The Effect of Educational Intervention Based on Health Belief Model and Social Support on the Rate of Participation of Individuals in Performing Fecal Occult Blood Test for Colorectal Cancer Screening

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Abstract

Background and Aim: Among the screening tests for colorectal cancer, fecal occult blood test (FOBT) is important in comparison other methods due to its ease of use and low cost. The aim of this study is to survey the effect of educational intervention based on health belief model and social support on the rate of participation of individuals in performing fecal occult blood test for colorectal cancer screening among men who referred to the health centers in Fasa City, Fars province, Iran. Materials and Methods: In this quasi-experimental study, 200 men (100 in experimental group and 100 in control group) in Fasa City, Fars province, Iran were selected in 2017. A questionnaire consisting of demographic information, knowledge, HBM constructs (perceived susceptibility, severity, benefits, barriers, self-efficacy, and cues to action) and social support was used to measure the rate of participation of individuals in performing Fecal Occult Blood Test for colorectal cancer screening before and three months after the intervention. Data were analyzed using SPSS22 via descriptive and inferential statistics, paired t-test, Mann-Whitney, Chi-square, and independent t-test at a significance level of 0.5. Results: The mean age of the men was 63.18 ± 8.25 years in the experimental group and 65.11 ± 7.66 years in the control group. Three months after the intervention, the experimental group showed a significant increase in the knowledge, perceived susceptibility, perceived severity, perceived benefits, Self-efficacy, cues to action, social support and the level of referrals (participation) of subjects for FOBT compared to the control group. Conclusion: This study showed the effectiveness of HBM constructs and social support in adoption of the level of participation of subjects for FOBT in men. Hence, these models can act as a framework for designing and implementing educational interventions for undergoing FOBT.

Keywords: Fecal occult blood test- men- health belief model- social support- colorectal cancer
from colorectal cancer annually, about half of which die before the fifth years after the onset of the disease (Newton et al., 2012).

Reports from Eastern Asian regions, such as Hong Kong, Taiwan, urban China, Singapore, and Thailand, indicate a rapid rise in CRC incidence, close to the rates reported in Western populations (Sung et al., 2005).

A rise in CRC incidence has also been observed in Western Asian countries that were historically considered to have very low rates of the disease. For instance, epidemiological studies in Iran have shown that the CRC rate, although still relatively low, has increased significantly over the past three decades (Malekzadeh et al., 2009). Notwithstanding the rise of CRC in almost all developing countries, the acceleration rates may differ among populations. For example, in India, where an increase in the rates of CRC over the past decades has been reported, the steep is steadier and less rapid compared to other developing countries in East Asia (Karsa et al., 2010).

The increase in CRC incidence in developing countries, that are often equipped with fewer resources, are paralleled by an increase in the mortality rates, as indicated by studies from South America and Eastern Europe (Center et al., 2009).

Hence, it is predicted that the incidence of CRC will dramatically increase over the next decade, nearing a doubling of the current rates, with most of the new cases occurring in developing countries (Karsa et al., 2010).

Given the shocking prevalence and mortality of colorectal cancer, prevention of this cancer is of particular importance. For diseases that cannot be prevented via primary prevention measures, secondary prevention is a priority. Therefore, in this case with no known primary prevention, secondary prevention including early diagnosis can be effective in providing rapid treatment and prevent its spread (Jemalet al., 2011). Since colorectal cancer has a slow progress, 90% of the patients can be treated after in time diagnosis. Regular screening is one of the best and most valuable early detection methods in this disease. Among the screening tests for colorectal cancer, fecal occult blood test (FOBT) is important in comparison other methods due to its ease of use and low cost (Mokarram et al., 2016). Accordingly, in the program for colorectal cancer screening in the United States at first, people with high and moderate risk undergo FOBT, and if the result of the test is positive, they are referred for more accurate tests, such as sigmoidoscopy and colonoscopy (Brouse et al., 2003). Given the high incidence and mortality rate of colorectal cancer, its prevention is of particular importance. This is particularly true because colorectal cancer is often asymptomatic in the early stages, but with the progression of the disease, symptoms such as bleeding from the rectum, the presence of blood in the stool, changes in bowel movements, pain and cramps in the lower abdomen, and weakness and excessive fatigue due to anemia resulted from bleeding, emerge (American Cancer Society, 2011). Despite the growing trend of this disease, a decline has been seen in the United States, which is partly due to an increase in the number of screening tests, resulting in early diagnosis and timely treatment (American Cancer Society, 2011). Since most mortality rates of colorectal cancer can be prevented through screening tests and timely treatment (Sadjadi et al., 2005). The 5-year survival rate of colorectal cancer is closely related to its diagnosis. If it is detected at an early stage, the survival rate increases to 90%. Therefore, regular screening is considered as one of the most important and most valuable diagnostic methods for this disease (Menon et al., 2003).

Health care providers play a key role in the screening behavior process by increasing awareness about CRC and screening tests in participants, reducing perceived barriers and increasing perceived benefits of screening tests. Physician recommendation has shown a strong correlation with CRC screening behaviors across the studies (Zapka et al., 2002).

Offering available recommended strategies and discussing benefits and drawbacks with patients have been suggested as the most effective procedure to achieve high participation rates (Klabunde et al., 2009).

Health system factors have been associated with CRC screening uptake and physician recommendation. Apart from the lack of insurance previously commented, coverage for accessing to the screening service, lack of time to discuss CRC screening with the patient, or lack of physician’s reminders have been consistently reported as barriers (Guerra et al., 2007).

Psychosocial factors involve those related to knowledge about CRC and screening, risk perception of CRC, and perceived barriers and benefits. Studies have been done on a number of demographic, social, and environmental determinants of colorectal cancer screening (e.g., insurance coverage, discussion with a medical professional. Given that screening ultimately requires behavioral action on the part of the individual person (e.g., going to a colonoscopy appointment; completing and mailing an FOBT card), understanding factors involved in individual decision making regarding screening is necessary to improve upon suboptimal screening compliance. The health behavior literature includes numerous theoretical models that describe factors serving as inputs to individual behavioral choices about engaging in health-related behaviors. The importance of theory-based approaches for both understanding health behavior and developing behavior change interventions is frequently discussed (Hou et al., 2005; James et al., 2002; Janda et al., 2002).

According to Taylor, Health Belief Model (HBM), which explains health behaviors, can well justify the lack of participation in the screening process (Taylor et al., 1999). HBM, which was also used as the theoretical framework in this study, has been used to evaluate health beliefs about screening behaviors (Hajializadeh et al., 2013). Based on this model, if people believe that they are susceptible to diseases such as cancer (perceived susceptibility); perceive the risk intensity of its various complications in their life (perceived severity); know about the required behaviors for reducing the risk or severity of the disease (perceived benefits); can overcome hindering factors such as cost and time (perceived barriers); and are assured of their abilities to behave in a way that achieves the desired result (perceived self-efficacy); then they will have a greater
willingness to participate in health promotion behaviors (Glanz et al., 2008), and probably will be screened for colorectal cancer. This model focuses on the collection of data on individual variables of behavior, but these are not the only factors that lead to behavior (Ryan et al., 2009; Sharma et al., 2010). Preventive behavior moderation programs can be successful, if they are flexible and tailored to the characteristics of an individual. Social cognitive theory is one of the theories, which have been used in cancer-related research, especially for colorectal cancer. According to this theory, there is a two-way relationship among cognitive factors, environmental and behavior factors (Wang et al., 2014). In order to compensate for the shortcomings of HBM, the social support construct of social cognitive theory was also investigated in this study. Studies show that social support has positive effects on various aspects of self-care activities. Social support is defined as the assistance that others provide to an individual. Also, this concept is referred to as a knowledge that makes a person believe that he is respected and loved by others, is considered a valuable member, and belongs to a social network of mutual relations and obligations. Investigation of social support is carried out through the evaluation of others as sources of support, including various people such as spouse, family members and friends (Marmot et al., 2008).

A study by Moattar et al. showed that HBM-based educational intervention increased the participation of the experimental group and their awareness about FOBT (Moattarat et al., 2014).

Chen et al. (2010) and Griffith et al. (2009) found that perceived susceptibility in patients referring for FOBT was significantly higher than the control group, indicating the effects of perceived susceptibility on performing the test. A study by Von et al. (2009) showed that higher perceived self-efficacy led to more participation in colorectal cancer screening. This study found that higher health literacy resulted in an increase in self-efficacy, and ultimately an increase in participation rates (Von et al., 2009). Brouse et al. (2003) also did a qualitative research on the barriers to participation in FOBT and found that low awareness, communication weakness, low self-efficacy and low perceived susceptibility had a direct relationship with the low level of FOBT participation. A study by Khani Jeihooni et al. (2017) showed that the mean scores of HBM and social support in people with a history of performing FOBT were significantly different from those who did not perform this test, so that in the group referring to the laboratory, people who had a history of doing the test in the last year achieved significantly higher scores on awareness, perceived susceptibility, perceived severity, perceived self-efficacy, perceived benefits, and social support compared to those in the group with no history of doing the test in the last year and also reported fewer perceived barriers than the latter group. The laboratory group achieved higher scores on awareness of colorectal cancer and ways to prevent it; perceived susceptibility, perceived severity, perceived self-efficacy, and social support than those who did not refer to the laboratory. Also, the latter group reported significantly more perceived barriers. In a study by Tastan et al. (2013), the most important barrier to colorectal cancer screening was lack of awareness (81.3%). Also, a study by Beydoun et al. (2008) in the United States aimed at identifying predictive factors for colorectal cancer screening and found that fear, embarrassment, and lack of advice from a doctor were described as barriers to screening. Sung et al. (2008) study based on HBM aimed at determining the factors influencing the colorectal cancer screening showed that the awareness of symptoms and the recognition of risk factors were directly related to colorectal cancer screening. Perceived severity and perceived barriers were also associated with screening test. In this study, the doctor’s advice and insurance coverage were the most important cues for action (Sunget al., 2007). Studies by Brittain et al. (2012) and Purnell et al. (2010) showed that social support played a key role in screening for colorectal cancer.

The Colorectal Cancer Screening Program in Iran has been in place since late 2010 to reduce the burden of colorectal cancer (Ramezani-Daryasari et al., 2012). However, despite the impact of screening programs on early diagnosis in the curable stage, most of the at risk population do not participate in the screening program (Shouri et al., 2015). Therefore, considering the importance of early detection of colorectal cancer and low levels of people undergoing FOBT as an effective way for detecting this cancer, and since colorectal cancer screening is an effective and cost-effective strategy for controlling and preventing this disease, and given the contradictions in the findings of previous studies, the low level of participation of men in Fasa in colorectal cancer screening, and lack of educational intervention, the present study aimed to investigate the effect of HBM-based educational intervention and perceived social support on participation rates of people over 50 years of age in Fasa in FOBT for colorectal cancer screening.

Materials and Methods

The present method is a semi-experimental study, which was conducted in 2016-2017. We use \[ n = \frac{2 \alpha \beta}{(\frac{2a_1^2 - 2}{a_1 + a_2})^2} \]

formula to estimate sample size for study. In this formula \( \alpha \) and \( \beta \) is the type 1 and 2 error which is equal to 0.05 and 0.20 respectively. \( O \) is the standard deviation that extracts previous study (Khani Jeihooni et al., 2017) and equal 12.75. \( d \) is the Acceptable difference equal 5. Based on mentioned points 100 sample for each group was required.

200 men who referred to the health centers in Fasa City, Fars province, Iran were selected for participant in study. Two centers were randomly selected out of the 6 health centers in the Facasy. Then, in each health center, 100 people were selected by convenience method. They were randomly assigned to two groups (100 assigned to the experimental group and 100 to the control group).

Participants were selected based on the numbers of Household Health Files registered in the health care centers. The criteria for entering the study were being over 50 years of age, no history of FOBT, no colorectal cancer diagnosis (the subject or primary relatives), no benign colon tumors, and being physically and psychologically able to respond to questions as well as consent to participate in the
study. Exclusion criteria included the individual’s or his first-degree relatives having a history of colorectal cancer, diagnosis with inflammatory bowel disease and intestinal polyps, hemorrhoids, and wounds; and unwillingness to participate in the study or incomplete questionnaire. The data collection instrument included a questionnaire based on HBM constructs and the multi-dimensional perceived social support questionnaire.

To evaluate the validity of the questionnaire items, the item effect size higher than 0.15 and content validity ratio (CVR) above 0.78 were considered and based on the exploratory factor analysis, they were classified into nine factors. To determine face validity, a list of the items was checked by 40 men with demographic, economic, social, and other characteristics similar to those of the targeted population. To determine the content validity, 12 specialists and professionals (outside the team) in the field of health education and health promotion (n = 10), Internal Medicine (n = 1), and biostatistics (n = 1) were consulted. Then, based on the Lawshe’s table, items with higher CVR value (than 0.56 for 12 people) were considered acceptable and were retained for subsequent analysis. The calculated values in this study for the majority of items were higher than 0.70.

To determine reliability, a list of the items by 40 men with demographic, economic, social, and other characteristics similar to those of the targeted population in two consecutive 20-day periods was completed. The overall reliability of the instrument based on the Cronbach’s alpha was 0.89. Cronbach’s alpha was 0.87 for awareness, 0.79 for perceived susceptibility, 0.85 for perceived severity, 0.81 for perceived benefits, 0.85 for perceived barriers, 0.79 for self-efficacy, 0.82 for cues to action and 0.80 for social support. Since the alpha values calculated for each of the structures studied in this research were higher than 0.7, the reliability level of the instrument was considered acceptable (Khani et al., 2017; Javadvad et al., 2012). The HBM questionnaire consisted of 53 questions and 9 sections including 7 items for demographic characteristics; 10 items for assessing awareness of colorectal cancer and its screening methods (correct / incorrect / unanswered); 4 items for perceived susceptibility; 5 items for perceived severity; 5 questions for perceived benefits; 12 items for perceived barriers (5-point Likert scale including strongly agree, agree, no idea, disagree, strongly disagree); 5 items for perceived self-efficacy (4-point Likert scale including never, sometimes, often, and always); and 8 items for cues to action (yes/no). The scores obtained from each construct were calculated on a scale of 100. MSPSS (Multi-Dimensional Scale of Perceived Social Support Instrument) was used to assess perceived social support. MSPSS has three subscales of family, friends, and significant other support measured by 12 items with a 7-level Likert scale (Very Strongly Disagree, Strongly Disagree, Mildly Disagree, Neutral, Mildly Agree, Strongly Agree and Very Strongly Agree). All questionnaires were completed through in-person administration by a trained interviewer.

The questionnaire was completed by both the experimental and control groups before the intervention. A card containing information on FOBT, food and drug restrictions before testing, how and when to collect stool samples and deliver them to the school, as well as the test results by the researcher and the referral of individuals for colonoscopy if the test result was positive, was given to the participants. Also, an invitation card containing the address and telephone number of the lab of the clinic, along with special containers for collection of stool samples was provided to the subjects and they were reminded after instructions that the test was done for free. In all stages of the study, FOBT was done for every participant in the experimental and control groups who went to the laboratory. This experiment was conducted free of charge in the laboratory of Fatemieh clinic in Fasa city. It was carried out by two experts to prevent any laboratory error. Then, the results of the tests were followed up and made known to people through telephone calls. Also on request, the results were sent in special written test forms to the participants in both experimental and control groups. In cases the FOBT result was positive, the target patients would receive a referral card containing information on when and how to perform colonoscopy, and on intestinal preparation, care measures before, during and after colonoscopy; and biopsy during the test in case of diagnosis of polyposis, cancer, or cancerous tumor. A card containing the address, telephone number and location of colonoscopy (Valiasr Hospital, Fasa City) was given to each participant. They were assured that their colonoscopy would be free of charge and that they would receive the necessary care and support. The training session for the test group included 8 sessions: lectures, questions and answers, video presentation, and group discussion. Two sessions per week were held at the Health Center Hall. The sessions focused on colorectal cancer, symptoms, prevention, screening, and performing FOBT. At one of the sessions, a person with colorectal cancer was invited to speak about the importance of FOBT and colorectal disease. A session was also attended by a family member as well as health center officials and doctors as supporters. At the end of the sessions, pamphlets were given to the individuals. A telegram group was set up to help exchange information and to submit educational materials to the individuals. At least one weekly training was sent to the group. Two monthly follow-up sessions were held by researchers.

To increase awareness about screening programs, face-to-face training on colorectal cancer and screening programs was done to create awareness and prepare for action (cues to action). In case of lack of advice and prescription of screening programs by physicians and healthcare providers, the following measures were taken: counseling and face-to-face training about the necessity of screening tests, doing follow-up meetings on the tests, providing the necessary facilities (e.g. lab containers and medicines needed), encouraging the subjects by sending recall cards, ensuring the subjects that the test is free and that they would receive the care and support needed to remove the barriers (perceived barriers); and providing advices, encouragement, and help for screening (cues to action).

Regarding feelings of shame and embarrassment,
the subjects received training about the importance and benefits of screening, emphasizing the benefits of faster diagnosis of colorectal cancer and more successful treatment in early stages. Attempts were made to increase their awareness about slow-growing polyps that are benign but can turn into malignancy, as well as about the importance of screening tests in identifying and removing them before becoming cancerous (perceived benefits). It was also emphasized that the subjects could choose to take the stool samples at their home or in the laboratory. They could do so with help of researchers of the same sex, to avoid shame and embarrassment. The subjects were assured that colonoscopy would be done by a physician of the same sex and their privacy would be protected during the study. These measures were aimed at removing obstacles (perceived barriers) and increase ability (self-efficacy) for screening. In cases of fear of dangers and painfulness of tests, the subjects’ uncertainties were eliminated via informing them of the type, method and location of the tests. In order to remove obstacles (perceived barriers) and prepare the subjects (cues to action), possible risks and complications (seriousness of the disease, perceived severity), and medical and nursing care were explained. Also they were assured that the tests were safe, and that colonoscopy examination was only carried out in case of positive FOBT (preparation for action, cues to action). Regarding the lack of clinical symptoms, subjects were informed that the lack of symptoms does not mean being healthy and that the value of screening programs lies in the detection of polyps and cancerous and pre-cancerous lesions in people without clinical symptoms, who seem healthy (perceived susceptibility). Studies have shown that informing people of risk factors, especially with emphasis on the relationship between the occurrence of cancer and age, is valuable in stimulating the individual’s motivation. Regarding the perception that experiments were not interesting, the subjects were informed that people aged 50 or older are more at risk (perceived susceptibility), the prevalence and mortality of colorectal cancer in Fasa City, Fars province, Iran; the mortality rate due to the lack of diagnosis of this cancer in the early stages; and complications and consequences of late diagnosis in advanced stages (perceived severity). It was suggested that the subjects refer to the Department of General Surgery at Valiasr Hospital, Fasa City, and visit patients who had undergone surgery for colorectal cancer and use a colostomy bag (perceived severity, and the importance of accepting the tests, despite disinterest).

Regarding the absence of a positive family history of colorectal cancer, people were informed of the importance of genetic factors (perceived susceptibility) and of the fact that lack of positive history does not provide sufficient guarantees for the absence of disease. To resolve lack of time, the subjects were told that they could call the researcher or assistant researchers so that they could take the necessary steps to deliver the stool sample to the laboratory (perceived barriers).

Three months after the intervention, both experimental and control groups completed the questionnaire and the participation results were collected for FOBT as well as for colonoscopy. In all stages of the intervention, information was confidential and the subjects completed the letter of written consent for participation in the study.

Ethical considerations performed by obtaining from the ethics committee of Fasa University of Medical Sciences (Ethical code IR.FUMS.REC.1396.264).

Data analysis was performed using SPSS 22 via descriptive and inferential statistics, paired t-test, Mann-Whitney, Chi-square, and independent t-test.

**Results**

The subjects of this study were 200 individuals covered by Fasa Health Centers (100 assigned to experimental group and 100 to control group). The mean age of the subjects in the experimental group was 63.18 ± 8.25 years and that of the control group was 65.11 ± 7.66 years indicating no significant difference between the two groups according to independent t-test (p=0.104). In this study, 96% and 98% of the experimental and control groups were covered by health insurance, and in terms of education, most of them were high school students. Other demographic characteristics of the subjects did not differ significantly for the two groups (Table 1). The most important cues to action (information sources) mentioned by both the control group and the experimental group were health care staff (52% and 36% respectively), family and friends (28%), radio and television (18%), and internet (6%).

Barriers to participate in screening programs (FOBT) from the subjects’ perspective were time (51%), feeling healthy and lacking symptoms (42%), lack of physician’s prescription and advice (38%), disinterest in FOBT (24%), lack of knowledge about the tests (4.5%), and other miscellaneous items (3.2%). The results of this survey showed that based on independent t-test, before intervention, there were no significant differences between the mean scores of experimental and control groups on awareness (p=0.105), perceived susceptibility (p=0.240), perceived severity (p=0.314), perceived benefits (p=0.216), perceived barriers (p=0.114), perceived self-efficacy (p=0.094), cues to action (P = 0.160) and perceived social support (P = 0.33). However, there were significant differences between them three months after the intervention (p<0.05). Paired samples t-test showed that mean scores of awareness, perceived susceptibility, perceived severity, perceived benefits, self-efficacy, cues to action and perceived social support increased in the experimental group, but the mean score of perceived barriers decreased (p<0.05). In the control group, the mean scores of these constructs did not change significantly (p>0.05) (Table 2).

The level of referrals (participation) of subjects for FOBT was 74 (74%) in the experimental group but was 6 (6%) in the control group. The McNemar test showed a significant difference between the two groups in this regard (p<0.05). One of the test subjects had a positive FOBT result and was referred for colonoscopy.
According to World Health Organization (WHO) recommendations, all people over 50 years of age are at risk for colorectal cancer (Satia et al., 2007). Early detection of colorectal cancer increases the chance of survival. Therefore, screening tests such as FOBT are vital and necessary for the diagnosis of this cancer (Levin et al., 2008). Studying factors affecting colorectal cancer screening and its appropriate educational interventions based on models such as HBM and social cognitive theory is necessary (Kiviniemiet al., 2010).

### Table 1. Comparison of Frequency Distribution of Demographic Characteristics in the Experimental and Control Groups

| Variables          | Experimental Group | Control Group | P-value |
|--------------------|--------------------|---------------|---------|
|                    | Number  | Percentage | Number  | Percentage |         |
| Education          |         |            |         |            |         |
| Illiterate         | 4       | 4          | 6       | 6          | 0.155   |
| Elementary         | 16      | 16         | 12      | 12         |         |
| Junior High School | 28      | 28         | 32      | 32         |         |
| High School        | 38      | 38         | 36      | 36         |         |
| Academic           | 14      | 14         | 14      | 14         |         |
| marital status     |         |            |         |            |         |
| Single             | 9       | 9          | 7       | 7          | 0.214   |
| Married            | 91      | 91         | 93      | 93         |         |
| Household income   |         |            |         |            |         |
| Below 2 million Rials | 20   | 20         | 24      | 24         | 0.116   |
| 10-20 million Rials| 48      | 48         | 40      | 40         |         |
| Above 2 million Rials | 32  | 32         | 36      | 36         |         |
| Insurance coverage |         |            |         |            |         |
| Yes                | 96      | 96         | 98      | 98         | 0.175   |
| No                 | 4       | 4          | 2       | 2          |         |

### Table 2. Comparison of the Mean Scores of HBM Constructs and Social Support for FOBT in the Control and Experimental Group before and Three Months after the Intervention

| Variable            | Group               | Before the intervention | Three months after the intervention | Paired samples t-test |
|---------------------|---------------------|-------------------------|-------------------------------------|-----------------------|
| Awareness           | Experimental        | 20.17 ± 6.45            | 75.25 ± 6.35                        | 0.001                 |
|                     | Control             | 22.1 ± 6.32             | 23.85 ± 6.65                        | 0.540                 |
|                     | Paired samples t-test | 0.105                   | 0.001                               |                       |
| Perceived susceptibility | Experimental  | 24.1 ± 7.52            | 69.34 ± 7.32                        | 0.001                 |
|                     | Control             | 23.8 ± 7.94             | 25.01 ± 6.9                         | 0.210                 |
|                     | Paired samples t-test | 0.240                   | 0.001                               |                       |
| Perceived severity  | Experimental        | 28.3 ± 6.5              | 71.33 ± 6.54                        | 0.001                 |
|                     | Control             | 26.24 ± 6.82            | 27.75 ± 6.78                        | 0.104                 |
|                     | Paired samples t-test | 0.314                   | 0.001                               |                       |
| Perceived benefits  | Experimental        | 20.16 ± 6.84            | 70.17 ± 6.14                        | 0.001                 |
|                     | Control             | 22.12 ± 6.09            | 23.55 ± 6.14                        | 0.001                 |
|                     | Paired samples t-test | 0.216                   | 0.001                               |                       |
| Perceived barriers  | Experimental        | 75.25 ± 6.55            | 28.11 ± 6.24                        | 0.001                 |
|                     | Control             | 74.32 ± 6.21            | 71.85 ± 6.08                        | 0.092                 |
|                     | Paired samples t-test | 0.114                   | 0.001                               |                       |
| Cues to action      | Experimental        | 32.21 ± 6.34            | 69.88 ± 6.44                        | 0.001                 |
|                     | Control             | 31.19 ± 6.5             | 32.96 ± 6.86                        | 0.244                 |
|                     | Paired samples t-test | 0.160                   | 0.001                               |                       |
| Perceived self-efficacy | Experimental  | 24.4 ± 7.14            | 73.14 ± 6.1                         | 0.001                 |
|                     | Control             | 25.19 ± 8.53            | 27.24 ± 8.16                        | 0.110                 |
|                     | Paired samples t-test | 0.094                   | 0.001                               |                       |
| Perceived social support | Experimental  | 29.25 ± 6.81            | 70.53 ± 6.92                        | 0.001                 |
|                     | Control             | 27.75 ± 6.56            | 29 ± 6.63                           | 0.129                 |
|                     | Paired samples t-test | 0.123                   | 0.001                               | 0.001                 |

**Discussion**

According to World Health Organization (WHO) recommendations, all people over 50 years of age are at risk for colorectal cancer (Satia et al., 2007). Early detection of colorectal cancer increases the chance of survival. Therefore, screening tests such as FOBT are vital and necessary for the diagnosis of this cancer (Levin et al., 2008). Studying factors affecting colorectal cancer screening and its appropriate educational interventions based on models such as HBM and social cognitive theory is necessary (Kiviniemiet al., 2010).
The purpose of this study was to determine the effect of HBM-based educational intervention and social support on the rate of participation in FOBT for colorectal cancer screening among people over 50 years of age in Fasa, Iran. The most important barriers mentioned by people that prevented their participation in the FOBT screening test included feeling healthy and lack of symptoms; lack of physician’s prescription and advice; disinterest in FOBT; and lack of knowledge about the tests.

In a study by Moattar et al., (2014), the most important barriers were shortage of time (being busy) and feeling healthy (lack of clinical symptoms). The results of a study by the United European Gastroenterology Federation (UEGF) showed that the most important barriers to FOBT included disinterest, discomfort, unpleasantness and lack of physician’s advice and prescription (United European Gastroenterology Federation, 2003). In the study by Katz et al., (2002) lack of positive family history, lack of physician’s advice and prescription, and lack of clinical symptoms were the most important barriers. Beydoun et al., (2008) found that fear and embarrassment and lack of physician’s advice and prescription were the most important barrier to screening for colorectal cancer. In a study by Gimeno-García et al., (2009) in Spain, fear and shame were the most important barriers to screening (Wolf et al., 2001). Other study results were in line consistent with our study (Sun et al., 2004; Bajracharya et al., 2006; Yan et al., 2008; Wolf et al., 2001; Vernon et al., 1997; James et al., 2002).

The results of this study showed that the mean scores of awareness were lower before the intervention in the experimental and control groups. However, 3 months after intervention, there was a significant increase in the mean scores of awareness for the experimental group, while the control group did not change significantly in this regard. The results of studies by Ueland et al., (2006); James et al., (2002); Brouse et al., (2003); Sung et al., (2007); James et al., (2002), and GhobadiDashdebi et al., (2016) showed that the level of subjects’ awareness about colorectal cancer screening was low. The reason for low awareness in the two groups can be attributed to lack of training sessions by health center staff and lack of access to appropriate information resources. In this study, holding training sessions, creating a telegram group for the exchange of information, and providing content in the form of video tutorials and group discussions increased the subjects’ awareness in the experimental group. In a study conducted in Spain, awareness of risk factors, and signs and symptoms of illness predicted the intention to participate in the screening for colorectal cancer (Gimeno-García et al., 2011). In studies by Powe et al., (2004); Doorenbos et al., (2011); Costanza et al., (2007); Tu et al., (2006); Maxwell et al., (2010); Cameron et al., (2010); Briant et al., (2015), and Mojica et al., (2015), educational intervention increased awareness of colorectal cancer screening.

In the present study, 3 months after intervention, the mean scores of perceived susceptibility and perceived severity of the experimental group were significantly higher than that of the control group. In other words, the educational intervention caused the subjects in the experimental group to feel more vulnerable and understand the consequences and severity of the disease. To increase the participant’s perceived susceptibility and perceived severity, a 64-year-old patient with colorectal cancer was invited to one of the training sessions to speak with the participants in the experimental group about the symptoms of the disease, the consequences and damages of the disease, and the importance of screening and conducting FOBT.

In Salimzadeh et al., (2014); Braun et al., (2005); and Shamsi et al., (2014), participants’ perceived susceptibility and perceived severity were low in colorectal cancer screening. Moattar et al., (2014) quasi-experimental study on two groups of 78 patients (experimental and control) showed that the susceptibility and perceived severity increased after intervention. In studies by Winterich et al., (2011) and Winterich et al., (2009), the mean score of awareness (perceived susceptibility and perceived severity) increased after the intervention.

Hey et al., (2003) and Bae et al., (2014) found that perceived susceptibility predicted participation in FOBT, in contrast ShouriBidgoli et al., (2015) showed that this construct was not predictive. The results of some other studies are in line with the findings of this study (Baratiet al., 2016; Kouhpayehet al., 2017; Khani Jeihooniet al., 2017; Khani Jeihooniet al., 2015; Kashfiet et al., 2012; Malmir et al., 2018). The results of this study showed that educational intervention increased the mean score of perceived benefits and decreased that of the perceived barriers in the experimental group. There was no significant difference in the control group between before and 3 months after intervention in terms of perceived benefits and perceived barriers. In the training sessions for the experimental group, the benefits of faster detection of colorectal cancer such as more successful treatment, and the importance of performing screening tests in case of identifying polyps were emphasized. In order to reduce the barriers, people were assured that the test would be free and they would receive care and support. They were given the necessary tools such as laboratory devices as well as medications. The tests were done by professionals of the same gender as the subjects to avoid shame and embarrassment in taking stool samples. In studies by Koo et al., (2012); Wong et al., (2013) and Zheng et al., (2006), perceived benefits and perceived barriers were significantly correlated with FOBT. Rawl et al., (2005) and Tessaro et al., (2006) also showed that perceived benefits and perceived barriers played a significant role in the colorectal cancer screening. In a study by Gimeno-García et al., (2009), a film-based educational strategy increased perceived benefits of colorectal cancer screening and reduced perceived barriers.

Jeihooni et al., (2015) found that educational intervention increased perceived benefits and reduced perceived barriers in a population. In this research, the most important external cues to action were physicians, health workers, family members, and friends. In studies by GhobadiDashdebi et al., (2002); KhaniJeihooni et al., (2017); Salimzadeh et al., (2014); Ruffin et al., (2009), Moghimi-Dehkordi et al., (2012) and Javadzade et al.,
The mean score of internal cues to action showed a significant increase in the experimental group as compared to the control 3 months after the intervention. In this study, individuals were trained on nursing care skills, were assured of the safety of the tests, and were recommended to go for colonoscopy at the designated site, if they were FOBT positive. The results of other studies in this regard are in line with the findings of this study (HazavhehJavadzadeh et al., 2010; Kashfi et al., 2012).

The level of perceived self-efficacy in the experimental group showed a significant increase after the intervention. Bandura defined self-efficacy as an individual's confidence in the ability to successfully complete an action. Individuals who have high perceived self-efficacy have a greater commitment to engaging in activities at times of challenges and difficulties, and spend more time and effort on work, and overcome barriers more easily (Bandura et al., 2006). In studies by Janz et al., (2003); Wong et al., (2013); KhaniJeihooni et al., (2017), self-efficacy was cited as a predictor of FOBT. The study by Kouhpayeh et al., (2017) using HBM-based intervention increased the perceived self-efficacy score in the experimental group. Jeihooni et al., (2017) and Moattar et al., (2017) found that educational intervention increased the self-efficacy score for cancer screening. The results of this study showed that 3 months after intervention, perceived social support increased significantly in the experimental group compared to the control group. Social support can help by influencing related behaviors such as encouraging FOBT testing, modifying the effects of acute and chronic neuropathic pressure associated with it, and increasing compatibility with the test, and early diagnosis of colorectal cancer (Brittain et al., 2012; Rogers et al., 2014). Studies by Rogers et al., (2015); Brittain et al., (2012); Christy et al., (2013), and Schoenberg et al., (2016) pointed out the role of social support, especially the family, as an effective factor in screening for colorectal cancer. Some studies such as Brouse et al., (2004) referred to the role of physicians and health care workers as supporters of screening. Other studies also highlighted the positive role of social support in screening for colorectal cancer as well as the quality of life associated with it (Honda et al., 2006; Ikeda et al., 2013; Gonzalez-Saenz et al., 2017; Cutrana et al., 2015).

In this study, with the involvement of a family member of each participant and his participation in the training session, their important role in helping to screen for colorectal cancer was emphasized. We also pointed to the important role of physicians and staff in health centers. Findings on the level of participation showed that 74% of the subjects in the experimental group and 6 persons (6%) in the control group had FOBT performed. The results of Moattar et al., (2014) showed that the participation rate of the experimental group in the first turn was 83.1%, but it was 14.1% for the control group. In the study by Khani Jeihooni et al., (2017) in the group of patients who referred to the laboratory, 64.2% participated in the FOBT, while in the non-referral group 12.72% participated in the test. In Bae et al., (2014) study, 40% of the subjects participated in FOBT. In GhabadiDashdebi et al., (2016) 29.9% of the subjects performed this test during the past year.

The findings of this study indicated the effect of education based on HBM and social support on the participation rate of the experimental group in the colorectal cancer screening program.

Underuse of population-based CRC screening is a multi-factorial problem involving patients, providers, and the organizational screening process. Plausible target factors for interventions aimed at increasing compliance have been identified at different levels. Specific interventions targeting these factors have been designed to increase screening uptake. However, they have had different success across the studies depending on the screening strategy and the intervention used. A better knowledge on factors associated with screening compliance and development of more efficient interventions are warranted in order to achieve higher rates of participation of individuals in performing fecal occult blood test for colorectal cancer screening among men.

It showed the need for a model-driven education to increase participation in screening programs. The results of this study can be widely used to improve the activities of health care professionals including physicians, nurses and health care providers. Using the results of this study to develop appropriate education programs at the community level, it is possible to increase the participation of people in colorectal cancer screening programs. The findings of this study suggest that managers of health care centers and educational institutions should promote the health status of the community in order to take appropriate action in regard to the need for screening. Implementing comprehensive training programs focusing on HBM constructs and social support and involving key supporters such as families, health center staff and laboratories to increase the participation of individuals in FOBT, as the easiest, cheapest and first way for early detection of colorectal cancer, is essential. The strengths of this study included the availability of a laboratory for performing FOBT free of charge for the subjects. Community-based educational intervention of at risk population is strength of this study.

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