

Practical Application of Health Belief Model to Enhance the Uptake of Colorectal Cancer Screening

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Abstract

Background

Health care providers have a pivotal role in promoting people's screening behaviors resulting in early detection of cancer. This study was conducted to examine the effect of an intervention program based on Health Belief Model (HBM) on knowledge and participation of administrative personnel of one of the major medical schools of Iran in colorectal cancer screening program

Methods

156 official administrative personnel's with average risk for colorectal cancer working in Shiraz Medical Sciences University including its affiliated hospitals were enrolled in the study. Their demographic data, level of knowledge, willingness and perception barriers to participate in screening programs were examined via two separated questionnaires. All the subjects were asked to provide stool sample for fecal occult blood test (FOBT). Then they were randomly assigned to experimental or control group (n=78). The experimental group was exposed to the interventional program. Two groups of the study were followed for three months. Then knowledge and the rate of subjects' participation in screening program were examined.

Results

The results of the study revealed that most of the subjects are not interested in colorectal screening tests. Their most perceived barrier for (FOBT) and colonoscopy were lack of time and low perceived susceptibility (feeling to be healthy), respectively. Pre (1.2 ± 4.7) to post-test (11.2 ± 1.9) changes in knowledge score of the experimental group was higher than that of the control group (1.7 ± 3.9 in the pretest and 2.6 ± 3.8 in the post test). Furthermore, participation of the experimental group in screening program was significantly higher than that of the control group ($p < 0.001$).

Conclusion

Application of HBM in the interventional program on colorectal cancer may result in an increase in the knowledge & participation of subjects in the screening program.

Keywords Health belief model; Screening program; Colorectal cancer, FOBT uptake, Colonoscopy

Introduction

Worldwide, about 1.24 million new cases of colorectal cancer were diagnosed in 2008, 664,000 in men and 571,000 in women [1]. CRC as a major health concern [2], is the third most common cancer in the United States and the United Kingdom [3,4]. CRC is the sixth most common cancer in Iran. Most of the cases are adenocarcinoma and the majority occur in patients over the age of 70[5].

Early detection of CRC leads to decrease in mortality [6]. Although periodic screening with the fecal occult blood test (FOBT), sigmoidoscopy, colonoscopy or double-contrast barium enema are suggested for early detection of CRC [7,8], screening utilization is extremely low [7,9-11]. Lack of physician's recommendation [12] has been found as important contributing factors and thereby primary care physicians' role in early detection has been recognised [13].

Factors associated with lack of adherence to CRC screening tests are conceptualized in Health Belief Model (HBM). Components of this model are: individual perceptions (perceived susceptibility and severity), modifying factors (perceived threat and cues to action) and likelihood of action (perceived benefit and perception barriers and

taking health action). Despite the importance of providing education for CRC screening, little is known about the effectiveness of application of (HBM) on knowledge and CRC screening behavior.

Method

This study was conducted to determine the overall perception of the subjects about colorectal screening tests and to measure the effect of an intervention program based on HBM on knowledge and also FOBT and colonoscopy uptakes of official administrative personals with average risk for colorectal cancer (n=156) working in Shiraz University of Medical Sciences. Therefore they had no risk factors except for their age which was >50.

Proportionate cluster sampling method was used. Sample size was determined based on the result of another study [14]. Subjects were assigned randomly to any of the control and experimental groups.

The data were acquired from questionnaire, FOBT uptake and colonoscopy uptake if a positive FOBT is reported. Two questionnaires were used in the pretest to collect demographic information and subjects' knowledge of screening tests. The latter contains 15 items and is similar to the questionnaire used in another study [15]. Its validity and reliability was confirmed.

Subjects were met at working hours and their consent was obtained. Then both groups were provided 2 cards. The first card supplied the necessary information regarding FOBT. The second one was an invitation card, containing the address and the telephone number of the laboratory at the hospital. Every subject was provided with a sample container and was remind that the tests are free of charge.

The intervention program

The intervention program of the study was offered just to the experimental group. They were provided with an educational booklet containing appropriate materials related to colorectal cancer which was approved by a panel of expert. In the second session, they were given an opportunity to raise any question about the content of the educational booklet and the information card. HBM was used to conduct the educational sessions. The components of HBM [16], cues to action and self-efficacy were used as a guideline in each individual teaching session (Table1).

Definition of the Concepts of Health Belief Model	Application in the intervention of the study
1. Perceived Susceptibility One's belief of the chances of getting a condition	Population at risk and their risk levels was defined. Low, average and high risk population for colorectal cancer was described.
	Personalized risk based on each person's behaviours and conditions e.g. their age and other personal habits such as eating habits were explored.
	Perceived susceptibility was heightened by showing them pictures of patients undergoing surgery for colorectal cancer.
	Recent statistics about colorectal cancer in the region, province and city was presented.
	The prevalence and mortality rate of CRC in Iran and Fars province was provided

	Regarding negative family history of CRC (perceived susceptibility), possibility of presence of a silent gene or development of solitary cancers without family history were explained.
	They also were explained that lack of a positive family history does not guarantee immunity from the disease.
	Booklet was reviewed with the subjects and they were asked to do risk assessment.
	Lack of recommendation or advice for screening tests by the physician and care providers was identified as one of the important factors influencing perceived susceptibility. Therefore; the necessity of screening tests (despite of no recommendation from physician) was emphasized.
	Necessity of conducting screening tests even in the absence of any clinical sign and symptom (perceived susceptibility) was described. The subjects were educated that lack of clinical sign or symptoms does not mean that they are healthy. In fact, the value of screening programs lies in their detection of pre-malignant lesions in people who do not show any clinical presentation and are apparently healthy. Increased risk with increased age was mentioned in order to motivate them.
2. Perceived Severity	Consequences of the risk and the conditions such as colostomy was specified and described. Pictures of patients with colostomy bags were shown to subjects.
One's belief of how serious a condition and its consequences are	Subjects experience related to cancer was explored.
	Statistics of negative consequences of colorectal cancer was provided.
	They were asked to reflect on the conditions related to colorectal cancer and its consequences.
	Early and delayed diagnosis was compared regarding mortality rate and complications. They were shown pictures of patients undergoing surgical operation for their CRC who are using a colostomy bags to understand the seriousness of the disease and the importance of accepting the test.
3. Perceived Benefits	Positive effects of a FOBT in preventing colorectal cancer was clarified and described.
One's belief in the efficacy of the advised action to reduce risk or seriousness of impact	Difference between early and late diagnosis of colorectal cancer was clarified.
	It was emphasized that polyps are benign neoplasms, however, potentially can progress to malignancy. Therefore; it is important to conduct screening tests for their early detection and removal in a treatable stage before advancing into an invasive cancer.
	Action to take was defined: A card containing all the information they need (how, where, when) was provided.

	The importance of screening behavior in reducing the seriousness of different cancer was explained
4.Costs and Motivation (Perceived Barriers)	barriers were Identified and reduced through reassurance, incentives, and assistance
One's belief in the tangible and psychological costs of the advised behavior.	In order to address lack of knowledge about availability of screening programs as a perceived barrier face – to – face instruction was conducted and necessary information was provided.
	They were reassured that the tests are free of charge (perceived cost) to eliminate the financial barrier.
	Reminder cards were sent to them to increase their motivation and compliance.
	The importance and advantages of screening and early diagnosis were reviewed with the subjects in order to overcome the feeling of embarrassment (perceived barrier).
	They were provided the opportunity to collect fecal samples at home, work or lab. Aid by same sex investigators was offered in order to eliminate shame and embarrassment factor. The subjects were assured that colonoscopy in case of detecting a positive FOBT will be done by a physician of the same sex and their privacy will be respected (perceived barrier).
	In regard to fear of risks and pain from each test (perceived barrier), the type, method and the place where the tests would be conducted were explained. Also risks and complications, medical and nursing care provision, and safety of tests were explained. It was emphasized that the colonoscopy would be performed only if the result of the FOBT is positive.
	Psychological comfort after detecting a negative FOBT or colonoscopy was described
	As the tests are perceived unpleasant (perceived barrier) the subjects were informed about the increasing risk of CRC in people after age 50.
	To overcome their time limitation (perceived barrier) subjects were provided the possibility of special arrangement for delivering the sample to the lab in their comfort. (Since the bowel movement habits are different in different persons). This measure was used to relieve their perceived cost.
5. Cues to Action	All the information about the test including preparation and facilities was provided to subjects in the forms of verbal and written (booklet, cards and reminders).
Strategies to activate "readiness"	Considering all other components of the health belief model special cues to action was provided to increase their awareness They were informed of the result of their tests by the phone.
6. Self-Efficacy	After each educational session they were asked to express their feeling about the confidence they have in their ability to perform the required test.

Confidence in one's ability to take action	Based on their confidence training and guidance was provided.
	They were informed of the result of their tests by the phone to reinforce them to recollect the sample for the second and third time.

Table 1: Application of the components of HBM in the intervention of the study

All the subjects were followed for determining their uptakes of FOBT and colonoscopy if required.

to increase their motivation.

Three months later, all subjects were interviewed again and the same knowledge questionnaire was completed for each person. After

To analyse data answers to the question about tendency of the subjects to undergo CRC screening was classified in 4 categories Answers to the open question about the cost and motivation (perception barriers) to do colorectal cancer screening tests including FOBT and colonoscopy (e.g. lack of time, lack of advice etc.) were also categorized.

To score the knowledge of subjects a true answer was awarded +1 point and a false answer was awarded -1 point and any answer in the form, "don't know" was awarded 0. The participation level of subjects was rated as follows: persons who did FOBT once, twice or thrice, were awarded 1, 2 or 3 points, respectively. Those who did not participate at all were awarded zero point. Based on the results of FOBT, there was no need for colonoscopy. Therefore; colonoscopy uptake was not applicable. Data were analyzed using SPSS ver. 11.5. Descriptive and inferential analysis was applied using mean, percentage, paired t test , t test, chi square and Mann- Whitney U test.

Ethical considerations

Institutional Review Board (IRB) approval for the study was obtained from the Ethics Committee of the University (ECSUMS). Written consent was obtained from each patient. The purpose of study, voluntary participation, confidentiality and freedom to discontinue at any time was reviewed.

Findings:

Subjects involved in the study were mostly men (69.8%), most of them were married (88.5%) and their education level was mostly post-secondary school diploma (41.7%), while the remained were distributed in other three groups of education level. Their intention to participate in the screening program was as follows: very interested (12.17%), relatively interested (33.97%), not so interested (28.86%), and absolutely not interested (25%). Based on the findings men and women were not significantly different in regard to their tendency status (p=0.19). Cost and motivation (perception barriers) to participate in the screening programs including (FOBT) and colonoscopy as viewed by the subjects are presented in Table 2.

FOBT (%)	57.6
Lack of time	45.6
feeling healthy (lack of clinical signs)	35.8
lack of advice by the physician	13
unpleasantness of the test	7.6
lack of knowledge of tests	5.4

other reasons	61.1
Colonoscopy (%)	51
feeling healthy (lack of clinical signs)	15.2
lack of advice by the physician	19.5
unpleasantness of the test	34.7
lack of knowledge of tests	8.6
shame and embarrassment	9.7
being afraid of pain	5.4
risks	
other reasons	

Table 2: Cost and motivation (Perception barriers) for FOBT and colonoscopy (%)

Knowledge scores of both groups are increased significantly from pretest to post test. . Pre (1.2 ± 4.7) to post-test (11.2 ± 1.9) changes in knowledge score of the experimental group was higher than that of the control group (1.7 ± 3.9 in the pretest and 2.6 ± 3.8 in the post test). Pre to post changes of the experimental group analysed by paired t test was significant ($P < 0.001$). Paired t test for the control group revealed no statistical difference. Also the pre to post-test changes in the experimental group was significantly higher than that of the control group ($p < 0.001$). The frequency of reference (participation) of subjects for FOBT is given (Table 3).

Participation Rate (3-timesFOBT)	Intervention	Control	Total
First Time	64 (83.1%)	11 (14.1%)	75 (48.7%)
Second Time	63 (80.8%)	6 (7.7%)	69 (44.2%)
Third Time	54(69.2%)	3(3.8%)	57 (36.5%)

Table 3: Average risk office employees participation rates in colorectal cancer screening test (FOBT) in both groups

Discussion and Conclusion

The findings revealed that only 12.17% of subjects were “so interested” in participation in screening programs (FOBT and colonoscopy) which is lower than the findings of another study conducted in Europe [15].

Lack of interest of the subjects in participation in the screening programs by a significant proportion of females and males without any difference between the female and male is not congruent with findings of other studies. In one study conducted in European countries it was found that men are less interested than women to participate in such screening programs [15]. However, in one study conducted in the US men showed more interest to participate and actually did [17].

The most frequent factors withholding participation in the FOBT screening program in our study were lack of time (being busy), and feeling healthy (lack of clinical signs). Findings of another study showed that unpleasantness and not being advised by the physician were the most frequent factors: 41% and 35%, respectively [15].

Regarding tendency to participate in colonoscopy, Feeling healthy (lack of clinical signs) and not being advised by the physician were the most frequent perception barriers. In a study aimed at analysis of the

African-Americans perception of barriers and advantages of screening for colorectal cancer, the most frequent factors affecting uptake of FOBT were lack of a positive family history, lack of advice by the physician, lack of clinical signs and for colonoscopy, were lack of advice by the physician and lack of clinical signs [18].

Both groups’ knowledge score increased significantly. The increase in the knowledge of the control group may be due to possible interaction with the experimental group and their exposure to mass media or self-study/awareness. Furthermore, providing both groups with a card containing summary information on the FOBT and colonoscopy in the first stage of the study may be a reason for the increase in knowledge of the control group. However, a significant difference was found between the two groups regarding their pre- to post-study scores of knowledge affirming the effectiveness of the interventional program on the knowledge level of experimental group.

Based on the finding of this study the experimental group participated in screening program more than the control group. It appears that the individual intervention based on the elements of health belief model is the key factor for this significant difference. It is reasonable to believe that cost and motivation (perception barriers) to screening and its benefits are key predictors of participation and could provide a guideline for intervention programs [19].

The results highlight the necessity for intervention regarding benefits and future consequences of screening to increase participation. Educating the experimental group about early diagnosis and treatment and complications or mortality of advanced disease as well as arrangement for saving participants’ time led to more participation in screening program. In one study it was found that low consideration of future consequences (CFC) group attributed greater importance to practicalities of screening than the high CFC group while the opposite was found for the importance of benefits [20]. Other criteria of the intervention applied in this study such as reminders, use of health belief model along with the subjects’ assessment results as a guideline in the intervention are other key factors in obtaining such results. Findings of another study suggest that interventions are most successful when they target individuals or communities, address known perception barriers to screening, deliver tailored messages, use multiple methods of message delivery, and are delivered over multiple time points [21].

High knowledge and awareness along with increase in screening behavior as supported by another study [17], concurred with our finding. However, to generalize the results further studies on different population are suggested. In one study low uptake in the most ethnically diverse areas and a striking gradient by socioeconomic status (SES) was found [22]. Application of the HBM in the current study provides an appropriate conceptual framework to be integrated in our conventional methods of teaching. However further studies are needed to better shed lights on the effectiveness of HBM particularly when compared with different models of teaching.

The findings of this study have extensive applications in the activities of physician, nurses, other health care providers, and maybe media. Using these findings and developing suitable interventional programs at the community level, we can increase participation of the individuals in screening programs of colorectal cancer.

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MM devised the concept for the study, developed the study design, supervised data collection and analysis and drafted the manuscript, involved in the coordination of the study. MR collected data, run the intervention of the study, involved in the conception of the study performed the analyses. SGH contributed to the design, contributed to the design of intervention of the study. MSF contributed to the design and provided feedback on this work. NZ conducted statistical analysis and provided inputs on design. All authors read and approved the final manuscript.

Conflict of Interest

The authors have no conflicts of interest.

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