

Analysis of research on interventions for the prevention of safety accidents involving infants: a scoping review

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Purpose: This study aimed to conduct a scoping review of studies on interventions for the prevention of safety accidents involving infants. **Methods:** The scoping review method by Arksey and O'Malley was used to conduct an overview based on information spanning a wide range of fields. Multiple electronic databases, PubMed, CINAHL, RISS, and KISS, were searched for articles written in English or Korean published from 2012 to the present on safety accident prevention interventions. A total of 2,137 papers were found, and 20 papers were ultimately analyzed. **Results:** Most studies were conducted in the United States (55.0%) and in the medical field (45.0%), and most were experimental studies (35.0%). The results were organized across five categories: 1) preventive precautions, 2) characteristics of children's developmental stages, 3) encouraging voluntary participation, 4) continuity of interventions, and 5) teaching methods. **Conclusion:** Safety accident prevention interventions should cover the establishment of a safe home environment, include voluntary participation, and provide routine follow-up interventions. Additionally, practical training and teaching methods that incorporate feedback rather than a lecture-oriented approach should be adopted.

Key words: Accidents, home; Infant; Child; Review literature; Safety

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INTRODUCTION

One in five children dies from safety accidents worldwide [1]. According to the Korea Consumer Agency [2], safety accidents involving children accounted for 26.4% of all safety accidents in 2020, and 52% of safety accidents involving children occurred in infants and toddlers. Moreover, over the past 5 years, an annual average of 69.0% of safety accidents involving children have been reported to occur at home [2]. Since children in infancy spend most of their time at home, safety accidents involving children in the home are a more important issue in terms of disease prevention and health promotion in children [1,2]. The South Korean government has established legal standards to prevent safety accidents involving children at home [2].

Infants and toddlers are curious and active. However, they are frequently exposed to environments posing a high risk for safety accidents due to a lack of awareness and coping skills in

situations, as well as poor self-regulation and physical strength [3-5]. Therefore, to prevent accidents involving infants at home, parents should focus on keeping the home environment safe and preventing accidents by closely monitoring their children's high-risk behaviors [3-6].

Parents play an important role in preventing accidents [4,6]. Since parents play many roles, they may not be able to pay sufficient attention to prevent safety accidents and may fail to prepare for safety accidents properly due to a lack of information. In addition, since the opinions of family members tend to differ, individual family members may confront risky situations inconsistently [5]. Therefore, to ensure the safety of children at home, parents of infants and toddlers should be educated to ensure their accurate understanding of information and strategies to prevent safety accidents involving children [7-9].

In addition to nursing, researchers in various other fields, such as medicine, social welfare, and early childhood educa-

tion, are interested in home and child safety. Several Korean and international studies have been conducted in which educational programs on home safety aimed at the parents of infants and toddlers were conducted and analyzed for their effectiveness [4,7,10,11]. Furthermore, many studies on interventions for sleep safety [12-15], home fire safety accidents [8], first aid [16,17], and car safety accidents [18] have been published, and educational interventions aimed at parents in these studies were confirmed to have a positive effect on the prevention of safety accidents involving children.

Supporting and helping parents to ensure the safety and health of their children is an important task in childcare; therefore, effective interventions for safety accident prevention should be provided for parents [5,13-15]. It is necessary to understand the importance of education to prevent accidents involving children practically and comprehensively.

A scoping review is a literature review method in which the characteristics, scope, and key concepts related to a specific research question are summarized and mapped to obtain an overview of findings across a wide range of fields [19,20]. Therefore, this study aimed to obtain an overview of studies related to interventions for the prevention of safety accidents involving infants using the scoping review method and to collect basic data for the development of future interventions for parents to prevent safety accidents. The specific objectives of this study were as follows: 1) to identify the general characteristics of relevant studies and 2) to identify the characteristics of interventions to prevent safety accidents involving infants.

METHODS

Ethics statement: This study was a literature review of previously published studies and was therefore exempt from institutional review board approval.

1. Study Design

This study conducted a literature review using the scoping review method proposed by Arksey and O'Malley [20]. Scoping reviews can be used to obtain an overview of information for a broad range of fields [19]. The process of conducting a scoping review involves the following steps: 1) identify the research question, 2) identify relevant studies, 3) select studies to include, 4) chart the data, and 5) collate, summarize, and report the results [20]. This study followed the criteria of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist [21].

2. Study Process

1) Identifying the research question

The research questions in scoping reviews are broadly designed to encompass a wide range of research areas [20]. According to Peters et al. [22], the population, concept, and context of the research question should be defined; in this study, the following definitions were applied: 1) population: infants/toddlers, and their parents; 2) concept: safety accidents and, interventions; 3) context: home. Therefore, the research question in this study was "What are the main findings of published academic articles on interventions aimed at parents to prevent safety accidents involving infants and toddlers in the home?"

2) Identifying relevant studies

According to the guidelines of Seo and Kim [19], which suggest conducting a search using a limited set of information sources, this study searched four major international and Korean search engines. The international search engines were PubMed and CINAHL, and the Korean search engines were RISS and KISS. The main keywords were "parent", "infant", "toddler", "safety", "program", "education", and "intervention". The literature search was conducted using MeSH terms, CINAHL subject heads, and natural language and Boolean operators, which are the main indices for each database, based on the advice of the librarian of the medical library at the researchers' university. To understand the latest trends, the publication period was limited to the last 10 years (from 2012 to the present). The search strategy adopted in this study is shown in Table 1. As a result of the search conducted on May 26, 2022, a total of 2,137 papers were identified, including 317 from PubMed, 180 from CINAHL, 27 from RISS, and 1,613 from KISS. Duplicate articles were removed using Endnote 20 (Clarivate, Philadelphia, PA, USA), with a total of 2,008 articles being removed. A total of 129 articles ultimately required review, and their titles and abstracts were collected (Figure 1).

3) Selecting studies to include

The inclusion criteria of this study were as follows: 1) journal studies related to interventions for the prevention of safety accidents involving infants, 2) studies published from 2012 to 2022, 3) peer-reviewed studies, and 4) English- or Korean-language studies. The exclusion criteria were as follows: 1) editorials, letters to the editor, and 2) conference proceedings. To control for selection bias, five in-person meetings were held to reach a consensus after an independent review by the researchers. In the first phase, the titles and abstracts were reviewed. In the second phase, the full texts were reviewed. In

Table 1. Database Search Formulas to Search for Research on Interventions for the Prevention of Safety Accidents Involving Infants

Database	Search	Queries	Items found
PubMed	#4	#2 AND #3	317
	#3	"safety" [MeSH Terms] OR "safe*" [Title/Abstract] AND (("education" [MeSH Terms] OR "educat*" [Title/Abstract]) OR "program*" [Title/Abstract]) AND ("early medical intervention" [MeSH Terms] OR "intervent*" [Title/Abstract])	14,889
	#2	((("Infant" [MeSH Terms] OR "infant*" [Title/Abstract]) OR "toddler*" [Title/Abstract]) AND ("Parents" [MeSH Terms] OR "parent*" [Title/Abstract]) AND (2012:2022 [pdat]))	45,046
	#1	((("Infant" [MeSH Terms] OR "infant*" [Title/Abstract]) AND "toddler*" [Title/Abstract]) AND (2012:2022 [pdat]))	5,851
CINAHL	#S4	#S2 AND #S3	180
	#S3	((MM "Safety") OR TI Safe* OR SU Safe*) AND ((MM "education") OR TI educat* OR SU educat*) OR (TI program* OR SU program*) AND (TI intervent* OR SU intervent* OR (MM "Early Childhood Intervention"))	9,334
	#S2	S1 AND ((MM "Parents") OR TI parent* OR SU parent* OR AB parent*)	21,282
	#S1	((MM "Infant") OR TI Infant* OR SU Infant* OR AB Infant*) OR (TI Toddler* OR SU Toddler* OR AB Toddler*)	173,948
RISS	#3	#1 < AND > #2	27
	#2	Safety < AND > (intervention < OR > education program)	1,731
	#1	Parent < AND > (infant < OR > toddler)	1,687
KISS	#3	#1 AND #2	1,613
	#2	Safety < AND > intervention < OR > education program	1,621
	#1	Parent < AND > infant < OR > toddler	261

AB, abstract fields; CINAHL, Cumulative Index to Nursing and Allied Health Literature; KISS, Koreanstudies Information Service System; MeSH, medical subject headings; MM, CINAHL exact major subject headings; RISS, Research Information Sharing Service; SU, subject heading; TI, terms in the title.

the third phase, the selected articles were reviewed for data collection. Finally, Gough's weight of evidence (WOE) (2007) was used for the quality evaluation of the selected articles. The logic of the study, quality of the research design, and quality of the research data were evaluated according to the WOE criteria.

4) Charting the data

The charting format based on the criteria of Peters et al. [22] was as follows: 1) first author, 2) year of publication, 3) country of origin, 4) academic field, 5) study design, 6) study aim, 7) study population and sample size, 8) intervention content, 9) duration of the intervention, 10) outcome variables, and 11) key findings. The researchers independently charted 20 articles using Microsoft Excel (Version 2013; Microsoft, Redmond, WA, USA), and each opinion was discussed over the course of three research meetings to compile a single chart. Table 2 summarizes the charts used in this study.

5) Collating, summarizing, and reporting the results

The researchers analyzed and summarized the study's re-

sults by faithfully following the guidelines for scoping reviews [20]. Tables and figures were prepared to outline the research results according to the purpose of this study.

RESULTS

1. Search and Selection of Scoping Review

As a result of a search conducted on May 26, 2022, a total of 2,137 papers were identified, including 317 from PubMed, 180 from CINAHL, 27 from RISS, and 1,613 from KISS. A total of 2,008 duplicate articles were removed using Endnote 20 (Clarivate). Thus, 129 articles required review, and the titles and abstracts of all remaining articles were collected (Figure 1).

After the titles and abstracts of the 129 articles were reviewed, 97 articles were excluded. The 97 papers included 42 papers related to safety accidents at institutions or kindergartens, 31 papers related to preschool-age children, nine papers related to school-age children, five non-English- or Korean-language papers, a letter, a paper from conference proceedings, and eight papers that did not match the research

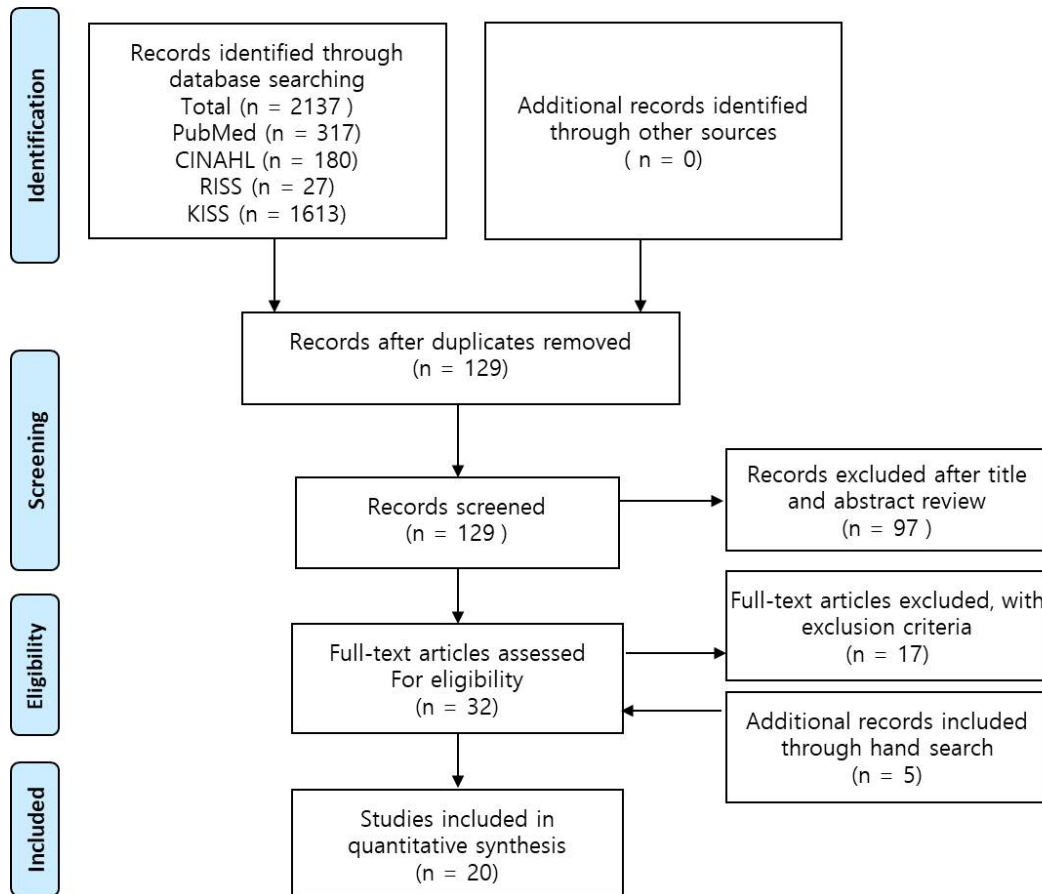


Figure 1. Flow diagram for the selection of research on interventions for the prevention of safety accidents involving infants.

question. Thirty-two articles were reviewed after obtaining the full texts. Seventeen articles were excluded since they did not meet the inclusion criteria, and five additional articles were included from the references of the reviewed articles. Twenty articles were ultimately reviewed for data collection. As a result of a close review of the criteria for inclusion and exclusion, and focusing on the research design, subjects, major variables, and major results as items for rough data recording, the researchers ultimately selected 20 articles to be analyzed in this study (Figure 1). All 20 articles were high-quality based on the WOE criteria [23].

2. General Characteristics of the Reviewed Research

The general characteristics of the reviewed studies are presented in Table 3. The USA had the largest percentage of published studies (55.0%), followed by South Korea (25.0%). By academic field, the highest percentage of articles came from the field of medicine (45.0%), followed by nursing, public health, social welfare, and education. A total of 55.0% of the studies were specifically on mothers, while 40.0% of studies

were on parents more broadly.

Falls and fire safety were the most common intervention topics, followed by child safety seats (car restraint systems [CRS]), emergency treatment, and poison prevention. A total of 36.4% of the studies provided an intervention program. Intervention materials most often included videos, followed by safety equipment, supervision, home visits, telephone conversations, text messages, booklets, and PowerPoint slides.

3. Characteristics of Interventions for the Prevention of Safety Accidents Involving Infants

Five characteristics were identified (Table 4). They included precautions to prevent safety accidents at home, characteristics of children's developmental stages, encouraging voluntary participation, continuity of interventions, and teaching methods to strengthen safety accident prevention competency.

1) Preventive precautions

Interventions for the prevention of safety accidents involving infants should include coverage of preventive precautions.

Table 2. Summary of the Reviewed Research on Interventions for the Prevention of Safety Accidents Involving Infants

First author (year)	Country	Academic field	Study design	Aims	Study population (sample size)	Intervention contents	Duration of intervention	Outcome variables	Key finding
Jang and Jeon (2016) [10]	South Korea	Social welfare	Experimental study	To verify the efficacy of parental safety education	Parents of infants and toddlers (EG 60, CG 60, total 120)	[Parental safety education] 1. Orientation 2. Development and safety of children 3. Prevent falls and maintain a safe environment at home 4. Make safety regulations 5. Fire safety 6. Internet school newsletter site on safety 7. Bathroom safety, electronic facility maintenance 8. Emergency treatment	8 sessions, 2 months	- Safety knowledge - Safety attitudes	This study identified the possibility of verifying an intervention's efficacy through an elaborative model of safety education.
Mun and Huh (2015) [24]	South Korea	Early childhood education	Methodological study	To develop a parental safety education program	Parents of infants and toddlers (not applicable)	[Parental safety education program] 1. Child development and safety accidents 2. Hazard factors and safety rules at home 3. First aid 4. Sexual violence and child abuse 5. TV, internet, smartphone addiction 6. Missing children and kidnapping 7. Disaster preparedness	7 sessions	Not applicable	This program was effective in strengthening the competence of parents to ensure the safety of infants and toddlers by developing their knowledge, skills, and attitudes related to safety.
Yoon and Jung (2012) [7]	South Korea	Child welfare	Experimental study, one group	To develop and analyze the effectiveness of an education program aimed at parents for the prevention of safety accidents at home	Mothers sending their children aged 1 to 6 years to daycare (963)	[Parental education program for home safety] 1. Types of safety accidents by age 2. Prevention of safety accidents at home 3. First aid	2 sessions, 3 hours	- Home safety knowledge - Home safety behaviors - Program satisfaction	Active types of education, such as demonstrations using safety products, are more effective.
Lehna et al. (2015) [8]	USA	Nursing	Longitudinal intervention study	To measure HFS knowledge 2. To describe HFS practices	Parents of infants (EG 103)	[Home Safe Home] 1. Burn prevention measures 2. Immediate treatment and care for burns 3. HFS practices in the kitchen and bathroom, proper smoke alarm installation and testing methods, heating and electrical safety, and burn first aid	One time for 5 minutes	- HFS knowledge - US Fire Administration/Federal Emergency Management Agency Home Safety Checklist	Using DVDs was an effective educational tool for increasing HFS knowledge.
Walcott et al. (2018) [12]	USA	Public health	Descriptive survey	1. To assess knowledge and behaviors regarding sleep position and sleep location 2. To identify the characteristics of parents related to positive safe sleep knowledge and behaviors	Parents of newborns in Georgia (420)	Not applicable	Not applicable	- Knowledge of safe infant sleep - Infant sleep practices - Sleep quality and quantity - Postpartum depression	This program was effective in cultivating high levels of parental knowledge and behaviors in trainees.
Mytton et al. (2014) [16]	England	Child and adolescent health	Multicenter cluster randomized controlled trial	To develop and assess the feasibility of a FAST program	Parents or guardians of children aged older than 5 years (32)	[FAST parenting program] 1. Injury risk and safety scenarios 2. Parenting UK & the Whoops! Child Safety Project	6 months	- Parent-reported home injuries - Child behavior - Parental knowledge - Parent-reported home safety practice - Maternal well-being - Parenting style and practice	It is important to recruit parents using non-stigmatized methods.

CG, control group; DVDs, digital video discs; EG, experimental group; FAST, first aid advice and safety training; HFS, home fire safety; TV, television; UK, United Kingdom; USA, United States of America.

Table 2. Summary of the Reviewed Research on Interventions for the Prevention of Safety Accidents Involving Infants (Continued)

First author (year)	Country	Academic field	Study design	Aims	Study population (sample size)	Intervention contents	Duration of intervention	Outcome variables	Key finding
Swartz et al. (2013) [18]	USA	Not reported	Randomized controlled trial	To evaluate the Keeping Baby Safe In and Around the Car campaign	Parents of children aged 0 to 24 months (195)	[Keeping Baby Safe In and Around the Car] 1. Safety hazards for young children in and around vehicles 2. Methods for choosing, installing, and using child safety seats	45 minutes	- Vehicle safety knowledge quiz - Child safety seat installation simulation test - User satisfaction	Using the DVD resulted in significant gains in parents' knowledge and their ability to discriminate the critical elements of a car seat.
Wang et al. (2022) [28]	USA	Medicine	Randomized controlled trial	1. To identify the attendance profile of a toddler safety intervention 2. To assess its relationship to relationships maternal depressive symptoms and reduction of home safety problems	Mothers of toddlers (91)	[The toddler safety promotion intervention] 1. Fire prevention 2. Fall prevention 3. Poison control 4. Car seat use	8 sessions	- Attendance - Maternal depressive symptoms - Home safety problems	To ensure a program's effectiveness, risk factors for maternal low attendance to interventions must be identified, and strategies to promote attendance should be devised.
Perez et al. (2020) [17]	USA	Medicine	Prospective intervention study	1. To evaluate parental knowledge and practice related to the correct use of CRS 2. To determine the efficacy of a brief PED educational intervention	Parents or caregivers of children (170)	[PED-based intervention] 1. Vehicle year 2. Restraint type and selection 3. Installation and harness aspects	One-time, one-on-one education	- Parental knowledge of CRS	- Children cannot be expected to appropriately use a CRS. - Future educational efforts should focus on rear-facing and booster seat age-group children.
Cheraghi et al. (2014) [4]	Iran	Public health	Randomized controlled trial	To assess the effectiveness of HBM-related education	Mothers with children aged <5 years (EG 60, CG 60, total 120)	[Educational programs based on the HBM] Injury prevention (falls, burns, poisonings)	4 sessions, for 1 hour, twice per week	- Knowledge, practices, and HBM constructs - History of recent injuries to the child	Education based on the HBM can be used as an effective approach for a program to prevent injury and promote safety in children.
Kahriman and Karadeniz (2018) [11]	Turkey	Nursing	Quasi-experimental study, single group, pretest and posttest	To raise mothers' awareness and knowledge regarding pediatric injuries at home	Mothers with children aged 0-6 years (300)	To identify pediatric injury risks in the home environment	2 sessions	- Identification scale of safety precautions for the prevention of pediatric injuries - Risk assessment form for pediatric injuries	This program for mothers to prevent pediatric injuries was effective in improving awareness.
Whiteside-Mansell et al. (2017) [13]	USA	Medicine	Naturalistic study	To assess intervention outcomes targeting safe sleep	Women with infants from birth to 6 months of age (78)	Not applicable	Not applicable	- Newborn sleep safety survey 1) Supine sleep position 2) Firm sleep surface 3) Separate sleep location and room sharing 4) Bedding safety- soft or loose bedding 5) Avoid overheating 6) Use of a pacifier	The Newborn Sleep Safety Survey is available to assess parent adherence to recommendations.
Zundo et al. (2017) [14]	USA	Nursing	Integrative literature review	To examine factors associated with parental noncompliance with supine sleeping position recommendation	Studies (16)	Not applicable	Not applicable	- Parent knowledge about sleep position - Source of advice - Infant comfort - Safety concerns - Race and ethnicity - Educational level and income	Noncompliance with sleeping position is related to knowledge level, ethnicity, education level, and income of parents, as well as sources of advice, infant comfort, and quality of infant sleep.

CC, control group; CRS, car restraint system; EG, experimental group; HBM, health belief model; PED, pediatric emergency department; USA, United States of America.

Table 2. Summary of the Reviewed Research on Interventions for the Prevention of Safety Accidents Involving Infants (Continued)

First author (year)	Country	Academic field	Study design	Aims	Study population (sample size)	Intervention contents	Duration of intervention	Outcome variables	Key finding
Kendi et al. (2021) [27]	USA	Medicine	Qualitative study	To explore barriers and facilitators to optimal CRS use	Parents of newborn infants (30)	Not applicable	Not applicable	Not applicable	The barriers and facilitators to CRS use were motor vehicle and CRS features, resources, and parental factors.
Chae and You (2017) [3]	South Korea	Early childhood education	Descriptive studies	To examine the current status and needs of safety education in households	Mothers of infants and toddlers (239)	Not applicable	Not applicable	- Safety education status - Needs for safety education	The needs for safety education included playtime safety, missing and kidnapping, sexual and child abuse, and traffic safety.
Chow et al. (2016) [9]	China	Medicine	Randomized clinical trial	To examine the effectiveness of a technology-based injury prevention program	Mothers (EG 154, CG 154, total 308)	[Web- and mobile-app-based safety materials] 1. 5-2 months: falls, scalds, sleeping safety, suffocation, drowning 2. 6 months: falls, burns, medicine poisoning, drowning, toy hazards 3. 9 months: concussion, drowning, driving hazards, finger pinching 4. 12 months: poisoning, falls, sunburn, driving hazards 5. 18 months: poisoning, falls, sunburn, driving hazards	Not report	- General safety knowledge - Age-appropriate safety questionnaire - Injury prevention behavior checklist - Website and mobile app usage statistics - Website and mobile app user acceptance	The technology-based intervention is effective in improving parents' knowledge of child safety and raising their awareness about injuries and prevention at home.
Jang and Kim (2015) [15]	South Korea	Nursing	Nonequivalent control group pretest-posttest design	To develop an effective verification of an infant sleep health education program	Primiparous women from postpartum care centers (EG 117, EG II 15, CG 27, total 59)	[Infant sleep health education program] 1. Orientation 2. Physiology of sleep 3. Care for sleep-activity cycle/SIDS 4. Sleep-activity cycle of infant 5. SIDS 6. Sleep disturbance	One-time session lasting 60 minutes	- Knowledge about infant sleep health - Confidence in the performance of mothers' roles	This program is effective for sleep health in infants by increasing the mothers' role confidence.
Mello et al. (2019) [29]	USA	Medicine	Qualitative study	To assess the feasibility and acceptability of mobile safety	Young mothers aged 15-20 years (20)	[mSafety] 1. Injury prevention knowledge 2. Home safety behavior	Not applicable	Not applicable	Intervention using a mobile application received positive feedback from young mothers for preventing injuries for their children.
Moon et al. (2017) [25]	USA	Medicine	Randomized clinical trial	1. To assess the effectiveness of 2 interventions separately and combined practices 2. To promote infant safe sleep	Mothers of healthy-term newborns (1,263)	[Nursing quality improvement intervention] 1. Key message 2. Role modeling [Mobile health messaging intervention] 1. Health messages and educational videos to be delivered by email or text messages	Daily for the first 11 days Every 3-4 days for 60 days	- Infant safe sleep practice recommendations from the AAP	A mobile intervention was effective in improving adherence to infant safe sleep practices.
Wang et al. (2018) [26]	USA	Medicine	Randomized, parallel-group trial	To examine the effectiveness of an intervention grounded in social cognitive theory	Low-income mothers with toddlers (EG 91, CG 186, total 277)	[Safety intervention] 1. Fire prevention 2. Fall prevention 3. Poison control 4. Car seat	8 sessions	- Home safety problems - Self-efficacy of safety measures	A safety intervention based on social cognitive theory was effective in promoting a safe home environment for toddlers.

AAP, American Academy of Pediatrics; CG, control group; CRS, car restraint system; EG, experimental group; SIDS, sudden infant death syndrome; USA, United States of America.

Table 3. General Characteristics of the Reviewed Research on Interventions for the Prevention of Safety Accidents Involving Infants (N=20)

Characteristics	Categories	n (%)
Country of origin	USA	11 (55.0)
	South Korea	5 (25.0)
	UK, Iran, Turkey, or China	4 (20.0)
Academic field	Medicine	9 (45.0)
	Nursing	4 (20.0)
	Public health	3 (15.0)
	Social welfare	2 (10.0)
	Education	2 (10.0)
Study design	Experimental study	7 (35.0)
	RCT	6 (30.0)
	Descriptive study	3 (15.0)
	Qualitative study	2 (10.0)
	Methodological study	1 (5.0)
	Literature review	1 (5.0)
Study population	Mothers	11 (55.0)
	Parents	8 (40.0)
	Studies	1 (5.0)
Intervention contents (n=15)*	General information regarding children's safety	3 (20.0)
	Fall safety	6 (40.0)
	Fire safety	6 (40.0)
	CRS	5 (33.3)
	Emergency treatment	5 (33.3)
	Poison prevention	5 (33.3)
	Safe home environment	3 (20.0)
	Sleeping safety	3 (20.0)
	Injury prevention	2 (13.3)
	Concussion prevention	1 (6.7)
	Drowning prevention	1 (6.7)
	Toy safety	1 (6.7)
	Kidnapping prevention	1 (6.7)
Number of intervention sessions (n=11)	Eight	3 (27.3)
	Seven	1 (9.1)
	Four	1 (9.1)
	Two	2 (18.2)
	One	4 (36.4)
Intervention materials (n=13)*	Videos	4 (30.8)
	Safety equipment	2 (15.4)
	Supervision	2 (15.4)
	Home visits	2 (15.4)
	Telephone calls	2 (15.4)
	Text messages	2 (15.4)
	Booklets	2 (15.4)
	PowerPoint slides	2 (15.4)
	Discussions	1 (7.7)
	Roleplay	1 (7.7)
Mobile applications	1 (7.7)	

*Multiple responses possible; CRS, car restraint system; RCT, randomized clinical trial; UK, United Kingdom; USA, United States of America.

The contents of interventions must address falls, fires, poisonings, sleep-related incidents, injuries, and drowning so that parents can create a safe home environment for their children

[3,4,7-16,24-26]. Additionally, parents' awareness of safety accidents involving infants and toddlers that may occur at home must be improved by interventions [3,4,7-12,14,16,18,24,26-29].

Table 4. Characteristics of Interventions for the Prevention of Safety Accidents Involving Infants

Categories	Contents
Preventive precautions	Creating a safe home environment [3,4,7-16,24-26] Awareness improvement [4,7-14,16,18,24,26-29] Building knowledge [3,4,7-12,14-18,24-29]
Characteristics of children's developmental stages	Cognitive development [3,4,7,8,10,11,16,24,26] Physical and motor development [3,7,9-11,15,16,18,24,26,27]
Encouraging voluntary participation	Using text messages [9,17,18,25-27] Using interactions [4,9,10,16,24,25,28] Demand-based interventions [3,7,8,10,11,13,16,28,29]
Continuity of interventions	Repeated interventions [3,7-11,14,15,17,18,25,27] Systematic interventions [3,4,7-10,15,16,18,24-26] Continuing interventions [8,10,17,25]
Teaching methods	Providing safety packages [3,7,8,12,14,16,18,24,26] Providing practical experience [7,18,24,27] Providing feedback [17,26,27,29]

Finally, interventions should ensure that parents have an accurate knowledge of safety accident prevention for their children [3,4,7-12,14-18,24-29].

2) Characteristics of children's developmental stages

The characteristics of a child's stage of development include cognitive development, which involves exploring various objects through the senses and interacting via active play [3,4,7,8,10,11,16,24,26], and physical and motor development [3,7,9-11,15,16,18,24,26,27] should be reflected in interventions for the prevention of safety accidents. Accident prevention and home safety measures should be applied differently, depending on the characteristics of the child's developmental stage since children at younger ages tend to have accidents while using their bodies, including when they are walking or running [10].

3) Encourage voluntary participation

A strategy in which parents of infants can voluntarily participate should be applied in interventions for the prevention of safety accidents. Using this strategy, messages can be sent via telephone or email [9,17,18,25-27], educators and trainees can interact using phone calls or pictures [4,9,10,16,24,25,28], and interventions can be designed based on the needs and preferences of parents [3,7,8,10,11,13,16,28,29].

4) Continuity of interventions

To ensure the success of an intervention for the prevention of safety accidents, it should be repeated [3,7-11,14,15,17,18,25,27] and systematic [3,4,7-10,15,16,18,24-26] and lead to ad-

ditional interventions [8,10,17,25]. Continuing interventions, in particular, strengthen the competency of parents related to the prevention of safety accidents involving their children.

5) Teaching methods

Effective teaching methods should be used to strengthen the effectiveness of interventions aimed at parents for the prevention of safety accidents involving infants. In particular, providing a package that contains safety products is an effective method for parents to learn practical home safety management methods [3,7,8,12,14,16,18,24,26]. Effective teaching methods also include hands-on experience managing home safety for infants and toddlers [7,18,24,27], and a program can be developed to improve the competency of parents related to safety accident prevention by providing feedback on their safety accident prevention practices [17,26,27,29].

DISCUSSION

The first characteristic that must be addressed in interventions for the prevention of safety accidents involving infants is the creation of a safe home environment. Specifically, parents must be able to recognize the various types of safety accidents that may occur in the home, and carefully inspect and manage the home. For example, to prevent falls and burn accidents, children should be unable to climb on a bed or other furniture at different heights and use hot water and bath water safely [10]. In addition, accidents involving jamming one's fingers or toes can be easily prevented by improving the physical environment, including by installing prevention devices

and shock relieving devices [10]. These results are similar to that of a study by Han and Chae [5] that analyzed the safety education needs of parents of infants and reported a high need for a safe family environment for children. Since the home is the place where most accidents involving infants and toddlers occur [2], parents should recognize the types of safety accidents that can occur in the home and assess and manage the home environment to prevent safety accidents or reduce the potential degree of injury [11,29]. Therefore, to ensure the safety of infants, intervention programs should be designed to focus on the establishment of a safe home environment among parents.

Second, the characteristics of children's developmental stages should also be considered when devising interventions. During early childhood, infants tend to put objects in their mouths, with the risk of suffocation increasing when coins, toy parts, and food block the respiratory tract [10]. In addition, due to the tendency of infants to imitate others, they often experience safety accidents after touching electronic products [30]. Infants and toddlers have a strong urge to explore their surrounding objects or environment, but their awareness of physical motor functions and safety is immature [3,4]. Parents should understand the relationship between the cognitive, physical, and motor, characteristics of their children's developmental stages and the types of accidents their children are most vulnerable to [7,10,24]. Therefore, interventions for the prevention of safety accidents should address prevention methods suited to children's developmental stages that reflect the characteristics of their cognitive, physical, and motor development.

Third, interventions for the prevention of safety accidents involving infants were more effective when parents participated on a voluntary basis. The voluntary participation of parents has been reported to have positive effects in education in various areas such as cognitive and social-emotional development and problematic behavior reduction in infants and toddlers [31,32]. Moreover, parents who voluntarily participate in their child's education tend to have a better understanding of their child's development and are more likely to positively change their attitude toward their child's education [33]. Various information and communication technologies, including mobile phones [25,28,29], e-mail [25], and mobile applications [9], can be used to encourage parents raising young children to participate. Safety equipment [7,29], home visits [11,16], and supervision [29] should also be incorporated to enhance the active participation of parents. According to a study by Han and Chae [5], parents of infants prefer home visits for one-on-one intensive interventions, as well as interventions that use mobile applications that transcend time and space, thereby supporting the results of this study.

Fourth, interventions for the prevention of safety accidents involving infants should include additional ongoing interventions. Additional interventions improve parents' knowledge and attitudes toward safety education and have a positive effect on the prevention of accidents involving infants at home [10]. Perez et al. [17] also reported that additional interventions effectively improved CRS knowledge. Interventions provided multiple times at 2-week intervals can supplement the effect of previous interventions and improve the content of interventions, effectively improving their quality [8]. Particularly, daily repeated interventions over the course of 60 days were found to improve parental behaviors [25]. Therefore, interventions for the prevention of safety accidents during infancy should not only provide information but also consider including additional further interventions to enhance parents' ability to implement safety accident prevention strategies. However, no papers have suggested guidelines for how to provide further education, including the recommended duration and frequency of additional interventions. Therefore, further research should be conducted to create standard guidelines for continued intervention.

Finally, providing practical experience and feedback as a teaching method for safety accident prevention competency reinforcement is a notable factor in interventions for the prevention of safety accidents involving infants. Honda et al. [34] reported that providing practical experience reinforces an active attitude toward injury prevention and safety behavior practices. There is a reported demand for education related to practical management methods among parents of infants and toddlers to reinforce the safety of their children at home [5]. The results of this study also showed that demonstrations and practice using safety equipment are effective educational strategies [7,29].

Feedback is one of the most important factors in educational interventions due to its high effectiveness and relative ease of implementation. It is a key element in the success of teaching methods and improves learning outcomes [35,36]. According to a study by Mello et al. [29] analyzed in this review, the results were positive after feedback was shared by a supervisor during interventions for the prevention of safety accidents aimed at young mothers. Faculty feedback is a teaching method that encourages complete learning, and previous studies have reported high satisfaction among trainees using this method; therefore, these findings support the results of this study [37]. Since there are various types of safety accidents for infants and toddlers, and the physical environment of each family differs [5], the adoption of a complex teaching method for safety education aimed at parents is believed to be particularly effective.

This study is meaningful since it laid a foundation for the

development of effective interventions for the prevention of safety accidents involving infants in the future by analyzing the research in general. However, since only studies published in English and Korean were included, data collection bias may have occurred. Many papers identified in the search were also excluded because they did not specifically cover interventions for the prevention of safety accidents involving infants and toddlers. Therefore, it is necessary to reconfirm the results of this study after further studies have been conducted.

CONCLUSION

This study was conducted to obtain an overview of the latest findings related to interventions for the prevention of safety accidents involving infants using the scoping review method for 20 papers published over the past 10 years. The main outcomes that can be considered the most important components of effective interventions for safety accident prevention were the creation of a safe home environment, the voluntary participation of the trainees, and continuous additional interventions rather than a one-time educational intervention. Moreover, practical training and teaching methods that incorporate feedback rather than lecture-oriented methods should be included.

Based on these results, when developing interventions to prevent safety accidents involving infants in the future, the goal of interventions should be to strengthen the competency of parents when creating and maintaining a safe home environment for their children. Additionally, to maintain the safety of infants and toddlers, various teaching methods have been proposed using various media, demonstrations, practice, and supervision strategies so that parents can participate in self-directed education whenever possible. Finally, the level of achievement of parents in terms of their competency related to safety accident prevention should be further examined, and continuous education should be considered in the intervention development stage so that parents of infants and toddlers can guarantee their children's safety. However, while this study was conducted to analyze interventions for the prevention of safety accidents, the research analyzed in this study was mainly limited to education. Therefore, various interventions other than educational interventions should be examined in future research.

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Conflict of interest

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Data availability

Please contact the corresponding author for data availability.

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