Journal of Cancer Education (2019) 34:904–912
https://doi.org/10.1007/s13187-018-1394-9

Evaluation of Health Belief Model-Based Intervention on Breast Cancer Screening Behaviors among Health Volunteers

Mohtasham Ghaffari[1] · Sanaz Nasiri Esfahani[2] · Sakineh Rakhshanderou[1] · Parisa Hosseini Koukamari[3]

Published online: 9 July 2018

Abstract
Breast cancer is the most common cancer and the second leading cause of death among women. Regarding the lack of knowledge about the cause of breast cancer and considering the fact that all women are prone to this disease, training on methods of early diagnosis to reduce its complications is of great importance. Thus, this study aimed to determine the effect of education based on the health belief model on breast cancer screening behaviors in health volunteers of health centers in Isfahan. In this experimental study, 480 healthy volunteers were randomly divided into two groups: the case (n = 240) and control (n = 240). The training program was designed according to health belief model structures. Before the training interventional program, the Champion standard questionnaire and functional checklist were completed for both groups. A standard questionnaire was completed during three stages (before, immediately after, and 2 months after the training). The experimental group received the educational intervention during eight sessions, and the collected data was eventually analyzed using the SPSS statistical software version 16 with relevant statistical tests. Participation of all individuals in the present research was voluntary and with informed consent. The results showed that mean scores of knowledge, perceived susceptibility, severity, benefits, barriers, self-efficacy, and behavioral intention related to breast self-examination (BSE) and mammography in the intervention group significantly increased compared with those of the control group immediately after and 2 months after educational intervention. There was a significant difference between groups in BSE skill 2 months after the intervention, but there was no significant difference between the two groups in BSE behavior and mammography 2 months after the intervention. The results confirmed the efficiency and effectiveness of an educational intervention based on the health belief model on improving factors affecting breast cancer screening behaviors.

Keywords Breast cancer screening · Health belief model · Intervention · Health volunteers

Introduction

Breast cancer is the leading cause of woman's death in developed and developing countries [1]. Breast cancer is the most prevalent type of cancer in women across the world, and nearly one million new cases of breast cancer are diagnosed annually. According to statistics, 23% of newly diagnosed cancer cases and 14% of cancer-related deaths account for breast cancer [2].

✉ Parisa Hosseini Koukamari
Hosseinikoukamari.parisa@gmail.com

[1] Environmental and Occupational Hazards Control Research Center, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

[2] Shahid Beheshti University of Medical Sciences, Tehran, Iran

[3] School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran

According to the statics of Institute for Health Metrics and Measurements, the number of breast cancer cases was 13.06 deaths per 100 thousand population that was 4.84 deaths per 100 thousand in Iran [3]. In Iran, cancer is the third most prevalent cause of death [4]. In Iran, breast cancer is the first cancer diagnosed among women [5]. Early detection of cancer has an important role in reducing death among women [6]. Incidence and prevalence of breast cancer in Iranian women are 22 and 120 per 100,000 persons over 30 years old, respectively. The ASR of breast cancer is 28.25/100000. According to National Cancer Registration in 2009, breast cancer in women has the highest rate in all cancers (23.0%). Tehran (43.36), Isfahan (39.67), Yazd (38.52), Markazi (36.63), and Fars (36.17) are in the first to fifth places in ASR, respectively [7]. According to researches, patients in Iran are 10 years younger than other countries, so this indicates the importance of the investigation, diagnosis, and control of this disease [7]. The incidence of breast cancer increases constantly with increasing age and its

incidence in the developing countries is 50% of the world rates that can be due to early diagnosis by preventive measurements and screening in developed countries [8, 9]. The mortality of breast cancer is directly associated with disease stage by the time of diagnosis and as cancer is usually diagnosed in low- and moderate-income countries in the final stages, its mortality rate is higher in these countries [10, 11].

Breast cancer is one of those cancers that can be early detected through screening that can reduce the mortality rates, as well [12]. Early diagnosis of breast cancer (up to 5 years after the first cancer's cell division), in order to improve breast cancer outcomes, forms the basis of the disease control that increases the chances of patients' survival from 56% to over 86% [13, 14]. Breast cancer screening means checking women's breast cancer before occurrence of any signs or symptoms of the disease. Breast cancer screening is performed through three main tests: mammography, breast self-examination (BSE), and clinical breast examination (CBE) [15]. The majority of breast cancers are discovered by patients (48%) and then by mammography (41%) and only 11% of them are detected in a physical examination by a physician [16]. Mammography and physical examination are complementary and considered as the standard screening methods. About 10–15% of cancers detected by mammogram are not palpable, while physical examination detects 10 to 20% of cancers that are not observed with mammography [17]. Mammography test is the most sensitive and specific test that can be performed for early detection of breast cancer. Results of seven population-based screening programs in the USA on 463,372 screening mammograms, showed its sensitivity and specificity at 75 and 92.4%, respectively [18]. This method can reduce up to 20–30% of breast cancer deaths among women over 50 years in high-income communities, with over 70% screening coverage [19]. Sufficient evidence indicates that mammographic screening in women of 50–59 years old can reduce death from breast cancer by 15–25% [20].

In countries, where breast cancer is considered a developing health and medical problem or where clinical examinations, especially mammography, are not cheap and available for different reasons, routine breast self-examination can improve the level of public awareness about cancer and its prevention, moreover it helps with early diagnosis of the disease [21, 22]. Generally, BSE is a simple, effective and affordable test for screening and early detection of breast cancer, recommended by American Cancer Society for women over the age of 20 [20, 23]. BSE should be used in conjunction with other methods of breast cancer screening methods and cannot be considered a substitute for them [4].

According to various studies, raising awareness among women about breast cancer and screening behaviors is known as one of the ways to prevent breast cancer. One way to highlight awareness is appropriate training so that it had a significant role in raising awareness in many researches [9, 10]. Several studies have been carried out to assess the factors affecting the performance or non-performance of breast cancer screening behaviors. In these studies, a significant relationship was found between variables, including perceived susceptibility, perceived barriers and perceived benefits and perceived self-efficacy of breast cancer screening behaviors [24, 25]. Perceived susceptibility of people refers to their belief based on their vulnerability to breast cancer. Also, when women perceive the benefits of screening behavior, they can defeat the barriers and costs of the behavior through believing in their ability to perform these behaviors (self-efficacy) and perform it. The mentioned variables are the structures of one of the most commonly used behavior change models, health belief model (HBM). This model is one of the first theories that have been created exclusively for health-related behaviors and is one of the most widely used models in the field of disease prevention and cancer screening behaviors [26].

Today, with people's cooperation, the needs related to public health can be diagnosed, plan to fulfill it, and execute programs based on people's power. One of the people's power, are healthy volunteers of health centers that each cover a considerable number of families [27]. Health volunteers are volunteers that communicate health centers with people without any expectations and play a great role in improvement of service efficiency and providing health services. If health volunteers have sufficient and complete health information, they can play this role better [28]. Also according to same language and culture with residents of local communities, health volunteers are suitable for transmission of educational issues [29]. This study aimed to evaluate the effectiveness of educational intervention based on health belief model on breast cancer screening behaviors in the health volunteers of health centers. It is hoped that its results can be used to provide solutions in designing, implementation, and evaluation of educational programs related to breast cancer in health care providers.

Materials and Methods

Design

This study was an experimental research conducted in health centers of Isfahan city.

Participants

To access a sample matched for social, economic, and cultural status in experimental and control groups, health centers that were closest were placed in one group and, as such, 11 centers were categorized into two groups. Then, according to random assignment method, one group was included into the study as the experimental group and the other as the control group. Among active health volunteers in centers, those who had the following

inclusion criteria were included into the study: age > 35, willingness to co-operate and actively participate in educational classes, and not being pregnant or breast feeding. The participants entered the study with informed consent (see Fig.1).

Ethics

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (No. 91–128).

In the present study, at the beginning, participants were assured of keeping the information confidential during the study period, analysis and after that. At the end, training sessions were conducted for the control group and educational materials and instructional videos were distributed among them.

Data Collection

Data collected from studied sample included a multi-sectional checklist, consisting of questions about demographic characteristics such as age, education, occupation, marital status, spouse's education, history of breast cancer in relatives, source of information in the field of breast cancer, and the health belief model structures; to assess knowledge, Noorizadeh questionnaire (2010) was used considering breast cancer (13 questions) and BSE (5 questions). To measure behavior and behavioral intention of BSE and mammography, two researcher-made questions was used for each of the behavior. To measure the components of health belief model structures, health belief model of Champion Scale with 50 items and a 5 Likert scale was used. Validity and reliability of the Persian version of the Champion HBM tool was obtained by Teymouri and colleagues [30]. Subscales of perceived susceptibility and perceived severity, perceived benefits, perceived barriers, perceived self-efficacy for BSE contained three items with Cronbach's alpha (0.82), 7 items with Cronbach's alpha (0.84), 6 items with Cronbach's alpha (0.80), 9 items with Cronbach's alpha (0.86), 10 items with Cronbach's alpha (0.90), respectively, perceived benefits and barriers for mammography included 6 and 9 items (Cronbach's alpha of 0.72 and 0.73, respectively) and 5-point Likert scale (from 1: strongly disagree to 5: strongly agree). A researcher-made checklist to assess the skills of BSE behavior was filled out with the mentioned questionnaire for each of the research units.

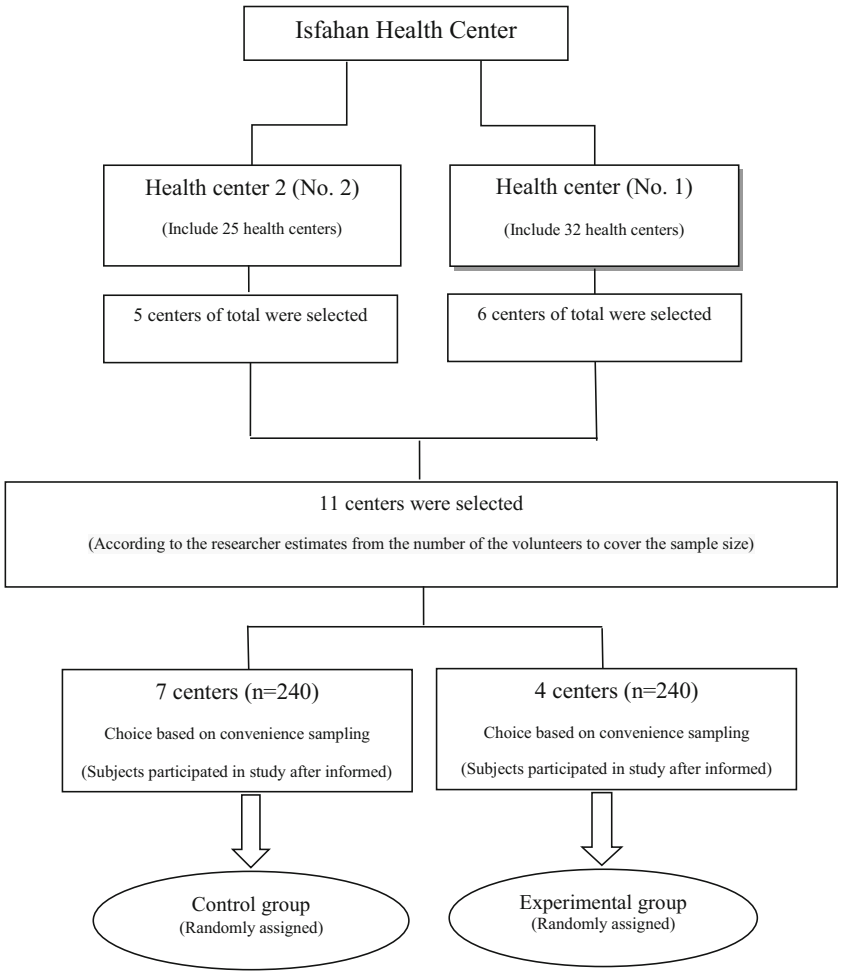

Fig. 1 Sampling diagram of research

Educational Intervention

After analyzing the pre-test results in the experimental group, the participants were trained in the field of breast cancer, breast self-examination, and mammography based on different parts of the questionnaire; the curriculum was developed based on needs and health belief model and produced and educated during eight sessions of 45 to 50 min for 8 weeks (two sessions per center) in the experimental group, in the auditorium of health centers. Other circumstances such as limitations and equipment were considered in this aspect.

The content of each educational material was designed and developed according to the structures of the health belief model and based on valid sources available from websites, books, and materials of other sources. Then, using the 10 female health volunteers who were not included in the main study, these materials were pre-tested and the necessary corrections and edits in clarifications, simplicity, and literature of the audience group were made.

Educational intervention included two sessions based on HBM constructs. Educational goals of program were determined as feeling danger of breast cancer occurrence (perceived susceptibility), feeling the seriousness of different complications and outcomes in physical, psychological, social, and economic aspects (perceived severity), understanding the usefulness and applicability of breast self-examination and mammography behavior (perceived benefits), overcoming obstacles that prevent breast cancer screening behaviors like; BSE (perceived barriers), and feeling confidence in doing BSE and taking mammogram (self-efficacy). The first session (for 50 min) activities were (1) lecture presentation and questioning/answering using educational slides, leaflets to cover constructs of knowledge, perceived susceptibility, perceived severity, and perceived benefits and (2) PPT slides and video show targeting self-efficacy for BSE and mammography. At the second session, brain storming and group discussion (for 60 min) were conducted to identify and provide solutions for overcoming any barriers from the perspective of women. Then, we used 15-min role-playing plan to promote self-efficacy of subjects for BSE.

Data Analysis

Immediately and 2 months after intervention, post-tests were performed for both groups. Then, the gathered data in all three phases were coded and was analyzed by statistical analysis software SPSS version 16. For matching both groups, in terms of demographic traits and HBM constructs before intervention, we used chi-square and Mann-Whitney, respectively. To assess the effect of education in post-tests, Mann Whitney test was used considering non-normality of data. Regarding the behavioral intention for mammography, because of the significance of the differences between the groups before intervention, the impact of these differences were controlled using ANCOVA test.

Results

In this study, 480 volunteers of Isfahan were studied regarding breast self-examination and mammography examinations. Findings related to matching both groups, in terms of age, education level, spouse's education level, occupation, marital status, breast cancer history of relations, background information were presented in Table 1. Also, according to Mann-Whitney test, the two groups had no significant difference before the intervention in terms of all HBM constructs except behavioral intention for mammography (Table 2). Because of the lack of choice and the possibility of re-assignment of groups (geographical, cultural, and economic restrictions, etc.), the difference in some variables was negligible. However, in periods of immediately after and 2 months after the intervention, it was adjusted using appropriate tests.

According to the results, assessing the structures of knowledge, susceptibility and severity, barriers, behavioral intention for BSE, and self-efficacy after intervention showed significant differences ($P < 0.001$). Regarding the behavioral intention for mammography, the results of covariance test showed a significant difference in behavioral intention of two groups, immediately after and 2 months after intervention ($P < 0.00$) that showed efficacy of educational intervention in increasing behavioral intention of mammography in the intervention group compared with the control one (Table 2). The chi-square test results showed no significant difference in terms of BSE behavior between the groups before the intervention ($P = 0.264$). This difference was also not significant 2 months after educational intervention ($P = 0.848$). Also, there was no significant difference after the educational intervention between groups in terms of mammography behavior (0.874).

Discussion

Breast cancer is the most common cancer and the second leading cause of cancer death among women. Regarding the fact that no definite solution has been found for early prevention of this disease, early diagnosis of breast cancer has a significant role in reducing mortality and complications of the disease. Breast self-examination and mammography are known to be available and accurate methods for early diagnosis of breast cancer. In this regard, the present study aimed to determine the effect of education on health belief model on breast cancer screening behaviors in the health volunteers of health centers in Isfahan.

Table 1 Frequency distribution of health volunteers based on demographic factors

Variable	Group	Experimental group ($n = 240$)		Control group ($n = 240$)		P*
		Number	Percent	Number	Percent	
Age	35–45	116	51.8	112	49.8	$P = 0.36$
	45–55	72	32.1	63	28	
	55–65	35	14.6	50	22.2	
	65 ≥	1	0.4	0	0	
	Not mentioned	16	6.7	15	6.3	
Education level	Illiterate	6	2.6	6	2.5	$P = 0.82$
	Elementary level	64	27.2	86	35.8	
	Middle school	63	26.8	59	24.6	
	Diploma	87	37	72	30	
	Associates degree and bachelor	15	6.4	17	7.1	
	Not mentioned	5	2.1	0	0	
Spouse's education level	Illiterate	9	3.8	19	7.9	$P = 0.67$
	Elementary level	56	23.9	41	17.2	
	Middle school	66	28.2	80	33.3	
	Diploma	79	33.8	76	31.7	
	Associates degree and bachelor	17	7.3	17	7.1	
	Above MSc	7	3	6	2.5	
	Not mentioned	6	2.5	1	0.4	
Occupation	Housewife	233	97.1	228	95	$P = 1$
	Employee	2	0.8	3	1.3	
	Self-employed	5	2.1	9	3.8	
Marital status	Married	211	87.9	223	92.9	$P = 0.66$
	Unmarried	10	4.2	4	1.7	
	Divorced	4	1.7	2	0.8	
	Widowed	14	5.8	11	4.6	
	Not mentioned	1	0.4	0	0	
Breast cancer history of relations	Yes	46	19.2	40	16.7	$P = 0.01$
	No	194	80.8	200	83.3	
Background information	Yes	224	93.3	229	95.4	$P = 0.01$
	No	16	6.7	11	64	

*Chi-square test

The results of the current study indicated that there was a significant difference in knowledge score of the two experimental and control group, immediately after the intervention and the knowledge score of the volunteers in the intervention group significantly increased, compared to controls. The changes in knowledge are in line with the results of the study by Bakhtari-aghdam and colleagues in Tabriz health centers on the efficacy of education based on health belief model on the improvement of belief and creating breast cancer screening behavior [31], similar to the results of the study by Secginili et al. [32]. Also, various studies conducted in Iran and around the world, state the fact that women's awareness about the signs, symptoms, and risk factors for breast cancer, and the benefits of screening for breast cancer when it has no symptoms is low to moderate and these studies suggested that improving the level of public awareness and attitude about breast cancer screening behaviors can have a positive role on women's screening behavior [9, 10, 33].

The results also showed that after the educational intervention, based on the health belief model, the perceived susceptibility enhanced significantly; this finding is consistent with studies by Gurosy and colleagues [34], and Secginli and Nahcivan [32]. According to this model, women who believe to be prone to breast cancer and feel at risk of developing breast cancer, are more likely to undergo screening behaviors. In the present study, to increase perceived susceptibility to the disease in the volunteers, a patient with breast cancer at similar age were selected as the target group. Based on the results, it seems that using an actual model of a diseased person is effective to sensitize people about the disease.

Table 2 Comparison of HBM constructs' scores (M ± SD) for BSE and mammography in both groups

Variable		Pre-intervention (M ± Std)	Immediately after intervention (M ± Std)	2 month after intervention (M ± Std)
Knowledge	Experimental	8.90 ± 3.68	15.48 ± 3.67	16.14 ± 3.58
	Control	8.45 ± 3.17	9.34 ± 3.54	10.33 ± 3
	P value*	0.189	*P* = 0 < 00	*P* = 0 < 00
Perceived susceptibility	Experimental	6.41 ± 2/03	9.50 ± 3.37	3.71 ± 9.20
	Control	6.19 ± 2.11	6.58 ± 2.19	2.67 ± 6.67
	P value*	*P* = 0.308	*P* = 0 < 00	*P* = 0 < 00
Perceived severity	Experimental	21.60 ± 4.93	26.65 ± 5.10	25.59 ± 7.44
	Control	21.86 ± 4.28	22.09 ± 4.74	21.54 ± 2.27
	P value*	*P* = 0.745	*P* = 0 < 00	*P* = 0 < 00
Perceived barriers for BSE	Experimental	31.91 ± 4.93	35.50 ± 6.81	36.85 ± 5.94
	Control	32.25 ± 5.63	32.09 ± 5.36	33.46 ± 5.33
	P value*	*P* = 0.767	*P* = 0 < 00	*P* = 0 < 00
Self-efficacy for BSE	Experimental	25.56 ± 8.12	35.74 ± 8.28	38.15 ± 8.65
	Control	60.28 ± 5.58	28.89 ± 8.03	29.89 ± 8.29
	P value*	*P* = 0.698	*P* = 0 < 00	*P* = 0 < 00
Behavioral intention for BSE	Experimental	0.60 ± 0.493	0.94 ± 0.244	0.81 ± 0.393
	Control	0.70 ± 0.461	0.77 ± 0.420	0.95 ± 0.219
	P value*	*P* = 0.186	*P* = 0.003	*P* = 0.007
Skill for BSE	Experimental	1.190 ± 3.59	–	4.71 ± 1.38
	Control	1.22 ± 3.72	–	3.69 ± 1.11
	P value*	0.58	–	0.09
Perceived benefits of BSE	Experimental	21.13 ± 4.12	23.12 ± 3.00	23.14 ± 3.23
	Control	20.15 ± 3.13	21.12 ± 3.40	22.12 ± 3.20
	P value*	*P* = 0.140	*P* = 0 < 00	*P* = 0 < 00
Perceived benefits of mammography	Experimental	22.16 ± 4.46	25.15 ± 3.02	25.33 ± 3.44
	Control	21.35 ± 3.13	22.40 ± 3.75	23.20 ± 3.35
	P value*	*P* = 0.229	*P* = 0 < 00	P = 0.007
Perceived barriers for Mammography	Experimental	31.09 ± 6.31	34.75 ± 6.37	35.73 ± 6.74
	Control	29.96 ± 5.17	29.69 ± 6.01	33.18 ± 5.82
	P value*	*P* = 0.155	*P* = 0 < 00	*P* = 0 < 00
Behavioral intention for mammography	Experimental	0.69 ± 0.416	0.86 ± 0.211	0.80 ± 0.320
	Control	0.72 ± 0.481	0.74 ± 0.31	0.75 ± 0.122
	P value**	0.05	*P* = 0.004	*P* = 0.008

*Mann Whitney U-test/**ANCOVA

According to the results, educational intervention based on health belief model could increase the perceived severity of breast cancer in the intervention group, compared to the control group. This result is consistent with the studies by Gozum et al. [35], and Hatefnia et al. [36]. In the present study, to increase perceived severity, a real patient with breast cancer was used in educational sessions to talk about the lasting and limited complications of the disease that the patient is currently involved with. Intervention was successful in increasing the deterioration and severity of breast cancer, from the perspective of the participants. Of course, severity variable acts as a double-edged blade, i.e., when it is too much, denial or failure to adopt preventive behaviors may occur.

Regarding the perceived benefits, the two groups were not placed in a similar status before the intervention. Also, this difference after educational intervention and 2 months after intervention was significant between two groups of intervention and control. This was consistent with the study by Park and colleagues [37]. Considering the perceived benefits of mammography, mean scores before the intervention was similar between the two groups with no significant difference between them; while this difference was significant immediately after and 2 months after the intervention between the two groups. The results of numerous studies indicated the effectiveness of educational interventions based on health belief model was significant in increasing perceived benefits of

mammography [32]. In the present study, to increase the perceived benefits of screening behaviors, group discussion, lectures, and questions and answers (Q & A) were used. Based on the obtained results, it seems that the mentioned methods are effective to introduce the disease and screening behavior and clarify the benefits of each screening behavior.

Regarding the perceived barriers, the results showed a significant difference in BSE and mammography between the experimental and control groups, immediately after and 2 months after the intervention. The findings of this study is consistent with previous results by Park and colleagues [37] on BSE and Secginli and colleagues [32], Hatefnia and colleagues [36] on mammography. According to HBM, when the volunteers perceive the screening behaviors more and reduce the perceived barriers to these behaviors, these screening behavior occur more likely. In the present study, using brain storm, we discussed the barriers to mammography and BSE behavior and used creativity and consultation of volunteers to identify and determine how to dominate these barriers as much as possible.

The research findings show that the difference of mean scores of perceived self-efficacy between two groups of experimental and control was not significant before the educational intervention, while this difference was observed after and 2 months after the educational intervention that was parallel to the study by Aghamollaie et al. [38]. In this study, in order to increase perceived self-efficacy of BSE, instructional videos were used. Also, slides were used to divide the BSE behavior to smaller parts and by showing the BSE part by part, perceived self-efficiency increased in people regarding the mentioned behavior. Self-efficiency is a strong predictor of these behaviors and it seems that various and stronger interventions, and the efficiency on people's belief to their ability should be assessed.

In the present study, two groups of experimental and control were in the same level regarding breast cancer screening behavior before the intervention; also, there was no significant difference 2 months after intervention; these findings are in line with the studies by Zhu et al. [39] and is on the other hand inconsistent with the findings of studies by Piri and colleagues [40], and Karimi et al. [41]. It can be said that the observed increase in the structures of the model were not to the extent that improve the self-examination behavior. Besides, it can be said that regarding the considerable increase in screening behavior in the control group, the difference between the two groups between the experimental and control groups were not significant 2 months after intervention. The possible reasons of this increase in the control group two months after intervention can include the fact that participants in the control group after pre-test and post-test were curious about the breast cancer screening behavior after the intervention and have gained information from different sources, such as friends, relatives, doctors and health workers, books and internet.

Also, mammography behavior in the two groups of experimental and control had no significant difference before the intervention; this difference between two groups was not significant 2 months after the educational intervention, as well; this finding is consistent with the studied by Bakhtari-Aghdam et al. [31] and contrary to studies by Saatsaz and colleagues [10], Hatefnia and colleagues [36], and Sadler and colleagues [42]. Mammography behavior is influenced by numerous factors and many barriers may prevent it that were not taken into consideration in the current educational intervention. It seems that one of the most important barriers are financial barriers. Other factors include the absence of a mammography center in different areas of the city as well as the short duration of follow-up in the present study.

According to the findings of this study on behavioral intention, the difference between the experimental and control groups was significant immediately after and 2 months after intervention. This results are in line with the studies by Fletcher et al. [43], and Juon et al. [44]. In this study, despite the increase in the behavioral intention of BSE and mammography, there was no increase in BSE and mammography behavior. This can be due to the effect of enabling factors proposed in BASNEF model.

There was also no significant difference between the two groups in terms of behavioral skills and they were on the same level. However, 2 months after the intervention, the mean score of behavioral skills in the intervention group was significantly different, compared with the control group. This is consistent with studies by Wood et al. [45], and Farrokhi and colleagues [46]. In the experimental group, in order to increase the BSE behavior skills, video display was used along with PowerPoint slides. Regarding the fact that the control group did not receive the specific training for BSE behavior, the results do not seem unlikely. In the experimental group, to increase the BSE behavior skill, video display was used along with PowerPoint slides. In the study by Hadizadeh et al. [47] that aimed to assess the effect of an educational program in increasing the technique skill of BSE on 84 girl students, mean skill scores increased in post-test phase and stability test, compared to pre-test. Before the intervention, 94% had week skills, while 96.4 and 92.9% had good skills in the post-test phase after 3 days and stability test after 1 month. In the study by Farrokhi et al. that compared the effect of two educational methods on the skill and behavior of mothers in Bushehr city, after sampling among mothers of daughters of a pre-university school of Bushehr city and performing a primary test, one group was educated by their trained daughters and the other group by educators for BSE. The results showed that mother's skill was higher in the group trained for BSE by their daughters than educator. Also, mothers in the first group (educated by their daughters) performed the 3 month follow-up examination in a more frequently and timely manner than mothers in the second group (educated by educators) [46].

Given that the intervention and control groups had no significant difference in terms of most of the main variables of health belief model before the intervention, it seems that the observed difference between the two groups after educational interventions result from the effectiveness of educational programs based on health belief model. According to the findings of the study, it is suggested that future studies on breast cancer screening behaviors use a combination of behavior change model to obtain more effective results. Also, the 2 month follow-up to assess the effect of educational intervention on mammography behavior was not appropriate and it is suggested that future studies consider longer follow-up periods.

Limitations of this study include the high age of majority of the participants, and receiving information through various means including mass media, friends, and relatives who were out of control of the researchers. In addition, the present study considered women related with health volunteers and did not include housewives and women with other jobs.

In the end, it can be concluded that interventions especially theoretically based ones, besides preparing facilitating factors and enabling determinants, should be considered as a key strategy in promoting screening behaviors of cancers. Health systems' staff should be equipped with skills for designing and performing such interventions in high-risk populations. Obviously, education in different levels of prevention can reduce the cancer incidence, also expect early diagnosis and improve quality of life among affected individuals.

Compliance with Ethical Standards

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (No. 91–128).

Conflict of Interests The authors declare that they have no conflict of interest.

References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D (2011) Global cancer statistics. CA Cancer J Clin 61(2):69–90. https://doi.org/10.3322/caac.20107.Epub.2011Feb4.
2. Mirzaii K, Nessari S, Khadivzadeh T, Shakeri M (2016) Evaluation of the effects of breast cancer screening training based on the systematic comprehensive health education and promotion model on the attitudes and breast self-examination skills of women. Evid Based Care J 6(3):7–18
3. Institute for Health Metrics and Evaluation (IHME). GBD compare: statistic of breast cancer in Iran.2013. Available from http://vizhub.healthdata.org/gbd-compare [Accessed: 3.1.2013]
4. Moradi Y, Jafari M, Chaichian S, Khateri S, Akbarian A, Moazzami B, Mansori K, Mahmodi Y, Samie S (2016) Trends in ovarian cancer incidence in Iran. Int J Cancer Manag 9(6):e5452. https://doi.org/10.17795/ijcp-5452
5. Safaee A, Moghimi-Dehkordi B, Zeighami B, Tabatabaee HR, Pourhoseingholi MA (2008) Predictors of quality of life in breast cancer patients under chemotherapy. Indian J Cancer 45(3):107–111
6. Hoerger TJ, Ekwueme DU, Miller JW, Uzunangelov V, Hall IJ, Segel J, Royalty J, Gardner JG, Smith JL, Li C (2011) Estimated effects of the national breast and cervical cancer early detection program on breast cancer mortality. Am J Prev Med 40(4):397–404
7. Hosseini SM, Mousavi MT, Rfiee H, Eddin Karimi S (2016) The effect of social capital enhancement on quality of life, treatment compliance and pain in patients with breast cancer. Int J Cancer Manag 9(5):e4618. https://doi.org/10.17795/ijcp-4618
8. Anderson WF, Chu KC, Devesa SS (2004) Distinct incidence patterns among in situ and invasive breast carcinoma, with possible etiologic implications. Breast Cancer Res Treat 88(2):149–159
9. Ghorbani M, Abdolahi AA, Royani S, Azizi R (2009) Comparison knowledge, attitude and practice of barest self-examination. Iran J Breast Dis 2(3, 4):36–42 (In Persian)
10. SaatSaz S, Rezaei R, Nazari R, Haji Hosseini F, Seyedi Andi SJ. Effect of educational intervention on condition of knowledge and practice. Iran J Breast Dis. 2009; 2(3): 28–35. (In Persian)
11. Coughlin SS, Ekwueme DU (2009) Breast cancer as a global health concern. Cancer Epidemiol 33(5):315–323
12. American Cancer Society. Cancer facts and figures 2012. Atlanta: American cancer society. 2012:9–10. Available from: http://www.cdc.gov/cancer. [Accessed May 15, 2012]
13. Yip CH, Smith RA, Anderson OB, Miller AB, Thomas DB, Ang ES et al (2008) Guideline implementation for breast healthcare in low-income and middle-income countries. Cancer 113(8):2244–2300
14. Zhaohui L, Xiaoming W, Shengwen G, Binggang Y (2008) Diagnosis of breast cancer tumor based on manifold learning and support vector machine. Proc. IEEE Int. Conf. Information and Automation; 20-23: 703–707.
15. National Health Service (NHS). Cancer screening program. Breast screening program. Available from: http://www.cancerscreening.nhs.uk/index.html. [Accessed May 15, 2012]
16. Newcomer LM, Newcomb PA, Trentham-Dieatz A, Storer BE, Yasui Y, Daling JR et al (2002) Detection method and breast carcinoma histology. Cancer 95(3):470–477
17. Coleman M, Alexe DM, Albreht T, Martin M (2008) Responding to the challenge of cancer in Europe. Institute of Public Health of the Republic of Slovenia, Ljubljana, pp 77–80
18. Elmore J, Armstrong K, Lehman C, Fletcher S (2005) Screening for breast cancer. JAMA 293:1245–1256
19. Lyon, International Agency for Research on Cancer (IARC). World cancer report 2008. Available from: http://www.iarc.fr/en/publications/pdfs-online/wcr/2008/. [Accessed May 15, 2012]
20. American Cancer Society. Find cancer early: cancer screening guidelines. Available from http://www.cancer.org/Healthy/FindCancerEarly/. [Accessed May 16, 2012]
21. Frazier EL, Jiles RB, Mayberry R (1996) Use of screening mammography and clinical breast examination among black, Hispanic, and white women. Prev Med 25(2):118–125
22. Tavafian SS, Hasani L, Aghamolaei T, Zare S, Gregory D (2009) Prediction of breast self-examination in a sample of Iranian women: an application of the health belief model. Bio Med Central Women's Health 9(1):37
23. Farshbaf Khalili A, Shanazi M, Ghahvechi A, Thorabi S (2008) Performance conditions of breast cancer screening methods and its efficient factors among women referring to health centers of Tabriz. Iran J Nurs Res 12(13, 14):27–38 (In Persian)
24. Shiraly R, Asadollahi K, Asadollahi P (2010) Risk perception and preventive issues for breast cancer among female employees. Iran J Cancer Prev 3(4):166–173
25. Nafissi N, Saghafinia M, Mk M, Akbari ME (2012) A survey of breast cancer knowledge and attitude in Iranian women. J Can Res Ther 8:46–49

26. Sadeghnezhad F, Niknami S, Ghaffari M (2008) Effect of health education methods on promoting breast self-examination (BSE). Sci J Birjand Univ Med Sci 15(4):38–48 (In Persian)
27. Baba Mohammadi H, Asgari MajdAbadi H, Kahoi M (2005) The effect of education based on health promotion model for empowerment of health volunteers of health centers in prevention of osteoporosis. Daneshvar Science Research Medical Scholar, Shahed University 13(59):250–251 (In Persian)
28. Sadeghiyan MR, Hatami R (1997) Menopause symbol development. Roshangaran publication, Tehran, pp 250–251 (In Persian)
29. Miri MR, Ramezani AA, Hanafi H (2005) The effect of rural livelihoods satellite project on rate of healthy knowledge and attitude of rural women's. Sci J Birjand Med Univ 12:1–2 (In Persian)
30. Teymoori P, Berry T (2009) The validity and reliability of champion's health belief model scale for breast cancer screening behaviors among Iranian women. Cancer Nurs 32(6):465–472
31. Bakhtari Aghdam F, Noorizadeh R, Sahebi L (2012) The role of health belief model in promotion of beliefs and behaviors of breast cancer screening in women referring in women referring to health care centers of Tabriz. Med J Tabriz Univ Med Sci Health 6(33):25–31 (In Persian)
32. Secgnili S, Nahcivan NO (2011) The effectiveness of a nurse-delivered breast health promotion program on breast cancer screening behaviors in non-adherent Turkish women: a randomized controlled trial. Int J Nurs Stud 48(1):24–36
33. Fazel N, Akbar zadeh R, Estaji Z, Akabery A. Breast self-examination: knowledge, and performance among upper 20 year old women in health centers in Sabzevar-Iran in 2010. Iran J Breast Dis 2010; 3(1): 49–54. (In Persian)
34. Gurosy AA, Ylmaz F, Nural N, Kahriman I, Yigitbas C, Erdol H et al (2009) A different approach to breast self-examination education: daughters educating mothers creates positive results in Turkey. Cancer Nurs 32(2):127–134
35. Gozum S, Karayurt O, Kav S, Platin N (2010) Effectiveness of peer education for breast cancer screening and health beliefs in eastern Turkey. Cancer Nurs 33(3):213–220
36. Hatefnia E, Niknami Sh, Mahmoudi M, Ghofranipour F, Lamyian M. The effect of health belief model education on knowledge attitude and behavior of Tehran pharmaceutical industry employees. Behbood J 2010; 14(1): 42–53. (In Persian)
37. Park S, Song HY, Hur HK, Kim G (2009) Effects of a cognitive-oriented breast self-examination intervention for Korean women and their spouses. Public Health Nurs 26(3):259–268
38. Aghamolaei T, Hasani L, Tavafian SS, Zare S (2011) Improving breast self-examination: an educational intervention based on health belief model. Iran J Cancer Prev 4(2):82–87
39. Zhu K, Hunter S, Bernard LJ, Wilks KP, Roland CL, Elam LC et al (2002) An intervention study on screening for breast cancer among single African-American women aged 65 and older. Prev Med 34(2):536–545
40. Piri M, Mohammad Yari S, Zarei M. Evaluation effect of education based on health belief model in creation of self-breast examination behavior in students of Medical University of Qom in 2011. Breast Cancer Res Center: Tehran University of Medical Sciences Jahad. Journal of Breast Diseases (The 7th international breast cancer congress). 2012 Feb.22–24: Tehran. Iran. P: 190. (In Persian)
41. Karimy M, Hasani M, Khorram R, Ghaffari M, Niknami Sh. The effect of education, based on health belief model on breast self-examination in health liaisons of Zarandieh city. ZJRMS 2008; 4(10): 281–289. (In Persian).
42. Sadler GR, Ko CM, Wu P, Alisangco J, Castaneda SF, Kelly C (2011) A cluster randomized controlled trial to increase breast cancer screening among African American women: the black cosmetologists promoting health program. J Natl Med Assoc 103(8):735–745
43. Fletcher SW, Harris RP, Gonzalez JJ, Degnan D, Lannin DR, Stretcher VJ et al (1993) Increasing mammography utilization: a controlled study. J Natl Cancer Inst 85(2):112–120
44. Juon HS, Choi S, Klassen A, Roter D (2006) Impact of breast cancer screening intervention on Korean-American women in Maryland. Cancer Detect Prev 30(3):297–305
45. Wood RN, Robin Y (1996) Breast self-examination proficiency in older women: measuring the efficacy of video self-instruction kits. Cancer Nurs 19(6):429–436
46. Farokhi M, Ghfariyan Shirazi HR (2001) Comparison of direct and indirect methods of teaching skills and behaviors of mothers about self-breast examination. Iran South Med J 3(2):94–97 (In Persian)
47. Hadizadeh Talasaz F, Latifinejad R, Khoynejad GH, Esmaelly H. The effect of a systematic instruction program on proficiency of female students about breast self-examination (BSE). Teb & Tazkiye 2005; 13(1): 60–67 (In Persian)