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ORIGINAL PAPER

Assessing Colorectal Cancer Knowledge Among Puerto Rican Hispanics: Implications for Cancer Prevention and Control

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Abstract In Puerto Rico, colorectal cancer (CRC) incidence and mortality rates are increasing. Moreover, adherence rates to CRC screening (52.2%) are still below the goals (70.5%) established by Healthy People 2020. Lack of knowledge is described as a significant barrier to adherence to CRC screening. The aim of this study was to assess CRC knowledge and screening rates among Puerto Rican Hispanics. Participants aged 40–85 years were recruited from the internal medicine outpatient clinics at the University of Puerto Rico. Demographic characteristics and knowledge about CRC, including risk factors and CRC screening tests, were obtained through face-to-face interviews. A mean CRC knowledge score was calculated based on correct responses to 13 validated questions. Mean knowledge scores were evaluated according to demographic characteristics using the Wilcoxon-Mann-Whitney test. A total of 101 participants were recruited with mean age of 63 (±10.6) years. Fifty-eight (58%) of participants were females, 59% reported ≥12 years of education, and 71% reported ever screening for CRC. The mean CRC knowledge score was significantly lower ($p < 0.05$) among participants with lower annual family income, those who had never received a recommendation for CRC screening by a healthcare provider, and those who had no history of CRC screening. Knowledge about CRC must be improved in Puerto Rico. Efforts must be made to promote and develop culturally appropriate CRC educational strategies. Future studies should focus on identifying other barriers and factors that may limit CRC screening in the Puerto Rican Hispanic population.

Keywords Colorectal cancer · Colorectal cancer screening · Cancer health disparities · Hispanics

Introduction

Colorectal cancer (CRC) is the third and second most commonly diagnosed cancer among men and women worldwide, respectively. In 2012, it was estimated that there were over 1.4 million cases and 693,900 deaths, which account for 8% of all cancer deaths worldwide [1]. In the United States (US), CRC is the third most commonly diagnosed cancer and the second leading cause of cancer death among men and women [2]. In Puerto Rico (PR), a US territory, CRC is the second most commonly diagnosed cancer among men and women, accounting for 12.7% and 12.2% of all cancers diagnosed from 2008 to 2012, respectively. In terms of mortality, CRC is the leading cause of cancer death, accounting for 13.0% of all male cancer deaths and 13.5% of all female cancer deaths in PR between 2008 and 2012 [3].

According to the Centers for Disease Control and Prevention (CDC), approximately 60% of CRC deaths could

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be prevented if individuals adhered to CRC screening guidelines [4]. The current US Preventive Services Task Force (USPSTF) guidelines recommend regular screening for CRC in adults beginning at age 50 years up to age 75 years using any of the following regimens: annual fecal immunochemical test (FIT) or guaiac-based fecal occult blood test (gFOBT), CT colonography every 5 years, flexible sigmoidoscopy every 10 years (plus FIT annually), or colonoscopy every 10 years [5]. Interestingly, since 1998, both CRC incidence and mortality rates have been declining in the US in both men and women [6]. In contrast, in PR, incidence rates are significantly increasing among men (APC = 3.3%) and women (APC = 1.0%). CRC mortality rates have also increased annually by an average of 4.5% in men ($p < 0.05$), although among women, the mortality rates has been reduced (APC = −1.14%) [7]. These epidemiologic trends are of concern as CRC is a highly preventable malignancy if diagnosed early.

Studies have shown that although CRC screening rates have increased, they are still below the goals established by Healthy People 2010 (50.0%) and 2020 (70.5%) [8]. Data from the 2010 National Health Interview Survey (NHIS) showed that CRC screening in the US was lower among Hispanics (46.5%) than among non-Hispanics (58.6%) [9]. In 2014, 52.5% of the population aged ≥50 years in PR reported undergoing a CRC screening test within the USPSTF recommended time intervals, compared to 66.6% of the general population in the US [10]. These CRC screening disparities observed among Puerto Rican Hispanics may in part explain the observed differences in the CRC incidence and mortality trends.

Several studies have explored the factors and barriers that affect adherence to CRC screening. It has been previously reported that knowledge and awareness of CRC in the general population is low [11–13], which is a significant barrier for CRC screening compliance especially among Hispanics [14–16]. Limited health literacy has been associated with less knowledge about CRC and CRC screening [17]. Other barriers to CRC testing include: misinformation about screening options, time constraints, income, educational level, medical insurance, family history of CRC, access to care, and knowledge about cancer screening tests in general [18–22]. There is no data available regarding CRC knowledge among the Puerto Rican Hispanic population. Therefore, this study aimed to examine the extent of knowledge about CRC, including risk factors and CRC screening tests, among Puerto Rican Hispanics. Furthermore, we examined the mean CRC knowledge scores according to demographic characteristics. These analyses will enable us to determine how knowledgeable Puerto Rican Hispanics are regarding CRC and if lack of knowledge is a barrier to undergo CRC, as it has been reported in other minority groups in the US [14–16].

Methods

Study Participants

A convenience sample of 101 participants, with ages between 40 and 85 years, was recruited from the internal medicine outpatient clinics of the University of Puerto Rico in two municipalities, San Juan and Carolina, during July 2015–February 2016. All participants consented to participate in the study. People with self-reported pre-existing CRC were excluded from the study.

Data Collection Instrument

A trained evaluator performed face-to-face interviews using anonymous questionnaires. The validated survey contained questions about general sociodemographic data (age, sex, years of education, annual family income, and health insurance), clinical data (including family history of CRC and history of CRC cancer screening), and 13 items that addressed knowledge about CRC in general, including risk factors and screening tests. These questions have been previously validated in a study in Puerto Rico that aimed to test the effectiveness of a Train-the-Trainers' (TTT) program to develop trainers capable of educating others within their communities about CRC prevention [23]. The internal consistency of the scale in this previous study reflected a Cronbach's alpha statistic = 0.97, which is an acceptable value. All study procedures were reviewed and approved by the Institutional Review Board of the University of Puerto Rico Medical Sciences Campus.

Statistical Analysis

Each correct answer of the scale was scored as 1 point. An incorrect or "don't know" answer was given a score of 0. Mean knowledge scores were calculated by adding the number of correct responses; total scores ranged from 0 to 13 points. Adequate knowledge was defined as at least 9 of 13 correct responses (70%). Mean knowledge scores (mean ± SD) were compared according to socio-demographic characteristics using the Wilcoxon–Mann–Whitney test. Frequency distributions for categorical variables and summary measures for continuous variables were used to describe the study population. For the interpretation of results, p values below 0.05 were considered statistically significant. All statistical analyses were performed using the Stata statistical package (Version 13.0, College Station, TX, USA).

Table 1 Sociodemographic characteristics of study participants (n = 101)

Characteristic	n	%
Age in years		
≤60	43	42.57
>60	58	57.43
Mean (±SD)	62.6 ± 10.6	
Sex		
Male	42	41.58
Female	59	58.42
Years of education		
≤12	41	40.59
>12	60	59.41
Annual family income		
≤$34,999	54	63.53
>$34,999	31	36.47
Health insurance		
Yes	100	99.01
No	1	0.99

Table 2 Clinical characteristics of study participants (n = 101)

Characteristic	n	%
Have a regular healthcare provider		
Yes	92	91.09
No	9	8.91
Last visit to a regular healthcare provider		
<1 year	94	93.07
1–2 years	3	2.97
>2 years	4	3.96
Family history of CRC		
Yes	13	12.87
No	88	87.13
Recommendation for CRC screening by a healthcare provider		
Yes	80	79.21
No	21	20.79
History of CRC screening		
Yes	72	71.29
No	29	28.71

Results

A total of 101 participants were recruited. The mean age of all participants was 63 years (±10.6), 59 (58%) were females, 59% have reported ≥12 years of education, and 64% reported annual family income <$34,999 (Table 1). The vast majority of participants (99%) reported to have health insurance and 93% reported to visit their regular health provider within the last year (Table 2). Family history of CRC was reported in 13% of the participants. Regarding CRC screening, 20% of participants reported that CRC screening has not been recommended by any health care provider and 29% of participants reported never been screened for CRC (Table 2).

Table 3 showed the individual items that compose the CRC knowledge scale. The proportion of correct responses ranged from 50 to 87%. 68% of participants knew that CRC screening should be done once a person turns 50 years old. However, only 57% of the participants recognized as false the premise "Everyone that has CRC present symptoms". Meanwhile, 86% of participants recognized that colonoscopy is one of the methods of prevention for CRC, only 64% of participants recognized as false the premise "Smoking, drinking, and a diet high in fats decrease your risk of CRC". The mean knowledge score about CRC, CRC risk factors, and CRC screening tests was 9.1 (95% CI 8.6–9.6). Adequate knowledge was defined as having 9 or more correct answers. Only 67% of participants had adequate knowledge.

The mean CRC knowledge score according to selected characteristics among study participants is shown in Table 4. The mean CRC knowledge score was significantly lower ($p < 0.05$) among participants with a lower annual family income, those who had never received a recommendation for CRC screening by a healthcare provider, and individuals with no history of CRC screening. CRC knowledge did not differ ($p > 0.05$) according to sex, age group, years of education, and having a regular healthcare provider.

Discussion

In Puerto Rico, CRC is the second most common cancer among men and women, and is currently the leading cause of cancer death [3]. More worrisome is the fact that statistics continue to show increasing trends in both incidence and mortality rates as well as low adherence to CRC screening rates, despite the existence of guidelines and methods that would increase detection at earlier, more treatable stages. Lack of knowledge has been associated and described as a significant barrier for CRC screening [14–16]. The present study evaluated CRC knowledge among a group of Puerto Rican Hispanic adults, and found a high proportion of adults with inadequate CRC knowledge.

Adherence to CRC screening among our study participants was higher (71%) to what has been reported in the Puerto Rican Hispanic population in other studies [10, 24]. Lopez-Charneco et al. [24] reported that only 46.7% of those surveyed in the Behavioral Risk Factor Surveillance System-Puerto Rico (BRFSS-PR) in 2008 had ever had any type of screening for CRC. A slight increase in

Table 3 CRC and CRC screening knowledge among study participants (n = 101)

Item	Correct answer	n (%)
Colorectal cancer affects mainly males	False	51 (50.5)
Colorectal is preventable	True	86 (85.2)
Colorectal cancer is a tumor that affects the large intestine	True	64 (63.4)
Colorectal cancer screening should be done once a person turns 50 years old	True	69 (68.3)
Cancer of the colon and rectum only affects people with family history of rectal cancer	False	83 (82.2)
Everyone that has colorectal cancer present symptoms	False	58 (57.4)
Colonoscopy is one of the methods of prevention for colorectal cancer	True	87 (86.1)
The majority of colon and rectal cancer begins with a polyp	True	63 (62.4)
Smoking, drinking, and a diet high in fats decrease your risk of colorectal cancer	False	65 (64.4)
Fecal occult blood is one of the screening methods for colon and rectal cancer	True	87 (86.1)
A colonoscopy done by a certified professional (gastroenterologist or colorectal surgeon) is a safe process	True	88 (87.1)
There is a greater change that you have colorectal cancer than the risks that comes from the screening test	True	57 (56.4)
1 in 25 Puerto Ricans will have colorectal cancer	True	61 (60.4)
Average score (±SD)	9.1 ± 0.3 (95% CI 8.6–9.6)	

Table 4 Mean knowledge score for CRC and CRC screening according to selected characteristics among study participants (n = 101)

Characteristic	Mean ± SD	P value
Age in years		0.80
≤60	9.0 ± 2.9	
>60	9.2 ± 2.2	
Sex		0.99
Male	9.0 ± 2.7	
Female	9.2 ± 2.4	
Years of education		0.70
≤12	9.0 ± 2.4	
>12	9.2 ± 2.6	
Annual family income		**0.05**
≤$34,999	8.6 ± 3.0	
>$34,999	10.0 ± 1.5	
Have a regular healthcare provider		0.72
Yes	9.1 ± 2.5	
No	9.1 ± 2.9	
Family history of CRC		0.98
Yes	8.9 ± 3.1	
No	9.1 ± 2.4	
Recommendation for CRC screening by a healthcare provider		**0.04**
Yes	9.4 ± 2.3	
No	7.9 ± 3.1	
History of CRC screening		**0.002**
Yes	9.7 ± 2.0	
No	7.7 ± 3.1	

P-values were statistically significance if $p < 0.05$. P-values were obtained from the Wilcoxon-Mann-Whitney test

CRC screening (52.2%) was reported in 2014 for Puerto Rican Hispanic respondents aged 50–75 years by BRFSS-PR [10]. These differences could be explained by various factors including self-reporting, confusion of clinical tests performed (such as digital rectal exam) [15] with screening tests for CRC, and population included in the present study who were patients visiting teaching medical facilities. Previous studies have documented marked differences in the quality of care between teaching and non-teaching hospitals [25, 26], which may have contributed to the high screening rates in our study population.

The results of our study demonstrated that only 67% of participants report adequate knowledge about CRC in general, risk factors, and screening. The mean CRC knowledge score obtained in our study is similar to those reported in two previous studies in PR using the same questionnaire. Cruz-Correa et al. reported a 9.4 ± 0.5 mean CRC knowledge score among the 115 healthcare professionals that participated in the TTT program [23]. Portilla-Skerrett et al. obtained a slightly higher mean CRC knowledge score (10.3 ± 0.10) among 154 participants recruited in health fairs in PR [27]. In both of the aforementioned studies, knowledge significantly increased after particular educational interventions.

The lack of adequate knowledge about CRC in our Hispanic subjects is comparable to than reported by Shokar et al. where minority groups, such as Hispanics and African Americans, had lower knowledge scores when compared to non-Hispanic whites [28]. Although the instruments used to measure knowledge differ between studies, thus limiting a direct comparison, the results obtained support that

there are racial/ethnic disparities in terms of knowledge about CRC. Furthermore, other socio-demographic variables such as household income affect the extent of knowledge that an individual has about CRC. In our study, we observed that lower income was significantly associated with lower mean CRC knowledge scores. Previous studies have documented this observation. Coughlin et al. [29] found that screening rates were lowest for Hispanic women with an annual household income of less than $15,000. In addition, in studies with different racial/ethnic groups, such as Hispanics, African Americans, Asians, and American Indians, the likelihood that a patient undergoes screening tests is lower in patients with lower income [30]. Both race and economic status appear to play roles not only in CRC knowledge, but also in CRC screening and incidence rates [31].

Our study also found that the mean CRC knowledge score among the participants in this study was significantly higher among those who had completed CRC screening. These results correlate with the findings of Ma et al. [32], who reported that Koreans and Chinese individuals with limited knowledge about CRC were less likely to undergo CRC screening. Also, Tseng et al. [33] showed that African Americans who had more CRC knowledge were more likely to undergo CRC screening. However, due to the nature of our study, we cannot determine whether having more knowledge increases adherence to CRC screening or if having undergone CRC screening tests increases CRC knowledge.

Our results also show that mean CRC knowledge scores were significantly higher among individuals who received a recommendation for CRC screening from a healthcare provider. Similar findings were described by Taylor et al. in an African American population, where a previous physician recommendation was strongly associated with CRC screening [34]. The same correlation has been well documented in many other studies [35, 36]. For example, Walsh et al. found that physician recommendations were by far the most important factor influencing previous CRC screening and intention to be screened in a population-based study with Latinos, non-Latino whites, and Vietnamese individuals [37]. The lack of CRC screening recommendations by physicians is one of the most common barriers among persons who do not undergo CRC testing [38]. These findings support the leading role that health care providers play in CRC screening behaviors, particularly in minority populations [39]. The factors limiting an effective education about CRC must be identified and addressed; physicians and other healthcare providers should be given tools to discuss the importance of CRC screening with their patients in adequate and culturally appropriate manner.

This study did not find a correlation between the extent of CRC knowledge and the patient's type of health insurance coverage. However, health insurance coverage appears to account for differences in CRC screening rates among racial/ethnic groups [30, 40]. Furthermore, previous studies have found that adults without health insurance had the highest rate of not undergoing CRC screening compared to individuals with private or public insurance [30, 41]. Disparities in adherence with CRC screening may contribute to disparities in survival and overall clinical outcomes. In fact, we reported disparities in CRC outcomes associated with the type of health insurance. Specifically, patients diagnosed with CRC who had the Puerto Rico government health plan (Medicaid) were diagnosed at more advanced stages, had worse survival, and had greater excess risk of death, than individuals with non-government health plan [42]. In addition, a recent study about CRC in PR reported that the factors associated with late stage at CRC diagnosis in individuals with government health plan were: (1) having their first visit for CRC diagnosis trough the emergency room, and (2) having a diagnostic delay of more than 59 days, in comparison with early stage diagnosed CRC cases [39]. These findings suggest that type of health insurance coverage is an independent factor associated with CRC screening rates. The type of health insurance coverage must therefore be considered when addressing health disparities associated to CRC screening.

This study has several limitations that warrant consideration. The cross-sectional nature of the investigation limits our ability to evaluate how the information may have changed over time. Secondly, the data obtained was self-reported which may lead to a reporting bias [43]; information about CRC screening was not verified in medical records. Thirdly, participants from our study were selected by convenience sampling, thus they are not representative of the general population in PR or the population that attends the internal medicine outpatient clinics of the University of Puerto Rico in both San Juan and Carolina. Notwithstanding these limitations, this is one of the first studies that describe knowledge about CRC and CRC screening in the Hispanic population of Puerto Rico. Our data shows that a substantial percent of the population lacks adequate knowledge about CRC in general, CRC risk factors, and CRC screening methods. Furthermore, we found that individuals who have heard of CRC and have undergone CRC screening were more knowledgeable than those who had never been screened. These results support the need to develop public health interventions in order to improve education about CRC in both the general population and in the health care professional community. Future studies should focus on identifying, understanding, and reducing additional barriers and implementing educational programs for health care providers and patients in this particular Hispanic population.

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Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest.

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