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Knowledge and Practice of Colorectal Screening in a Suburban Group of Iraqi American Women

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Abstract

Colorectal cancer (CRC) was the second most common cancer among women in 2008, accounting for 571,000 cases, and 9.4 % of all cancer cases afflicting women worldwide. According to the World Health Organization (WHO) and the Iraqi National Cancer Registry (INCR), Iraq has seen a steady rise in CRC rates among its general population over the past several decades. Despite Iraq's increasing national incidence of CRC and the growth of the US' Iraqi immigrant population over the last 10 years, little remains known about the prevalence of CRC among the latter population, their knowledge of CRC and associated risk factors, or their behavioral intent and practices regarding CRC screening. The aims of this study were to (1) examine the knowledge of and adherence to National Cancer Institute screening recommendations for CRC among a population of Iraqi women living in the Washington D.C. Metropolitan Area and (2) test the efficacy of a one-time educational intervention conducted using linguistically and culturally appropriate materials to raise awareness of, and promote future adherence to, CRC screening methods. This descriptive study used a pre/post design with a 12-month follow-up. Following extensive dissemination of information regarding the study in the Iraqi American community in the study location, 50 women were initially recruited, of whom 32 participated in the study. The study's findings revealed that the participants generally had low baseline levels of CRC screening adherence and preventive knowledge that significantly improved after the intervention as demonstrated by pre- and post-assessments of knowledge and behavior. These findings could be used to raise awareness (1) among clinicians regarding the need for early detection and screening of and referral for CRC treatment among Iraqi American women and (2) among Iraqi American women about risk factors for this disease and the importance of early detection and screening. The study also highlights the need for a larger study of knowledge, attitudes, and perceptions among both this population and the clinicians who serve them.

Keywords

Iraqi refugees; Women; Immigrants; CRC (colorectal cancer); Cancer prevention and screening

Introduction

Colorectal cancer (CRC) was the third most common cancer worldwide in 2012, with nearly 1.4 million new cases diagnosed in that year, 614,000 of which were in women—9.2 % of all cancers among women, according to the World Health Organization (WHO) [1]. The World Cancer Research Fund estimates that, by 2035, there will be 1.08 million women with CRC [2]. Both the American Cancer Society and the United States Preventive Services Task Force (USPSTF) on Colorectal Cancer note that CRC is primarily a preventable disease. The adoption of certain prophylactic health practices such as the maintenance of a healthy weight, adherence to a low-fat diet, reduced alcohol consumption, and no smoking along with regular colorectal screenings can significantly reduce the risk of developing CRC [3]. The use of screening tools alone has decreased the incidence of CRC in the USA during the past 30 years [4, 5].

CRC in Iraq

The World Health Organization (WHO), Iraqi Cancer Board, and the Iraqi Ministry of Health have published cancer incidence and mortality rates for the period between 1991 and 2005 [6]. The data collected by the Iraqi Cancer Board identified CRC as the seventh most common type of cancer among both male and female Iraqis, with an incidence of 2.56/100,000 [7]. The WHO published statistics in 2008 that confirmed the Iraqi Cancer Board's findings that the mortality rate of CRC in Iraq (3.9/100,000 population) almost equaled the country's age-standardized incidence of CRC (4.4/100,000 population) [8]. The near equilibrium of CRC mortality and incidence rates in Iraq contrasts sharply with CRC trends in the USA, where the mortality rates associated with the disease are much lower than its incidence rate and continue to decline [2, 3]. Health professionals attribute the US's progressive decrease in CRC mortality rates to its population's awareness of and adherence to preventive health behavior, early detection and screening, and referral for treatment [2]. Humadi and Bahrani (2008) correlated the increase in CRC incidence rates in Iraq to health behaviors related to Westernization [9], and thus demonstrated the need for a heightened awareness of CRC prevention information and compliance with screening methods among Iraqi populations in Iraq and the USA. Although no published studies regarding CRC prevention knowledge and practices among Iraqi immigrants living in the USA were found, studies of other cancers have revealed that immigrants generally have less knowledge, awareness, and behavioral intent toward cancer prevention than the US general population [10–12]. Screening adherence for CRC in particular has been linked to a person's health insurance status, educational level, and screening recommendations by one's health care provider (HCP) [13, 14].

Non-modifiable Risk Factors

Age, individual medical history, and family medical history constitute non-modifiable risk factors for the development of CRC. Almost all (90 %) of CRC cases present in individuals over the age of 50. Patients who have a medical history of inflammatory bowel disease [15, 16], diabetes [17, 18], and/or colonic polyps also experience a higher risk of developing CRC [19].

Familial and somatic genetic mutations may also lead to CRC. In families with known histories of early onset genetic CRC, DNA testing can be used to detect familial adenomatous polyposis (FAP), which occurs in 1 in 10,000 people in the US population, and Lynch syndrome (HNPCC: hereditary non-polyposis colorectal cancer), which accounts for 2 to 4 % of all colon cancers. Unfortunately, when new mutations occur in an individual, it is likely that the individual will not become aware of said mutation until an early onset tumor has been identified [20].

Modifiable Risk Factors

The strong link between obesity and higher CRC incidences highlights the importance of modifiable lifestyle risk factors in the prevention of this disease. For example, the consumption of a diet rich in red, processed meat and few fruits or vegetables contributes to CRC risk [21–23]. Research has also shown that physical inactivity, alcohol consumption, and smoking are positively correlated with CRC incidence [24–26].

CRC Screening

The United States Preventive Services Task Force (USPSTF) recommends beginning screening at age 50 and continuing until the age of 75 through the use of colonoscopy, sigmoidoscopy, and the fecal occult blood test (FOBT) [27–30]. Colonoscopy is the preferred diagnostic procedure for CRC screening and detection every 10 years [31, 32] because it involves a full exploration of the entire colon and can be used to remove colonic polyps [33–36]. FOBT is considered to be a very convenient, noninvasive screening method that should be conducted on an annual basis. Moreover, screening guidelines generally recommend that individuals with a genetic predisposition toward CRC follow an earlier screening regimen. In the context of our study, the age of participants as well as their knowledge of CRC risks and family medical history proved central to the design, development, implementation, and evaluation of the educational interventions [37].

Iraqi Women in America

Although Iraqis have immigrated to the USA for the greater half of the twentieth century, the aftermath of Operation Desert Storm (1991) and, more recently, Operation Iraqi Freedom (2003) has seen a greater influx of Iraqi immigrants over the past two decades [37–39]. Recent research on health disparities in immigrant communities has included Iraqi American women in response to this marked population increase. The research findings suggest that Arab American women generally have a low awareness of cancer screening methods; potential avenues through which to access screening procedures; the role of the health care

provider; and potential treatment options [40–43]. In the case of Iraqi women in the USA, cultural and linguistic barriers may prevent recent Iraqi immigrants from easily acquiring knowledge of cancer incidences, risk factors, screening methods, or treatment options. Consequently, it is imperative for researchers to conduct culturally appropriate intervention studies to determine the most effective ways to improve knowledge, attitude, and practices among this population and achieve a decrease in CRC incidence rates [44].

The conception and design of the present educational intervention was based on educational materials from the American Cancer Society and the United States Preventive Services Task Force (USPSTF) on colorectal cancer and on the demonstrated success of CRC prevention programs targeting specific populations. These included, for example, those based on telephone outreach and the mailing of FOBT kits directly to at-risk individuals [45], and health-fair style screening for the uninsured [46].

Although studies regarding the cost-effectiveness of CRC prevention programs generally focus on national screening initiatives, a review of the cost-effectiveness of several CRC screening modalities led Jeong and Carins [47] to conclude inter alia that (a) “[i]t is vital to know what test(s) should be considered first in which population, or in what combination or sequence, in order to maximize health benefit considering... effectiveness and cost-effectiveness evidence.” and (b) “the cost-effectiveness of a diagnostic strategy depends in part on the consequences for subsequent treatment” [47]. We did not address cost-effectiveness in this qualitative research study.

Insofar as the present intervention and other comparable population-targeted interventions are concerned, however, the insights provided by Jeong and Carins imply that the more specific the intervention is to the targeted population, the more impact the intervention will have, and therefore, the more most cost-effective it will be.

The purpose of this study was to explore the knowledge, attitudes, and practices of Iraqi American women with regard to CRC to (1) examine the knowledge of and adherence to National Cancer Institute screening recommendations for CRC among a population of Iraqi women living in the Washington D.C. Metropolitan Area and (2) test the efficacy of a one-time educational intervention conducted using linguistically and culturally appropriate materials to raise awareness of, and promote future adherence to, CRC screening methods.

Materials and Methods

Research Design

The study, which was initiated in October 2011 and completed in April 2012, comprised a pre-experimental descriptive pre/posttest design to assess the efficacy of a culturally appropriate educational intervention regarding CRC. Upon obtaining approval from the Institutional Review Board of the University of the District of Columbia, the researcher conducted the study over a 2-month period with a sample of Iraqi women living in the Washington Metropolitan Area.

Participants and Recruitment

Purposive and snowball sampling methods were used to recruit participants through local organizations with which the Iraqi women associated. Flyers advertising this study were distributed to members of the Iraqi American Community Center in Northern Virginia, Iraqi HCP clinics, the Arabic School for Iraqi Children, and similar organizations. In addition, this information was posted on Facebook pages belonging to the Iraqi Students Association (ISA) and the US Iraqi Youth organization (USIY). Eligibility criteria included female of Iraqi origin (whether born in Iraq or not), 21 to 60 years old, a resident of the Washington D.C. Metropolitan Area, and willing to participate in the study.

Fifty women who responded to the recruitment advertisements and met the study criteria were contacted. Thirty-four of these initial respondents expressed an interest in attending the groups, and 32 ultimately participated. Initial respondents who did not participate in the study cited a variety of reasons for doing so, including the limitations imposed by fulltime jobs and familial responsibilities. No one mentioned lack of interest in CRC.

Intervention

All participants attended an educational session at convenient locations (e.g., in the homes of several of the women and community centers) in groups ranging in size from four to seven women. The study was first explained to the participants, followed by verbal informed consent obtained from each participant by the researcher. Pre-intervention questionnaires were distributed and explained; participant questions regarding the study were answered. The pre-intervention questionnaire included categories in: sociodemographic information, CRC knowledge, CRC screening behavior, and behavioral intention; open-ended responses were allowed. Once the participants had completed the pre-questionnaires, the researcher gave an educational PowerPoint presentation in both English and Arabic. This included (1) definitions of colorectal cancer; (2) CRC morbidity and mortality rates; (3) CRC signs and symptoms; and (4) colorectal preventive measures (i.e., healthy eating, physical activity, and screening). The educational intervention was followed by a question-and-answer session, during which participants made open-ended comments. The researcher then distributed handouts from Medline Plus and the Michigan Cancer Consortium (MCC). Finally, the researcher distributed post-intervention questionnaires with comparable categories to the pre-intervention questionnaire, to the participants, who then completed them at the location of intervention.

Literature used and distributed during the educational intervention contained information in Arabic about colorectal cancer incidence, signs and symptoms, and screening methods taken from MCC and Medline Plus as well as brochures that explained the range of colonoscopy services covered by Medicare and most insurance companies. The researcher, a native Arabic speaker, selected and evaluated educational material to ensure that it was linguistically appropriate.

Data Collection

To test participants' retention of the information and the efficacy of the session on behavioral intent regarding CRC, a follow-up questionnaire was administered to the

participants 1 month after the educational session. Twenty-eight of the original total 32 women agreed to participate in the follow-up questionnaire. The follow-up questionnaire included three parts: (1) the knowledge section of the original questionnaire for all participants; (2) the behavioral intention for all participants; and (3) the screening behavior section for participants over 50 years of age. Three of the 28 women completed the questionnaire by phone after having been contacted by the researcher, while 25 women completed the questionnaires in person.

Measures

To measure the participants' knowledge of CRC and CRC screening, 14 true/false/do not know items were created. Participant knowledge of CRC screening methods was assessed by asking the participants whether or not they recognized any of the following: digital rectal exam (DRE), FOBT, sigmoidoscopy, colonoscopy, double-contrast barium enema (DCBE), and fecal immunohistochemical test (FIT). CRC screening behavior was similarly gauged by asking the participants if they had ever had one or more of the above CRC screening methods performed.

The researcher created the question items using a Likert scale to assess participant attitudes and beliefs with respect to CRC generally and colonoscopy in particular. For example, Menees et al. [13] concluded that one of the barriers to CRC screening was women patients' preference for female health care providers [12]. As a result, one item asked subjects if they preferred a female health care provider with whom to discuss their colon health. An additional set of six questions was posed exclusively to women at or over the age of 50 in order to assess their behavioral inclinations before and after the intervention. Five professors at Georgetown University and the University of the District of Columbia reviewed the pre-post-assessment prior to its being finalized, including assessing the instruments for validity and reliability. The data collection instruments were translated into Arabic and back-translated into English.

Data Analysis

Since most of the data were categorical, a codebook was developed and used to enter the data collected at three points throughout the study: (1) baseline data collected before the educational intervention; (2) immediate post-intervention data; and (3) follow-up data collected 1 month after the intervention. SPSS software (SPSS 18.0, Copyright ©2009, SAS Inc., Chicago, USA) was used to conduct the analyses, and descriptive statistics to describe the study population and their knowledge, attitude, and practices regarding CRC and pre-post-intervention changes. Qualitative analysis of open-ended items was based on Strauss and Corbin's grounded theory and used the editing style [48]. The audio recordings of the interviews were transcribed and each response to each question was analyzed independently by two authors who identified keywords/phrases and then agreed on final keywords and phrases, categories, and themes.

Results

Sample Sociodemographic Characteristics

The sociodemographic characteristics of the participants are shown in Table 1. Participant ages show a roughly equal distribution across the ranges, with 40–49 years of age being the most heavily represented group ($n=9$ or 28.1 %). Most participants had been born in Iraq ($n=30$ or 93.8 %) and a high percentage of them ($n=26$ or 81.3 %) were married. These women were primarily low to low-medium income; only 18.9 % ($n=6$) reported a household income of \$30,000 or more. Fourteen (43.8 %) lived in households with an annual family income of \$15,000 or less—below the poverty level for the census tract in which they lived. Half of the women ($n=16$) were unemployed. All of the women were Muslims and self-identified Arab Iraqis, with the exception of two women: one Kurdish Iraqi and one Turkmen Iraqi. Most had lived in the USA for 1 to 5 years ($n=18$, 56.2 %). For nearly half of the sample (46.9 %), completion of college was the highest level of education achieved. For one fourth (21.9 %) of participants, it was high school. The majority of participants (43.8 %) lived in a household of four to five people, while a minority (15.6 %) lived in a household of ten people or more. More than two thirds of the women ($n=22$ or 68.7 %) reported having health insurance; the other 31.3 % ($n=10$) were uninsured. Irrespective of health insurance coverage, most of the participants ($n=30$ or 93.8 %) had regular health care providers.

Knowledge of CRC and its Screening Methods

To measure immediate changes in the participants' CRC knowledge, a score of 1 was assigned to correct answers and a score of 0 to incorrect/do not know answers for each of the 14 items. A paired *T*-test was used to analyze the results. The mean baseline score was 8 with a standard deviation of 3.02, while the mean post-intervention score was 12.94 with a standard deviation of 0.88 ($p<0.0001$; 95 % confidence interval (CI), -5.99 to -3.89).

At baseline, the participants' knowledge about CRC and its preventive measures was limited. For example, only 28.1 % ($n=9$) of participants knew that CRC screening should begin at age 50 even if an individual does not exhibit any symptoms. When the follow-up questionnaire was administered 1 month after the educational session, only 67.9 % of participants answered the question for the item "A family history of..." correctly (Table 2).

After the educational intervention, the number of correct answers increased. The question regarding the influence of family history on getting cancer received 71.9 % correct answers. Twenty-nine women (90.6 %) reported having heard of colonoscopy; 27 women (84.4 %) of DRE; 26 women (81.3 %) of DCBE; nine women (28.1 %) of sigmoidoscopy; and 8.25 % of FOBT. Only one woman had heard of FIT (Tables 3 and 4).

Twenty-eight women (87.5 %) responded to the follow-up part of the study. The researcher re-administered the CRC knowledge section to willing participants either by phone or in-person meeting. As during the pre- and post-intervention questionnaires, participants' aged 50 and older also received the behavioral intent and practice portion of the original questionnaire. Using a paired *T*-test, the mean baseline score was 8/14 with a standard deviation of 3.02, while the mean follow-up score was 12/14, with a standard deviation of 1.66 ($p<0.0001$; 95 % CI, -5.14 to -3.14).

CRC Screening Behavior

At baseline, the seven women who were 50 years of age or older were asked six additional questions designed to gauge the extent of their CRC prevention practices. Although six described having a good relationship with their health care provider, only one of the seven participants reported having discussed CRC screening with her HCP. Additionally, only three participants aged 50 or older expressed either a willingness to discuss CRC screening methods with their HCPs, or the intention to follow their recommendations. The most common reported barriers to undergoing colonoscopy were fear that the procedures would be painful ($n=6$ or 86 %); a lack of knowledge about the screening methods, and the expectation that screening would be embarrassing ($n=4$ or 57 %); and the failure of their HCPs to advise CRC screenings ($n=5$ or 71 %). After having been provided with the correct information during our educational session, however, all seven women (100 %) expressed the behavioral intention to follow screening guidelines and discuss their colon health with their HCPs.

In the follow-up session, six (85.7 %) of the seven CRC screening-eligible women participated in the follow-up questionnaire and answered questions related to their CRC screening behavior and behavioral intention. None of these women had discussed CRC screening methods with their HCP in the month since the intervention; however, five (83.3 %) said that they willing to discuss it. Four of the five women still thought that undergoing a colonoscopy would be embarrassing, while three admitted to being too afraid to do so. Participants also cited a lack of transportation and family or personal issues as part of the reason why they had not yet had a colonoscopy. One woman stated that she had not and would not follow the screening guidelines, explaining that “[i]t’s all in the hands of God and I hope I won’t get that disease.”

Five (83.3 %) of the seven women aged 50 and above reported a lack of recommendation by their HCPs as the reason for not having received a colonoscopy. Study participants also noted that they had not recently had an appointment with their HCP but reported willingness to discuss CRC during their next visit.

Discussion

The results of our study confirm the general trends identified by previous investigations into knowledge-based health disparities among Arab Americans [40–43]. These trends highlight the importance of HCP recommendations and educational initiatives in promoting knowledge of and screening adherence for colorectal cancer [44, 48–51]. Participants’ mean score of 8 with a standard deviation of 3.02 on the pre-intervention questionnaire represents a limited knowledge of the nature of, risk factors associated with, and screening methods for CRC. Statistics regarding knowledge of the available screening methods for CRC were equally revealing. Although most participants had at least heard of a colonoscopy (90.6 %), DRE (84.4 %), and DCBE (81.3 %), only two participants had undergone any screening tests: one under the age of 50 and one over the age of 50. Moreover, five out of the seven participants at or over the age of 50 (71 %) stated that their failure to regularly screen for CRC was due to their health care provider never having advised it (Table 5).

That study participants reported not having recently had an appointment with their HCP but would be willing to discuss CRC during their next visit underscores the critical role that a HCP plays in a patient's decision to screen for diseases for which he or she may be at risk. Our findings also suggest that, in this sample, health care providers did not adequately address the necessity of screening for colorectal cancer with participants aged 50 and older. Lack of knowledge regarding the nature of, risk factors associated with, and screening methods for CRC constitutes the most fundamental barrier to positive screening adherence. This translates into a greater obligation for health care providers to play a more proactive role in educating at-risk patients about potential screening methods for colorectal cancer, and encouraging younger women to make positive lifestyle changes that could decrease their chances of developing the disease later on in life [48, 49].

Furthermore, we found that participant fears that screening method procedures would be painful and/or embarrassing constituted the most commonly reported barriers to treatment. That all seven Iraqi women over the age of 50 communicated the behavioral intent to follow screening guidelines and discuss their colon health with their HCPs immediately after the intervention, when only three who had done so prior to it, suggests that an incomplete knowledge of CRC screening methods leads to fear and anxiety. This, in turn, dissuades at-risk participants from screening for colorectal cancer. Consequently, the immediate success of our educational intervention in allaying participants' fears and anxieties demonstrates that education serves not only to inform in the absence of knowledge but also to correct misperceptions where partial knowledge already exists.

Nevertheless, the results of the questionnaire administered a month following the educational intervention revealed self-reported fear and anxiety among participants over the age of 50, which reflects the practical limitations of educational initiatives alone and, in so doing, emphasizes the need for a holistic, community-oriented approach to the promotion of a healthy lifestyle and positive screening adherence.

To address the return of participant fears and misconceptions regarding CRC screening, proponents of educational initiatives, HCPs, and community organizers could engage Iraqi women and men aged 50 or older through population-targeted versions of screening programs currently employed by health care organizations and governments all over the world. In their international survey of colorectal cancer screening programs, for example, Swan et al. compared the screening rates of CRC screening programs utilizing one of four contact strategies: mailed contact, primarily in the form of invitations mailed to individuals determined to be eligible for CRC screening; mailed contact with an FOBT screening kit and reminders to visit a general practitioner or send in the kit; encouragement of primary care physicians and health care providers to recommend CRC screening for at-risk patients; and a multifaceted approach combining mailed contact, screening kits, and office visits. Although the multifaceted approach to CRC screening outreach reported the highest screening rate on average, mailed contact with or without screening kits and office visits all enjoyed varying degrees of success that ranged from 14–38, 20–74, and 2–80 %, respectively [52].

Given recurrent participant fears that screening would be embarrassing, the use of mailed contact with FOBT screening kits would thus promote CRC awareness among at-risk individuals by allowing them to perform the test alone, in the privacy of their own homes. The success of such an initiative would ideally mirror that of a similar program conducted at the Heartland International Health Center (HIHC) in Chicago from 2008 through 2009. In that study, researchers found that the mailing of FOBT kits directly to patients was not only cost-effective, but “efficacious for promoted colorectal cancer screening among a population with high levels of poverty, limited English proficiency, and racial and ethnic diversity” [46].

Study Limitations

First, the study’s small sample size, short duration, and the researcher’s recruitment of participants via Iraqi community organizations in Northern Virginia, social networks, and through personal contacts may have resulted in the exclusion of more Iraqi American women who could have represented the Iraqi community’s full diversity, including, for example, Christian and Kurdish women. Second, owing to the small sample size for this study, the effect of sociodemographic characteristics on the screening profile was not considered and cannot be generalized. Third, the researcher’s personal acquaintance with some of the participants was such that, while participants trusted her and were willing to answer sensitive questions—a positive outcome—there was potential bias. Potential information bias was addressed by (1) the use of a semi-structured questionnaire with objective items; (2) training of the researcher in interview and focus group techniques to minimize bias; and (3) review of data and independent analysis of results and findings/interpretation by two faculty mentors. Finally, half of the sample was below 40 years of age and therefore were likely not counseled about CRC prevention specifically. These findings therefore may not be unique to Iraqi American women.

Conclusion

To our knowledge, this is the first study to have explored the knowledge of Iraqi women living in the USA with regard to the prevalence of, risk factors for, and screening methods used to detect CRC. It thus makes an important contribution to the literature concerning health disparities among minority populations in the USA, and specifically begins this line of research with the US Iraqi population. Although our one-time educational intervention exhibited moderate success in examining and improving participant knowledge of CRC pre- and post-intervention, respectively, the results of the questionnaire administered a month following the educational intervention revealed a resurgence of fear and anxiety among participants over the age of 50. Moreover, the fact that the research was able to elicit information from the participants in part because she shares their culture raises the question of how to promote trust of Iraqi women in their HCPs to facilitate their asking sensitive questions, and trusting the information given leading to appropriate action.

The findings highlight the limited success of our educational initiative in affecting screening behavior and indicate the need for strengthened public and individual patient cancer education and outreach targeting this population and education of clinicians who serve this

population to ensure that they have the capacity to educate their patients about colon cancer, its etiology, and their behaviors related to it, and encourage them to accept screening tests.

Future studies examining the knowledge of immigrant populations living in the USA regarding the prevalence of, risks factors for, and screening methods used to detect CRC could include those from other countries in the Middle East and North Africa region and should recruit a sample population large enough for researchers to control for the effects of sociodemographic characteristics on a participant's screening status. These studies should also advance this current study by investigating additional potential screening obstacles related to cultural or religious beliefs, HCP attitudes, beliefs, and practices related to the recommendation of CRC methods to their patients, and CRC incidence, morbidity, and mortality among Iraqi American women.

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Table 1

Participant demographics

N=32		
Age	Frequency	Percent (%)
21–29	8	25.0
30–39	8	25.0
40–49	9	28.1
50–59	7	21.9
Months lived in USA		
12	4	12.5
13–59	18	56.2
60	10	31.3
Education completed		
Elementary	3	9.4
Intermediate	2	6.3
High school	7	21.9
College	15	46.9
Graduate	5	15.6
Annual family income (\$/year)		
Less than 15,000	14	43.8
15,000–29,000	12	37.5
30,000–39,000	2	6.3
40,000–49,000	2	6.3
More than 50,000	2	6.3
Number of persons in household		
2–3	7	21.8
4–5	14	43.8
6–7	6	18.8
8	5	15.6
Employment status		
Unemployed	16	50.0
Work occasionally	3	9.4
Part-time	2	6.3
Full-time	5	15.6
Student	6	18.8
Marital status		
Never married	3	9.4
Married	26	81.3
Divorced	2	6.3
Widowed	1	3.1
Children		
N/A	3	9.4

<i>N</i> =32		
Age	Frequency	Percent (%)
None	2	6.3
1–2	9	28.1
3–4	14	43.8
5–6	4	12.5
Health insurance		
No insurance	10	31.3
Yes, governmental (Medicaid)	10	31.3
Yes, private	12	37.5
Health care provider		
Yes	30	93.8
No	2	6.3

Table 2

Pre-intervention answers for CRC knowledge items

<i>N</i> =32			
Question/phrase	Correct answer (%)	Incorrect answer (%)	Do not know answer (%)
Colorectal cancer is always hereditary	56.2	18.8	25
Colorectal cancer is a disease that usually affects elderly people	28.1	43.8	28.1
Regular screening for colorectal cancer is not necessary	81.2	9.4	9.4
Screening for colorectal cancer should start at age 50 even if you don't have symptoms	28.1	43.8	28.1
Healthy eating is a protective factor that helps to prevent colorectal cancer	90.6	0	9.4
There is no cure for colorectal cancer	59.4	18.7	21.9
Not much can be done to prevent colorectal cancer	56.2	9.4	34.4
Smoking is a risk factor for colorectal cancer	68.8	3.1	28.1
People who are overweight are at a higher risk of getting colorectal cancer	50	12.5	37.5
People with a medical history of colonic polyps have the same risk as others who do not for getting colorectal cancer	37.5	15.6	46.9
Inflammatory bowel disease (Crohn's disease/ulcerative colitis) increases the colorectal cancer risk	43.8	3.1	53.1
Diet that is high in fiber protects against colorectal cancer	71.9	6.2	21.9
A family history of colorectal cancer does not influence my chances of getting the same cancer	68.7	18.8	12.5
There are specific genetic tests which diagnose familial colorectal cancer syndromes.	59.4	3.1	37.5

Table 3

Post-intervention answers for CRC knowledge items

N=32			
Question/phrase	Correct answer (%)	Incorrect answer (%)	Do not know answer (%)
Colorectal cancer is always hereditary	90.6	6.3	3.1
Colorectal cancer is a disease that usually affects elderly people	81.2	18.8	0
Regular screening for colorectal cancer is not necessary	93.7	6.3	0
Screening for colorectal cancer should start at age 50 even if you don't have symptoms	90.6	3.1	6.3
Healthy eating is a protective factor that helps to prevent colorectal cancer	100	0	0
There is no cure for colorectal cancer	100	0	0
Not much can be done to prevent colorectal cancer	96.9	3.1	0
Smoking is a risk factor for colorectal cancer	96.9	3.1	0
People who are overweight are at a higher risk of getting colorectal cancer	96.9	3.1	0
People with a medical history of colonic polyps have the same risk as others who do not for getting colorectal cancer	78.1	21.9	0
Inflammatory bowel disease (Crohn's disease/ulcerative colitis) increases the colorectal cancer risk	96.9	3.1	0
Diet that is high in fiber protects against colorectal cancer	100	0	0
A family history of colorectal cancer does not influence my chances of getting the same cancer	71.9	21.8	6.3
There are specific genetic tests which diagnose familial colorectal cancer syndromes.	100	0	0

Table 4

CRC knowledge score for pre- and post-intervention

N=32		
Respondents' ID	Pre-intervention	Post-intervention
11	8	14
12	9	12
13	2	14
14	7	13
15	4	12
16	7	11
21	10	13
22	8	12
23	12	14
24	12	13
25	11	13
26	9	12
27	8	11
31	11	13
32	11	13
33	5	12
34	5	13
35	2	12
41	5	12
42	4	13
43	5	13
51	8	14
52	10	14
53	9	14
54	9	14
55	6	13
61	13	14
62	9	13
63	7	14
64	9	13
65	7	13
66	14	13

Respondent knowledge scores on the pre- and post intervention questionnaires reflect the number of questions answered correctly out of fourteen. Each questionnaire featured the same fourteen items in order to measure both how effectively the educational intervention improved participant knowledge of CRC and how well participants retained the information presented during said intervention. To measure immediate changes in the participants' CRC knowledge, a score of 1 was assigned to correct answers and a score of 0 to incorrect/do not know answers for each of the fourteen items. A paired *T*-test was used to analyze the results

Table 5

Pre-intervention answers

<i>N</i> =32		
Pre-intervention: screening methods: have you ever heard of the following:	Yes (%)	No (%)
Digital rectal exam (DRE)	84.4	15.6
Fecal occult blood test (FOBT)	25.0	75.0
Sigmoidoscopy	28.1	71.9
Colonoscopy	90.6	9.4
Double contrast barium enema (DCBE)	81.3	18.8
Fecal immunochemical test (FIT)	3.1	96.8