Original Article

Evaluating the implementation of colorectal cancer screening practices at King Abdul-Aziz Medical City, Riyadh

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Abstract

Background: Colorectal cancer (CRC) is a major public health problem in Saudi Arabia, where there is currently no widespread CRC screening program. This study aimed to assess the implementation of CRC screening within medical practices at King Abdul-Aziz Medical City in Riyadh, Saudi Arabia, targeting beneficiaries aged 50–75 years. **Methodology:** A retrospective chart review and cross-sectional analysis were conducted between January and December 2022 for an age group from 50 to 75 years. Frequency and percentages were used to display categorical variables. The Chi-square test and independent *t*-test were used to assess the association between the variables. **Results:** Out of the 296 patients between the ages of 50 and 75 years, less than half were men (49%). The average age of the participants was 61.5 years, ranging from 56 to 69. During the research, the incidence of CRC among patients was found to be 8.1%. Most patients had negative FOBT tests (73%), while about 27% tested positive, and approximately 23% underwent colonoscopy. Patients with a FOBT test positive tended to be older than those with a negative result. **Conclusion:** This study found that the utilization of CRC screening is not fully maximized at King Abdul-Aziz Medical City. It highlights the importance of raising awareness and promoting adherence to screening guidelines for individuals between the ages of 50 and 75 years. Additional research is necessary to identify the factors that hinder or facilitate CRC screening in this context to assess the effectiveness and cost-effectiveness of various screening methods.

Keywords: Colonoscopy, colorectal cancer, CRC screening, early detection, fecal occult blood test, screening compliance

Introduction

Colorectal cancer (CRC) is a health concern, being the second most prevalent form of cancer-based on the number of individuals diagnosed within 5 years after initial detection. It is also the leading cause of death related to cancer. Currently, 3,544,000 people are living with CRC, and an estimated 1,361,000 new cases occur annually, with around 694,000 deaths attributed to this disease.[1] In Saudi Arabia, colon cancer has become a form of cancer among both men and women over the past 4 decades. It has been noted that around half of the individuals who are diagnosed with cancer at stages have also experienced the development of colorectal cancer.[2] Similar to types of malignancies, genetic mutations can lead to the development of cancer. The classification of CRC into hereditary or familial types depends on the origin

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of these mutations. The causes behind CRC are diverse. Factors include age, genetic mutations, personal history of CRC, inflammatory bowel disease (IBD), family history, and obesity.[3]

Socioeconomic background significantly affects people's health and the impact of diseases. It can affect access to healthcare services, preventive measures, and quality treatment. Various studies have shown how socioeconomic status influences the occurrence and mortality rates of cancer (CRC).[4] In a study in 2020, 27,885 confirmed cancer cases, with colorectal cancer constituting a considerable proportion of 14.4% across all cancer diagnoses, encompassing both genders.[5] These findings emphasize the importance of interventions. In Saudi Arabia, recent socioeconomic transformations have contributed to the prevalence of CRC, making it a significant portion of all cancer diagnoses. Between 1990 and 2016, several studies have highlighted a rise in diagnosed colorectal cancer (CRC) cases with a ten-fold increase in incidence.[6] Unveil a striking surge in CRC incidence, transitioning from 300 to 2400 cases, representing a profound ten-fold surge in newly diagnosed instances.[2] The treatment approach for CRC depends on factors such as the stage of the disease, patient response, and the type of treatment. Surgical intervention is often recommended for early-stage CRC, while advanced cases may require chemotherapy, targeted therapy, or immunotherapy.[7] In detecting CRC at a stage, various screening methods like colonoscopy, guaiac fecal occult blood test (gFOBT), and fecal immunochemical testing (FIT) have been used to identify premalignant polyps, with varying levels of effectiveness and cost efficiency.[8] The effectiveness of screening cancer (CRC) methods relies on various factors, such as how willing the population is to participate, the impact on quality of life, and financial considerations.[9–11] Research suggests that conducting a test (FIT) every 2 years between the ages of 55 and 65 is a cost-effective approach in Saudi Arabia.[12] In contrast, the United States Preventive Services Task Force suggests that all adults between 50 and 75 years old should undergo CRC screening.[13] Meanwhile, in Saudi Arabia, individuals with a risk of CRC (between the ages of 45 and 75) are recommended to have screening tests.[2,14,15] A Saudi Arabian study revealed that 9 of every 1,000 45-year-old males would die from CRC without screening.[16] Implementing biennial fecal immunochemical testing (FIT) from ages 55 to 65 years could avert 2 instances and 3 deaths, while colonoscopy screening could prevent 9 cases and 6 deaths compared to no screening.[17] CRC screening is not widely practiced among individuals at risk in Saudi Arabia, particularly among females and those living in rural areas.[16,18] This is primarily due to a lack of awareness, concerns about discomfort, and limited availability of services. Over the past decade, there has been an increase in the number of CRC cases, mainly observed in areas with Westernized lifestyles and industrial development.[19] Despite the implementation of CRC screening programs, the overall incidence has not decreased significantly, as the rise outweighs the decline seen in cases.[20]

In Saudi Arabia, Colorectal Cancer Screening programs have been put into effect. There is a lack of research exploring the current approaches to Colorectal Cancer Screening. Consequently, this is a critical research gap, and no study was found that thoroughly evaluated the Colorectal Cancer Screening implementation at King Abdul-Aziz Medical City, Riyadh. In addition to addressing this gap, this study has significant implications for both practitioners and patients. For practitioners, it will offer valuable insights into the current practices and challenges in the implementation of colorectal cancer screening at King Abdul-Aziz Medical City. Understanding these factors can help healthcare providers identify gaps, optimize screening protocols, and improve service delivery, ensuring that screening programs are more effective and accessible. This, in turn, will enable early detection, more precise interventions, and improved patient outcomes. For patients, this study will contribute to enhancing the accessibility and effectiveness of colorectal cancer screening. As a result, more patients, particularly those at risk, can benefit from early detection and treatment, reducing colorectal cancer morbidity and mortality rates in the region. Therefore, this study aimed to assess the current practice and the implementation of colorectal cancer screening as recommended by the Ministry of Health Saudi Arabia at King Abdul-Aziz Medical City in Riyadh, Saudi Arabia.

Materials and Methods

Study design

This is a retrospective chart review, cross-sectional analysis of specific screening lab results at King Abdul-Aziz Medical City (KAMC-NGHA) in Riyadh, Saudi Arabia, as well as patient medical records. IRB approval was granted at 2023 by KAIMARC.

Study population and sampling

This research was conducted at (KAMC-NGHA) in Riyadh, Saudi Arabia, for the sample subjects who underwent FOBT and/or FIT screenings throughout the year 2022 and between 50 and 75 years of age, followed by reviewing their health-related data within the BESTCare healthcare system. The medical records of sample MRNs were reviewed for FOBT test results among a complete list of all eligible beneficiaries aged 50–75 years old during 2022 with patients' MRNs, which was requested through the IT department.

A computerized selection for patients' records from the BESTCare Database with FOBT results among all eligible beneficiaries at NGHA aged 50–75 years old in 2022 (estimated 30,000 individuals as population size). Study analysis depended on a margin of error of 5% and a confidence level of 95%, and the minimum sample was 320 subjects.

Inclusion and Exclusion Criteria

For this research, we enrolled individuals aged between 50 and 75 years. They were required to have undergone either a fecal

occult blood test (FOBT) or a fecal immunochemical test (FIT) during the year 2022, from January to December. The participants also had to have complete and accessible medical records. However, we excluded individuals who did not meet the criteria for participation in the study. The target age group for CRC screening was individuals between 50 to 75 years old. Hence, participants who were not within this range were excluded. It was important for participants to have accessible records to collect and analyze data accurately. In addition, participants with a history of CRC screening within the past 10 years were not included to ensure results in the current screening process.

Data collection methods, instrument used, and measurements

A chart review approach was used to collect the data from BESTCARE. The main variables to be included are demographics (age, gender), methods used to screen fecal occult blood test (FOBT) or fecal immunochemical test (FIT), with other related variables for the second modality (if done), addition to the result of (FOBT) and number of times test is done. Dates of orders, actual testing, and diagnosis were collected.

Statistical analysis

Data analysis was performed using Statistical Package for the Social Sciences, SPSS 23rd version. Frequency and percentages were used to display categorical variables. Minimum, maximum, mean, and standard deviation were used to display numerical variables. A median with an interquartile range was used to display the not-normally distributed data. The Chi-square test was used to test for the presence of association between categorical variables. The independent *t*-test was used to test for association between numerical and binary categorical variables. The level of significance was set at 0.05.

Results

The study's findings reveal that the estimated total count of individuals within the specified age range (50–75 years) amounts to approximately 30,000. However, upon comprehensive scrutiny of patients' records, only 296 individuals were identified as having undergone screening within this entire demographic subset, constituting a meager 1%.

In our study, the gender distribution of the screened patients was carefully assessed. Out of the total participants, it was observed that 145 individuals (49%) were male. The remaining 151 (51%) individuals in the sample were female [Figure 1].

In this study, the gender distribution shows that a higher percentage of males (60%) received negative FOBT results compared to females (40%). However, males also had a slightly higher rate of positive FOBT results (25% vs. 20%) and were more likely to be diagnosed with CRC (15% vs. 10%) [Figure 2].

The graph illustrates the distribution of positive FOBT results and confirmed colorectal cancer (CRC) diagnoses across various

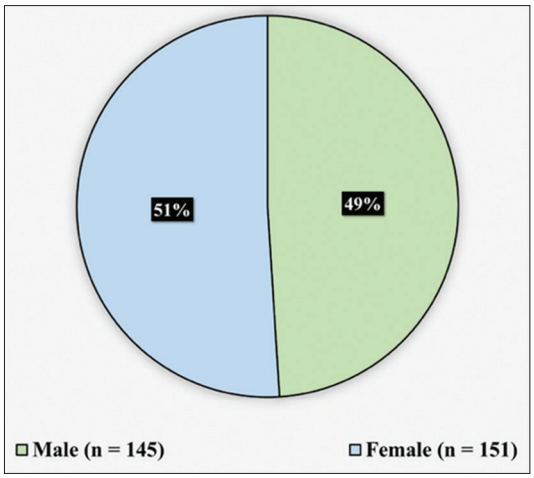

Figure 1: Gender distribution of patients

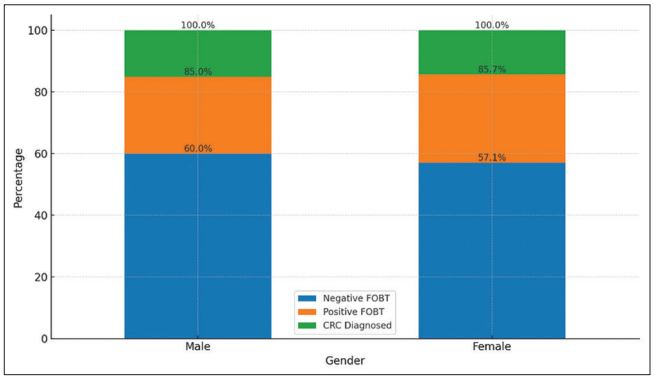

Figure 2: Compliance rate of FOBT screening among participants in colorectal cancer screening program

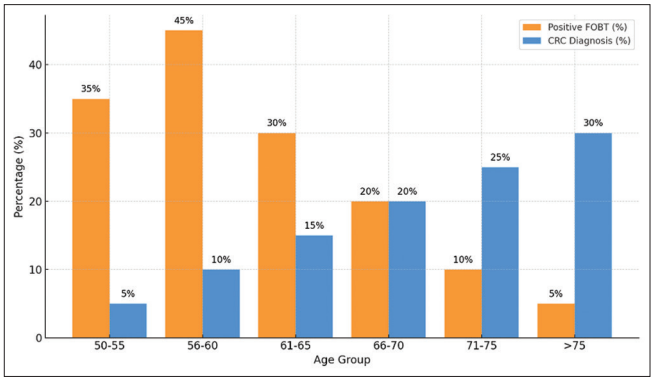

Figure 3: FOBT positivity and confirmed CRC diagnoses by age group

age groups. Among participants aged 56–60 years, 30% tested positive for FOBT, making it the group with the highest positive FOBT rate. However, the actual confirmed CRC diagnoses in this age group were relatively low at 12%. In contrast, the 71–75 age group shows a different trend. Although this group had a lower FOBT positivity rate of 18%, it had the highest percentage of confirmed CRC diagnoses, at 25% [Figure 3].

The age distribution among the patients in this study spans from a minimum age of 50 to a maximum age of 75, and the

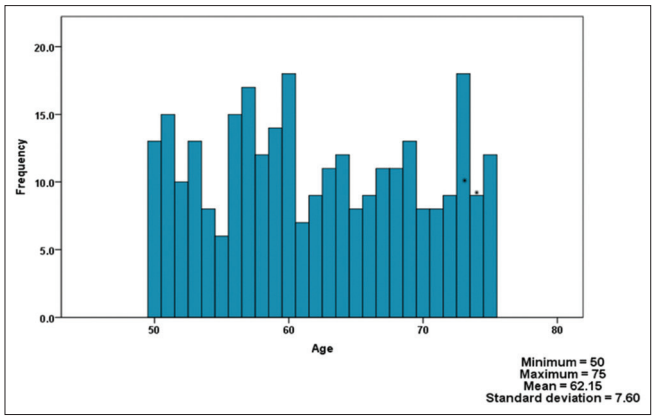

Figure 4: Age distribution of patients

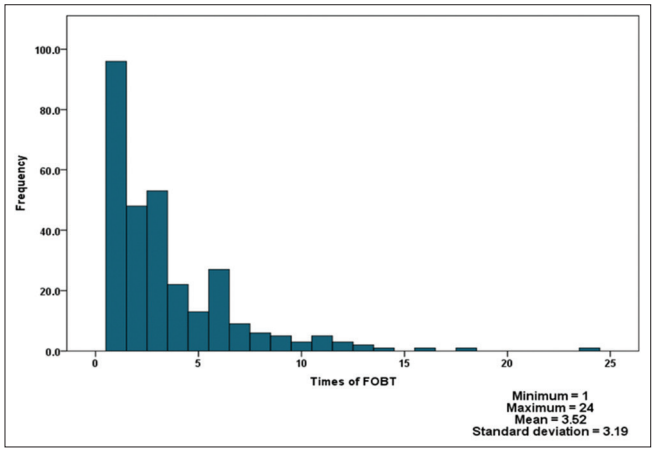

Figure 6: Frequency of fecal occult blood tests conducted for patients

Table 1: Patients' outcome profile (*n*=296)

Question	*n*	%
Treatment		
None	291	98.3
Chemotherapy	2	0.7
Radiotherapy	1	0.3
Chemotherapy and radiotherapy	1	0.3
Palliative care	1	0.3
Surgical intervention		
No	278	93.90
Hemicolectomy	6	2.00
Ileocecal resection/Sigmoidectopmy/End-ileostomy	1	0.30
Liver transplantation	2	0.70
Polyp removal by forceps	1	0.30
Polyp removal by Snare	4	1.40
Polyp Resection	4	1.40
Mortality rate		
Alive	257	86.8
Passed away	39	13.2
Cure rate		
Yes	2	0.7

median age was 61.5 (56–69 years) [Figure 4]. To determine the distribution of age, Kolmogorov–Smirnova was performed and showed that the age distribution does not follow a normal distribution. Based on this outcome, we decided to use a median with the interquartile range to summarize the age distribution.

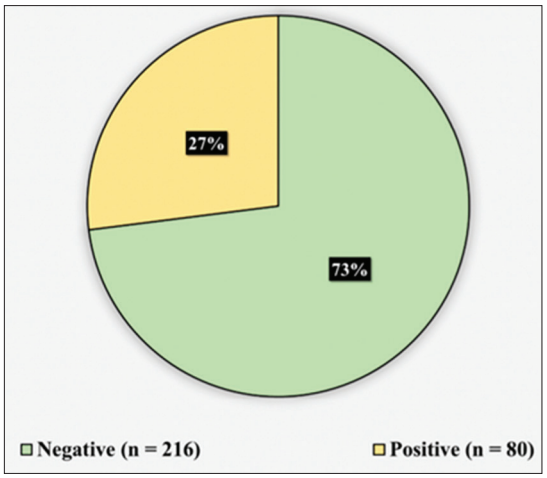

Figure 5: Fecal occult blood test result

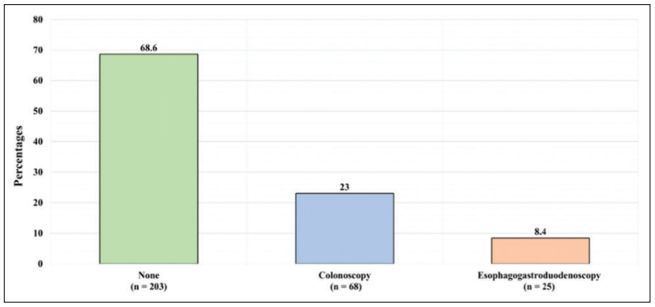

Figure 7: Second modality of investigation

Regarding the fecal occult blood tests, the study observed that a majority of 216 individuals (73%) exhibited negative results in the fecal occult blood tests, while a notable subset of 80 individuals (27%) returned positive results [Figure 5].

The study observed a range of frequencies for fecal occult blood tests conducted among the patients, with a minimum of 1 test and a maximum of 24 tests. On average, each patient underwent approximately 3.52 tests, with a standard deviation of 3.19 tests [Figure 6].

The utilization of secondary investigative modalities among the patients is depicted in the study. Notably, a significant proportion of 203 patients (68.6%) did not undergo any supplementary modalities of investigation. Among the participants, 68 individuals (23%) underwent colonoscopy, while 25 individuals (8.4%) underwent esophagogastroduodenoscopy [Figure 7].

In the subset of patients who underwent screening, discernible 24 cases (8.1%) were diagnosed with colorectal cancer, while a predominant 272 cases (91.9%) exhibited normal findings [Figure 8].

In our study, the patient's outcome profile shows that, as for the treatment, 291 (98.3%) patients did not receive treatment, 2 (0.7%) had chemotherapy, 1 (0.3%) had radiotherapy, 1 (0.3%) had chemotherapy and radiotherapy, and 1 (0.3%) had palliative care. As for the surgical intervention, 278 (93.9%) patients did not have any surgical intervention, 6 (2%) had hemicolectomy, 4 (1.4%) had polyp removal by Snare, 4 (1.4%) had polyp resection, 2 (0.7%) had liver transplantation, 1 (0.3%) had polyp removal by forceps, and 1 (0.3%) had ileocecal resection/sigmoidectomy/end-ileostomy. As for the mortality rate, 39 (13.2%) passed away, while 257 (86.8%) are still alive. As for the cure rate, only 2 (0.7%) were cured [Table 1].

The age and gender association with fecal occult blood results and colorectal cancer incidence is presented in the following Table 2. Age was significantly higher among patients with positive fecal occult blood compared to those with negative fecal occult blood (65.35 ± 7.42 vs 60.96 ± 7.34) ($P < 001$). Age was also significantly higher among patients with colorectal cancer compared to those who did not have colorectal cancer (65.63 ± 7.03 vs 61.84 ± 7.59) ($P = 0.019$). Gender was not significantly associated with either the result of fecal occult blood or with colorectal cancer.

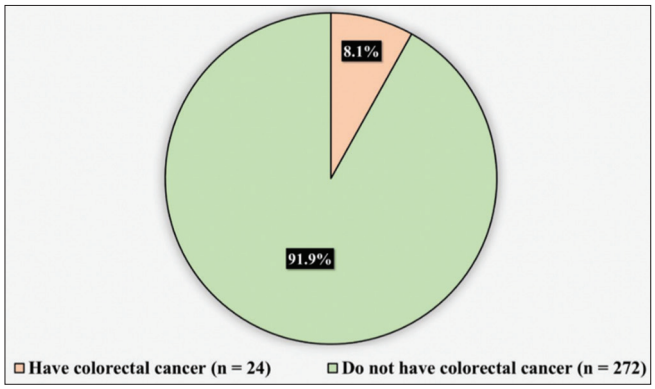

Figure 8: Incidence of colorectal cancer among screened patients

Table 2: Age and gender association with fecal occult blood result and colorectal cancer prevalence

Factor	Age		*P*
	Mean	Standard deviation	
Fecal occult blood result			<0.001*
Negative	60.96	7.34	
Positive	65.35	7.42	
Colorectal cancer status			0.019*
Have colorectal cancer	65.63	7.03	
Do not have colorectal cancer	61.84	7.59	
Factor	**Gender**		***P***
	Male	**Female**	
Fecal occult blood result			0.960
Positive	106 (73.1%)	110 (72.8%)	
Negative	39 (26.9%)	41 (27.2%)	
Colorectal cancer status			0.071
Have colorectal cancer	16 (11%)	8 (5.3%)	
Do not have colorectal cancer	129 (89%)	143 (94.7%)	

Denote: *P *Significant at level <0.05

Discussion

International and regional

Cancer is one of the leading causes of death worldwide and a major impediment to raising life expectancy in all nations. While colorectal cancer (CRC) ranks second in terms of mortality with over 935,000 fatalities, it ranks first in terms of incidence, with roughly 1.9 million new cases (10%) worldwide (9.4%) in 2020.[21] According to the American Cancer Society (ACS), one of the primary causes of cancer-related deaths in the US is CRC; however, an early diagnosis typically leads to a full recovery.[22] On the other hand, previous studies conducted regarding colorectal cancer in the Arab world revealed that the prevalence of CRC was 0.72% in Saudi Arabia[23] and 0.78% in the UAE,[24] while Egypt reported different prevalence rates of 0.4%.[25] In general, there is limited literature on CRC from the Middle East, highlighting the need for more studies on screening practices and outcomes in this region. Our study, with its focus on hospital-based screening at King Abdul-Aziz Medical City (KAMC-NGHA) in Riyadh, contributes to this gap by providing unique insights into the local incidence and outcomes of CRC screening.

Saudi Arabia

According to the National Saudi Cancer Registry, there were 1,729 instances of colorectal cancer among Saudi nationals in 2020, representing 12.3% of all newly diagnosed cases. The Age Standardized Incidence Rate (ASR) for men was 12.4/100,000, whereas for women, it was 9.6/100,000. The highest ASR region was Riyadh, with 18.3/100,000 and 16.5/100,000 for male and female, respectively. In 2020, another study found that the incidence of CRC was 14.4% in both sexes (colon: 7.6% and rectum: 6.4%), mortality was 8.3% in the colon and 6.7% in the rectum, and the gender distribution was 19.3% in favor of men and 9.2% in favor of women.[19] We also found that age was directly proportional with positive fecal occult blood results (65.35 + 7.42 vs. 60.96 + 7.34; $P < 001$), as well as having a diagnosis of colorectal cancer (65.63 + 7.03 vs 61.84 + 7.59; $P = 0.019$). However, CRC and the presence of fecal occult blood were not statistically significant when tested for association with gender. This lack of gender association in our study may be due to the smaller sample size or because both genders are equally likely to be screened in our hospital setting.

CRC screening worldwide and in Saudi Arabia

In the United States, Canada, much of the European Union, Japan, and other countries around the world, there are several policies in place to screen people at risk for CRC.[26,27] The Colorectal Cancer Control Program (CRCCP) uses evidence-based methods to remind healthcare providers and patients of when screening becomes appropriate and by making it available to them.

In 2015, the Saudi Centre for Evidence-Based Healthcare convened a panel of experts to develop national guidelines for colorectal cancer screening in Saudi Arabia. The panel recommended starting a colorectal screening program aimed at asymptomatic and average-risk patients.[28] A project called "Colon Cancer Early Detection" has been launched by the Saudi Ministry of Health to reduce CRC-related mortality and improve survival and prognosis by early detection in adults 50 years of age and older.[29] By providing care to people who registered at healthcare facilities and classifying them as moderate or high risk. The project lists fecal occult blood and colonoscopy as its two main investigations. The present healthcare reform in Saudi Arabia involves the digitization of numerous services, an emphasis on prevention, and community involvement.[30,31] Our study's setting is at a National Guard Health Affairs Facility, meaning it adheres to National Guard policy, procedure, and protocol in cohesion with the Saudi Ministry of Health. At (KAMC-NGHA), CRC screening is requested for patients when visiting preventive medicine, family medicine, and staff clinics. In our study, fecal occult blood testing (FOBT) was used to screen all 296 patients for CRC. The screening revealed that 216 (73%) patients had negative results, whereas 80 (27%) had positive results. Almost a third of the screened patients received an additional form of screening modality; 68 (23%) underwent colonoscopy, while 25 (8.4%) underwent esophagogastroduodenoscopy. While in the United States, in 2021, 71.8% of adults aged 50–75 years had received colorectal cancer screening based on the most recent guidelines. However, in a study conducted in Riyadh with 500 participants, only 6.7% of those aged 50 to 55 underwent CRC screening, which was much lower than the global average for persons who had undergone screening.[28] According to another study done to evaluate the uptake of CRC screening in the Middle East, they found that only 15.24% of the Saudi population has average risk, and 5.64% older than 60 years of age participate the CRC screening. While in UAE, only 23% of the population underwent to the CRC screening.[32]

Cost-effectiveness and disease as a burden

Without screening, 14 out of 1,000 45-year-old males will develop CRC, and 9 will die from CRC. Biennial FIT is the cheapest efficient option for patients ages 55 to 65 and would stop 2 of those instances and 3 of those deaths at an incremental cost of $100,000. Colonoscopy screening would be much more expensive (up to $950,000) but save up to 9 cases and 6 deaths. The study found that, in Saudi Arabia, if they implement the screening program, total costs of CRC screening, surveillance, complications, and treatment in the second year would decrease to 29$ million 30 years after implementation.[12] Our study, which used FOBT as the primary screening modality, further supports the cost-effectiveness of early CRC detection. With only 8.1% of patients diagnosed with CRC, the long-term financial burden of late-stage treatment could be significantly reduced through regular screening programs

Limitations

It is important to consider that there are constraints that should be acknowledged. First, it is important to acknowledge that there might be some selection bias since the study only included patients from one center. As a result, we should be cautious about generalizing these results to the population. Moreover, the study could not obtain the final diagnosis and stages of CRC for some patients due to poor documentation from the physician. This limited the ability to assess the outcomes and prognosis of CRC screening. Furthermore, the research used a cross-sectional methodology offering only a limited glimpse into the situation at a specific moment in time. Future studies should adopt a longitudinal design, which could compare different time points and create a trend to understand the impact of various decisions and services on CRC screening. Finally, the study relied on the Saudi Cancer Registry, which did not capture all the screened patients in the country. This could lead to an underestimation of the CRC screening rate and incidence.

Conclusion

According to our study, the incidence of CRC in Riyadh, Saudi Arabia, was relatively high (8.1%). The current CRC screening practice at King Abdul-Aziz Medical City was found to be suboptimal, characterized by the absence of a standardized and systematic screening program. Barriers to screening implementation were identified, including a lack of awareness among patients and the limited engagement of physicians in recommending screening measures.

There is a need for a comprehensive CRC control program that raises awareness of the disease, encourages Saudi citizens to sign up for CRC early detection projects, and encourages them to adopt healthy lifestyles is desperately needed to lessen the burden of this fatal disease. Furthermore, further longitudinal investigations are required to determine the relationship between genetic and environmental variables and CRC incidence in KSA. These studies would provide the information that KSA CRC control programs need to reduce morbidity and mortality from this disease through disease prevention, early detection, and better management options. Future research should focus on larger studies and can be focused on further evaluating the CRC screening implementation in various Saudi Arabia regions.

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Conflicts of interest

There are no conflicts of interest.

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