accidents in children. Since the report of accidents led to children's injury is a suitable strategy to increase parents' understanding of their child's vulnerability to injury and motivate them to supervise their children more actively, healthcare workers can give these reports to mothers in their educational sessions about domestic accidents. In fact, if the negative effects and severe complications of injuries on the current and future lives of children and even their families are properly perceived by parents, many of them will be prevented. In other words, the attitude of parents or guardians of children under five years old can determine the type of preventive intervention and its effectiveness [20, 21].

Interventions to prevent traffic accidents identified in children under five years old included: Having correct traffic behaviors, improving the skill of crossing the street, traffic management training courses, using child safety equipment in cars, building safety barriers for pedestrians, using car seats for children in cars, wearing helmets for bicycles and motorcycles, and road traffic management. Sperring et al. [22] suggested that keeping children in car seats correctly and also considering specific physiological and anatomical risks related to children's age is necessary to prevent traffic accidents in children.

Interventions to prevent burn & electrical accidents in children under five years old included: Using smoke alarms, reducing the temperature of the water heater, parents' non-smoking, attention to the mental health of mothers, restricting access to alcohol and tobacco, equipping a separate cooking space at home, access to clean fuels, cooking with the rear burner of the gas stove, keeping cooking utensils out of the reach, and keeping electrical appliances and combustible items out of the reach. Families should be encouraged to use the electrical appliances with high safety [23]. Most preventive interventions to prevent burn accidents in children under 5 years of age should be done at home [24], which is consistent with the results of the present study.

Maintaining the safety and health of children under 5 years of age is one of the most important and vital issues for families. Various accidents can happen to children at any time and in any place. Prevention of these accidents is very important. Teaching parents about safe behaviors in areas such as kitchen and bathroom at home can reduce the risk of injury to children. Also, teaching children about safety behaviors such as wearing seat belts in cars, keeping away from dangerous toys, and using the medicines made for children, can help reduce accidents. The use of safety devices in cars for children such as seat belts and car seats can be effective in reducing traffic accidents in children. Ensuring the child's presence in a safe place and inaccessibility of dangerous chemicals and drugs to children should also be considered. Finally, in case of accidents, it is necessary to be prepared for timely intervention and early treatment. Training on basic treatment methods and provision of medical equipment to respond to such accidents in areas such as home, school and kindergarten can be effective in reducing the complications of these accidents. One of the limitations in conducting this study was the lack of access to the full text of some articles.

## Conclusion

In this review study, the identified preventive interventions against accidents for children under 5 years of age were put in four categories of interventions to prevent domestic accidents, man-made disasters, traffic accidents, and burns & electrical accidents. Most of the studies were related to preventive interventions against domestic accidents. Mothers and family caregivers play an important role in preventing domestic accidents in children under 5 years of age. Providing education to mothers and family caregivers, can improve their knowledge and safety behaviors and reduce harm to children. Also, installing appropriate safety equipment and paying attention to children's living environment can be effective. The need to prevent accidents in children is an important issue that requires the planning and implementation of control and protection programs in health, educational and recreational centers for children.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Research Ethics Committee of [Isfahan University of Medical Sciences](#) (Code: IR.MUI.RESEARCH.REC.1399.626).

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## Authors' contributions

Conceptualization: Ali Reza Rahimi; Study design and data collection: Parvaneh Heidari; Data analysis and interpretation: Golrokh Atighechian; Writing the original draft: Parvaneh Heidari and Ali Reza Rahimi; Final approval: All authors.

## Conflict of interest

The authors declared no conflict of interest.

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