The Effectiveness of Health Belief Model Initiative in Breast Cancer Screening Behaviors among Women Health Volunteers

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ABSTRACT
Knowledge of screening methods and regular diagnostic tests play an important role in reducing the incidence of cancers and their mortality. We investigated the effectiveness of health belief model initiative in breast cancer screening behaviors among women health volunteers. A quasi-experimental design and non-probability sampling technique was conducted during 2019 in Abhar, Iran. Two out of six health centers were approached and each was recruited in either experimental or control group. Based on the Iranian and standardized version of the Champion's Health Belief Model Scale, the different domains of the scale and breast cancer screening behaviors of eligible women health volunteers (n = 72) were evaluated. Then, seven training sessions were designed and implemented for the intervention group using local language and different educational approaches. The participants were reevaluated according to the same questionnaire three months after the intervention. There was a meaningful difference regarding breast self-exam, knowledge, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers among both the control and intervention groups before and after the intervention. Training programs using health belief model are crucial in developing breast cancer screening behaviors for women health volunteers. Thus, it is recommended that training programs should be conducted using individual behavioral models.

KEYWORDS
Cancer of breast; education; screening behaviors; volunteers; Iran

Introduction
Cancer is considered as one of the most concerning health problems throughout the world (Saadatpour et al., 2017). Among all the cancers, breast cancer is the most common among women and the second in the world, yet the survival rate is better than other cancers, given its relatively good prognosis and is the fifth leading cause of death (Akbarzadeh, Zangiabadi, Moattari, & Tabatabaei, 2009; Bray et al., 2018). The prevalence in the United States has been reported to be 29%, with about 16% of annual deaths (Ferlay et al., 2015; Siegel, Miller, & Jemal, 2015).

Despite the increase in prevalence, mortality rates have decreased and treatment outcomes have enhanced in developed countries (Akbarzadeh et al., 2009; Pearlman, 2014). It seems that early diagnosis of breast cancer affects the options of treatment choice, as a result of which the psychological effects of body image reduce in some women making women feel they have control over their disease and body (Mark, Temkin, & Terplan, 2014). In general, cancer-related fatigue causes disruption in all...
domains of quality of life (psychological, spiritual, physical, and functional dimensions) and may be a risk factor for reduced survival (Zou, Hu, & McCoy, 2014).

Breast cancer is the most prevalent cancer among women in Iran, accounting for around 32.9% of the cancers and is the cause of 19% of cancer-related deaths (Akbarzadeh et al., 2009). Also, age-standardized incidence rate for Iranian women in 2018 per 100,000 populations was 31.0 and age-standardized mortality rate of breast cancer was 8.7 per 100,000 populations (Jonsson, Kobelt, Motlagh, Wilking, & Wilking, 2019). Moreover, breast cancer is usually diagnosed in advanced stages with poor prognosis in Iran. The main reason behind the delay in the diagnosis of breast cancer is the lack of awareness of cancer signs and symptoms (Ferlay et al., 2015; Ghaffari, Esfahani, Rakhshanderou, & Koukamari, 2019). Studies have indicated that using screening in routine medical care reduces mortality and improves survival (Bagb et al., 2011; Omar, Burgess, Tucker, Whelehan, & Ramirez, 2010; Siegel et al., 2015). Screening methods recommended for early diagnosis of breast cancer are mammography, magnetic resonance imaging, clinical examination, and breast self-examination (Desantis, Siegel, & Jemal, 2013). Breast Self-Exam (BSE) is a simple, low-cost, technology-free approach that can be performed with brief training (Mark et al., 2014).

Various Iranian studies have shown that women are less aware of the symptoms and risk factors for breast cancer when they do not find themselves at risk for this cancer (Fazel, Akbarzadeh, Estaji, & Akbari, 2010; Ghaffari et al., 2019). These studies suggest that public awareness should be raised to learn more about breast cancer prevention strategies. Furthermore, the rate of regular breast cancer screening behaviors in Iran is significantly low, varies from 1.3% to 30%, and various factors such as age, level of education, insurance and occupation affect the rate of these behaviors (Alavi, Hoseininejad, Masoom, & Shakeri, 2010; Banaeiian, Kazemian, & Kheiri, 2006; Farshbaf, Shnazi, Ghahvehchi, & Torabi, 2009; Khazaee-Pool et al., 2014). Early diagnosis remains an important early detection strategy, particularly in low- and middle-income countries where the diseases are diagnosed in late stages and resources are very limited (Bozorgi et al., 2018; Khazaee-Pool et al., 2014).

Despite having access to information about the risks and awareness about screening, similar studies have shown that many women do not implement it regularly (Kataoka, Ohbayashi, & Suzuki, 2015; Masoudiyekta et al., 2018). A set of behavioral patterns related to thoughts, manners, actions, values, attitudes, and perceptions of cancer affect breast cancer screening behaviors (Donnelly et al., 2013). Moreover, most of the literatures have explored that more training is associated with promoting awareness and breast self-exam behaviors (Bhatt et al., 2011; Rosmawati, 2010). Choosing a suitable health-promoting model is the first step of an initiative which relies on mastering the best theory and appropriate strategies. Health Belief Model (HBM) is a proprietary model that covers prevention of diseases and cancer issues as well as screening behaviors (Mohamed, Moey, & Lim, 2019; Oyekale & Oyekale, 2010). The model was developed by Hochbaum and Rosenstock in 1950 for health professionals (Hochbaum, Rosenstock, & Kegeles, 2019). It posits that six constructs predict health behavior: risk susceptibility, risk severity, benefits to action, barriers to action, self-efficacy, and cues to action. Based on this model, when people consider themselves at risk, they may understand that the disease has serious and potential consequences, therefore they may believe that preventive actions have positive outcomes. The greatest perceived benefit from breast screening and self-efficacy would encourage them to perform screening behaviors seriously (Assari, 2011; Tavafian, Hasani, Aghamolaei, Zare, & Gregory, 2009).

Although addressing issues of health problems of the community is the main task of the health care system and its employees, performing this mission is impossible without the assistance of social participation (Rezakhani Moghaddam, Allahverdispour, & Matlabi, 2018a). One of the best ways to organize people’s participation is the implementation of a health volunteer program. They usually learn health subjects and share to the community members using simple word and phrases. They also identify people’s needs and beliefs thoroughly and interestingly bring health training sessions closer to their experiences and real lives (Rezakhani Moghaddam, Allahverdispour, & Matlabi, 2018b).
In regard to women health volunteers, we could not identify the relevant literatures in the northwest of Iran, therefore, the goal of this study was to investigate the effectiveness of health belief model initiative in breast cancer screening behaviors among women health volunteers.

**Materials and methods**

**Study design**

A quasi-experimental design (pre- and post- two groups design) and non-probability sampling technique was conducted during 2019 in Abhar, Iran.

**Setting and participants**

Abhar, with a population of approximately 99,285 consists of the 6 health centers and 230 villages located 100 km (km) south east of Zanjan and has an area of 3362 km². The target population was chosen from Abhar health volunteers. The total number of active volunteers was 400 who operated at six health centers. First of all, two health centers were randomly approached and all eligible volunteers (n = 74) were divided into two groups of intervention and control with 95% confidence interval, second error (\( \hat{\beta} = 0.2 \)), and significance value (\( p < .05 \)) based on the sample size calculation formula (Ebadifard Azar & Rimaz, 2012).

\[
\hat{n} = \frac{\left( Z_{\frac{\alpha}{2}} + Z_{\beta} \right)^2 \left( \sigma_1^2 + \sigma_2^2 \right)}{(\mu_1 - \mu_2)^2}
\]

Two volunteers refused to cooperate after allocation to the research groups. The inclusion criteria were specified as follows:

1. being 18 years old;
2. having an active relationship with the health center in recent year;
3. having no history of breast problems among themselves and their relatives.

**Tools**

Socio-demographic characteristics and the Iranian version of the Champion’s Health Belief Model Scale were used to design the intervention. Champion developed and validated the original scale in 1984, consisting of 36 items to measure perceived susceptibility as well as perceived benefits and barriers to breast self-exam behaviors (Champion, 1984). The validity and reliability of the scale was confirmed during 2009 among Iranian women (Taymoori & Berry, 2009).

**Procedures and protocol**

The health managers were contacted for permission to use their scheme for fieldwork.

The face-to-face questionnaire-based interviews took approximately one hour to complete on average in a suitable place in health centers. All health volunteers answered the questions during two stages of pre and post intervention. The factors affecting breast screening behaviors were identified based on the different domains of the scale and health motivation. Then, all participants in the case group attended a seven-weekly session, in which a midwife acted as a facilitator to encourage the participants to learn and share their experiences about chosen topics using different educational approaches such as lectures, role playing, and audio-visual technologies (see Table 1). Finally, after three months the perceived susceptibility as well as perceived benefits and barriers to breast self-exam behaviors of both groups were reevaluated by the same questionnaire.
Table 1. The protocol for health belief model initiative and breast self-exam behaviors.

| Sessions | Meetings details |
|----------|------------------|
| Session 1 | Communicating and introducing volunteers to each other, explaining the aims of the training sessions, familiarizing with the concepts in breast self-examination, improving beliefs about breast self-awareness, increasing volunteers’ sensitivity about breast cancer, breast self-examination, familiarizing with breast cancer screening methods, filling the consent form, and closed session. |
| Session 2 | Holding a lecture about breast anatomy, explaining the different parts of the breast using different audio-visual technologies, presenting signs and symptoms of breast cancer (breast lump or thickening that feels different from the surrounding tissue; change in the size, shape or appearance of a breast; changes to the skin over the breast), and closed session. |
| Session 3 | Assessing the perceived susceptibility, severity of breast cancer survivors, and their irrational beliefs about breast self-awareness through group discussions, presenting assignments to group members, and closed session. |
| Session 4 | Explaining about different types of breast discharges, benign breast lumps, non-cancerous, and malignant breast tumors, and closed session. |
| Session 5 | Explaining different breast cancer screening behaviors and breast self-examination techniques, discussing about the benefits/barriers of breast self-examination, and closed session. |
| Session 6 | Practicing breast self-examination using different educational approaches, exercising about mammography screening method, the benefits of mammography, and closed session. |
| Session 7 | Discussing about barriers and problems related to breast cancer screening behavior, and summarizing/evaluating the previous sessions. |

Data analysis

The collected data were analyzed using descriptive statistics, paired t-test, independent t-test, chi-square, and ANCOVA. The significance level was considered 0.05. The Kolmogorov–Smirnov test was used to determine if a data set was well modeled by a normal distribution ($p > .05$). Moreover, covariance analysis is used to adjust for difference between groups before intervention.

Results

Socio-demographic characteristics

In this section, the characteristics of the 72 respondents including age, levels of education, family size, profession, level of income, breastfeeding history, types of feeding, and family history of breast cancer is described. All participants were female. As for their age distribution, 78% and 88% of the health volunteers in the experimental and control groups were aged 20–49 years. Regarding levels of education, the majority of women health volunteers were ranged from primary to secondary level. The most common professions were housekeeper. Furthermore, three specific types of infant feeding were stated as exclusively breastfeeding (more than half); replacement feeding receiving no breast milk (nearly one-third); or mixed feeding with breast milk and replacement feeding. Concerning family history of breast cancer, 95% and 100% of the respondents in the experimental and control groups did not report the diseases among their family members. Income, defined as the earnings in 2019, was recorded as one of three categories (low, middle, and high). Approximately two-thirds of the participants were classified as having a middle income. There were no statistically significant differences between the two groups in terms of age, education, occupation, number of children, types of feeding, family history of breast cancer, and income groupings (see Table 2).

As mentioned before, the HBM posits that six constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and motivation) predict health behavior. In this section, the constructs are compared before and after the educational intervention among two groups (see Table 3). Before the intervention, no significant differences were found between the groups except for perceived benefits and self-efficacy. However, after the intervention, mean scores of perceived susceptibility, perceived barriers, self-efficacy, and motivational variables were significantly different between the two groups (tested by ANCOVA after adjusting for pre-intervention means). Paired t-test showed that in the intervention group except the perceived severity and motivation for health, the mean scores of other constructs before and after the intervention were significantly
Table 2. Socio-demographic characteristics of the women health volunteers (n = 72).

| Variables              | Control group     | Experimental group | p-Value |
|------------------------|-------------------|--------------------|---------|
|                        | N  | %    | N  | %    |                |         |
| Age groups             |    |      |    |      |                |         |
| 20–29                  | 7  | 19.44| 2  | 5.55 | 0.96           |         |
| 30–39                  | 12 | 33.33| 16 | 44.44|                |         |
| 40–49                  | 9  | 25   | 14 | 38.88|                |         |
| 50–59                  | 5  | 13.88| 3  | 8.33 |                |         |
| ≥60                    | 3  | 8.33 | 1  | 2.77 |                |         |
| Levels of education    |    |      |    |      |                |         |
| Primary                | 23 | 63.88| 22 | 61   | 0.37           |         |
| Secondary              | 11 | 30.55| 11 | 30.5 |                |         |
| College                | 2  | 5.5  | 3  | 8.3  |                |         |
| Profession             |    |      |    |      |                |         |
| Housekeeper            | 30 | 83.3 | 31 | 86.1 | 0.56           |         |
| Employed               | 6  | 16.6 | 5  | 13.8 |                |         |
| Family size            |    |      |    |      |                |         |
| 2                      | 7  | 19.4 | 9  | 25   | 0.2            |         |
| 3                      | 10 | 27.7 | 4  | 11.1 |                |         |
| ≥4                     | 19 | 52.7 | 23 | 63.8 |                |         |
| Types of feeding       |    |      |    |      |                |         |
| Replacement feeding    | 10 | 27.7 | 10 | 27.7 | 0.68           |         |
| Exclusively breastfeeding | 22 | 61.1 | 24 | 66.6 |                |         |
| Mixed feeding          | 4  | 11.1 | 3  | 8.3  |                |         |
| Family history of breast cancer | Yes | 2 | 5 | 0 | 0 | 0.15 |
|                        | No  | 34 | 95 | 36 | 100 |         |
| Income groupings       |    |      |    |      |                |         |
| Low                    | 10 | 27.7 | 4  | 6   | 0.36           |         |
| Middle                 | 23 | 68.8 | 28 | 77.7|                |         |
| High                   | 3  | 3.3  | 4  | 6   |                |         |

Table 3. Comparison of the HBM constructs before and after the intervention (n = 72).

| Variables          | Control group | Experimental group | ANCOVA |
|--------------------|---------------|--------------------|--------|
|                    | Mean (± SD)   | Mean (± SD)        |        |
| Perceived susceptibility | 7.31 (2.66) | 7.42 (2.94) | 24.97 | <0.001 |
| Perceived severity  | 23.06 (4.1)  | 23.31 (4.89) | 0.61  | <0.001 |
| Perceived benefits  | 21.89 (3.52) | 23.81 (3.3)  | 3.35  | 0.43   |
| Perceived barriers  | 22.28 (5.05) | 22.61 (10.24) | 6.08  | 0.01   |
| Self-efficacy       | 27.36 (8.93) | 29.17 (9.33) | 44.51 | 0.07   |
| Motivation          | 27.08 (4.57) | 27.39 (4.53) | 9.07  | 0.004  |

Discussion and conclusion

The goal of this study was to investigate the effectiveness of health belief model initiative in breast cancer screening behaviors among women health volunteers. A HBM-based education in Turkey among immigrants living in Antalya indicated that the intervention had a positive effect on cancer screening behaviors. The perceived susceptibility to breast cancer and self-efficacy significantly improved and the barriers to screening methods decreased (Tuzcu, Bahar, & Gozum, 2016). Similar study in Iran showed that BSE and mammography were significantly increased in the experimental group compared to the control group (Ghaffari et al., 2019). We found that the intervention performed had a significant effect on BCS behaviors among health volunteers.

While the mean scores of health belief model constructs (except for perceived benefits and self-efficacy) were not statistically significant between the two groups before the intervention, the differences were significant after the intervention. There are many reasons that could lead to this concern,
such as the availability of continuing training about particular issues for volunteers in the health centers. Moreover, it has been revealed that a person with high self-efficacy is more likely to feel confident, capable, competent, and merit (Karimy, Montazeri, & Araban, 2012). A further research among Indian women introduced different approaches to improve self-efficacy and BCS behaviors (Kessler, 2012). Bandora and Adams also consider self-efficacy as the most significant precondition for behavior changes (Taghdisi & Nejadsadeghi, 2011). Individuals with high self-efficacy choose to perform healthier habits and practices as self-efficacy are the strongest determinant of intention to control and reduce barriers. It is advocated that health system professionals should have a precise analysis of the individual’s self-efficacy to design and implement a suitable intervention.

In the present study, significant differences among experimental group were more intense in perceived susceptibility, which is in line with the findings of most studies in this area (Ghaifari et al., 2019; Khiyali, Aliyan, Kashfi, Mansourian, & Jeihooni, 2017; Masoudiyekta et al., 2018). However, some studies have reported a decrease in perceived susceptibility after training (Avci & Gozum, 2009; Lu, 2001). One of the reasons for increasing perceived susceptibility about breast cancer could be the initiative intervention strategies used and the method of implementation. Many people do not take preventive behavior because they do not consider themselves exposed to a disease or health problem, therefore, health care workers should present appropriate information about the status of individuals at risk for diseases.

### Table 4. Comparison of the HBM constructs before and after the intervention (n = 72).

| Variables            | Experimental group | Control group | *p*-Value |
|----------------------|--------------------|---------------|-----------|
|                      | Mean (± SD)        | Mean (± SD)   |           |
| **Motivation**       |                    |               |           |
| Before               | 30.4 (5.91)        | 28.56 (4)     | 0.055     |
| After                | 31.52 (3)          | 29.53 (4)     | 0.00      |
| p-value              | 0.32               | 0.001         |           |
| **Perceived susceptibility** |                |              |           |
| Before               | 8.75 (2)           | 8.6 (2)       | 0.85      |
| After                | 10.5 (1.84)        | 7 (2.65)      | 0.00      |
| p-value              | 0.00               | 0.001         |           |
| **Perceived severity** |                   |               |           |
| Before               | 23.5 (6.22)        | 23 (4)        | 0.35      |
| After                | 24 (3.17)          | 23.09 (4.89)  | 0.46      |
| p-value              | 0.86               | 0.46          |           |
| **Perceived benefits** |                   |               |           |
| Before               | 23.38 (3)          | 22.51 (3)     | 0.09      |
| After                | 27 (2.22)          | 21 (3.51)     | 0.00      |
| p-value              | 0.00               | 0.00          |           |
| **Perceived barriers** |                   |               |           |
| Before               | 24 (6.08)          | 22.5 (5.04)   | 0.1       |
| After                | 18 (3.72)          | 22.2 (5.04)   | 0.00      |
| p-value              | 0.00               | 0.002         |           |
| **Self-efficacy**    |                    |               |           |
| Before               | 21 (7.68)          | 26 (1.01)     | 0.02      |
| After                | 39 (3.47)          | 26 (4.53)     | 0.00      |
| p-value              | 0.00               | 0.00          |           |

*Paired t-test.

### Table 5. The frequency of breast self-exam before and after the intervention (n = 72).

| Phase     | Experimental | Control | p-Value |
|-----------|--------------|---------|---------|
| Before    | 10 (28%)     | 12 (33.3%) | 0.14 |
| After     | 25 (70%)     | 12 (33.3%) | 0.004 |
| <b>p-value</b> | 0.001 | 0.14 |
Perceived severity (also called perceived seriousness) refers to a person’s subjective perception of the risk of acquiring an illness or disease such as a diagnosis of cancer (Che Mohamed, Moey, & Lim, 2019). After the program, the experimental group perceived a given health problem as serious and were more likely to engage in behaviors to prevent the breast cancer from occurring or reduce its severity, which is in agreement with the results of other studies (Ebadifard Azar & Rimaz, 2012; Ghaaffari et al., 2019). The health system personnel should improve the women perceived severity based on their individual and mental conditions. It should be noted that the creation of unrealistic fears precludes timely referral and diagnosis and treatment of the disease.

The perceived benefit construct is most often applied to health behaviors and the term is frequently used to explain an individual’s motives of performing a behavior and adopting an intervention or treatment (Oyekale & Oyekale, 2010). Our intervention increased cancer knowledge and perceived benefits significantly. This result is consistent with related studies about preventive approaches of breast cancer (Eskandari-Torbaghan, Kalan-Farmanfarma, Ansari-Moghaddam, & Zarei, 2014; Farma, Jalili, Zareban, & Pour, 2014). Various studies have also shown a significant relationship between perceived benefits and adopting healthy behaviors (Ceber, Yücel, Mermer, & Ozentürk, 2009; Masoudiyekta et al., 2018). Furthermore, both retrospective and prospective studies have shown that perceived barriers are the most capable aspect in expressing or predicting caring behaviors (Mohammadi & Rafee, 2004). One can state that reducing the barriers to adopting BCS behaviors has been associated with an increased motivation for health and perceived benefits. In many cases, people usually do not consider preventive behaviors carefully as they seem unrealistic and simplistic. Therefore, along with actual perceived susceptibility and severity, the benefits of cancer screening should also be explained. These results are comparable with the theoretical foundations of HBM (Glanz, Rimer, & Viswanath, 2008).

Getting regular breast-cancer-related tests such as breast physical exam and yearly imaging studies can reduce risk. The purpose is to find breast cancer early, before any symptoms can develop and the cancer usually is easier to treat (Beydag & Yurugen, 2010). In regard to screening behaviors, we found that the mean scores of the related variables in the intervention group were significantly different from the control group before and after the intervention. Likewise, previous studies have revealed that applying multi-approach initiatives based on different domains of HBM may improve the adoption of breast cancer screening behaviors (Khiyali et al., 2017; Mirzaei, Nessari, Khadivzadeh, & Shakeri, 2016). For this reason, it is suggested that all constructs of the model should be considered in the studies. Furthermore, we found that about 30% of women health volunteers practiced breast cancer screening regularly. This trend was interestingly reported 63% in the United States (Secginli & Nahcivan, 2006). It may raise that Iranian women are ignoring these healthy behaviors. Thus, identifying cognitive factors is essential for developing effective interventions. Factors that may contribute to include barriers to early detection and screening, access to health centers and the higher likelihood of being diagnosed with a more aggressive form of cancer known as triple-negative cancer. We applied a multi-approach through local language training sessions involving lectures, role playing, film screening, and use of moulage to improve women’s performances. This may indicate the need for doing cancer screening and removing obstacles, since breast diseases involve the emotional and sexual division of women’s bodies (Mikhail & Petro-Nustas, 2001). Generally, community-based interventions and models of individual health behavior along with cultural and environmental determinants may influence the promotion of breast cancer screening.

**Limitations of the study**

One of the limitations of the study was that only 3 months after the intervention the follow-up was conducted and not followed up in long time periods for the durable assessing.
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Compliance with ethical standards

This study was approved by the Ethical Review Committee of the Tabriz University of Medical Sciences (IR.TBZMED.REC.1397.033).

Disclosure statement

The authors declare that they have no conflict of interest.

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