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

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ABSTRACT

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

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

Results: 325 articles were identified during initial search strategy. Duplicates were removed and article were screened by title and abstract. Final eight articles were selected and reviewed. Risk of bias for each study were assessed using Cochrane Risk of Bias tool. The systematic
review synthesized the characteristics of the selected studies and features of delivery methods of health education intervention. All the reviewed paper concluded their intervention was effective in achieving their objectives which is improving the knowledge, attitude, and safety practice for injury prevention. Majority of the intervention supplemented their education intervention with printed materials such as pamphlets and booklets. Half of the intervention were delivered by healthcare professionals. This review provides fresh narrative evidence on the latest delivery methods for health education in injury prevention to the parents and caregivers.

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

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

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

Background

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

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

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

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

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

**METHODS**

**Protocol and registration**

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

**Eligibility criteria**

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

**Population**

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

**Intervention**

The intervention given to the selected population was specifically focused on childhood injury prevention education. Setting of the intervention included in the study is primary health care.
settings where the participants were either recruited from the clinic or the intervention is conducted in the clinic itself. Other setting will be excluded from the studies for example community child centre or schools.

**Comparison**

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

**Outcome**

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

**Data sources and search strategy**

A search strategy was conducted using text words and thesaurus headings related to health education, health promotion, health advice, health teaching to parents and caregivers of young children about prevention of unintentional childhood injuries in selected databases and websites. Selected electronic databases were chosen after consultation with qualified librarian which include Medline, CINAHL, PubMed, ProQuest and Ovid. The terms injury prevention and health education OR health promotion OR health teaching AND parents OR mother OR father OR caregiver were searched at each database. The combined searches resulted in 235
after duplicates being removed and imported into Mendeley. Search strategy also include hand search reference lists of articles that have been identified by database searches and bibliographies of systematic and non-systematic reviews which yielded 90 articles. Publications were filtered for peer reviewed papers published in the last 10 years, from year 2010 to May 2020, in English language only.

**Data extraction**

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

**Data collection process and data items**

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

**Quality appraisal**

All paper titles and abstracts were screened independently by one reviewer for inclusion based on pre-defined inclusion criteria. A sample of 20% were screened independently by a second reviewer using the same criteria. Any paper with inconclusive criteria will be reviewed by both reviewers and resolved by discussion. The modified Cochrane Risk of Bias Tool (11) were used to appraise the quality of the studies selected based on the strength and limitation of the methodology of included studies. Both reviewers will critically examine all the included studies
based on this instrument. No studies were excluded after the quality appraisal, but the results of the assessment were reported in this review to provide insight on the methodological rigor of each individual studies included. Summary of the results are presented in the Supplementary A.

RESULTS

Study selection

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

Study characteristics

The study characteristics are summarised in Table 1. Majority of the studies were published between year 2011 and 2016 (7,12,14–16) while remaining two studies published in year 2019 (9,17). Country of the study published were USA, Iran, Brazil, Sweden and Netherlands. Five of the studies are randomized controlled trial, two of the paper are quasi-experimental studies and one paper is a longitudinal study with one intervention point. Sample size of the studies included ranging from 30 to 1292 participants. Majority of the participants are mothers, followed by fathers and other family members. The oldest age of children included in the
studies were 6 years old. Most of the intervention were conducted among lower education level
and in urban areas. All of the reviewed paper concluded their intervention was effective in
achieving their objectives which is improving the knowledge, attitude and safety practice for
injury prevention.

**Features of the intervention methods of deliveries**

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

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

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

Half of the intervention were delivered by healthcare workers which were either a doctor,
experienced nurse or healthcare educators, one study reported having students delivered the
intervention (16) while the remaining three studies were delivered by application such as mobile app, web-based module and self-read baby books. The primary care setting described in the paper include child health clinics and primary health care centres.

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

**DISCUSSION**

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

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

Typical injury prevention intervention evaluates the effectiveness by measuring outcomes such as knowledge, attitude and safety behaviour but it is important to note the sustainability of the
education intervention in term of satisfaction of delivery methods, timing and relevance of the

topic to the targeted population. Evidence has shown that injury prevention intervention

program would be more sustainable in term of support from the medical staff if the patients are

highly satisfied and have high perceived value on the program (21).

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244 The delivery of education interventions needs to be considered in the context if feasibility and

implementation in the primary care setting. Commonly reported barriers in health education
delivery in the primary care clinic include limited number of staff and time that leads to

inadequate counselling and explanation (22). A systematic review that look at the intervention
to prevent drowning among adolescents recommended that setting-based analyses may help to
define their target population better and formulate an appropriate education strategy for

intervention.

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The use of tailored information rather than generic advice is proven to result in better

information recall (4). In addition, a systematic review of two trials found that knowledge of

respondents significantly improved when written materials were accompanied by verbal health

information in comparison with verbal information only (23). All the studies included in this

review supplement the respondents with printed materials except for technology based

intervention of the mobile app intervention.

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Implications for practice

258 Utilizing technology to deliver the tailored information for example integration of medical

records on child development and specific injury prevention advice to the parents. Studies have

shown that use of computer improves satisfaction and information retention (24), however the

limitation would be financial resources and accessibility among the lower socioeconomics.

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

**Implications for research**

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

**Limitation**

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

**Strength**

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

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

DECLARATION

Ethics approval
Not applicable

Consent for publication
Not applicable

Availability of data and materials
Not applicable

Competing interest
The authors declare no competing interests.

Funding
This review was not funded by any party.

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

Acknowledgements

We would like to thank Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia for their support and assistance in this review. We also like to thank the students from Year 1 of Doctor of Public Health cohort for the input and support.

No financial disclosures were reported by the authors of this paper.

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| 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)| Netherlands | 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 | 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 |
|   | Study Authors       | Country | Design | Sample Description | Intervention | Outcome Measures                                                                 |
|---|---------------------|---------|--------|---------------------|--------------|----------------------------------------------------------------------------------|
| 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%). |

RCT: Randomized Controlled Trials, IG: intervention group, CG: control group
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         | 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            | 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       | 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         | 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                                                |
| Ebadi Fardazar et al   |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            | 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            | 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        | 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         | behaviour changes feedback on intervention                                         |

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

Results of risk of bias assessment

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