

Methods of Health Education Delivery to the Parents and Caregivers on Preventing Childhood Injuries: A Systematic Review

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Research article

Keywords: unintentional childhood injury, injury prevention, health education, young parents

Posted Date: November 17th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-105795/v1>

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1 **Methods of Health Education Delivery to the Parents and**
2 **Caregivers on Preventing Childhood Injuries: A Systematic**
3 **Review**

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7 **ABSTRACT**

8 **Background:** Unintentional injuries to children have significant impact on child mortality and
9 mortality. Health education is one of the important strategies in the childhood injury prevention
10 which involve various methods and techniques. The aim of the review is to provide narrative
11 findings of systematic review of different methods of delivery for health education intervention
12 to reduce unintentional childhood injuries among parents and caregivers in primary care
13 setting.

14 **Methods:** The systematic review was guided by PRISMA guidelines. The searched databases
15 included Medline, CINAHL, PubMed, ProQuest and Ovid. All report titles and abstracts were
16 screened using pre-defined criteria. Peer-reviewed journal and grey literature published from 1
17 January 2010 to 31 May 2020 were included. Two independent reviewers select studies,
18 extracted data, checked accuracy, assessed risk of bias and assessed the quality of each article
19 selected. Articles were included if they were peer-reviewed and published in English language.
20 Data was extracted and analysed using narrative synthesis approach.

21 **Results:** 325 articles were identified during initial search strategy. Duplicates were removed
22 and article were screened by title and abstract. Final eight articles were selected and reviewed.
23 Risk of bias for each study were assessed using Cochrane Risk of Bias tool. The systematic

24 review synthesized the characteristics of the selected studies and features of delivery methods
25 of health education intervention. All the reviewed paper concluded their intervention was
26 effective in achieving their objectives which is improving the knowledge, attitude, and safety
27 practice for injury prevention. Majority of the intervention supplemented their education
28 intervention with printed materials such as pamphlets and booklets. Half of the intervention
29 were delivered by healthcare professionals. This review provides fresh narrative evidence on
30 the latest delivery methods for health education in injury prevention to the parents and
31 caregivers.

32 **Conclusion:** Majority of the studies reported using a combination of various methods of
33 delivery in their intervention and proven to be effective. However, there is a gap in term of use
34 of technology and economic evaluation of each methods that can be addressed in future
35 research and practice.

36 **Study registration:** The study was registered with PROSPERO International Prospective
37 Register of Systematic Review (CRD:42020202753).

38 **Keywords:** unintentional childhood injury, injury prevention, health education, young parents
39 (350 words)

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46 **INTRODUCTION**

47 **Background**

48 Childhood injuries are now a growing global public health concern as it carries a significant
49 burden with wide range of personal, social and economic implications. Injury related causes
50 are one of the major cause of death among children below 14 years old worldwide and leading
51 cause of death and long term morbidity among children under five years old in the last decade
52 (1). From all injuries related deaths, unintentional injuries accounted for more than 90% of
53 these deaths and this is alarming as unintentional injuries are preventable when all the
54 appropriate safety measures are taken. Young children are exceptionally vulnerable to
55 unintentional injuries because of their nature of curiosity to explore the environment yet they
56 are not capable of protecting themselves or understand the consequences and danger of their
57 behaviour.

58 Sustainable Development Goals (SDG) calls for concentrated effort to ensure better health of
59 the children by ending preventable deaths for children under five years old and reducing
60 number of deaths from traffic accidents for older children (5-18 years old) under the health
61 targets (2). Therefore, countries are now looking at reducing the burden of childhood injury as
62 the main agenda to improve child health as the burden has shifted away from the communicable
63 diseases that causes from sanitation and hygiene factors. Prevention and control of
64 unintentional injuries in childhood age often use a combination of passive and active strategies
65 where the passive strategies are referring to the environmental and products change and active
66 strategies directed towards behavioural changes by means of health education (3). Health
67 education is defined as any set of planned activities using combination of methods with the aim
68 of improving target audience's knowledge and health behaviours (4), and methods of delivery

69 referring to the mechanism of how the content of the education can be transferred to the target
70 audience.

71 Evidence suggest that health education alone can achieve the most modest gain but legislation
72 alone without education component will result in non-compliance and objective not being met
73 (5). This emphasize on the importance of health education as main strategy in preventing
74 childhood injuries. Various studies have evaluated impact of health education regarding home
75 injury among children (6,7). Some focus on target injuries, while some other focus single injury
76 type. Specific prescription of health education given during routine health checks and linked
77 to developmental abilities of children are shown to be more acceptable to parents as compared
78 to general safety advice (8). Study has shown that injury prevention education can be
79 effectively delivered to families in clinic setting by utilizing time spend in waiting room (9).
80 However, there are limited mention in the literature with regards to the methods of delivery for
81 the health education on preventing childhood injuries in the health clinic settings. Previous
82 systematic review by Kendrick et al (10) to assess the effects of parenting interventions for
83 preventing childhood injury also include methods of program delivery but the studies included
84 in the review were outdated since it were published before the year 2010. It is also hypothesized
85 that the delivery methods might be different with the recent advancement in technology and
86 use of social media in health education.

87 Therefore the purpose of this review will specifically look at the recent delivery methods of
88 health education intervention in primary care setting which include primary health care clinic,
89 paediatric primary care clinic, child health clinics and community clinics as the existing
90 childhood injury prevention program in Malaysia based in primary health care clinics.

91

92 **Objective**

93 The aim of the paper is to systematically review the latest literature and review different
94 methods to deliver health education intervention to parents and caregivers regarding injury
95 prevention in children.

96 **METHODS**

97 **Protocol and registration**

98 The systematic review was registered with International Prospective Register of Systematic
99 Reviews (PROSPERO) with registration number CRD:42020202753; available on the registry
100 website. It was conducted and reported based on Preferred Reporting Items for Systematic
101 Reviews and Meta-Analyses (PRISMA) statement for reporting systematic reviews and meta-
102 analyses.

103 **Eligibility criteria**

104 The inclusion criteria for study to be included in this review are English article, peer-reviewed,
105 published within the year 2010 to May 2020 and fulfil the pre-determined Population,
106 Intervention, Comparison and Outcome (PICO) study criteria. Study design that is eligible to
107 be included is limited to interventional study only. Studies with no available full text article,
108 duplicates and did not include details on the health education methods delivered to the
109 participants were excluded.

110 **Population**

111 The participants involved in the studies were either both parents, father, mother, or caregivers
112 of children.

113 **Intervention**

114 The intervention given to the selected population was specifically focused on childhood injury
115 prevention education. Setting of the intervention included in the study is primary health care

116 settings where the participants were either recruited from the clinic or the intervention is
117 conducted in the clinic itself. Other setting will be excluded from the studies for example
118 community child centre or schools.

119 **Comparison**

120 The comparators for the studies were different methods of delivery used to convey the
121 information regarding childhood injury prevention to the parents and caregivers. In this study,
122 methods of delivery for health education intervention is defined as technique to deliver the
123 teaching strategies which include traditional lectures, discussions, games, computer
124 technology, written materials, video, role playing (4). The delivery can be towards individual
125 or in group settings.

126 **Outcome**

127 The outcomes of the studies were the effectiveness of the health education intervention to
128 improve the knowledge, attitude, and practice of preventing childhood injuries among parents
129 and caregivers, as well as reducing risk and incidence of childhood injuries. The reviewer also
130 includes the discussion on the strength and limitation of each intervention methods into the
131 narrative findings of this review.

132 **Data sources and search strategy**

133 A search strategy was conducted using text words and thesaurus headings related to health
134 education, health promotion, health advice, health teaching to parents and caregivers of young
135 children about prevention of unintentional childhood injuries in selected databases and
136 websites. Selected electronic databases were chosen after consultation with qualified librarian
137 which include Medline, CINAHL, PubMed, ProQuest and Ovid. The terms injury prevention
138 and health education OR health promotion OR health teaching AND parents OR mother OR
139 father OR caregiver were searched at each database. The combined searches resulted in 235

140 after duplicates being removed and imported into Mendeley. Search strategy also include hand
141 search reference lists of articles that have been identified by database searches and
142 bibliographies of systematic and non-systematic reviews which yielded 90 articles.
143 Publications were filtered for peer reviewed papers published in the last 10 years, from year
144 2010 to May 2020, in English language only.

145 **Data extraction**

146 Criteria for data extraction were adapted from Cochrane Collaboration Handbook for
147 Systematic Reviews of Health Promotion and Public Health Interventions. Descriptive
148 synthesis was performed based on extraction form developed from the objective of the study
149 to summarize information about year and country of implementation, population group, and
150 the detail of health education deliveries. Analysis of subgroups will be taken once all the papers
151 have been read in full and there is sufficient data available to determine whether certain
152 challenges and strength of each methods of health education vary by subgroups and settings.

153 **Data collection process and data items**

154 Once studies were selected, data was extracted using a standard form developed for this review.
155 Extracted data items included study objectives, methods, participants, follow-up period,
156 settings, interventions, and outcomes.

157 **Quality appraisal**

158 All paper titles and abstracts were screened independently by one reviewer for inclusion based
159 on pre-defined inclusion criteria. A sample of 20% were screened independently by a second
160 reviewer using the same criteria. Any paper with inconclusive criteria will be reviewed by both
161 reviewers and resolved by discussion. The modified Cochrane Risk of Bias Tool (11) were
162 used to appraise the quality of the studies selected based on the strength and limitation of the
163 methodology of included studies. Both reviewers will critically examine all the included studies

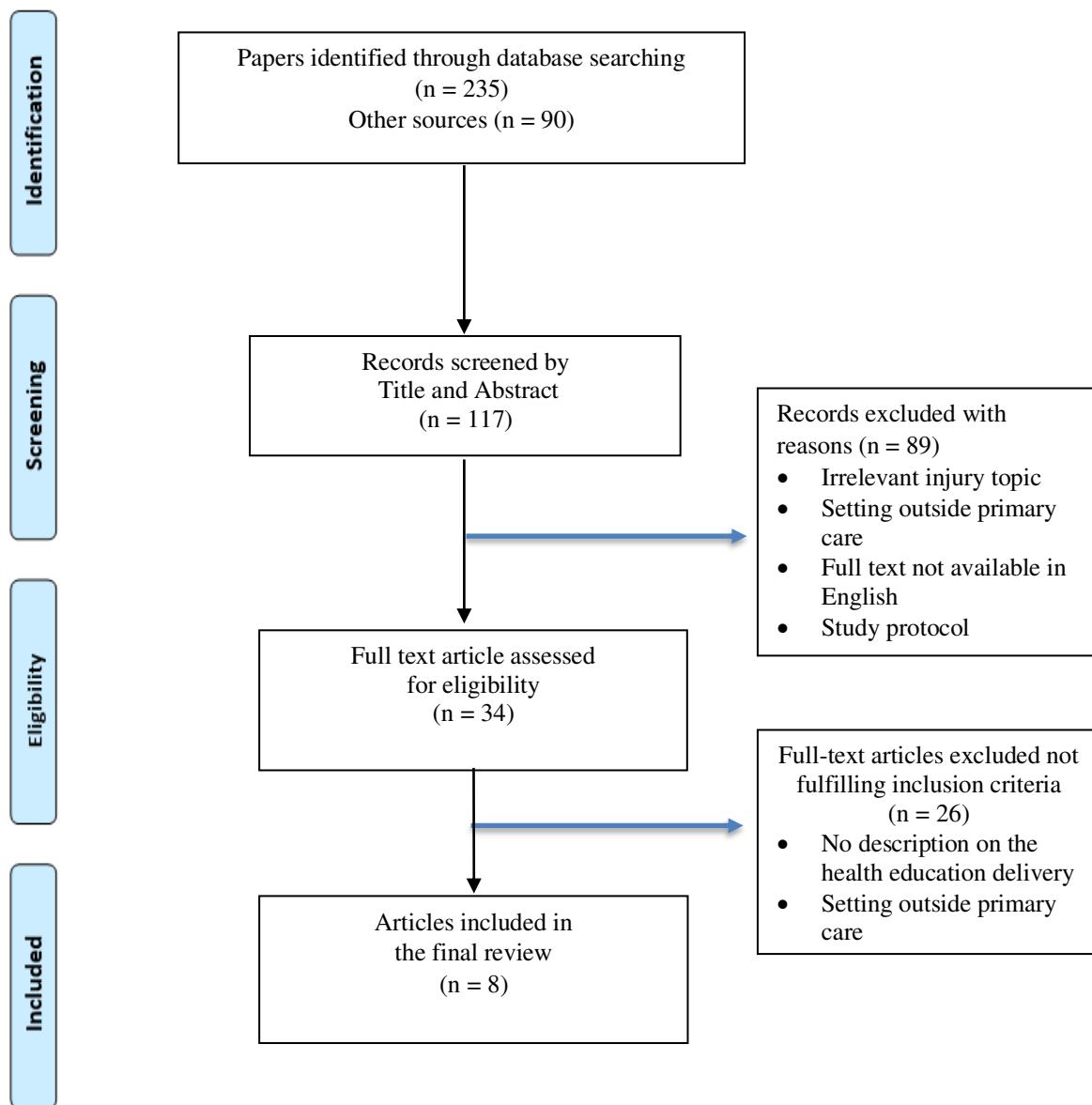
164 based on this instrument. No studies were excluded after the quality appraisal, but the results
165 of the assessment were reported in this review to provide insight on the methodological rigor
166 of each individual studies included. Summary of the results are presented in the Supplementary
167 A.

168 **RESULTS**

169 **Study selection**

170 Databases searches resulted in 290 articles. An additional 90 articles were found through
171 citation searching. A total of 117 paper were screened by titles and abstracts after duplicates
172 removed from the 325 total studies. Thereafter, 89 papers were removed as the setting of the
173 intervention study were outside primary care setting i.e. schools or childcare centre, the main
174 scope of study were related to post-injury prevention and 2 papers were not available in English
175 in full text. From there on, 34 articles were reviewed in full article text and further 26 paper
176 were being excluded as there were no description on the health education intervention delivery
177 methods in detail and remaining studies setting were only mentioned in full text that it was
178 done outside primary care setting. Therefore, the final paper included in this review was 8
179 papers (6,9,12–17). Summary of the results are presented in the PRISMA flow chart in the
180 Figure 1.

181



182 **Figure 1. PRISMA Flow chart**

183 **Study characteristics**

184 The study characteristics are summarised in Table 1. Majority of the studies were published
 185 between year 2011 and 2016 (7,12,14–16) while remaining two studies published in year 2019
 186 (9,17). Country of the study published were USA, Iran, Brazil, Sweden and Netherlands. Five
 187 of the studies are randomized controlled trial, two of the paper are quasi-experimental studies
 188 and one paper is a longitudinal study with one intervention point. Sample size of the studies
 189 included ranging from 30 to 1292 participants. Majority of the participants are mothers,
 190 followed by fathers and other family members. The oldest age of children included in the

191 studies were 6 years old. Most of the intervention were conducted among lower education level
192 and in urban areas. All of the reviewed paper concluded their intervention was effective in
193 achieving their objectives which is improving the knowledge, attitude and safety practice for
194 injury prevention.

195 **Features of the intervention methods of deliveries**

196 The areas of childhood injuries prevention topic covered by the studies selected mostly include
197 home injuries such as fall, burns and poisoning (12,14–16). Outdoor injuries such as drowning,
198 road safety, animal safety are also mentioned in some of the studies (9,13,17), and one study
199 mention violence (intentional) injuries prevention in their health education intervention (6).

200 From the total eight studies selected, only three studies explicitly mentioned the use of
201 behavioural theory in developing the intervention (14–16), one study mention the use of
202 behavioural theory but did not mention the exact theory while the remaining studies did not
203 mention any use of behavioural theory in their intervention development and implementation.
204 Health Belief Model (HBM), Protection Motivation Theory (PMT) and Socio-Ecological
205 Model (SEM) were the theories employed in the three studies mentioned earlier.

206 Educational approach used in the selected studies include individual and group-based training,
207 home visits, question and answer, group discussion, personalized counselling and interview
208 and lectures. Educational tools mentioned in the primary studies included electronic devices
209 with build-in mobile application (17), online web based module, booklets and pamphlets, baby
210 books and video. Majority of the intervention supplemented their education intervention with
211 printed materials such as pamphlets and booklets. One study used primarily printed materials
212 which is child health record book as their delivery methods of education material (18).

213 Half of the intervention were delivered by healthcare workers which were either a doctor,
214 experienced nurse or healthcare educators, one study reported having students delivered the

215 intervention (16) while the remaining three studies were delivered by application such as
216 mobile app, web-based module and self-read baby books. The primary care setting described
217 in the paper include child health clinics and primary health care centres.

218 The duration of health education session given to the parents ranging from 30-60 minutes each
219 session with a minimum number of one session in a week. The median follows up period is
220 two months. The outcome measures reported by the studies are improvement in knowledge,
221 attitude, safety practices and behavior changes. Details of the intervention methods of health
222 education delivery in this review are presented in Table 2.

223 **DISCUSSION**

224 The eight studies that met our inclusion criteria was explored in terms of health education
225 delivery methods however it is difficult to specify specific methods that are superior from
226 another or what works in what context. What is clear is that all the intervention utilizes more
227 than one method, of at least a combination of verbal and written methods. The review also
228 found that one to two session of at least 30 to 60 minutes duration is adequate to see significant
229 improvement in knowledge and behavior changes following health education intervention. The
230 use of theory-based intervention in three of the studies provide structured framework and
231 outcomes measure for the researcher to evaluate their interventions.

232 Three out of eight studies in this review were guided by theoretical framework. Studies have
233 shown that theory-based health education materials contributed to the effectiveness of the
234 health education intervention (19). The theory provides systematic approach on how
235 information is being processed and this can help with designing education materials that
236 enhance understanding and maximize comprehension of the target populations (20).

237 Typical injury prevention intervention evaluates the effectiveness by measuring outcomes such
238 as knowledge, attitude and safety behaviour but it is important to note the sustainability of the

239 education intervention in term of satisfaction of delivery methods, timing and relevance of the
240 topic to the targeted population. Evidence has shown that injury prevention intervention
241 program would be more sustainable in term of support from the medical staff if the patients are
242 highly satisfied and have high perceived value on the program (21).

243

244 The delivery of education interventions needs to be considered in the context if feasibility and
245 implementation in the primary care setting. Commonly reported barriers in health education
246 delivery in the primary care clinic include limited number of staff and time that leads to
247 inadequate counselling and explanation (22). A systematic review that look at the intervention
248 to prevent drowning among adolescents recommended that setting-based analyses may help to
249 define their target population better and formulate an appropriate education strategy for
250 intervention.

251

252 The use of tailored information rather than generic advice is proven to result in better
253 information recall (4). In addition, a systematic review of two trials found that knowledge of
254 respondents significantly improved when written materials were accompanied by verbal health
255 information in comparison with verbal information only (23). All the studies included in this
256 review supplement the respondents with printed materials except for technology based
257 intervention of the mobile app intervention.

258 **Implications for practice**

259 Utilizing technology to deliver the tailored information for example integration of medical
260 records on child development and specific injury prevention advice to the parents. Studies have
261 shown that use of computer improves satisfaction and information retention (24), however the
262 limitation would be financial resources and accessibility among the lower socioeconomics.

263 Computer-and-mobile-technology-based technology implemented in primary care settings
264 may help the health authority to tailor heath education to the individual as well as able to
265 provide immediate feedback and open communication channel to the parents beyond clinic
266 visits (25).

267 **Implications for research**

268 The review found that cost effectiveness and economic evaluation of various methods of health
269 education delivery were not reported in the literature. Cost effectiveness is one of the important
270 factors to consider when considering the best methods of delivery for health education
271 intervention in injury prevention. The findings from this review also highlights the need for
272 strong randomized controlled trials in newer technologies to deliver health education to the
273 parents with regards to injury prevention as it is still lacking.

274 **Limitation**

275 All the studies included in the review have shown significant effectiveness in the intervention
276 given therefore there might be some publication bias in a sense that ineffective intervention is
277 not being published, we might lose important learning point from the ineffective intervention
278 in the review.

279 **Strength**

280 Despite the limitations, the review provides fresh narrative evidence on the latest delivery
281 methods for health education in injury prevention to the parents and caregivers. The review
282 also summarized the facilitating factors and barriers in implementing the methods as well as
283 their strength and limitation. Future injury prevention intervention program should take into
284 consideration the findings presented in this review to ensure optimum delivery and uptake to
285 the target population.

286 **CONCLUSION**

287 The evidence on the effectiveness of health education intervention methods to improve the
288 safety behaviour among parents in preventing childhood injuries in the health clinic settings
289 are abundance however few details should be taken into further consideration in ensuring the
290 sustainability and acceptance of the program. Majority of the studies reported using a
291 combination of various methods of delivery in their intervention and proven to be effective.
292 However, there is a gap in term of use of technology and economic evaluation of each methods
293 that can be addressed in future research and practice.

294

295 **DECLARATION**

296 **Ethics approval**

297 Not applicable

298 **Consent for publication**

299 Not applicable

300 **Availability of data and materials**

301 Not applicable

302 **Competing interest**

303 The authors declare no competing interests.

304 **Funding**

305 This review was not funded by any party.

306 **Author contributions**

307 SH conceptualized the systematic review and developed the search criteria. Then SH and NA
308 independently examined titles, abstracts, and hand search citations from selected papers. SH
309 drafted the manuscript, and NA, NA and HS read, revised, and approved the final manuscript.

310 **Acknowledgements**

311 We would like to thank Department of Community Health, Faculty of Medicine and Health
312 Sciences, Universiti Putra Malaysia for their support and assistance in this review. We also like
313 to thank the students from Year 1 of Doctor of Public Health cohort for the input and support.
314 No financial disclosures were reported by the authors of this paper.

315

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Table 1. Characteristics of primary studies included in the review

No.	Author, Year, Country	Country	Study Design	Participants	Sociodemographic Characteristics	Results	Findings
1	Carlsson et al (2011)	Sweden	Quasi	Mothers of children under age 7 months (n=99)	low educational level, foreign ethnicity	Intervention group significantly improved precautions ($p<0.001$) taken by mothers to prevent burn and scald injuries compared to control group	Preventive practice Protect cooker: OR 3.08, 95% CI 1.1-8.7 Protect sink: OR 4.4, 95% CI 1.5-13.1
2	Reich et al (2011)	USA	RCT	Primiparous mother (n=167)	urban, low income, ethnically diverse	Intervention group had fewer risks of injuries at home, exercised more safety practices and more likely to engage in safety behaviour as compared to control group	Safety practice Effect size: -0.30; 20% risk reduction
3	van Beelen et al (2014)	Netherland	RCT	parents of children aged between 5 and 8 months old (n=1292)	mixed urban-rural, intermediate-high education level	Intervention group have significantly less unsafe behaviour compared to control group	Differences in unsafe behaviour after intervention: OR -1.59, 95% CI -2.26 to -0.93
4	Cheraghi et al (2014)	Iran	RCT	mothers of children under 5 years old (n=120)	urban, housewives, low education level	Intervention group have significant differences in knowledge, perceived susceptibility, severity, benefits, barriers, cues to action, self-efficacy and practices compared to control group	All mean differences in HBM construct, $p=0.001$
5	Fardazar et al (2016),	Iran	RCT	mothers of children under 5 years old (n=190)	urban, majority housewives and low education level	Intervention group have statistically significant difference between mean scores of all structures of Protection Motivation Theory after the intervention	All mean differences in PMT construct, $p<0.05$
6	Silva et al (2016), Brazil	Brazil	Quasi	mothers of children under 5 years old (n=155)	peripheral area of city, low education level	The intervention group have significant increase in knowledge on childhood injuries prevention after the intervention	Knowledge increase preventing fall: $p <0.001$ drowning: $p<0.001$ intoxication: $p=0.007$

7	Dixon et al (2019)	USA	RCT	parent-child dyad 5-6 years old (n=30)	Caucasian, moderate-high level of education	The intervention group had higher bicycle and dog-related safety knowledge scores and exhibited more safety skills compared to the control group	Higher Knowledge bicycle safety: p=0.029 dog related safety: p=0.003 Better safety skills Bicycle: p=0.007 Dog: p<0.001
8	Habermehl et al (2019)	USA	NRCT	caregivers of children aged 1-4 years (n=200)	Majority mothers, African-American ethnicity	The caregivers reported making a change to their living arrangement after the intervention (93.5%) and brought new safety equipment (42.7%).	-

414 RCT: Randomized Controlled Trials, IG: intervention group, CG: control group

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Table 2. Details of health education interventions delivery methods

Study	Intervention name/ Topic	Theory used	Methods use	Delivered by, location	Intensity/ frequency/ duration	Follow up period	Outcome measures
Carlsson et al (2011)	Untitled, Scald and burn injuries	-	lecture, workshops, home visits	researcher (nurse), child health centres	30-60 minutes, 1 session, 2 home visits	7 months	attitude safety practices
Reich et al (2011)	Baby Books project, home safety, car & outside safety ++	-	educational book	self-read	7 times follow up	18 months	safety practices environmental risks
van Beelen et al (2014)	E-Health 4u, home safety, fall, poisoning, drowning and burning	SEM, PMT	online module with personal counselling	doctor, child health clinics	follows routine clinic follow up	6 months	safety behaviour PMT constructs
Cheraghi et al (2014)	Untitled, general injury prevention	HBM	lecture, slide presentation, focus group discussion	experts in health education and healthcare worker	1 hour, 2 session in 1 week (2 weeks)	2 months	knowledge HBM constructs practices
Ebad Fardazar et al (2016)	Untitled, Home accidents and injuries	PMT	lecture, printed materials, Q&A, video, discussion	students, health centres	45 minutes, 2 session in 1 week	2 months	PMT constructs: perceived vulnerability, intensity, self-efficacy, response cost, behaviour
Silva et al (2016)	Untitled, Prevention of accident and violence	-	expository and dialogued session in group using projector and laptop	facilitators, health clinic	30 minutes, 1 session	immediate	knowledge opinion attitude
Dixon et al (2019)	iBSafe, Bicycle and dog safety	not detailed	mobile apps in electronic device loaned to kids	mobile app, paediatric primary clinic	1 week	1 week	knowledge safety skills
Habermehl et al (2019)	Untitled, Car safety, fall safety, home safety	-	one-on-one briefing toolkit with printed materials	doctor, paediatric primary care clinic	10 minutes, 1 session	2 weeks – phone survey	behaviour changes feedback on intervention

429 SEM – Socio-ecological Model; HBM – Health Belief Model; PMT – Protection Motivation Theory

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432 **Supplementary A**

433 **Results of risk of bias assessment**

Criteria	Carlsson et al (2011)	Reich et al (2011)	van Beelen et al (2014)	Cheraghi et al (2014)	Ebadи Fardazar et al (2016)	Silva et al (2016)	Dixon et al (2019)	Habermehl et al (2019)
Selection bias – randomization	High	Low	Low	Low	Low	High	Low	-
Selection bias – allocation concealment	High	Low	Low	Unclear	Unclear	High	Low	-
Reporting bias – selective reporting	Low	Unclear	Unclear	High	Unclear	Unclear	Unclear	Low
Other bias – other sources of bias	-	-	-	-	-	High	High	-
Performance bias – blinding participants/ personnel	Low	Low	Low	Low	Low	High	Low	Low
Detection bias – blinding outcome	High	High	High	High	Unclear	Unclear	Low	Low
Attrition bias – incomplete outcome data	Low	Low	Low	Low	Unclear	Unclear	Low	Low

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Figures

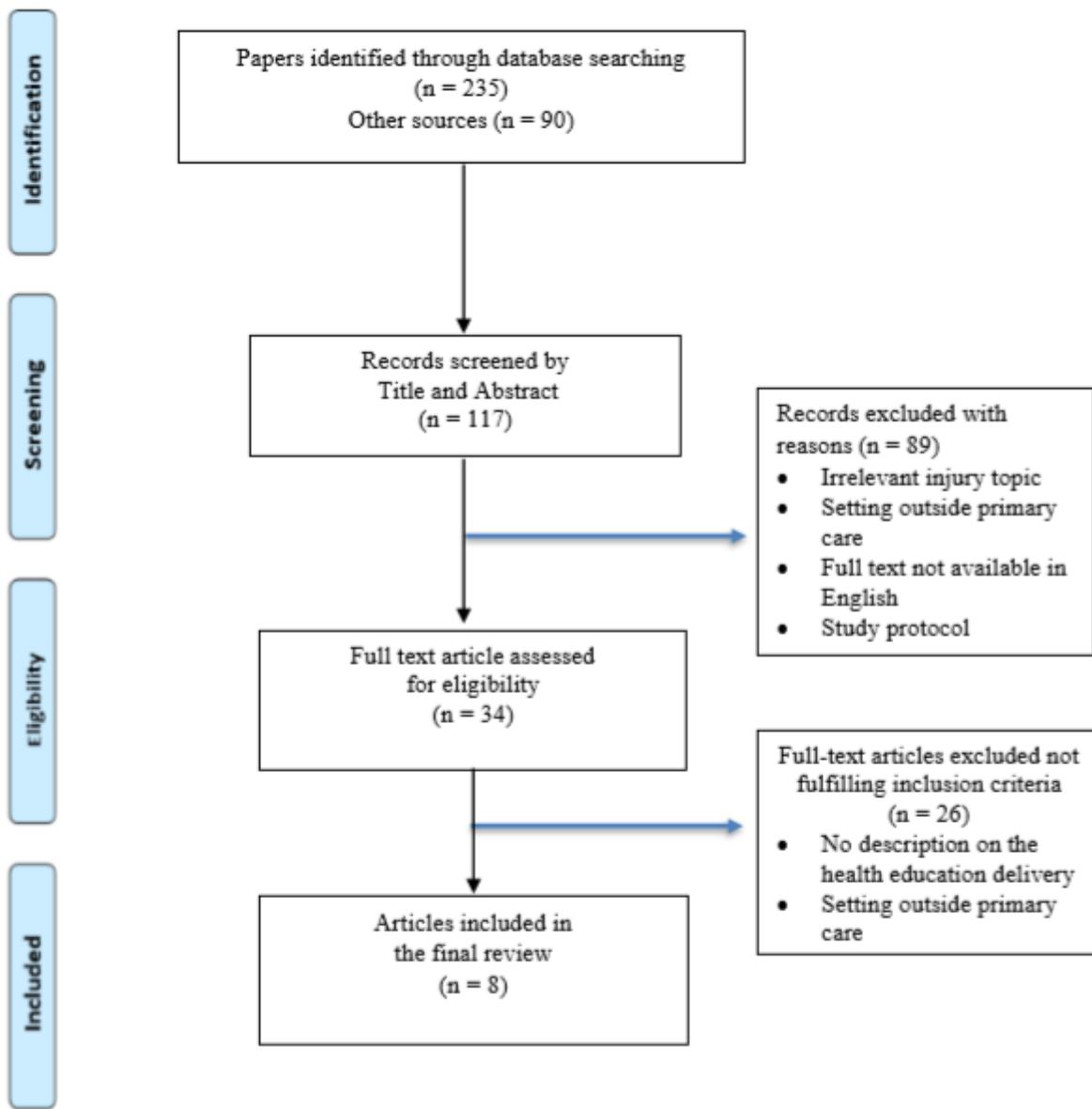


Figure 1

PRISMA Flow chart