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# Prevention of Colorectal Cancer Behavior with an Application of the Extended Health Belief Model in Sample of Iranian Women

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**Abstract:** This paper reports on predictors of women' prevention of colorectal cancer behaviors, using variables based on the Health belief Model in an attempt to identify influential variables that may be addressed through intervention efforts. The purpose of this study was the asses of predictor of prevention of colorectal cancer health behavior in women based an extended health belief model. In a cross-sectional study, a community sample (N = 560) of women completed a questionnaire assessing HBM variables, as well as their performance of the colorectal cancer prevention behaviors. The statistical analysis of the data included bivariate correlations, t-test, one-way ANOVA and linear regression. The results showed that the perceived severity and perceived benefits are high and the perceived barriers, yet high are relatively low among the women which increases the cues for action and increased participation. The cognition variables, perceived benefits, perceived barriers, were significantly related to prevention of colorectal cancer among the respondents. A negative association was found between prevention health behaviors and perceived barriers. Interpersonal influences, such as modeling and norms and situational influences were found to be significantly related to increased health behaviors. Perceived barrier significantly predicted to prevention health behavior also. All of the Health belief Model variables were statistically significant predictors of health behaviors and accounted for 38% of the variation. Promotion of interpersonal modeling and the women' perceived barrier should be priorities of any programs aimed at promoting prevention of health behaviors among women'. It is also concluded that the Health belief Model may be used in developing countries, like Iran, as a framework for planning intervention programs in an attempt to improve the colorectal cancer prevention health behaviors of women'.

**Key words:** Colorectal Cancer · Health Behavior · Health Belief Model · Women

## INTRODUCTION

There has been a remarkable increase in colorectal cancer (CRC) incidence in Asian countries [1]. Colorectal cancer (CRC) remains a major clinical and public health challenge, with 148,810 new cases and 49,960 deaths expected in the United States in 2008. The field of CRC research is dynamic and expanding in several directions, encompassing areas of clinical and outcomes research, epidemiology, public health and molecular sciences. Among cancer death rates for persons 40 to 79 years of age in the United States, colorectal cancer (CRC) ranks second to lung cancer in men and third in women, behind lung and breast cancer, respectively [2].

The goals of CRC screening are to reduce colorectal cancer mortality through early detection and curative intervention and to reduce the colorectal cancer incidence by detecting and removing adenomatous polyps. Screening recommendations from the American Cancer Society, American College of Gastroenterology and the United States Agency for Healthcare Research and Quality for the 70-80% of the population at average risk of

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colorectal cancer include annual FOBT in combination with flexible sigmoidoscopy every 5 years [3].

Although the benefits of alternative screening tests have not been demonstrated, these organizations have suggested that colonoscopy every 10 years may be satisfactory options based on the availability and quality of screening and diagnostic resources. In a 1999 random telephone survey conducted in the United States, 20.6% of respondents reported FOBT in the previous year and 33.6% reported having undergone flexible sigmoidoscopy or colonoscopy within the previous 5 years [4].

According to the National Cholesterol Education Program's Adult Treatment panel III, risk factors for colorectal cancer, metabolic syndrome is the presence of 3 or more of the following factors: hypertension (blood pressure of 130/85 mm Hg or greater), central adiposity (waist circumference greater than 102 cm in men or greater than 88 cm in women or a body mass index [BMI] greater than 27 [kg/m2]), low high-density lipoprotein (HDL) cholesterol (HDL _40 mg/dL in men or _50 mg/dL in women), hyper triglyceridemia (150 mg/dL or greater) and impaired glucose tolerance (fasting serum glucose of 110 mg/dL or greater) [5].

Colorectal neoplasia has been associated with markers of glucose and insulin control; insulin resistance, which is the cornerstone of the metabolic syndrome, may be the mechanism by which several risk factors (obesity, diabetes mellitus, lack of fitness) affect colorectal carcinogenesis [6].

Periodic colonoscopy has been found to be effective in reducing the incidence, morbidity and mortality of CRC in high-risk individuals [7-8]. One of the major organizing frameworks that has been used to predict cancer screening behavior is the Health Belief Model [9]. Despite variations in study design and measurement of screening attitudes and behavior, considerable support for the HBM has been documented [10-12].

**Models of Preventative Health Behavior:** This is a cross-sectional study that was carried out on 560 women. The guiding principles found in health behavior models provide useful methods to the colorectal cancer health behavior providers in promoting effective individual client behaviors.

Theories provide explanations about observable facts in a systematic manner. Therefore, utilizing these health behavior models as a framework for understanding the determinant factors of prevention of colorectal cancer behaviors is critical for planners and health care providers to achieve a comprehensive set of those factors as the goals of intervention programs in the community. Health education scientists have prepared models by using different psychological and social patterns, which are very effective. One of these models is Health Belief Model (HBM), which was planned in 1950 and developed during the years [13]. It has these dimensions:

***Perceived Susceptibility:*** That is the level, which a person knows his sensitiveness about a disease.

***Perceived Severity:*** That is the perceptions of the person about severity of the disease.

***Perceived Benefits:*** That is the person's understanding about the advantages of doing the preventive behavior.

***Perceived Barriers:*** Each healthy behavior and practice may encounter some barriers and problems.

***Cues to Actions:*** They are stimulations, which facilitate decision making. They act in two ways: some of them are internal like headache, which make the person to show a behavior for solving it. Some of the cues to actions are from outside like mass media and communication between people, which helps the person to do an especial behavior [13].

Other evidences showed that HBM model would increase likelihood of taking healthy behaviors. According to increasing kind of cancer in population in Iranian and because of importance of prevention health education through proper model for studying the behaviors, in this study health belief model was used in colorectal cancer prevention behavior the first time. Therefore the aim of this study was to predict of colorectal cancer health behavior in women with an extended Health Belief Model.

## MATERIALS AND METHODS

This is a cross-sectional study that carried out on 560 women were selected with random sampling method from health centers in Arak a city in Iran 2013.

In this study inclusion criteria included consent women for the study and without of colorectal cancer. Exclusion criteria was mother with any cancer complication were excluded. The women agreed to participate and complete a questionnaire. Interviews were conducted with a sample of 560 women, with questions addressing access/barriers to colorectal cancer prevention health practices based on health belief model.

This study that was carried out through the following steps: (1) a draft interview guide was developed; (2) a focus group was conducted to refine the interview tool and ensure questions were culturally appropriate; (3) one-on-one interviews were conducted with low level of education participants; and (4) interview results were analyzed.

The survey instrument, a questionnaire, was redesigned and reviewed many times to produce a questionnaire that would be friendly and easy to follow. The questionnaire consisted of multiple section based on HBM. The first part of the questionnaire included information on age, level of education, status of occupation and so on. Second part the questionnaire included information on colorectal cancer prevention health behavior and colorectal cancer health beliefs. Furthermore, the items related to colorectal cancer prevention health beliefs were categorized according to five domains (susceptibility, severity, benefit, barrier, cues to action) with individual items in each set to explore the same. Questionnaire was explained to study subjects who found it difficult to understand the questions.

While developing commitment to a plan of action scale, various ways of wording questions were considered to avoid the possibility that certain responses may be consistently chosen in error. This was important, as a particular phrasing of a question may ultimately be misleading to the respondent.

A panel of experts, consisting of 10 scholars in the areas of health education and promotion, epidemiologist, oncologist, preventive medicine and health care provider with field experience, reviewed and assessed the questions of commitment to a plan of action scale, orally, by evaluating the appropriateness and relevance of the items and response format. They confirmed them to be representative of the construct in order to confirm content validity of the instrument. The feedback from the panel of experts, which was mostly regarding the wording and phrasing of questions, was used to revise and modify the instrument. A pilot study was conducted to examine the utility of the instruments and to identify the problems and benefits associated with the design. The first draft was prepared following consultation with the multidisciplinary team. The content validity of the scales was also established. This pilot sample was not included in the final sample.

The questionnaire was pilot-tested with 30 women. The data were used to estimate the internal consistency of the scales, using Cronbach's coefficient alpha. The reliability of the questionnaire was found to be good (Cronbach's alpha = 0.78).

Respondents completed scales assessing the HBM factors (susceptibility, severity, benefits, barriers, internal and external cues to action). All items were rated on five point Likert scales from 1 (strongly disagree) to 5 (strongly agree) adapted from HBM literature [8-22] and were averaged to create scales.

The data were obtained by using a questionnaire, a checklist for colorectal cancer prevention (food, screening, periodical examination and so on )of women. The questionnaire included some demographic question and questions about HBM elements based on Lickert scale (five emotional detection spectrums). Score of variables (perceptions) categorized based on (Mean±SD) into weak, moderate and good level. In addition based on the proportion of correct answers, perceptions were categorized into three levels i.e. weak (less than 30%), moderate (31-60%) and good (>61%). In order to assess the validity with content validity.

The statistical package for the social sciences was used for the purpose of data entry, manipulation and analysis. Summery statistics and frequency distributions were used to describe and interpret the meaning of data and the relationship between demographic variables. The Health belief Model variables were calculated with t-test and one-way ANOVA. A Pearson's correlation coefficient was used to demonstrate the nature of associations between colorectal cancer health behavior and the Health belief Model variables. In order to explain the variation in colorectal cancer health behavior scores on the basis of these Health belief Model variables, linear regression analysis was performed. In this study Hierarchical multiple regression analyses using centered variables assessed demographic variables, HBM factors, in predicting colorectal cancer health behavior.

Research assistants explained the purpose of the study and obtained written informed consent from the eligible participants. Women participation was voluntary and anonymous using self-administered data collection procedures. The study was approved by both the Ethics Committee of Arak university of medical sciences with number 730 (Arak-Iran) and the health center Arak province in 2013.

## RESULTS

The mean age of the women was 34.48 ±10.77 years and the mean of number children was 2.11±1.73. Of the women, 21% were history of colorectal cancer in first of family.

The demographic characteristics of the women are shown in Table 1.

Table 1: Demographic characteristics and colorectal cancer variables of the women recruited in this study

| Frequency (percent) Demographic and dental variable | | No. (%) |
|---|---|---|
| Status of marriage | Single | 44(7) |
| | Married | 516(93) |
| Level of education | Illiterate | 42 (7.5) |
| | Elementary school | 108 (19) |
| | Middle school | 95(17.5) |
| | High school | 188 (33) |
| | College or university | 127 (23) |
| Status of employment | Yes | 88 (16) |
| | No | 472(84) |
| Monthly family income | 0-500$(low) | 151(27) |
| | 500-800$(moderate ) | 321(57) |
| | >800$(high) | 88(16) |
| History of colorectal cancer in family | Yes | 117(21) |
| | No | 404(72) |
| | I don't know | 39 (7) |
| History of death of colorectal cancer in family | Yes | 65(11) |
| | No | 448 (80) |
| | I don't know | 47 (9) |

Table 2: Mean and SD of dimension of HBM and colorectal cancer prevention health behavior in women

| Mean/SD Dimension of HBM | Mean | SD | Maximum | Minimum |
|---|---|---|---|---|
| Percieved Susceptilility | 62.71 | 8.82 | 25 | 92 |
| Percieved severity | 66.5 | 12 | 39 | 100 |
| Percieved threat | 64.60 | 10.41 | 32 | 96 |
| Percieved benefits | 72.11 | 12.16 | 35 | 100 |
| Percieved barrier | 61.1 | 10.77 | 23 | 100 |
| Practice | 29.33 | 8.54 | 3 | 97 |

Respondents completed scales assessing the HBM factors (perceived susceptibility, severity, threat, benefits and barriers) and colorectal cancer prevention health behavior (Table 2).

Moreover other correlation coefficience between of health belief model dimension about prevention of colorectal cancer health behavior in women showed in Table 3.

Applying Pearson's correlation analysis, it was found that colorectal cancer prevention had statistically significant positive correlations with all health belief model variables.

The cognition variables (perceived benefits, perceived barriers and activity-related effects) were significantly related to prevention of health behaviors about colorectal cancer among the respondents, with a positive association found between prevention health behaviors and perceived benefits, commitment to a plan of screening health behavior and activity-related effects. Negative associations were found between prevention of colorectal cancer health behaviors and perceived barriers. Among the cognition variables, perceived barrier had the highest correlation with colorectal cancer health behaviors. Interpersonal influences, such as modeling and norms and situational influences were found to be significantly related to the increased colorectal cancer prevention of health behaviors.

Results obtained from stepwise multiple linear regression analysis based on highest predictors respectively showed that perceived barrier and internal cues to action was higher and lower predictors about prevention of colorectal cancer behaviors in women (Table 4).

Multiple regression analysis was performed to explain the variation in prevention of colorectal cancer health behavior scores on the basis of Health Belief Model variables. All norms were statistically significant predictors and accounted for 38% of the variation (Table 5).

Statistically significant differences were found in prevention of colorectal cancer behaviors, perceived barrier, activity-related affects and perceived benefits and barriers by job (yes or not) using t-test. The difference favored women with jobbing. Also, statistically significant differences were found in prevention of colorectal cancer by women education level ($p=0.01$). Using one-way ANOVA for independent samples. women education level differences persisted after post hoc tests, with high school, diploma and college/university education perform prevention of colorectal cancer significantly higher than those having primary education and no literacy ($p<0.01$).

The respondents noted that the following individuals (as interpersonal influences) encourage them a lot to perform prevention of colorectal cancer. The most external cues to action: TV (n=337), physician (n=131), health workers (n=161) and other women (n=145).

The results showed that the most internal cues to action was: Fear of getting complications from colorectal cancer (n=193), Feeling of health and vitality (n=136), Felling of higher self-esteem for doing cancer colorectal prevention (n=190) and so on.

Approximately three-quarters of interviewees stated that they had not visited the physician in the past year. Regarding the frequency of physician visits, 37% believed that individuals should receive a exam every one year; 23% believed that visits should occur every two years.

Table 3: Correlation coefficience between of health belief model dimension about prevention of colorectal cancer in women

| Dimension of HBM | Percieved Susceptilility | Percieved severity | Percieved threat | Percieved benefits | Percieved barrier | Prevention of colorectal cancer |
|---|---|---|---|---|---|---|
| Percieved Susceptilility | 1 | | | | | |
| Percieved severity | 0.297** | 1 | | | | |
| Percieved threat | 0.167** | 0.246** | 1 | | | |
| Percieved benefits | 0.301** | 0.373** | 0.339** | 1 | | |
| Percieved barrier | -0.122* | -0.251* | -0.175* | -0.391* | 1 | |
| Prevention of colorectal cancer | 0.415* | 0.365* | 0.194* | 0.318* | -0.457* | 1 |

*P<0.01; **P<0.05

Table 4: Results obtained from stepwise multiple linear regression analysis based on highest predictors respectively (N=560)

| Steps | | Standardized B | 95 CI for B | P |
|---|---|---|---|---|
| Step 1 | Barrier | 0.35 | 0.31-0.45 | <0.01 |
| Step 2 | Barrier | 0.34 | 0.32-0.41 | <0.01 |
| | Internal cues | 0.31 | 0.28-0.37 | <0.01 |
| Step 3 | Barrier | 0.30 | 0.22-0.41 | <0.01 |
| | Internal cues | 0.33 | 0.26-0.37 | <0.01 |
| | Susceptibility | 0.28 | 0.21-0.33 | <0.01 |
| Step 4 | Barrier | 0.41 | 0.38-0.51 | <0.01 |
| | Internal cues | 0.37 | 0.30-0.42 | <0.01 |
| | Susceptibility | 0.38 | 0.31-0.45 | <0.01 |
| | External cues | 0.31 | 0.27-0.39 | <0.01 |
| Step 5 | Barrier | 0.37 | 0.24-0.43 | <0.01 |
| | Internal cues | 0.34 | 0.31-0.37 | <0.01 |
| | Susceptibility | 0.29 | 0.21-0.32 | <0.01 |
| | External cues | 0.23 | 0.19-0.30 | <0.01 |
| | Severity | 0.21 | 0.17-0.26 | <0.01 |
| Step 6 | Barrier | 0.38 | 0.32-0.43 | <0.01 |
| | Internal cues | 0.31 | 0.29-0.35 | <0.01 |
| | Susceptibility | 0.33 | 0.31-0.37 | <0.01 |
| | External cues | 0.26 | 0.20-0.29 | <0.01 |
| | Severity | 0.21 | 0.17-0.24 | <0.01 |
| | Benefit | 0.19 | 0.14-0.26 | <0.01 |

Table 5: Multiple linear regression analysis with stepwise constructs health belief model in prediction of prevention colorectal cancer in women (N=560)

| Model | Adjusted $R^2$ | Predictors (constant) |
|---|---|---|
| Model 1 | 0.352 | Predictors (constant): Barrier |
| Model 2 | 0.363 | Predictors (constant): Barrier, internal cues |
| Model3 | 0.369 | Predictors (constant): Barrier, internal cues, susceptibility |
| Model4 | 0.372 | Predictors (constant): Barrier, internal cues, susceptibility, external cues |
| Model 5 | 0.378 | Predictors (constant): Barrier, internal cues, susceptibility, external cues, severity |
| Model 6 | 0.381 | Predictors (constant): Barrier, internal cues, susceptibility, external cues, severity, benefit |

## DISCUSSION

In this study, prevention of colorectal cancer health behavior related factors among Iranian women based on the Health Belief Model were assessed. The mean score of prevention colorectal cancer health behavior scale in the respondents was 29.33±8.54. In the prevention colorectal cancer health behavior domain, "screening colorectal cancer regularly" and "using health service" were rated as the most frequent behaviors among study subjects. The lowest scores in prevention colorectal cancer health behaviors were for "referring to physician regularly". Health worker professionals should provide information about the best way of performing prevention of colorectal cancer health behaviors for women, or refer them to physician specialists for further guidance or assistance, as well as considering these behaviors as priorities while designing educational programs for women.

Not using screening colorectal cancer in Iranian women may be a result of their lack of knowledge and attitude (especially low perceived susceptibility) regarding the importance of this behavior for prevention and not instructing them. It was reported that education about colorectal cancer in the health centers could be an important factor that can influence the prevention of colorectal cancer attitudes of women. Based on what was stated, educating women about prevention of colorectal cancer in health centers periods may promote not only their knowledge and attitude, but promote performing health behaviors through other periods of their life.

As the theoretical framework to understand the health behavior and possible reasons for noncompliance with recommended health action. The health belief model addresses six major components: perceived susceptibility, severity of the disease, belief that doing something about the disease is more salient than doing other things, perceived benefit belief that the action will be of benefit for either preventing or alleviating the seriousness of the disease, perceived barrier - perception that the action will cause inconvenience [14].

The mean for grade scores of perceived susceptibility, as one of the constructs of HBM was under average. The results of our study are similar to the results of Braun study about intervention to improve colorectal cancer screening among native Hawaiians[15] and study of Pignone *et al* about decision aid for colon cancer screening[16].

Perceived severity was negatively related to performance screening. This echoes Sun *et al*. [17] finding among American but is, however, contrary to the principles of the Health Belief Model, which states that increased perceived severity is associated with health seeking behavior. some studies suggesting a positive relationship between CRC screening and perceived severity[18] and others, a negative relationship[19].

Only a limited number of studies have investigated the factors that play a major role in compliance/noncompliance with colon screening advice (most usually, sigmoidoscopy) and they have yielded somewhat inconsistent findings[20].

For example, while some studies have reported a positive association between perceived susceptibility to CRC and compliance [21], others have found no such relationship [20, 22]. Similarly, perceived benefits of screening (eg, early detection of cancer) have also shown an inconsistent relationship with compliance [19-20, 23].

The most consistent findings relate to the negative association of perceived barriers to screening (eg, pain) with sigmoidoscopy [19,23] and the positive association of physicians' advice [21-24] with compliance behavior. Furthermore, in US studies, limited insurance coverage has been reported as a major barrier to colon screening [22-25].

In multiple regression analysis, we found that interpersonal modeling perceived barrier are the most powerful predictors of colorectal cancer health behavior. The total variance explaining these behaviors was 38%. It was concluded that the Health Belief Model may be used in developing countries, like Iran, as a framework for planning intervention programs in order to predict and improve the colorectal cancer health behaviors of women.

The Health Belief Model provided a useful framework for understanding respondents' attitudes and beliefs regarding colorectal cancer and the available screening tests. Perceived barriers to CRC screening tests were found to be the most relevant predictors among the Health Belief Model constructs measured in this study. Additionally, consistent with previously published studies by Myers and colleagues [26], salience and coherence or the extent to which a preventive behavior makes sense in everyday life was found to be an important predictor of screening activity.

Further health communication interventions promoting CRC screening and the benefits of early detection are needed. In addition, interventions must provide information addressing the major barriers, misconceptions and salience of CRC tests as they relate to other demands in daily life.

In the report which tested the Health Belief Model for the prevention on self-medication in women, interpersonal and situational influences and barriers were the most powerful predictors of the behavior [27].

Study participants who sought care were largely deterred by limited financial resources and the lack of adequate health insurance. These findings are consistent with the existing literature on other population, which identify income and inadequate health insurance as significant barriers to accessing care among this populations [28,29].

In the current study, however, most participants were not only aware of services available to them in health centers. Moreover, participants were aware of the recommended frequency of physician visits. That most interviewees indicated they had not utilized available services within the last 12 months appears incongruous with these findings.

The results of this study showed that physician are the most important influences on colorectal cancer health behaviors of the women. Furthermore, regression analysis showed that interpersonal modeling is the strongest predictor of prevention of colorectal cancer health behaviors.

Results showed support was found for the HBM with barriers and the extended model inclusion, perceived barrier, predicting colorectal cancer [30-32]. Population-based studies are required to sort out the relative importance of various determinants that influence decisions to participate in CRC screening procedures.

Emphasis must be placed on developing behavioral theory-based interventions that serve to enhance adherence to recommended screening guidelines by different gender groups.

Findings have shown workers in the field of prevention of colorectal cancer health, should try for changing these four perceptions more because increasing such perceptions can be effective in behaviors, which prevention of colorectal cancer.

The results of this study identified several basic educational needs of participants which increase their motivate change in their practices for prevention of cancer. In addition, internal cues to action that encourage the women to care for colorectal cancer and the contribution of physician to care, as an external cue to action to increase the care of health, are very important.

## CONCLUSSION

Support was found for the control factors, specifically a consideration of barriers, in the context of understanding prevention of colorectal cancer. Using health belief model in prevention of colorectal cancer education for increasing the likelihood of taking preventive health behaviors is applicable.

The perceived severity, perceived benefits are high and the perceived barriers, yet high are relatively low among the women which increases the cues for action and increased participation. The results of the study suggest that the women might have favorable compliance for health promotional programs. In order to reduce the burden of colorectal cancer disease endured by this group, public health practitioners must recognize and embrace their role in facilitating comprehensive prevention of colorectal cancer health programs for vulnerable, marginalized populations. The work of public health is also crucial in establishing programs to educate women on the importance of preventive care in reducing risk of colorectal cancer and serves as an important means of improving access to health care by helping at-risk groups locate financial aid. Finally the results of the study suggest that the women might have favorable compliance for colorectal cancer health promotional programs.

Findings suggest that: (1) this population (women in Arak city in Iran) is at-risk for morbidity kind of cancer for air pollution and industrial, (2) culturally appropriate programs are needed for preventive colorectal cancer education, (3) community and statewide support may help improve access to affordable health care.

**Limitations:** The above findings must be understood alongside the study's limitations. This study has limitations, including self-reported performance in prevention of colorectal cancer.

**Conflict of Interest:** None declared.

**Ethical Considerations:** The study received ethical clearance from the Arak university of medical sciences Arak Research Ethics Committee. The researcher explained the project's purpose, voluntary nature, confidentiality and use of written consent.

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