

RESEARCH ARTICLE

Editorial Process: Submission:12/19/2017 Acceptance:08/23/2018

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

Yousef Gholampour¹, Atefeh Jaderipour², Ali Khani Jeihooni^{3*}, Seyyed Mansour Kashfi⁴, Pooyan Afzali Harsini⁵

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 FasaCity, Fars province, Iran. **Materials and Methods:** In this quasi-experimental study, 200 men (100 in experimental group and 100 in control group) in FasaCity, 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

Asian Pac J Cancer Prev, **19** (10), 2777-2787

Introduction

Cancer is a major problem in Iran and around the world (Safaeet al., 2008). Cancer is a chronic and common disease, which is on the rise (Tabariet al., 2007). Colorectal cancer is one of the most prevalent invasive cancers and is significantly responsible for causing physical and psychosocial discomfort (Dunn, 2007). The reasons for the increase in cancers in Iranian society include environmental pollution, changes in diet habits (fast food), smoking, and the ageing population. Colorectal cancer is one of the most commonly diagnosed cancers around the world and is the most common type of gastrointestinal cancer (Azizi Fet al., 2000; Dayet al., 2015). Colorectal

cancer is the third most common cancer amongst men (10% of all cancer cases) after lung and prostate cancer, and the second most common cancer amongst women (9.4% of all cancer case) after breast cancer worldwide (Ferlayet al., 2013; Jemalet al., 2011; Jemalet al 2010). Colorectal cancer is the third most common cancer among Iranian women and the fifth most common cancer among Iranian males (Etemadet al., 2009). According to the International Agency for Research on Cancer (IARC) the prevalence of colorectal cancer in Iranian men was 7.8%, with a mortality rate of 6.3% per 100,000, while these figures for women were 4.6 and 6.4 per 100,000, respectively (Ghahremani et al., 2016; Mokarramet al., 2016). About one million people around the world suffer

¹Department of Internal Medicine, ²Student of Medicine, School of Medicine, ³Department of Public Health, School of Health, Fasa University of Medical Sciences, Fasa, ⁴Department of Public Health, School of Health, Shiraz University of Medical Sciences, Shiraz, ⁵Department of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran. *For Correspondence: Khani_1512@yahoo.com

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 (Mokarramet 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 (Brouseet 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 (Hajjalizadehet 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 an 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 (Moattar 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 Tasthan

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 (Shouriet 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 $n = \frac{2\sigma^2(Z_{1-\alpha/2} + Z_{1-\beta})^2}{d^2}$ formula to estimate sample size for study. In this formula α and β is the type 1 and 2 error which is equal to 0.05 and 0.20 respectively. σ 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 Fasa city. 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 (KhaniJeihooniet al., 2017; Javadzadeet 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 of lectures, questions and answers, video presentation, and group discussion. A 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 case 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 investigation, 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.

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	
	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 (Satie 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; Vanet 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 Baeet 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; Kouhpayeh et al., 2017; Khani Jeihooniet et al., 2017; Khani Jeihooniet et 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.,

(2001), the most important cues to action were physicians, health care workers, and family members.

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 (HazaveheiJavazade 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; Cutrona 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 people (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 GhobadiDashdebi 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.

Acknowledgments

The authors wish to thank Mr. H.Argasi at the Research Consultation Center (RCC) at Shiraz University of medical Sciences for his invaluable assistance in editing this manuscript.

References

- American Cancer Society. Global cancer facts and figures 2nd Edition. Atlanta: American Cancer Society 2011.
- Azizi F, Hatami H, Janghorbani M (2000). Epidemiology and control of common disease in Iran. Tehran, Iran: Eshtiagh Publication, pp158-60.
- Bae N, Park S, Lim S (2014). Factors associated with adherence to fecal occult blood testing for colorectal cancer screening among adults in the Republic of Korea. *Eur J Oncol Nurs*, 18, 72-7.

- Bajracharya SM (2006). An assessment of the perceived barriers and strategies to promoting early detection of colorectal cancer: A practitioners' perspective. *Int Quart Commun Health Edu*, **26**, 23-44.
- Bandura A (2006). Guide for constructing self-efficacy scales. Self-efficacy beliefs of adolescents, **5**, pp 307-37.
- Barati M, Amirzargar MA, Bashirian S, et al (2016). Psychological predictors of prostate cancer screening behaviors among men over 50 years of age in Hamadan: perceived threat and efficacy. *Iran J Cancer Prev*, **9**, e4144
- Beydoun HA, Beydoun MA. (2008). Predictors of colorectal cancer screening behaviors among average-risk older adults in the United States. *Cancer Causes Control*, **19**, 339-59.
- Braun KL, Fong M, Kaanoi ME, Kamaka ML, Gotay CC (2005). Testing a culturally appropriate, theory-based intervention to improve colorectal cancer screening among Native Hawaiians. *Prev Med*, **40**, 619-27.
- Briant KJ, Wang L, Holte S, et al (2015). Understanding the impact of colorectal cancer education: a randomized trial of health fairs. *BMC Public Health*, **15**, 1196.
- Brittain K, Taylor JY, Loveland-Cherry C, Northouse L, Caldwell CH (2012). Family support and colorectal cancer screening among Urban African Americans. *J Nurs Pract*, **8**, 522-33.
- Brouse CH, Basch CE, Wolf RL, Shmukler C (2004). Barriers to colorectal cancer screening: An educational diagnosis. *J Cancer Edu*, **19**, 170-3.
- Brouse CH, Basch CE, Wolf RL, et al (2003). Barriers to colorectal cancer screening with fecal occult blood testing in a predominantly minority urban population: a qualitative study. *Am J Public Health*, **93**, 1268-71.
- Cameron KA, Persell SD, Brown T, Thompson J, Baker DW (2011). Patient outreach to promote colorectal cancer screening among patients with an expired order for colonoscopy: a randomized controlled trial. *Arch Intern Med*, **171**, 642-6.
- Center MM, Jemal A, Smith RA, Ward E (2009). Worldwide variations in colorectal cancer. *CA Cancer J Clin*, **59**, 366-78.
- Chen CC, Basch CE, Yamada T (2010). An evaluation of colonoscopy use: implications for health education. *J Cancer Educ*, **25**, 160-5.
- Christy SM, Perkins SM, Tong Y, et al (2013). Promoting colorectal cancer screening discussion: a randomized controlled trial. *Am J Prev Med*, **44**, 325-9.
- Costa ALS, Heitkemper MM, Alencar GP, et al (2017). Social Support is a predictor of lower stress and higher quality of life and resilience in Brazilian patients with colorectal cancer. *Cancer Nurs*, **40**, 352-60.
- Costanza ME, Luckmann R, Stoddard AM, et al (2007). Using tailored telephone counseling to accelerate the adoption of colorectal cancer screening. *Cancer Detect Prev*, **31**, 191-8.
- Cutrona SL, Wagner J, Roblin DW, et al (2015). E-mail to Promote Colorectal Cancer Screening Within Social Networks: Acceptability and Content. *J Health Commun*, **20**, 589-98.
- Day LW, Velayos F (2015). Colorectal cancer screening and surveillance in the elderly: updates and controversies. *Gut Liver*, **9**, 143-51.
- Doorenbos AZ, Jacobsen C, Corpuz R, Forquera R, Buchwald D (2011). A randomized controlled calendar mail-out to increase cancer screening among urban American Indian and Alaska Native patients. *J Cancer Educ*, **26**, 549-54.
- Dunn J (2003). Dimensions of quality of life and psychosocial variables most salient to colorectal cancer patients. *Psychooncology*, **15**, 20-30.
- Etamad K, Goya MM, Ramezani R, et al (2009). Iranian Annual National Cancer Registration Report, Iran. [In Persian].
- Ferlay J, Soerjomataram I, Ervik M, et al (2013). GLOBOCAN2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Lyon, France: International Agency for Research on Cancer;. Available from: <http://globocan.iarc.fr>, accessed on 13/12/2013.
- Ghahremani R, Yavari P, Khodakarim S, et al (2016). The Estimated survival rates for colorectal cancer and related factors in Iran from 1384 to 1388 using the Aalen's additive risk model. *Iran J Epidemiol*, **11**, 20-9.
- GhobadiDashdebi K, Noroozi A, Tahmasebi R (2002). Factors predicting fecal occult blood testing among residents of Bushehr, Iran, Based on the Health Belief Model. *Epidemiol Biomarkers Prev*, **11**, 529-34.
- Gimeno-García AZ, Quintero E, Nicolás-Pérez D, Jiménez-Sosa A (2011). Public awareness of colorectal cancer and screening in a Spanish population. *Public Health*, **125**, 609-15.
- Gimeno-García AZ, Quintero E, Nicolás-Pérez D, et al (2009). Impact of an educational video-based strategy on the behavior process associated with colorectal cancer screening: a randomized controlled study. *Cancer Epidemiol*, **33**, 216-22.
- Glanz K, Rimer BK, Viswanath K (2008). Health behavior and health education: theory, research, and practice. 4th edition, John Wiley and Sons, Inc.
- Gonzalez-Saenz de Tejada M, Bilbao A, Baré M, et al (2017). Association between social support, functional status, and change in health-related quality of life and changes in anxiety and depression in colorectal cancer patients. *Psychooncology*, **26**, 1263-9.
- Griffith KA (2009). Biological, psychological and behavioral, and social variables influencing colorectal cancer screening in African Americans. *Nurs Res*, **58**, 312-20.
- Guerra CE, Schwartz JS, Armstrong K, et al (2007). Barriers of and facilitators to physician recommendation of colorectal cancer screening. *J Gen Intern Med*, **22**, 1681-8.
- Hajjalizadeh K, Ahadi H, Jomehri F, et al (2013). Health beliefs and screening behavior of cervical cancer among the women of Bandar Abbas. *Life Sci J*, **10**, 454-51.
- Hazavehei SM, KhaniJeihooni A, Hasanazadeh A, Amini S (2010). The effect of educational program based on BASNEF model for eye care in non-insulin dependent diabetic patients. *J Res Health Sci*, **10**, 81-90.
- Hey JL, Ford JS, Klein D, et al (2003). Adherence to colorectal cancer screening in mammography-adherent older women. *J Behav Med*, **26**, 553-76.
- Honda K, Kagawa-Singer M (2006). Cognitive mediators linking social support networks to colorectal cancer screening adherence. *J Behav Med*, **29**, 449-60.
- Hou S, Chen P (2005). Cancer screening beliefs and reactions to an innovative colorectal cancer screening kit among Chinese worksite population. *Methods Inf Med*, **44**, 315-8.
- Ikeda A, Kawachi I, Iso H, et al (2013). Social support and cancer incidence and mortality: the JPHC study cohort II. *Cancer Causes Control*, **24**, 847-60.
- James AS, Campbell MK, Hudson MA (2002). Perceived barriers and benefits to colon cancer screening among African Americans in North Carolina: how does perception relate to screening behavior?. *Cancer Epidemiol Biomarkers Prev*, **11**, 529-34.
- Janda M, Stanton WR, Hughes K, et al (2003). Knowledge, attitude and intentions related to colorectal cancer screening using faecal occult blood tests in a rural Australian population. *Asia Pac J Public Health*, **15**, 50-6.
- Janz NK, Wren PA, Schottenfeld D, Guire KE (2003). Colorectal cancer screening attitudes and behavior: a population-based study. *Prev Med*, **37**, 627-34.

- Javadzade H, Mostafavi F, Emami M, Hasanzade A, Sharifirad Gh (2001). Factors related to occult blood test in feces for screening for colorectal cancer, Based on Health Belief Model constructs in moderate individuals in Isfahan. *J Health Sys Res*, **7**, 3
- Javadzade SH, Reisi M, Mostafavi F, et al (2011). Factors associated with the fecal occult blood testing for colorectal cancer screening based on health belief model structures in moderate risk individuals, Isfahan. *Iran J Health Educ Health Promot*, **1**, 18.
- Jeihooni AK, Hidarnia A, Kaveh MH, Hajizadeh E, Askari A (2015). The Effect of an educational program based on Health Belief Model on preventing osteoporosis in women. *Int J Prev Med*, doi:10.4103/2008-7802.170429.
- Jeihooni AK, Kashfi SM, Hatami M, Avand A, Bazrafshan MR (2017). The effect of educational program based on PRECEDE model in promoting prostate cancer screening in a sample of Iranian men. *J Cancer Educ*, **14**, doi: 10.1007/s13187-017-1282-8.
- Jemal A, Bray F, Center MM, et al (2011). Global cancer statistics. *CA Cancer J Clin*, **61**, 69-90.
- Jemal A, Siegel R, Xu J, Ward E (2010). Cancer Statistics, 2010. *CA Cancer J Clin*, **60**, 277-300.
- Kashfi SM, KhaniJeihooni A, Rezaianzade A (2012). Effect of health workers' training programs on preventive behavior of leishmaniosis based on BASNEF model. *J Res Health Sci*, **12**, 114-8.
- Kashfi SM, KhaniJeihooni A, Rezaianzadeh A, Amini S (2012). The effect of health belief model educational program and jogging on control of sugar in type 2 diabetic patients. *Iran Red Crescent Med J*, **14**, 442-6.
- Karsa LV, Lignini TA, Patnick J, Lambert R, Sauvaget C (2010). The dimensions of the CRC problem. *Best Pract Res Clin Gastroenterol*, **24**, 381-96.
- Katz ML, James A, Campbell MK, et al (2002). Patient-provider communication and colorectal cancer knowledge: associations with screening behavior among African Americans. The 130th Annual Meeting of APHA 9-13; Philadelphia, PA; USA.
- Kelly KM, Phillips CM, Jenkins C, et al (2007). Physician and staff perceptions of barriers to colorectal cancer screening in appalachian kentucky. *Cancer Control*, **14**, 167-75.
- KhaniJeihooni A, Askari A, Kashfi SM, et al (2017). Application of health belief model in prevention of osteoporosis among primary school girl students. *Int J Pediatr*, **5**, 6017-29.
- KhaniJeihooni A, Hidarnia A, Kaveh MH, Hajizadeh E (2015). The effect of a prevention program based on health belief model on osteoporosis. *J Res Health Sci*, **15**, 47-53.
- KhaniJeihooni A, Kashfi SM, Shokri A, Kashfi SH, Karimi S (2017). Investigating factors associated with FOBT screening for colorectal cancer based on the components of health belief model and social support. *Asian Pac J Cancer Prev*, **18**, 2163-9.
- Kiviniemi MT, Bennett A, Zaiter M, Marshall JR (2011). Individual-level factors in colorectal cancer screening: a review of the literature on the relation of individual-level health behavior constructs and screening behavior. *Psychooncology*, **20**, 1023-33.
- Klabunde CN, Lanier D, Nadel MR, et al (2009). Colorectal cancer screening by primary care physicians: Recommendations and practices, 2006-2007. *Am J Prev Med*, **37**, 8-16.
- Koo JH, You MK, Liu K, et al (2012). Colorectal cancer screening practise is influenced by ethnicity of medical practitioner and patient. *J Gastroen Hepatol*, **2**, 390-6.
- Kouhpayeh A, Jeihooni AK, Kashfi SH, Bahmandoost M (2017). Effect of an educational intervention based on the model of health beliefs in self-medication of Iranian mothers. *Invest Educ Enferm*, **35**, 59-68.
- Levin B, Lieberman DA, McFarland B, et al (2008). Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *CA Cancer J Clin*, **58**, 130-60.
- Malekzadeh R, Bishhehshari F, Mahdavinia M, Ansari R (2009). Epidemiology and molecular genetics of colorectal cancer in iran: a review. *Arch Iran Med*, **12**, 161-9.
- Malmir S, Barati M, KhaniJeihooni A, Bashirian S, Hazavehei SMM (2018). Effect of an educational intervention based on protection motivation theory on preventing cervical cancer among marginalized women in west Iran. *Asian Pac J Cancer Prev*, **19**, 755-61.
- Marmot M, Wilkinson RG (2008). Social determinants of health. Trans. Montazeri A.
- Maxwell AE, Bastani R, Danao LL, et al (2010). Results of a community-based randomized trial to increase colorectal cancer screening among Filipino Americans. *Am J Public Health*, **100**, 2228-34.
- Menon U, Victoria L, Champion DNS, et al (2003). Beliefs associated with fecal occult blood test and colonoscopy use at a worksite colon cancer screening program. *Int J Occup Environ Med*, **45**, 891-8.
- Moattar M, Roozitalab M, Gholamzadeh S, Firoozi MS, ZareN (2014). Practical application of health belief model to enhance the uptake of colorectal cancer screening. *J Community Med Health Educ*, **4**, 297.
- Moghimi-Dehkordi B, Safaee A (2012). An overview of colorectal cancer survival rates and prognosis in Asia. *World J Gastrointest Oncol*, **4**, 71-5.
- Mojica CM, Morales-Campos DY, Carmona CM, Ouyang Y, Liang Y (2016). Breast, cervical, and colorectal cancer education and navigation: Results of a community health worker intervention. *Health Promot Pract*, **17**, 353-63.
- Mokarram P, Kumar K, Brim H, et al (2009). Distinct high-profile methylated genes in colorectal cancer. *PLoS One*, **4**, 70-8.
- Newton KF, Newman W, Hill J (2012). Review of biomarkers in colorectal cancer. *Colorectal Dis*, **14**, 3-17.
- Powe BD, Ntekop E, Barron M (2004). An intervention study to increase colorectal cancer knowledge and screening among community elders. *Public Health Nur*, **21**, 435-42.
- Purnell JQ, Katz ML, Andersen BL, Bennett N (2010). Social and cultural factors are related to perceived colorectal cancer screening benefits and intentions in African Americans. *J Behav Med*, **33**, 24-34.
- Ramezani-Daryasari R, Nadi F, Modirian M, et al (2012). Comprehensive national cancer control program. Iran: Ministry of Health and Medical Education; Center for Non-Communicable Disease control.
- Rawl SM, Menon U, Champion VL, et al (2005). Do benefits and barriers differ by stage of adoption for colorectal cancer screening?. *Health Educ Res*, **20**, 137-48.
- Rogers CR, Goodson P, Foster MJ (2015). Factors associated with colorectal cancer screening among younger African American men: A Systematic Review. *J Health Dispar Res Pract*, **8**, 133-56.
- Rogers CR, Goodson P (2014). Male role norms, knowledge, attitudes, and perceptions of colorectal cancer screening among young adult African American men. *Front Public Health*, **2**, 252.
- Ruffin MT, Creswell JW, Jimbo M, Fetters MD (2009). Factors influencing choices for colorectal cancer screening among previously unscreened African and Caucasian Americans: findings from a triangulation mixed methods investigation. *J Community Health*, **34**, 79-89.

- Ryan P (2009). Integrated theory of health behavior change: background and intervention development. *Int J Adv Nurs Pract*, **23**, 161-70.
- Sadjadi A, Nouraie M, Mohagheghi MA, et al (2005). Cancer occurrence in Iran in 2002, an international perspective. *Asian Pac J Cancer Prev*, **6**, 359-63.
- Safaei A, Moghimi-Dehkordi B, Zeighami B, et al (2008). Predictors of quality of life in breast cancer patients under chemotherapy. *Indian J Cancer*, **45**, 107-11.
- Salimzadeh H, Eftekhari H, Delavari A, Malekzadeh R (2014). Psycho-social determinants of colorectal cancer screening in Iran. *Int J Prev Med*, **5**, 185-90.
- Satia JA, Galanko JA (2007). Demographic, behavioral, psychosocial, and dietary correlates of cancer screening in African Americans. *J Health Care Poor Underserved*, **18**, 146-64.
- Schoenberg NE, Eddens K, Jonas A, et al (2016). Colorectal cancer prevention: Perspectives of key players from social networks in a low-income rural US region. *Int J Qual Stud Health Well-being*, **11**, 10.
- Shamsi M, Sharifi A, Rajabi R, Almasi A, Dejam S (2014). Prevention of colorectal cancer behavior with an application of the extended health belief model in sample of Iranian women. *Middle-East J Sci*, **21**, 1410-8.
- Sharma M, RomasJA (2010). Theoretical foundations of health education and health promotion. Jones Bartlet.
- Shouribidgoli AR, TaheriKharami Z, Asayesh H, et al (2015). Study of knowledge, attitude, and practice on colorectal cancer screening among individuals older than 50 years based on health belief model. *Qom Univ Med Sci J*, **9**, 59-65.
- Sun W, Basch C, Wolf R (2004). Factors associated with colorectal cancer screening among Chinese-Americans. *Prev Med*, **39**, 323-29.
- Sung JJ, Choi SY, Chan FK, et al (2008). Obstacles to colorectal cancer screening in Chinese: a study based on the health belief model. *Am J Gastroenterol*, **103**, 974-81.
- Sung JJ, Lau JY, Goh KL, Leung WK.(2005). Increasing incidence of colorectal cancer in Asia: implications for screening. *Lancet Oncol*, **6**, 871-6.
- Tabari F, ZakeriMoghadam M, Bahrani N, Monjamed Z (2007). Evaluation of the quality of life in newly recognized cancer patients. *Hayat*, **13**, 5-12.
- Tastan S, Iyigun E.(2013). Evaluation of the knowledge, behavior and health beliefs of individuals over 50 regarding colorectal cancer screening. *Asian Pac J Cancer Prev*, **14**, 5157-63.
- Taylor VM, Schwartz SM, Jackson JC, et al (1999).Cervical cancer screening among Cambodian-American women. *Cancer Epidemiol Biomark Prev*, **8**, 541-6.
- Tehran:Jahad Daneshgahi (2008), 193.(Persian).
- Tessaro I, Mangone C, Parkar I, Pawar V (2006). Knowledge, barriers, and predictors of colorectal cancer screening in an Appalachian church population. *Prev Chronic Dis*, **3**, A123.
- Tu SP, Taylor V, Yasui Y, et al (2006). Promoting culturally appropriate colorectal cancer screening through a health educator: a randomized controlled trial. *Cancer*, **107**, 959-66.
- Ueland AS, Hornung PA, Greenwald B (2006). Colorectal cancer prevention and screening: a health belief model-based research study to increase disease awareness. *Gastroenterol Nurs*, **29**, 357-63.
- United European Gastroenterology Federation (UEGF).(2003). Public awareness of colorectal cancer in Europe. A summary report prepared for the UEGF public affairs committee by IPSOS research.
- Van Rijn AF, van Rossum LG, Deutekom M, et al (2008). Low priority main reason not to participate in a colorectal cancer screening program with a faecal occult blood test. *J Public Health*, **30**, 461-5.
- Vernon SW (1997). Participation in colorectal cancer screening: a review. *J Natl Cancer Inst*, **89**, 1406-22.
- Von WC, Semmler C, Good A, Wardle J (2009). Health literacy and self-efficacy for participating in colorectal cancer screening: The role of information processing. *Patient Educ Couns*, **75**, 352-7.
- Wang JH, Liang W, Ma GX, et al (2014). Promoting Chinese-speaking primary care physicians' communication with immigrant patients about colorectal cancer screening: a cluster randomized trial design. *J Health Care Poor Underserved*, **25**, 1079-100.
- Winterich JA, Quandt SA, Grzywacz JG, et al (2011). Men's knowledge and beliefs about colorectal cancer and 3 screenings: Education, race, and screening status. *Am J Health Behav*, **35**, 525-34.
- Winterich JA, Quandt SA, Grzywacz JG, et al (2009). Masculinity and the body: How African American and White men experience cancer screening exams involving the rectum. *Am J Mens Health*, **3**, 300-9.
- Wolf RL, Zybert P, Brouse CH, et al.(2001). Knowledge, beliefs, and barriers relevant to colorectal cancer screening in an urban population: a pilot study. *Fam Comm Health*, **24**, 34-47.
- Wong RK, Wong ML, Chan YH (2013). Gender differences in predictors of colorectal cancer screening uptake: a national cross sectional study based on the health belief model. *BMC Public Health*, **13**, 677- 89.
- Zapka JG, Puleo E, Vickers-Lahti M, Luckmann R (2002). Healthcare system factors and colorectal cancer screening. *Am J Prev Med*, **23**, 28-35.
- Zheng YF, Saito T, Takahashi M, Ishibashi T, Kai I (2006). Factors associated with intentions to adhere to colorectal cancer screening follow-up exams. *BMC Public Health*, **6**, 272.



This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.