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Original Article

Application of a Risk Management Program Based on the Health Belief Model for Preventing Home Accidents

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Abstract

Background: Accidents are the main cause of mortality in children aged less than 5 years throughout the world. The present study was conducted to empower mothers with children aged less than 5 years in preventing home accidents through the implementation of a risk management training program based on the Health Belief Model (HBM). **Materials and Methods:** The present pretest-posttest, quasi-experimental study was conducted on 70 mothers with children aged less than 5 years who referred to Community Health Centers of Shahid Beheshti University of Medical Sciences, Iran, in 2019. The subjects were selected through multistage random sampling and were randomly assigned to intervention (n = 35) and control (n = 35) groups. The data were collected using a two-part questionnaire for demographic characteristics and HBM constructs before, immediately after, and 45 days after the implementation of the risk management training program at a significance level of <0.05. **Results:** No significant difference was observed between the two groups before the intervention in terms of HBM constructs (p>0.05). However, they significantly differed between the intervention and control groups after the intervention. Moreover, scores of HBM constructs were significantly different immediately and 45 days after the intervention (p <.05). **Conclusions:** The study results showed the effectiveness of the HBM-based risk management training program; thus, it is essential to design and implement such programs in community health centers to prevent and reduce injuries caused due to home domestic accidents.

Keywords: *Accident prevention, child, health education, mothers*

Introduction

As defined by the World Health Organization, "An accident is an inadvertent event that happens as a result of a sudden external force causing physical and mental injury".[1] Accident among children is one of the top public health issues and is associated with a large amount of morbidity and mortality in children below the age of 5 years worldwide.[2-5] Every year, thousands of children lose their lives in the world due to home accidents and millions of children are transferred to hospitals due to accident-related injuries,[6] which occasionally lead to brain traumas and lifelong disabilities in children, and impose a huge financial and psychological burden on their families and society.[4,5]

Although children spend more than half of their time at home before reaching school age, they are exposed to more injuries compared to school-aged children and thus the home plays a major role in accidents,[7] and a large proportion of accidents such as drowning, burns, and falls happen in or around the home.[8] As per the statistics of The National Safe Kids Campaign in the United States, 40% of deaths and 50% of unintentional nonfatal injuries occur at or around the home.[9] Children are at a higher risk of unintentional injuries due to rapid developmental changes in their physical and cognitive abilities, curiosity, and ignorance of the risks involved at this age.[10]

As per statistics from the Iranian Ministry of Health, 64% of children's accidents are due to household accidents, of which airway obstruction and drowning have been reported to be the most common causes of mortality at home among children aged less than 5 years.[11] Several studies have reported unsafe home environments, low socioeconomic status, and lack of knowledge and inappropriate attitude of mothers as the most important risk factors

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for domestic injuries among children.[5] Evidently, parents believe that accidents occur among the inappropriate attitudes considered as the main barrier to preventing and managing accidents. Changing such beliefs requires addressing preventive educational interventions.[12,13]

Many models and theories have been proposed to predict, explain, and change health-related behaviors and decisions. Some of these models focus on behavioral change at a personal level, for example, the Health Belief Model (HBM).[14] Models and theories for personal behavior change provide an appropriate conceptual basis for the development and evaluation of injury-preventing interventions.[10] The HBM was developed as a systematic method to explain preventive health behaviors.[15] The HBM constructs (perceived sensitivity and perceived severity) lead to the recognition of health threats, whereas perceived benefits, perceived barriers, cues to action, and self-efficacy encourage individuals to adopt healthy behaviors, which can improve the caregiver's attitude toward the prevention and control of injury in children and enhance their quality of life.[2] Previous studies on household accident prevention have been more descriptive[2,5] and educational interventions have not been based on the HBM model.[11] The present study was an educational intervention based on the HBM model. Given that children aged less than 5 years learn mostly at home and through their mothers, the present study was conducted to investigate the effect of HBM-based risk management training of mothers attending community health centers affiliated to Shahid Beheshti University of Medical Sciences on preventing home accidents. Empowerment of mothers is expected to reduce the rate of home accidents in children.

Materials and Methods

This research was a quasi-experimental study conducted on mothers referred to community health centers affiliated with Shahid Beheshti University of Medical Sciences from October 2019 to January 2020. The participants were randomly recruited through a cluster sampling method. The community health centers included two health centers in the north and east districts of Tehran, Iran, and each of these centers has several subcenters that provide community health services. First, the two centers in the north and east regions were considered as the clusters and based on the lottery card, the center in the north region was considered as the intervention group, and the center in the east region as the control group. Then, from among the centers covered by each cluster, based on the lottery card, one center was chosen and assigned to the intervention group and another center to the control group. Finally, from among the centers delivering community health services, one center was randomly selected (i.e., based on the lottery card) from each cluster for conducting the study. Based on a similar study,[2] with 95% confidence interval and 90% test power, and using the equation below, the minimum sample size was calculated as 32 mothers, which was raised to 35 per group (70 mothers in total) taking into account the possible dropout rate of 10%.

In the next step, the participants were randomly selected from among the mothers registered in each center who had children aged less than 5 years and met the study inclusion criteria through stratified random sampling (i.e., mothers with an even number as the last digit on their national ID cards were chosen). Finally, the participants were randomly recruited from two randomly selected centers for both the intervention (n = 35) and control (n = 35) groups. The inclusion criteria were informed consent for participation, Iranian nationality, having children aged less than 5 years, lack of particular illness in the mothers such as severe depression or cancer, lack of specific illness in the children such as malignancies and debilitating mental and physical diseases, lack of history of training programs related to the present study training program in the past 6 months, and the ability to read, write, and speak Persian. The exclusion criteria were absence from two sessions and mother's unwillingness to continue cooperation during the educational program for any reason.

The data were collected using a demographic characteristics questionnaire and another based on the HBM constructs. The demographic characteristics questionnaire contained items related to variables such as mother's age, education, and employment status. The HBM-based questionnaire contains the following constructs: perceived sensitivity with 5 items, for example, my child may suffer from a moderate injury, perceived severity with 5 items, for example, moderate injuries cause temporary disability in my child's activities, perceived benefits with 5 items, for example, supervision of my child's activities maintains their health, and perceived barriers with 5 items, for example, constant supervision and control of my child's activities makes me tired, cues to action and self-efficacy constructs with 4 items which assess mothers' ability to perform preventive measures. All items are scored on 6-point Likert scale ranging from totally agree to totally disagree. The minimum score for all constructs is 6 and the maximum score is 30 for the first 4 constructs and 24 for the cues to action and self-efficacy constructs. Validity and reliability of the HBM-based questionnaire have been confirmed in Iran.[16] In the present study, the reliability of the instruments was confirmed using internal consistency and stability methods. The internal consistency of the questionnaire was determined using Cronbach's alpha. The questionnaire was made available to 10 health and safety education experts to assess its validity. Its reliability was determined through a pilot study with a sample size of 10 individuals. The Cronbach's alpha coefficient of the constructs of perceived sensitivity, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy were 73%, 72%, 85%, 65%, 75%, and 77%, respectively. The educational contents were presented as

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educational pamphlets, booklets, posters, and videos[17,18] and covered the following subjects: introduction to children's developmental stages, common home injuries and accidents, risk factors and causative factors of home injuries and accidents, introduction to injury prevention methods, safety of children's toys and playground, and training on first aid in accidents, especially resuscitation of children. Training was also provided with regard to home safety in terms of prevention of falls from stairs and windows, storing of sharp objects far from reach, and use of personal protective equipment for children during playing [Table 1].

Based on the study objectives, the initial content of the educational program was extracted from the Ministry of Health's Home Accident Prevention Guide available in community health centers.[19] The educational program contents were approved by 10 professors of community health nursing, pediatric nursing, and family nursing. After making arrangements with the authorities of the community health centers and selecting eligible mothers, the study objectives were explained to the participants. The study questionnaires were completed by the subjects before the intervention, immediately after, and 45 days after the intervention. The educational program was designed in 4, 50-minute sessions and performed over 4 weeks by the researcher at the community health centers using educational aids (Video and PowerPoint presentation) together with question and answer sessions and practical exercises [Figure 1]. The data were analyzed in SPSS software (version 18, SPSS Inc., Chicago, IL, USA). Mean and standard deviation were used to describe quantitative data with normal distribution and median, minimum, and maximum to describe data with non-normal distribution. Moreover, independent *t*-test was used to compare intervention and control groups, and repeated measures analysis of variance (ANOVA) was used to compare changes in each group at a significance level of <0.05.

Ethical considerations

The present study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.PHARMACY.REC.1398.134) and was performed in accordance with the Declaration of Helsinki. The participants were briefed about the confidentiality of their data and the study method and objectives and gave an informed written consent for taking part in the study. To comply with the ethical principles, all educational pamphlets were given to the control group once the study ended.

Results

The results showed that 10 (29%) mothers in the intervention group and 15 (43%) in the control group held a bachelor's degree. In addition, 23 (65.70%) and 20 (57%) of women in the intervention group and control group were housewives, respectively. Chi-squared test and *t*-test results showed no significant difference between the study groups in terms of age, education, and occupation ($p>0.05$) [Table 2]. No significant difference was observed between the study groups in terms of HBM constructs before the intervention, but this difference was significant after the intervention [Table 3]. Repeated measures ANOVA test showed that scores of HBM constructs changed in each group at different stages of the study. Moreover, the score of these constructs at each stage of the study was significantly different ($p <0.05$) [Table 4]. Table 3 presents a comparison of HBM constructs before, immediately after, and 45 days after the intervention, with statistically significant mean differences in perceived sensitivity, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy ($p <0.05$).

Discussion

The present study was conducted to determine the effect of HBM-based risk management education among mothers with children aged less than 5 years on preventing

Table 1: Objectives and topics of the Health Belief Model (HBM) -based risk management educational program[19] by sessions

Session	Objective	Topic
One	Increasing awareness and perceived sensitivity and severity	The concept and importance of health in children below the age of 5 years, the concept of accidents and various home accidents
	Increasing perceived sensitivity	Common childhood accidents, relationship of accidents with age, relationship of child's development with incidence of injuries, and parents' role in preventing accidents
	Increasing perceived severity	Complications and severity of accidents and injuries they cause at each age and developmental stage
Two	Reducing perceived barriers	Identifying mothers' concerns and problems in overcoming barriers, benefits, and the importance of safety and preventive measures
	Increasing perceived benefits	
Three	Self-efficacy	Managing and control of the child's behaviors through parental supervision and a secure home environment
Four	Improved performance	Safe and unsafe behaviors during accidents, identifying accident-prone areas at and around the home, key points in preventing accidents, first aid when accidents occur

HBM: Health Belief Model

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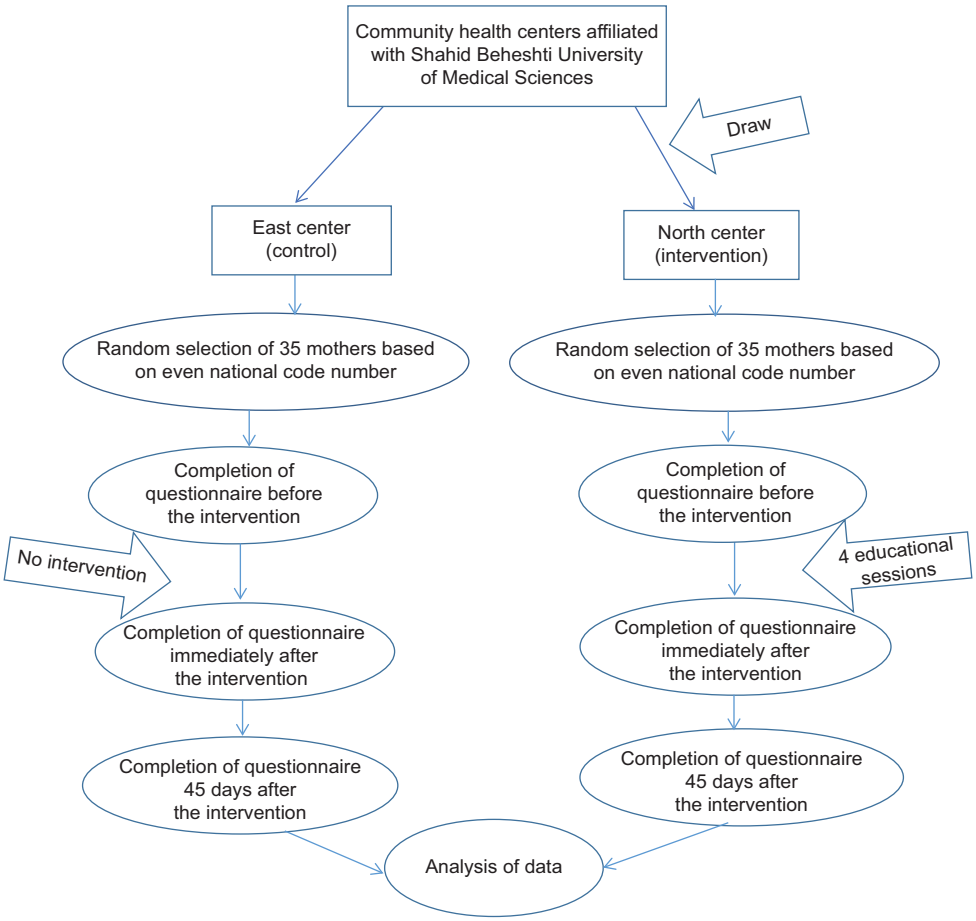

Figure 1: Study stages

Table 2: Demographic information of mothers with children of less than 5 years of age participating in the study (Chi-square)

	Intervention group (*n*=35)	Control group (*n*=35)	*t*	*p*
Mother's age				
Mean (SD)	33.28 (5.71)	32.42 (5.01)	0.62	0.540
	n (%)	**n (%)**	**df**	***p***
Mother's education				
Elementary school	6 (17)	5 (14)	1	0.365
Middle school	3 (9)	0		
High school	9 (26)	10 (29)		
Diploma	6 (17)	5 (14)		
Bachelor's degree	10 (29)	15 (43)		
Master's degree and higher	1 (2.90)	0		
Mother's employment status				
Housewife	23 (65.70)	20 (57)	1	0.312
Employed	12 (34.30)	15 (43)		

accidents. The results showed an increase in mean scores of HBM constructs (perceived sensitivity, perceived severity, perceived benefits, perceived barriers, cue to action, and self-efficacy) in these mothers as a result of HBM-based training. There was a significant difference in the perceived sensitivity scores immediately and 45 days after the intervention in the intervention group with regard to children's injury. The results of other studies have shown a significant change in mothers' perceived sensitivity, severity, benefits, and barriers after educational interventions, indicating their effectiveness on parents' performance in reducing children's accidents.[2,20]

These findings suggest that mothers better perceive children's vulnerability to accidents after the intervention, and therefore, prevent accidents through supervision and

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Table 3: Mean and standard deviation of health belief model constructs before, immediately after, and 45 days after the implementation of the risk management training program in mothers with children of less than 5 years of age participating in the study

HBM* constructs	Period	Intervention group Mean (SD)	Control group Mean (SD)
Perceived sensitivity	Before intervention	51.54 (9.49)	52.57 (9.90)
	Immediately after intervention	71.08 (9.90)	52.57 (9.90)
	45 days after intervention	70.51 (12.50)	52.57 (9.90)
Perceived severity	Before intervention	70.51 (16.80)	67.42 (17.46)
	Immediately after intervention	87.54 (14.01)	67.42 (17.46)
	45 days after intervention	87.88 (13.63)	67.42 (17.46)
Perceived benefits	Before intervention	80.22 (9.70)	78.06 (9.02)
	Immediately after intervention	94.51 (5.04)	78.06 (9.02)
	45 days after intervention	93.82 (5.85)	78.06 (9.02)
Perceived barriers	Before intervention	32.46 (29.94)	31.54 (29.79)
	Immediately after intervention	24.57 (25.22)	31.54 (29.79)
	45 days after intervention	24.91 (25.24)	31.54 (29.79)
Cues to action	Before intervention	54.28 (14.35)	54.28 (14.35)
	Immediately after intervention	59.71 (17.40)	54.28 (14.35)
	45 days after intervention	59.71 (17.40)	54.28 (14.35)
Self-efficacy	Before intervention	51.42 (14.43)	53.42 (11.74)
	Immediately after intervention	73.14 (13.67)	53.57 (11.85)
	45 days after intervention	72.42 (13.95)	53.57 (11.85)

*HBM: Health Belief Model

safety measures. There was a significant difference in the mean score of mothers' perceived severity immediately and 45 days after the intervention with regard to injuries in children aged less than 5 years, indicating the positive effect of training on increasing mothers' perceived severity, which is in line with the results of previous studies.[2,20] Discussing the complications, severity, and injuries caused by accidents for each age and developmental stage in the training sessions can be one of the reasons for the increase in the perceived severity score in the intervention group. Poorolajal *et al*.[16] also reported this construct as one of the strong predictors of mother's safety behaviors. This change can be attributed to the effectiveness of training in increasing perceived sensitivity and severity in the intervention group, to the extent that mothers' belief in children's vulnerability increased, and so did their sensitivity. Various studies have also reported an increase in perceived severity and sensitivity after the intervention.[2,21]

Based on the findings, there was a significant increase in the intervention group immediately and 45 days after the intervention, which can be attributed to the effectiveness of the educational intervention in increasing the score of perceived benefits in mothers receiving the intervention. This change increased their belief in the benefits of adopting injury-preventing behaviors after the training. The mean score of perceived benefits indicates that the mothers understood that the benefits of implementing safety measures far outweigh ignoring them. Various studies have also reported a direct relationship between increased perceived benefits and adopting healthy and preventive behaviors.[2,22]

There was no significant difference in the intervention group immediately and 45 days after the intervention, which can be attributed to the effectiveness of the educational intervention in reducing perceived barriers and that HBM-based training improved mothers' attitude toward childcare. Various studies have also reported a reduction in perceived barriers after educational interventions in the group receiving education.[2,20,23] Poorolajal *et al*.[16] reported this construct of the HBM as one of the strong predictors of mother's safety behaviors. Results showed that a significant increase was observed in the score of cues to action (health centers, friends and relatives, spouse, and mass media) in the intervention group after training, which can be attributed to the effectiveness of the educational intervention in increasing cues to action in mothers receiving education. Various studies have also reported the application of cues to action after the intervention in the group receiving education.[2,20,23] In a study conducted in Iran, this construct of the model was also determined as one of the strong predictors of mother's safety behaviors,[16] which is in line with the present study results.

There was a significant difference in the mean score of self-efficacy immediately and 45 days after the intervention in the intervention group. This difference was also significant in a study by Cheraghi *et al*.[2] In a similar study, this construct of the model was also determined as one of the strong predictors of mother's safety behaviors.[16] This

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Table 4: Comparison of the mean constructs of the health belief model before, immediately after, and 45 days after the implementation of the risk management training program in mothers with children of less than 5 years of age participating in the study (repeated measures ANOVA)

HBM* constructs	Intragroup effects	Mean square	F	*p*
Perceived sensitivity	Group	457.62	23.90	< 0.001
	Time	270.58	335.52	< 0.001
	Group, time	270.58	335.52	< 0.001
Perceived severity	Group	11771.02	14.33	< 0.001
	Time	200.74	242.77	< 0.001
	Group, time	200.74	242.77	< 0.001
Perceived benefits	Group	14133.68	37.68	< 0.001
	Time	121.27	186.84	< 0.001
	Group, time	123.12	189.69	< 0.001
Perceived barriers	Group	938.74	0.405	< 0.001
	Time	642.55	52.38	< 0.001
	Group, time	642.55	52.38	< 0.001
Cues to action	Group	27.50	0.88	< 0.001
	Time	343.81	130.57	< 0.001
	Group, time	343.81	130.57	< 0.001
Self-efficacy	Group	3.50	0.143	< 0.001
	Time	209.66	64.45	< 0.001
	Group, time	0.069	0.021	0.888

*HBM: Health Belief Model

construct has been suggested to be beneficial in designing educational interventions for the improvement of mothers' behaviors in preventing poisoning in children aged less than 5 years,[24] and this effect can be attributed to the effectiveness of the educational intervention in increasing the self-efficacy of mothers. As such, educational intervention improves and empowers mothers in preventing accidents and increases their self-efficacy in childcare. Various studies have also reported the improvement of self-efficacy after the intervention in the group receiving education.[2,25-27] Thus, it is necessary that healthcare personnel and families boost mothers' confidence and self-efficacy regarding their ability to control and prevent injuries in children. A study by Snowdon *et al*.[28] showed that specialist sources (e.g., nurses) may provide parents with important evidence-based advice regarding children's safety in vehicles. A study on the causes of accidents in rural children emphasized the key role of health professionals in monitoring and identifying accident prevention measures related to the environment in which the child lives.[29] As a community-oriented approach, using community health nurses in community health centers can improve mothers' knowledge and awareness about childhood risks and injuries and change their attitude toward the prevention and management of injuries. Therefore, this model can be used as an effective approach in planning and developing programs to prevent injury and promote the safety of children.

The strength of the present study was the design and implementation of a risk management educational program based on HBM, as a behavior changing model, for training mothers with children aged less than 5 years. In this present study, mothers were the main target population and other family members were affected indirectly. However, other family members should participate in the educational program and another limitation of this study was that it was impossible to watch the behavior of mothers and children in real situations. Thus, it is recommended that future studies use accurate objective methods including the assessment and observation of the behavior of mothers and children and the assessment of home safety.

There were limitations in this study. We used the original version of HBM, and for future studies, we suggest to test the applicability of the protection motivation theory, as some influential psychological factors like fear have been provided in this theory. The respondents of this study were recruited only from Tehran. Therefore, inferences drawn from the results should be applied with caution. Finally, the data were collected via a self-reported tool. Thus, participants may have underestimated or overestimated their behavior, which in turn might have affected the research findings.

Conclusion

Our results showed the effectiveness of the HBM-based risk management education program in preventing accidents. Moreover, the variables related to HBM constructs significantly increased in the intervention group after the implementation of the program. Given the important role of training in promoting home accident prevention and complications caused by accidents, more extensive training using different tools, especially using the expertise of community health nurses, appears to be a necessity and a health priority.

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Conflicts of Interest

Nothing to declare.

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