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The impact of educational intervention based on the health belief model on observing standard precautions among emergency center nurses in Sirjan, Iran

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Abstract

Providing health care services has always been considered as a hazardous job due to a number of reasons. The risk of blood-borne viruses and the importance of their prevention has led to the formulation of principles called standard precautions (SPs). The goal of this study was to investigate the impact of an educational intervention based on the Health Belief Model constructs on the behavior of nurses in emergency centers regarding observing SPs in Sirjan, Iran. This was a quasi-experimental study. The study population included 100 emergency personnel working in health centers in Sirjan city (of Iran), who were randomly divided into two intervention ($n = 50$) and control ($n = 50$) groups. The educational intervention was conducted over two sessions each lasting for 60 min. Information was collected by a questionnaire (with 64 questions), completed in an interview conducted directly before the intervention and 3 months later. Data were analyzed using the χ^2 test, *t*-test and paired *t*-test.The results showed nurses did not have enough information about SPs, but after the intervention, knowledge scores increased in both groups. In the Health Belief Model (HBM) constructs, significant differences were observed in perceived susceptibility, perceived severity, perceived benefits and barriers, cues to action and self-efficacy, after the intervention, in the intervention group ($P < 0.001$), but not in the control group ($P > 0.05$). HBM was effective in educating SPs among emergency personnel.

Introduction

Due to the potential risk of transmission of blood-borne infections, contact with blood and body fluids has been considered as one of the most salient issues of professional health care workers in the last 50 years [1].

Standard precautions (SPs) are a set of infection control practices used to prevent transmission of diseases that can be acquired by contact with body fluids, blood, injured skin (including rashes), and mucous membranes. These measures should be observed when providing care to all individuals, whether or not they are infectious/symptomatic or not [2]. Health care workers are exposed to needle stick injury, contact with blood secretions, infection with Hepatitis B, C and AIDS/HIV through occupational exposure to blood and other body fluids [3]. According to international statistics, among 35 million healthcare workers worldwide, almost every year, 3 million people are exposed to blood-borne virus transmission. As a result of such injuries, 16 000 cases of Hepatitis C, 66 000 cases of Hepatitis B, and 200–5000 HIV cases are reported, and the majority of these infections happen in low-income countries [4].

Based on universal precautions, health care workers should seriously follow infection control

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procedures. Failure to observe universal and SP regarding blood and other body fluids significantly exposes them to HIV infection, Hepatitis B and other blood-borne pathogens. Universal precautions are defined by Centers for Disease Control and Prevention (CDC) as a series of precautions to prevent infection caused by HIV, Hepatitis B and other blood-borne pathogens. These precautions include the provision of first aid or health care, and they are used for blood, fluids contaminated with blood and other body fluids [5].

According to various studies, various factors may cause occupational injuries such as misunderstandings, not being alarmed, the unavailability of needle cutters, obligations for covering needles, negligence on the part of officials, being busy or old etc. An important factor in preventing occupational injuries is the observation of universal SPs. Despite awareness of health care workers from needle stick injury risks, such injuries are less often reported. One way to prevent blood-borne diseases in health care workers is to not re-cap the needle stick [6].

Proper and regular education can help people to better understand these precautions. Education is a process that improves knowledge and skills and helps individuals make health decisions. As a result of education, certain behaviors can change [6].

Research showed that the most effective training programs are based on theory-based approaches derived from behavior change models. Therefore, choosing an educational model is the first step in the process of developing a health care training program [7].

Health belief model

The Health Belief Model (HBM) was used in this study since it is a personal and motivational model and can prevent certain behaviors [8]. Motivation is a very important issue in learning. Self-efficacy has a major role in health education, and is required for behavior change in HBM; and defines human behavior via the interaction between cognitive behavior and environmental determinants. HBM tells us why health preventive behaviors such as adherence to infection control instructions and observation of universal precautions are or are not practiced. This model has been developed to explain health behaviors at the level of individual decision making. In this model, the possibility that a person will do a health behavior depends on his/her willingness to do that behavior and also on the advantages of doing it despite all costs and obstacles [9].

The model was initially put forth with only four key concepts (perceived susceptibility, perceived severity, perceived benefits and perceived barriers) [10]. Cues to action were added later to stimulate behavior, and finally in 1988, the concept of self-efficacy proposed by Albert Bandura was added (see Fig. 1) [11]. The HBM, evaluates whether or not people are prone to suffer from a health problem? And this problem or disease has serious and severe health effects? In fact, in the majority of references, both the 'perceived susceptibility and perceived severity' in the HBM are classified as 'perceived threat'. Rosen-Stock states that the combination of perceived susceptibility and severity provide motivation for action, and the comparison of the perceived benefits and barriers provides the tools or course of action [12]. Therefore, as perceived susceptibility, severity and benefits become stronger and perceived barriers get weaker, the probability of adopting preventive health measures increases. Past experiences and demographic factors act like cues to action and affect the four dimensions (susceptibility, severity, barriers and benefits) [13].

Several studies have been conducted about this. The results of Krishnan et al.'s study showed the effect of an educational intervention on the knowledge of primary health care workers regarding occupational exposure to blood and body fluids [14]. The results of another study by Williams et al. [15] also showed that their educational program had a positive and permanent impact on knowledge, attitude and behavior of care workers in China. The findings of Lueveswanij et al's study on dental and oral health personnel in Thailand showed that an educational intervention had a positive impact on knowledge, attitude and practice regarding AIDS in the group under study [16].

HBM is a person-related model and based on its structures, reminds nurses to maintain their health.

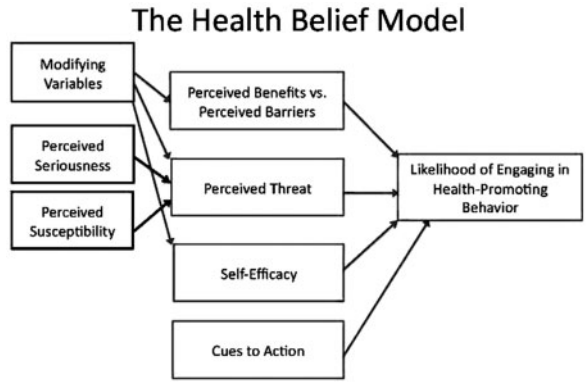

Fig. 1. Health belief model [8].

So it is ultimately the person who decides to take care of her/his health or not. But definitely knowledge and education can help improve behavior. The HBM has been applied to diverse sets of health behaviors. However, some research suggested that the HBM was not effective in improving behaviors related to observing SPs. It is suggested that a model is needed to guide prevention efforts and that these factors need to be incorporated into any such model [17].

Considering the results of previous studies that show a high rate of occupational exposure to blood, poor awareness about health issues and following up injuries, and poor performance while encountering occupational exposure in health care workers; and also considering the fact that no study has been done on emergency personnel in Sirjan, this study aimed to determine the impact of an educational intervention based on the HBM on SP among emergency center nurses in Sirjan, Iran.

Methods

This study was a quasi-experimental study based on the HBM and was conducted in 2016.

Participants

The participants enrolled into this study were all of the 100 male employees aged between 20- and 47-years old working in the hospital and emergency facilities of Sirjan, located in the southeast of Iran. Nurses were assigned to intervention ($n = 50$) and control ($n = 50$) groups. The participants were assigned in the two groups randomly. The inclusion criteria were: being employed in emergency centers and living in Sirjan. The exclusion criterion was unwillingness to continue or to participate in the study.

Instrument and procedure

The instrument used in this study was a self-administered questionnaire. Although there were questionnaires on this subject, we preferred to design a questionnaire that fitted the cultural, social and native conditions of Iran. This tool was developed according to a focus group discussion that was held with 10 health experts.

An anonymous coded questionnaire was developed in three parts. The first part included demographic information with six questions about age, marital status, history of vaccination against Hepatitis B, antibody titer control, history of contact with blood or infected needles. The second part of the questionnaire assessed HBM constructs. In this section, there were six questions for perceived susceptibility, seven questions for perceived severity, six questions for perceived benefits, seven questions for perceived barriers, six questions for cues to action and seven questions for self-efficacy. The

third section was the measurement of knowledge construct (8 questions) and performance (11 questions). The scoring was done as follows: 'Yes' responses received 2 scores and 'No' or 'I don't know' received 1 point in the 'knowledge' and 'cues to action' section. The range of score for knowledge was 8–16 and for cues to action was 6–12.

The questions about perceived benefits, perceived barriers, attitude and performance were based on a five-level Likert scale, and the responses were Strongly Agree (score = 5), Agree (score = 4), No Idea (score = 3), Disagree (score = 2) and Strongly Disagree (score = 1). The range of scores for perceived susceptibility and perceived benefits was from 6 to 30, and for perceived severity, barriers and efficacy, it was from 7 to 35. The score range for performance was 11–55.

To ensure the questionnaire validity, content validity analysis was done. To fulfill this purpose, nine heath education experts (four health education experts, two public health experts and two nursing experts) were asked to evaluate the comprehensiveness of the questionnaire. In addition, to determine the reliability, test–retest was performed within 2 weeks. The internal reliability coefficient for each scale was calculated using Cronbach's alpha technique. The Cronbach's alpha for knowledge questions was 0.91; for perceived susceptibility was 0.83; for perceived severity was 0.89; for perceived benefits was 0.87; for cues to action was 0.91; for perceived barriers was 0.82; for self-efficacy was 0.86 and for performance was 0.80.The correlation coefficient (r) of test–retest for knowledge questions was 0.86; for perceived susceptibility was 0.73; for perceived severity was 0.77; for perceived benefits was 0.83; for cues to action was 0.84; for perceived barriers was 0.79; for self-efficacy was 0.75 and for performance was 0.74.

The pre-test questionnaire was completed by the researchers during an interview for all nurses; and then a training program was delivered to the intervention group.

Intervention (training program)

In total 50 participants were in the intervention group. The intervention was delivered by a trained health expert. The training program was performed for two groups with 25 participants, and it consisted of two training sessions for 1 h. There was a 1 month interval between each session. The sessions were held in the form of lecture, group discussion and practical demonstration. Lectures were used to provide regular training and to save time and resources. Group discussions were used to get participants involved in learning, and practical demonstration was performed in order to learn skills through observation. After 1 and 2 months intervention, two follow-up sessions were held. At the end of the training, educational materials, booklet and pamphlets were given to participants. Classes were held in hospitals and health centers. After 3 months training, post-test questionnaires were completed for all participants.

The educational program was designed and developed based on the HBM. The educational content was about making nurses sensitive to the problem (perceived susceptibility), then understanding the depth of the risk and the seriousness of its various complications (perceived severity), with positive message that come from their surroundings (cues to action), believing in the usefulness and applicability of preventive behaviors (perceived benefits), not engaging in these behaviors are also less costly than their benefits (perceived barriers) and enabling them to perform preventive actions (self-efficacy) and to ultimately function properly in observing SP and learning how to protect themselves during medical operations and services.

This study was approved by the Ethics Committee of Kerman University of Medical Sciences (Ethics Code: IR.KMU.REC.930303). All participants were informed about the aim of this study and consented to participate. Although the control group did not receive the educational intervention along with the intervention group, after completion of the study, training was provided to the control group with the same quantity and quality.

Data analysis

The collected data were analyzed by SPSS16. In order to compare the mean score of knowledge

Table I. *Comparing some variables among the Sirjan's emergency nurses in the control and intervention groups*

Variables	Intervention group ($n = 50$), n (%)	Control group ($n = 50$), n (%)	P-value
Marital status			
Married	41 (82)	40 (80)	0.752
Single	9 (18)	10 (20)	
History of complete vaccination against hepatitis B			
Yes	19 (38)	18 (36)	0.712
No	31 (62)	32 (64)	
Antibody titer control			
Yes	8 (16)	9 (18)	0.642
No	42 (84)	41 (82)	
History of contact with infected needle and blood			
Yes	44 (88)	43 (86)	0.567
No	6 (12)	7 (14)	

Note: χ^2 test.

and HBM constructs before and after the intervention in each group, paired t-tests were used; and independent t-tests were used to show the difference in the knowledge score and HBM constructs between the two groups. The level of significance in the tests was considered < 0.05.

Results

The Kolmogorov–Smirnov test was used to check the normality of our data and showed that the data had a normal distribution.

The mean and standard deviation of the participants' age in the intervention and control group were respectively 38.92 ± 11.53 and 39.42 ± 10.77and this difference was not significant ($P = 0.264$). Other demographic characteristics in the two groups showed no significant difference either (Table I).

The results showed that the mean scores of knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, efficacy and practice in the intervention and control groups was not significantly different before the intervention, but after the intervention, the difference was significant, and the scores increased (Table II).

The statistical results also showed that the emergency personnel's knowledge, both in the intervention group and the control group increased after the intervention. However, in the intervention group there was also a significant increase in the mean scores of the perceived susceptibility, severity, benefits, cues to action, efficacy and practice (with the exception of perceived barriers) after the intervention (Table III).

The results showed that the number (percent) of health behaviors in the intervention group increased after the intervention (Table IV).

Discussion

The results of this study showed that most participants did not have enough information about the SP (69.7%) and they required educational interventions. A study by Abou El-Enein and El Mahdy [18], reported that Egyptian nurses had not received any training program at all either. In a study by Frazer et al. [19] on Irish nurses, a minority (27·3%) of respondents agreed they were well informed about the Hepatitis C virus. Jamshidi et al.'s study in Iran showed that almost half of all nurses were not sufficiently aware of the existing practicing standards [8]. In a study by Myers et al. [20] on Columbia Dental Students, 42.5% of the students did not have sufficient knowledge about transmission and control of blood-borne infections. These mentioned studies showed that personnel's knowledge about SPs was generally low, and training programs was necessary.

The results also showed that 87% of the nurses experienced injury by needle stick, sharp objects, and contaminated secretions. In a study by Laraqui et al. [21], 80.3% of Moroccan nurses and in another study by Saleem et al. [22], 47% of Pakistani medical students experienced needle stick injury. In a study by Osborne on Australian nurses showed that mean compliance rates for reporting exposures incurred were considerably low [23].

In this study, 37% of the emergency personnel had a complete vaccination record, 18% of the staff had checked their blood HBsAb level, and

Table II. *The mean scores of Sirjan's emergency nurses between the control and intervention groups regarding SP, before and after the intervention*

	Before intervention ($n = 50$)			After intervention ($n = 50$)		
	Intervention group, mean ± SD	Control group, mean ± SD	*P*-value	Intervention group, mean ± SD	Control group, mean ± SD	*P*-value
Knowledge score	9.32 ± 1.16	9.44 ± 1.37	0.141	14.38 ± 0.64	10.63 ± 1.56	<0.001
Perceived susceptibility	21.82 ± 2.62	20.77 ± 2.96	0.340	28.77 ± 1.82	20.78 ± 2.95	<0.001
Perceived severity	26.94 ± 3.69	26.65 ± 4.02	0.055	33.18 ± 2.75	26.67 ± 3.87	<0.001
Perceived benefits	23.33 ± 2.66	23.45 ± 2.83	0.391	28.61 ± 1.72	23.45 ± 2.78	<0.001
Perceived barriers	31.62 ± 5.69	31.52 ± 5.83	0.922	20.30 ± 2.75	31.56 ± 5.53	<0.001
Cues to action	9.72 ± 1.55	9.18 ± 1.18	0.170	14.85 ± 0.77	9.43 ± 1.93	<0.001
Self-efficacy	26.51 ± 3.53	26.32 ± 3.46	0.845	33.61 ± 2.48	26.36 ± 3.32	<0.001
Practice	32.43 ± 3.49	32.41 ± 3.39	0.845	50.75 ± 2.48	32.42 ± 3.42	0.001

Note: Independent *t*-test.

Table III. *The mean scores of Sirjan's emergency nurses in the control and intervention groups regarding observing SP before and after the intervention*

	Intervention group ($n = 50$)			Control group ($n = 50$)		
	Before intervention, mean ± SD	After intervention, mean ± SD	*P*-value	Before intervention, mean ± SD	After intervention, mean ± SD	*P*-value
Knowledge score	9.32 ± 1.16	14.38 ± 0.64	<0.001	9.64 ± 1.37	10.63 ± 1.56	0.007
Perceived susceptibility	21.82 ± 2.62	27.77 ± 1.82	<0.001	20.77 ± 2.96	20.78 ± 2.95	0.266
Perceived severity	26.94 ± 3.69	33.18 ± 2.75	<0.001	26.65 ± 4.02	26.67 ± 3.87	0.247
Perceived benefits	23.33 ± 2.66	38.61 ± 1.72	<0.001	23.45 ± 2.83	23.45 ± 2.78	0.234
Perceived barriers	31.62 ± 5.69	20.30 ± 2.75	<0.001	31.52 ± 5.83	31.56 ± 5.53	0.487
Cues to action	9.72 ± 1.55	14.85 ± 0.77	<0.001	9.18 ± 1.18	9.43 ± 1.93	0.674
Self-efficacy	26.51 ± 3.53	33.61 ± 2.48	<0.001	26.32 ± 3.46	26.36 ± 3.32	0.417
practice	32.43 ± 3.49	50.75 ± 2.48	<0.001	32.41 ± 3.39	32.42 ± 3.42	0.652

Note: Paired *t*-test.

after the educational intervention the vaccination rate increased to 88%. In a United States study, 72% of the personnel had received full vaccination, and 68% had controlled their blood HBsAb level [24]. In Poland, 75.5% of the employees had receive full vaccination, and the majority of injuries happened in the surgery rooms and among female nurses [25]. In a study conducted in Uganda, only 6.2% of the personnel had done vaccination, and from those only 34.8% received full vaccination [26]. Norway had reported the highest number of nurses who received vaccinations among the literature review [27]. The low level of vaccination and antibody control among personnel was considered in the design of interventions in this study. Studies have mainly focused on reporting the prevalence or the risk factors of these injuries, and training (as the most important factor) has been neglected [28, 29].

Our study demonstrated that using model-based education in the training of emergency nurses, can lead to their increased knowledge and scores of HBM constructs (with the exception of perceived barriers) in the intervention group.

The results showed a significant increase in the mean score of the nurses' knowledge of both the control and intervention groups at the end of the study

Table IV. *The comparison of health behaviors regarding observing SP before and after the intervention*

	Intervention group ($n = 50$)		Control group ($n = 50$)	
	Before intervention, *n* (%)	After intervention, *n* (%)	Before intervention, *n* (%)	After intervention, *n* (%)
Completed their vaccination record	19 (38)	44 (88)	19 (38)	20 (40)
Checked their blood HBsAb level	9 (18)	42 (84)	10 (20)	10 (20)
Other	22 (44)	6 (12)	21 (42)	20 (40)

after the intervention, which was probably due to the routine education program in those centers. CDC has studied the impact of education on preventing HIV in students [30], and Krishnan et al. also showed that training has a proper impact on the increase of knowledge among personnel [14].

In this study, the mean scores for perceived susceptibility increased in the intervention group after the intervention. Increase in this construct has been observed after training in several studies [31–33].

This study showed that perceived severity significantly increased in the nurses of the intervention group, after the intervention, which shows that these individuals considered themselves susceptible to diseases such as HIV and Hepatitis B, and they recognizes them as fatal and deadly. They better understood the consequences of these diseases and were ready to takepreventive measures. A study from Pakistan, in line with our findings, showed increase in the mean score of perceived severityafter the educational intervention [34].

The significant reduction in the mean score of perceived barriers and increase in perceived benefits after the intervention shows the significant effect of training. Raising knowledge and correcting misconceptions as well as discussion and conversation can be effective in reducing barriers and increasing the perceived benefits of preventing disease or possibly taking measures against that disease. A study in Iran showed that the application of the HBM in education plays an effective role in reducing perceived barriers to HIV prevention and increasing perceived benefits in female students [35]. Other studies also showed that educational interventions were significant in this regard [36, 37].

Also, in this study, the mean score of cues for action significantly increased in the intervention group compared with the control group, which is consistent with the findings of Choi and Kim [38].

In this study, the mean self-efficacy score in the intervention group increased significantly after the intervention. Self-efficacy is defined as one's ability to ensure the successful implementation of an action [39]. A study in Turkey showed that self-efficacy and health motivation are two important components of HBM in comparison to other parts of the model, and they are stronger predictors [40]. Similar studies also showed the effect of training on increasing the mean score of self-efficacy [41, 42].

Finally, it is recommended that permanent workshops and training sessions be held especially regarding blood-borne diseases such as Hepatitis B, C and AIDS. Furthermore, increasing and improving sanitary facilities, providing safety equipment and observing standards in work, and abundantly providing personal protective equipment such as gloves, gowns, masks and safety gaggles can help in preventing these health hazards.

Limitations

Some limitations of this study include lack of a control group with another intervention not related to hygiene recommendations in order to examine the effect of the education program used in the intervention group. Other limitations were lack of direct observation of compliance, lack of control for confounding variables (organizational context; individuals variables; group climate etc.). A number of studies [31, 43, 44] have demonstrated the interdependence of individual factors, environmental

constraints and organizational climate could play a major role in behavioral intentions regarding hygiene precautions.

Conclusions

The training provided positively affected certain health behaviors (complete vaccination, vaccination rate, checking blood HBsAb levels) in the emergency centers of Sirjan, Iran. The results of this study showed that using model-based education in the training of emergency nurses, can lead to increased knowledge and HBM construct scores in the intervention group, in regard to SP.

Thus, it is suggested that necessary training in regard to SPs be designed and implemented based on HBM constructs for nurses.

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Conflict of interest statement

None declared.

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