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## RESEARCH ARTICLE

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# Factors Predicting Fecal Occult Blood Testing among Residents of Bushehr, Iran, Based on the Health Belief Model

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### Abstract

Colorectal cancer is a major cause of mortality worldwide. Fecal occult blood testing has proven a very effective screening tool for early detection and mortality reduction. The aim of this study was to determine predictors factors related to fecal occult blood testing using the Health Belief Model method among residents of Bushehr, Iran. A cross sectional study was performed on a sample of 600 men and women more than 50 years of age. The sample was selected by a convenience method from patients referred to public and private laboratories throughout the city. Each subject filled out a questionnaire which was designed and developed based on Health Belief Model constructs. Statistical analysis was conducted using ANOVA, T-test, chi-square test, and logistic regression. Fecal occult blood tests were performed on 179 (29.8%) out of 600 subjects, of which 95 patients (58.1%) did a periodic examination test and 84 patients (46.9%) had a doctor's advice for testing. According to the logistic regression model, the perceived barriers ( $P=0.0$ ,  $Exp(B)=0.3$ ), perceived benefits ( $P<0.01$ ,  $Exp(B)=1.9$ ) and self-efficacy ( $P<0.01$ ,  $Exp(B)=1.6$ ) were predictive factors related to occult blood testing among subjects. The results showed that reducing people's perception of barriers to testing, increasing perceived benefits of screening, and reinforcing self efficacy can have major effect in increasing the rate of fecal occult blood screening for colorectal cancer prevention.

**Keywords:** Colorectal cancer - fecal occult blood test - Health Belief Model - Iran

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### Introduction

Colorectal cancer is one of the most prevalent and important types of cancer (Moshfeghi et al., 2011), and every year almost one million new cases of this cancer is reported worldwide. It plays out fatal for more than half of patients (Sadjadi et al., 2005). Recent studies indicate the increasing trend of this cancer in Asian countries (Centers for Disease Control and Prevention, 2008) and in Iran, this trend has been higher compared to other Asian countries (Moghimi-Dehkordi et al., 2012), in a way that among Iranian women, this illness is considered as the third most prevalent type of cancer and also among Iranian men, it is considered as the fifth prevalent type of cancer (Khazaeli et al., 2014).

High rates of death resulted by colorectal cancer have signified the importance of prevention of this cancer more than before. However, most fatalities resulted by colorectal cancer are easy to prevent through screening tests (Khazaeli et al., 2014). In addition, the five year survival rate of colorectal cancer is closely related to its diagnosis stage. If it is diagnosed during the early stages, the rate of survival increases up to 90 percent (Tastan et al.,

2013). Therefore, regular screening tests are considered as one of the most valuable and important methods for diagnosis of this illness (Menon et al., 2003).

For diagnosis of colorectal cancer, there are several methods such as fecal occult blood testing (FOBT), Endoscopy (Colonoscopy and Sigmoidoscopy), and X-ray imagery (Winawer et al., 1993; Rex et al., 2009). Among these methods, the fecal occult blood testing can be considered as a simple, non-expensive and non-aggressive method as well as being the first credible way of early diagnosis of colorectal cancer (Moshfeghi et al., 2011) in a way that in many countries for men and women who are at risk of this cancer, the current recommendation is a onetime annual fecal occult blood test after reaching the age of 50. However, for people who are at high risks, these tests should start from younger ages and more frequently (Wong et al., 2013).

Evidence has shown that a person's level of knowledge, type of perspective and beliefs in the context of risk factors and diseases are significantly related to performance of screening behaviors. And with respect to complexity of screening behaviors, application of behavioral theories and models becomes necessary in conducting screening

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tests (Sylvia et al., 2011). One of the applied models in this domain is the health belief model (HBM) which is widely used for evaluation of beliefs of individuals regarding screening behaviors (Sylvia et al., 2011; Levin et al., 2008; Pignone et al., 2011). According to this model, if an individual believes that he or she is susceptible to diseases such as cancer (Perceived susceptibility), and also comprehends the depth of this risk and seriousness of its several side-effects (Perceived severity) and considers recommended behaviors beneficial (Perceived benefits) for reduction of the risk or severity of illnesses, also if she or he is able to overcome the barriers of behavior such as expenses, time and etc. (Perceived barriers), and has enough confidence in his or her capabilities for behaving in a way that it leads to a desirable outcome (Perceived self-efficacy), then the individual will definitely have more tendency for participation in behaviors which promote health (Kim et al., 2012). In addition the individual will be more likely to perform colorectal cancer screening.

In this regard, there are some disagreements on the effective constructs of HBM and in different studies, different constructs of HBM are related to performance of screening test (Javadzade et al., 2012; Hind et al., 2008).

On this basis, with respect to importance of early diagnosis of colorectal cancer and low trend of people older than fifty years to performance of fecal occult blood testing as an effective method for diagnosis of this cancer, in addition to existence of paradoxes in findings of previous researches regarding effective elements in performance of this method of screening, researchers have performed a research aimed at determination of anticipator factors in performance of fecal occult blood testing based on HBM among over 50 year old citizens of the city of Boushehr in order to design and propose an effective solution for propagation of this hygienic behavior which can be extremely effective in promotion of health level of the entire society.

## Materials and Methods

### *Study design*

The present study is a cross-sectional study performed on 600 men and women over fifty years old since March to May, 2015 in four laboratories in Bushehr, a southwestern province in Iran. The sampling was convenience method from clients of private and public laboratories. The criteria for entering this study include an age of over 50 years, permanent residence in the city of Bushehr, not being infected with colorectal cancer or other cancers as well as not having a record for colorectal cancer among the family. Also the exclusion criteria were lack of tendency for participation in the study.

With respect to rate of performance of fecal occult blood testing which was reported as 40 percent in previous researches (Bae et al., 2014), a minimum number of 577 individuals were estimated for the sample and with considering for 5% attrition rate, the sample size was determined as approximately 600 individuals.

### *Methods and data collection*

The study was performed in two stages. The first stage

was dedicated to preparation and determination of validity and reliability of the questionnaire. For this purpose, through a library study, the entire questionnaires regarding the health belief model in the context of colorectal cancer were extracted and translated (Satia et al., 2007; Shokar et al., 2008; Chen et al., 2010). Furthermore, a series of questions were prepared. Face and content validities of the questionnaire were evaluated by 11 experts in the domain of health education and nursing. According to content validity index (CVI) and the content validity ratio (CVR), necessary reformations were performed. CVR was respectively 0.8 for perceived susceptibility, 0.7 for perceived severity, 0.7 for perceived benefits, 0.6 for perceived barriers, and 0.7 for self-efficacy. The total CVR of the scale was determined as 0.7 and for awareness questions, this value was calculated as 0.8. The simplicity index for scale was 0.9. The index of clarity was calculated as 0.9. In addition, the index of relevancy for the total scale was calculated as 0.9. Furthermore, in preliminary studies, reliability of instruments was determined through completion of questionnaires by 30 individuals of the sample and calculation of Kuder Richardson coefficient for awareness questions as well as calculation of Cronbach's alpha coefficient for constructs of the model. The Cronbach's alpha coefficient was respectively calculated as 0.7 for the structure of susceptibility, 0.9 for severity, 0.9 for benefits, 0.9 for barriers, and 0.9 for self-efficacy. Also the total reliability of questions was calculated as 0.8.

In the second stage, the final questionnaire was filled by respondents referred to public laboratories (one laboratory) and private laboratories (three laboratories). It is noteworthy to state that certain laboratories were selected randomly.

### *Instruments and measures*

The final questionnaire included three sections comprised of modifying factors, questions regarding the constructs and a section related to performance of screening test.

The section of modifying factors was aimed at evaluation of demographic features and predisposing factors to colorectal cancer with 20 questions as well as evaluation of awareness regarding colorectal cancer with 20 items which included right answers (1 point), and wrong answers (0 points).

The section related to constructs of HBM included 52 items. Six items were related to perceived susceptibility, 15 items were related to perceived severity, eight items were related to perceived benefits, 17 items were related to perceived barriers, and six items were related to self-efficacy. Perceived susceptibility, severity, benefits and barriers were evaluated on a 5 degree Likert scale of completely disagree (1 point) to completely agree (5 points). Also the questionnaire of self-efficacy was evaluated based on a 5 degree Likert scale of never (1 point) to always (5 points). Section three included two questions regarding the performance of FOBT and causes of performance of FOBT including doctors' advice, periodical checkups, spotting blood in stool, etc.

After data collection, the data were analyzed by the

statistical package for social sciences software (SPSS) version 16.0. Descriptive statistics, Chi-square test, ANOVA, T- test, and logistic regression tests were used for data analysis.

#### Ethical principles

In order to consider research ethics, prior to completion of questionnaires, the entire goals and aims of the study were orally explained for studied subjects and the questionnaires were filled upon their agreement. During the completion of questionnaires, subjects were free to leave the study whenever they desired to.

## Results

Among 612 completed questionnaires, 12 questionnaires were put away as they were incomplete. Finally, data analyses was performed on 600 individuals. In this study, 311 participants were female (51.8%) and 289 participants were male (48.2%). Most of participants were married (504 participants or 84%). Also 380 participants (63.4%) were illiterate or with primary education. Most of women participating in this study were housewives (248 participants or 79.7%). The number

of retired men was 125 individuals (43.2%). The rest of demographic descriptions and their relation with fecal occult blood testing are demonstrated in Table 1. Among the participants of the study, 252 individuals (42%) had a history of gastrointestinal diseases, and 198 individuals (33%) had reported a history of other cancers in their family. Most of participants of the study (319 individuals or 53.2%) were covered by social security insurance. In terms of predisposing factors to colorectal cancer, 289 individuals (48.2%) had no exercise or physical activity. Most individuals (460 participants or 76.7%) reported consuming fruits and vegetables more than three times per week. Also 209 individuals (34.8%) smoked cigarettes or hookah.

In terms of performance of screening for fecal occult blood testing, 179 individuals (29.9%) had performed the test during the last recent years and most of them (95 individuals or 53.1%) had performed the test for periodical checkups. Also 84 of them (46.9%) had performed the test by recommendation of their physician because of having pain in their stomach. Other subsidiary causes of performance of test for these people included spotting blood in stool (32 individuals or 17.9%), having problems in bowel (23 individuals or 12.8%) and recommendation of

Table 1. Demographic Variables and Their Relationship with Fecal Occult Blood Testing

Variable		Doing FOBT in last year (%)	Not FOBT in last year (%)	P value
Sex	Man	83.0 (28.8)	205.0 (71.2)	0.60
	Woman	96.0 (30.9)	215.0 (69.1)	
Marriage	Single	5.0 (41.7)	7.0 (58.3)	0.02
	Married	138.0 (27.4)	365.0 (72.6)	
	Widowed or divorced	35.0 (42.2)	48.0 (57.8)	
Education	Illiterate	69.0 (34.5)	131.0 (65.5)	0.02
	Primary education	60.0 (33.3)	120.0 (66.7)	
	Diploma	38.0 (23.3)	125.0 (76.7)	
History of gastrointestinal disease	Academic	10.0 (18.5)	44.0 (81.5)	0.63
	Yes	78.0 (31)	174.0 (69)	
	No	101.0 (29.1)	246.0 (70.9)	
Family history of cancer	Yes	68.0 (34.5)	129.0 (65.5)	0.08
	No	111.0 (27.6)	291.0 (72.4)	
	No insurance	7.0 (12.7)	48.0 (87.3)	
Insurance	Social security	98.0 (30.8)	220.0 (69.2)	0.03
	Health service	43.0 (30.9)	96.0 (69.1)	
	Others	28.0 (34.6)	530.0 (65.4)	
Physical activity	Yes	101.0 (33.7)	208.0 (67.3)	0.24
	No	77.0 (26.6)	212.0 (73.4)	
Fruits and vegetables	Less than 3 times a week	46.0 (34.3)	88.0 (65.7)	0.22
	More than 3 times a week	132.0 (28.8)	327.0 (71.2)	
Cigarette and hookah	Yes	58.0 (27.9)	150.0 (72.1)	0.42
	No	120.0 (31.1)	266.0 (68.9)	
Job	Yes	100.0 (30.1)	232.0 (69.9)	0.95
	No	78.0 (30.4)	179.0 (69.6)	
Source of information	Yes	124.0 (38.3)	200.0 (61.7)	0.00
	No	55.0 (20)	220.0 (80)	

Table 2. Model Structures and Their Relationship to Do or Not to Do a Fecal Occult Blood Test

Constructs of HBM Structures	Doing FOBT in last year Mean±SD	Not FOBT in last year Mean±SD	P Value
Perceived susceptibility	3.3±0.6	3.2±0.6	0.02
Perceived severity	3.9±0.4	3.8±0.5	0.00
Perceived barrier	2.3±0.5	2.8±0.5	0.00
Perceived benefits	4.2±0.5	3.8±0.6	0.00
Self-efficacy	4.1±0.6	3.5±0.9	0.00
Knowledge	0.4±0.2	0.5±0.2	0.00

families (22 individuals or 12.3%).

Most common information sources were respectively radio and television (195 individuals or 32.6%), healthcare agents (130 individuals or 21.7%), and family and friends (110 individuals or 18.3%). In addition, 72 individuals (12.0%) had no previous information regarding prevention of colorectal cancer.

In this study, the mean, standard deviations of awareness, and constructs of model based on doing and not doing of FOBT are shown in Table 2.

For determining the prediction power of constructs of the model in performance of fecal occult blood testing, the Logistic regression model was used. In this model, the two level variable of performance of screening test as the response variable and demographic variables and constructs which were associated with performance of test as independent variables were inserted into the Logistic model; as a result, the model became significant (P=0.00). Based on Logistic regression, the constructs of

perceived barriers (P=0.00), perceived benefits (P<0.01) and perceived self-efficacy (P<0.01) were predictors of FOBT performance in a way that as one unit was added to perceived barriers, the chance of performance of test decreased by 74%. Also with a one unit increase in perceived benefits, the performance chance of the test would increase by %91. In addition by one unit increase in the perceived self-efficacy, the performance chance of the test would increase by 58.8%. Among the demographic variables, the variable of education had also a significant effect. In this regard, the chance of performance of test in individuals with university education (P=0.00) and in individuals with high-school education (P=0.00) was lower compared to illiterate individuals.

### Discussion

Results of this research indicated that the rate of performance of fecal occult blood testing was 29.9% and in comparison with a similar previous research by Bae in Southern Korea which reported this rate as 40.3% (Bae et al., 2014), this rate is too low.

Also Shoori Bigdeli et al (2015) have carried out a research in the city of Qom aimed at analysis of awareness, beliefs and performance of people older than 50 years towards colorectal cancer screening. In this study, results showed that only 2.5% of respondents had previously performed screening tests and 93.5% of them had no awareness regarding colorectal cancer screening. James et al (2006) also performed a study and revealed that most people participating in their research had low levels of information about screening tests.

In this study, most people who had previously underwent screening tests, had reported their reasons as their physicians' recommendation and the most important and prevalent information source for participants of this research included radio, television, healthcare personnel

Table 3. Logistic Regression Coefficients Related to Predictive Testing for Fecal Occult Blood Test

Constructs and variables	B	Exp(B)	P- value	
Perceived susceptibility	0.2	1.3	0.21	
Perceived severity	0.1	1.1	0.66	
Perceived barrier	-1.0	0.3	0.00	
perceived benefits	0.6	1.9	<0.01	
self-efficacy	0.5	1.6	<0.01	
Knowledge	1.1	3.0	0.09	
Marriage	Marriage/single	-0.8	0.4	0.33
	widowed or divorced/single	-0.3	0.7	0.74
Education	Primary/illiterate	-0.4	0.6	0.11
	Diploma/illiterate	-1.2	0.3	0.00
	Academic/illiterate	-1.8	0.2	0.00
Insurance	Social Security/no insurance	0.8	2.2	0.09
	Health service insurance/no insurance	0.8	2.2	0.12
	other Insurance/insurance loss	1.0	2.7	0.06
Information Source	Get information/no information	0.6	1.9	0.01

and agents. These results are consistent with several studies (Dassow et al., 2005; Ruffin et al., 2009; Powe et al., 2009; Shokar et al., 2008; Javadzade et al., 2012; Moghimi-Dehkordi et al., 2012) which all signify the necessity of performance of educational interventions as well as suitable informing through these mass media as well as healthcare personnel in order to propagate screening tests of the gastrointestinal system.

Among the modifying factors (demographic variables), marriage status, education level, insurance and having information sources were related to taking fecal occult blood testing. But, in the regression model, the only demographic predictors are education and having information sources. In this sense, people who have higher levels of education are less likely to perform these tests and also having valid information sources was considered as an important factor in performance of these screenings. Therefore, it is evident that if people have valid information sources such as radio, television and healthcare personnel, they are more likely to perform in-time screening tests. In terms of education, the findings of this research are inconsistent with the findings of Biden et al (2008). But this relation was not reported and observed in other studies (Shouri Bidgoli et al., 2015; Javadzade et al., 2012). This paradox may be the result of cultural differences or differences in method of conducting the research. In this study, it seems that highly educated people are confident that they can diagnose digestive problems based on their bodily symptoms and this reason has caused them to have less tendencies for undergoing screening tests. However, as a result of existence of paradoxes in this context, it is recommended that more researches be conducted in different educational levels and in different areas.

Results of this study have also demonstrated that perceived awareness, susceptibility, severity, barriers, benefits and self-efficacy are related to performance of test in the past year and this result is inconsistent with researches performed by Javadzadeh et al (2012) on older than 50 year people in the city of Isfahan. Also in a study carried out by Menon et al (2003) a significant relation was discovered between perceived benefits and performance of test during the past recent year. In other studies, there was a significant relation discovered among perceived benefits and self-efficacy and intention for taking screening test in the future (Shouri Bidgoli et al., 2015). This result is similar to the result of this research and it shows that changes in personal beliefs such as increase perceived benefits of a behavior and also reduce of barriers encourages individuals towards exhibiting screening behavior.

In addition, results of this research indicated that perceived self-efficacy, barriers and benefits are likely to be the predictors of performance of fecal occult blood testing, in a way that as the perceived barriers are increased, the chance for performance of this test decreases and by increase in perceived benefits and self-efficacy, the chances of taking this test are increased. These findings are compatible with the findings of one study (Janz et al., 2003). Also the results of study conducted by Koo

et al (2012) have signified that perceived barriers is the most powerful and potential anticipator for performance of screening test for colorectal cancer. In another study, perceived barriers were found to have a negative significant relation with fecal occult blood testing (James et al., 2002). Also in a study carried out by Wong et al (2013) perceived benefits and instructions for operation were the most potential predictors for performance of screening tests for colorectal cancer. In addition, in several studies, perceived benefits and self-efficacy were found to have a positive relation with performance of screening test (Wong et al., 2013; Shouri Bidgoli et al., 2015).

Among the structures of health belief model, the perceived susceptibility and awareness were not considered as the determinants of performance of screening test and fecal occult blood testing. These results were similar to the results obtained by one study (Shouri Bidgoli et al., 2015). On the other hand, these results are inconsistent with the results obtained by several studies (Hey et al., 2003; Bae et al., 2014) which indicated that these constructs were predictors of performance of FOBT test. The reason for this paradox or lack of consistency could be associated with cultural and social differences between populations, in a way that in Iranian culture, the perceived severity was high for all types of cancer and people were reluctant of accepting their susceptibility for occurrence of this disease. Therefore, these constructs were not considered as anticipators. In addition, the level of awareness throughout the society is remarkably low and as a result, this factor is not a good anticipator either. On this basis, people should be encouraged towards performance of these screening tests through increasing their perceived benefits and self-efficacy as well as reduction of their perceived barriers.

Limitations of this study include self-report state of manner of filling information, illiteracy of a large number of participants, problems in remembering the last time of testing and occasionally, lack of participants' ability for differentiating between different types of screening tests and reasons of performing them. These limitations were mostly overtaken by asking precise and exact questions and interviews and in some cases, asking the companies of patients regarding the time of previous tests and their types.

In conclusion, generally, results of this research have shown that the rate of performance of screening test is currently low and this fact requires more courage for encouraging people towards performance of screening tests. Also the results have indicated that perceived barriers, benefits and self-efficacy are potential predictors of performance of fecal occult blood testing. Therefore, it is recommended to seek the help of strategies for reduction of barriers as well as increasing benefits and self-efficacy.

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