Female medical students are stronger advocates for colorectal cancer screening than their male colleagues

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Abstract

Colorectal cancer (CRC) remains one of the most commonly diagnosed malignancies worldwide. A significant body of evidence supports the role of CRC screening in reducing disease mortality. Previous studies addressed barriers to screening among physicians and the general populace. As the role of medical students as CRC screening promoters could be significant, we sought to assess medical students' attitude and knowledge toward CRC screening and to determine the obstacles that they face. We conducted a cross-sectional study at our academic hospital by distributing a paper-based survey to medical students in their clinical years. The predictors of students' attitude and knowledge were determined by conducting regression analyses. The response rate was 74%. Among study participants, 24.9% suggested CRC screening to their relatives. Knowledge-related barriers were the most commonly disclosed barriers (85.4%). Sixth-year students ($P < 0.001$) and participants who had direct relatives diagnosed with CRC ($P < 0.001$) were more likely to recommend CRC screening, where as male students ($P = 0.026$) and students with a lower cumulative grade point average (pass/good) ($P = 0.026$) were less likely to recommend it. Medical students have not reached their full potential as CRC screening proponents for a variety of reasons, including inadequate knowledge and suboptimal attitudes, as well as the presence of various barriers that hinder them. In this study, female students were stronger advocates than males. Strategies to enrich students' knowledge and help them overcome the barriers they face should be offered through educational sessions and training to enhance their role as screening champions.

Key words:
Colorectal Cancer Screening, Medical Students, Medical Education, Health Knowledge, Colorectal Cancer, Colorectal Neoplasms, Cancer Screening, Student Attitudes

Introduction

Colorectal cancer (CRC) remains the third most common malignancy in men and the second most common malignancy in women worldwide, with incidence rates of 13.1% among men and 10.1% among women(1,2). There is some global variation in CRC incidence (3). In Saudi Arabia, the CRC incidence rate ranks first in men (8.9%) and third in women (4.2%) (4). The median age of diagnosis in Saudis is 59 years in males and 57 years in females, which represents a younger median age of presentation than in other countries (5,6). Early diagnosis has been significantly linked to improved CRC prognosis and reduction in mortality rates (7, 8). Results from the Surveillance, Epidemiology, and End Results Program showed a peak incidence of CRC in the 1980s, with a reduction in the incidence and mortality rate after screening implementation in subsequent years (9).

Several screening modalities with various sensitivities are available,(10) including colonoscopy, computed tomography colonography, and stool tests such as guaiac-based, immunochemical fecal tests, and stool DNA sampling. The US Preventive Services Task Force guidelines recommend starting screening at the age of 50 until 75 years with either an annual fecal occult blood test and sigmoidoscopy every 5 years, or a full colonoscopy every 10 years (11). In Saudi Arabia, earlier screening starting from the age of 45 years has been recommended because evidence suggests that CRC presents at an earlier age (12). Screening people over the age of 70 years is not recommended in Saudi Arabia in most cases (13,14). Despite the reported success of CRC screening in reducing mortality,(9) published articles on CRC practices have demonstrated inadequate screening (14-17). Interventions to promote the screening process have been investigated, such as improving health promotion, enriching the population's awareness, and implementing CRC screening education in medical schools (15,18,19).

Enhancement of medical education and an emphasis on cancer prevention in medical school can result in positive attitudes and an intent to apply prevention in future practice (19,20). Studies on medical students' knowledge and their attitude as CRC screening advocates are, however, limited. In order to develop better learning outcomes, we aimed in this study to evaluate medical students' attitudes and knowledge toward CRC screening and to identify the hurdles they face as screening advocates.

Methodology

Study participants and design

We obtained approval for this study from the Biomedical Ethics Research Committee at the King Abdulaziz University Faculty of Medicine. We conducted a cross-sectional study at King Abdulaziz University Hospital in Jeddah, Saudi Arabia. All 1,270 medical students studying in their clinical years (fourth to sixth year) were included. The study was conducted over 8 months starting from September 2018 until April 2019. A literature review on knowledge assessment and barriers toward CRC screening was performed, and a study questionnaire was created from questionnaires identified in the literature. The final version of the questionnaire was reviewed independently by four experts in the field: three colorectal surgeons and one statistician. Two medical students also offered their input. The questionnaire was in English, as it is the teaching language at the faculty. It comprised four sections. The first section included demographic data. The second section assessed respondents' knowledge about CRC screening methods and guidelines. This section included five questions with a calculated score out of a total of 5. The correct answers to the questions and the scoring used are represented in Appendix 1. The third section assessed students' attitude as CRC screening advocates. The fourth section aimed to identify the perceived barriers that medical students encounter as CRC screening advocates. This section included yes/no questions for 18 identified barriers. The barriers were further divided into four categories: knowledge-related barriers, health system barriers, social barriers, and personal beliefs. A voluntary paper-based questionnaire was distributed among all of the included study participants (Appendix 2).

Statistical analysis

Frequencies and percentages were used to summarize categorical data and means and standard deviations were used to summarize continuous variables such as age. Five questions assessed knowledge regarding CRC screening. A cumulative score was calculated for each respondent (out of 5). We used linear regression to explore factors associated with the knowledge score and performed hypothesis testing at a 5% level of significance. Statistical analysis was performed with R software (v 3.6.2).

Results

A total of 938 students completed the survey, with a response rate of 73.85%. Female students represented 49% of the study sample. The three academic years (fourth, fifth, and sixth years) were well presented. The demographics of the respondents are represented in Table 1. Most of the respondents (83.4%) were aware of the presence of CRC screening tests. However, only one quarter of them had recommended CRC screening to a relative (n = 233, 24.9%). Only 29.2% of the relatives who received such a recommendation had undergone screening. The family members that medical students were most likely to discuss CRC screening with were their parents (73.82%) (Table 2).

The overall mean knowledge score was 1.86 ± 1.04 (a full mark was 5). The correct target population for CRC screening was identified by approximately 21% of the respondents, and 35% of respondents did not know that CRC is completely curable. Colonoscopy was the most commonly identified test (85%) of the acceptable screening modalities and was identified as the gold standard test by 64% of the students (Figure 1). The distribution of students' responses to knowledge questions and the percentages of correct answers for each question, as well as their overall knowledge score, are represented in Table 3.

Table 1. Demographic characteristics of the study cohort.

Characteristic	All respondents, *n* (%)	*N*
	(*N*=938)	
Gender		938
Female	460 (49.0%)	
Male	478 (51.0%)	
Age, M (SD)	22.4 (1.17)	926
Nationality		937
Saudi	910 (97.1%)	
Non-Saudi	27 (2.88%)	
Academic year		938
Fourth year	400 (42.6%)	
Fifth year	312 (33.3%)	
Sixth year	226 (24.1%)	
Cumulative GPA		897
Pass	5 (0.56%)	
Good	72 (8.03%)	
Very good	479 (53.4%)	
Excellent	341 (38.0%)	
Direct relatives with CRC		936
No	755 (80.7%)	
I do not know	83 (8.87%)	
Yes	98 (10.5%)	

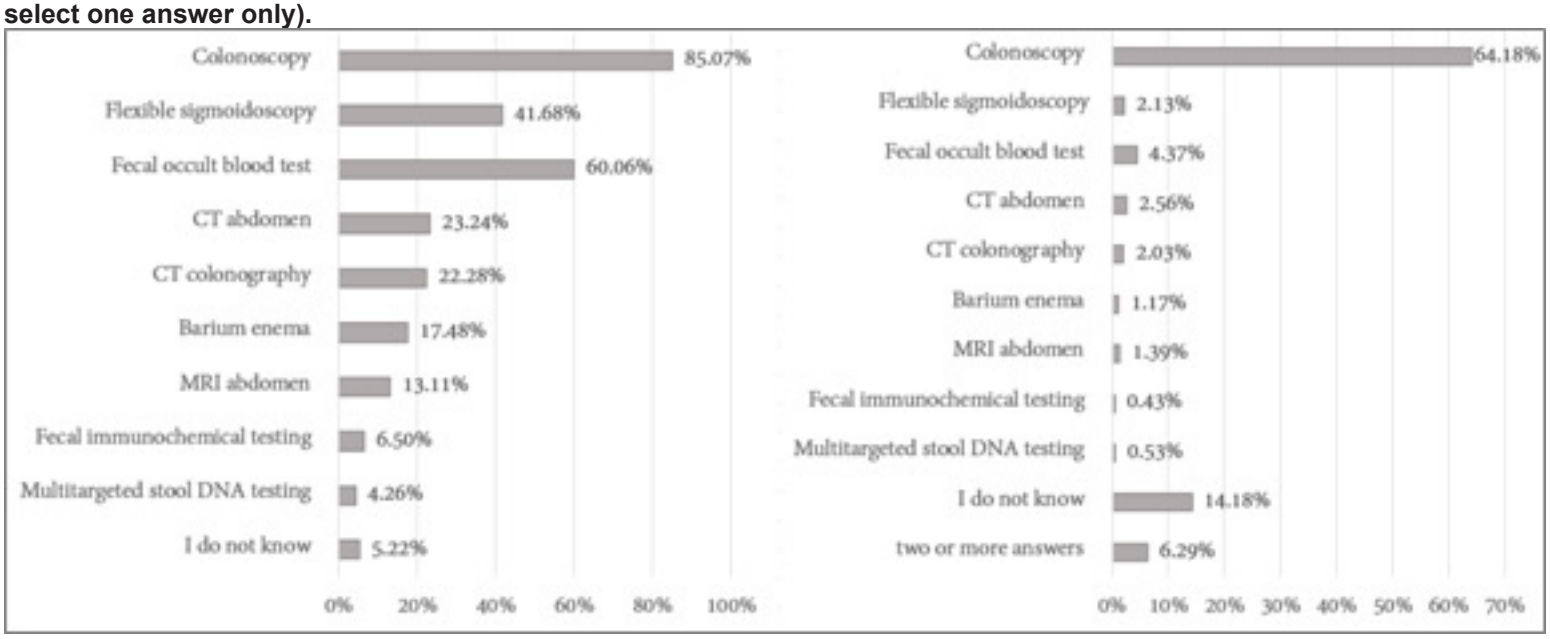
Note. All values are n (%) except where otherwise indicated.
CRC: colorectal cancer; GPA: grade point average.

Table 2. Students' responses to the questions assessing their attitude toward CRC screening.

Question	All respondents, n (%)	N
	(*N*=937)	
Ever recommended CRC screening to a relative in the complete absence of symptoms?		937
No	706 (75.1%)	
Yes	233 (24.9%)	
Did the family member you recommended CRC screening to do it?		233
No	102 (43.8%)	
I don't know	63 (27.0%)	
Yes	68 (29.2%)	

.Note. CRC: colorectal cancer.

Figure 1. Summary of participants' answers about (A) acceptable tests for CRC screening (participants could select as many answers as appropriate) and (B) the gold standard modality for CRC screening (participants could select one answer only).



A **B**

Note: CRC: colorectal cancer; CT: computed tomography; MRI: magnetic resonance imaging.

Table 3. Distribution of students' correct answers to CRC screening knowledge questions and their mean knowledge score.

Knowledge Assessment Question	All respondents, n (%)
CRC screening program available in the training hospital	75 (8.03%)
Target population for CRC screening	205 (21.9%)
Acceptable test for CRC screening	256 (27.3%)
Gold standard for CRC screening	602 (64.2%)
CRC is completely curable	609 (65%)
Knowledge score (out of 5), M ±SD	1.86 ±1.04

Note. All values are n (%) except where otherwise indicated.
CRC: colorectal cancer.

Table 4. Perceived barriers to recommending CRC screening.

	All respondents, n (%)	*N*
Barriers	*N=914*	
Knowledge	784 (85.4%)	918
Health System	625 (68.1%)	918
Social	664 (72.3%)	918
Personal Thoughts	696 (75.8%)	918

Note. Participants could select as many barriers as appropriate. CRC: colorectal cancer.

Common responses regarding barriers to recommending CRC screening to direct relatives included "I did not think of it" (65.6%) and "the lack of a national screening program" (53.6%). Other common barriers as perceived by students included "fear of discovering a cancer" (53.1%), "financial cost of a colonoscopy is too high" (39.3%), and "difficulty in gaining access to a hospital/difficulty in opening a medical file" (35.1%) (Figure 2). Barriers were further classified as lack of knowledge, social factors, personal beliefs, and those related to the health system. Knowledge barriers were the most commonly reported barrier to CRC screening (85.4%) (Table 4).

The results of bivariate logistic regression analyses, which demonstrate the predictors of students' attitudes as CRC screening advocates, are represented in Table 5. Sixth-year students (odds ratio [OR]: 2.84, 95% confidence interval [CI]: 1.65 to 4.94, P < 0.001) and participants who had direct relatives with CRC (OR = 2.94, 95% CI: 1.79 to 4.79, P < 0.001) were more likely to recommend CRC screening to their relatives. However, male students (OR: 0.67, 95% CI: 0.47 to 0.95, P = 0.026) and students with a lower cumulative GPA (pass/good) (OR: 0.43, 95% CI: 0.20 to 0.87, P = 0.026) were less likely to recommend screening.

Multivariate linear regression was conducted to ascertain the factors affecting medical students' level of knowledge about CRC screening. We found that being a male (B=-0.25, 95% CI: -0.40 to -0.11, P < 0.001), having a good cumulative GPA (B = -0.76, 95% CI: -1.02 to -0.49, P < 0.001), or having a very good cumulative GPA (B = -0.23, 95% CI: -0.37 to -0.09, P = 0.001) was significantly associated with a lower knowledge score. On the other hand, being a sixth-year student was the only significant factor associated with a higher knowledge score (B = 0.63, 95% CI: 0.40 to 0.86, P < 0.001). None of the remaining factors showed a statistically significant association with the overall knowledge score (Table 6).

The average perceived number of barriers was higher in males (B = 0.96, CI: 0.50 to 1.42, P < 0.001), fifth-year students (B = 1.22, CI: 0.65 to 1.78, P < 0.001), and students with a lower cumulative GPA (good/pass) (B = 0.94, CI: 0.10 to 1.78, P < 0.028) (Table 7).

Figure 2. Perceived barriers to recommending CRC screening and getting screened.
Note. Participants could select as many barriers as appropriate. CRC: colorectal cancer.

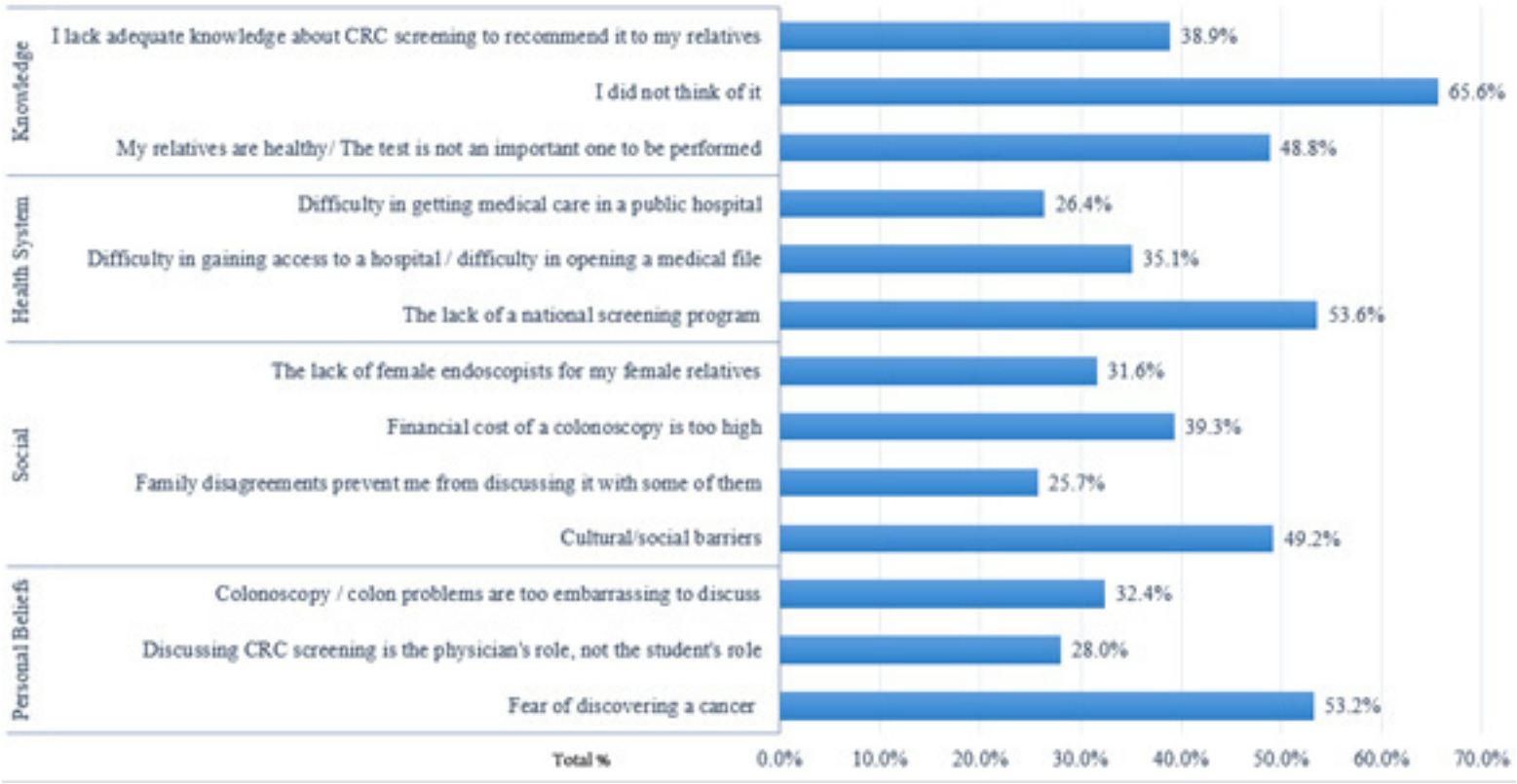


Table 5. Predictors of medical students' attitudes as CRC screening advocates

Predictor	Odds ratio	CI	P
(Intercept)	0.02	0.00 – 1.51	0.071
Gender: Female	Ref		
Gender: Male *	0.67	0.47 – 0.95	**0.026**
Age	1.14	0.94 – 1.38	0.168
Academic year: Fourth year	Ref		
Academic year: Fifth year	1.27	0.81 – 2.01	0.302
Academic year: Sixth year *	2.84	1.65 – 4.94	<**0.001**
Cumulative GPA: Excellent	Ref		
Cumulative GPA: Very good	0.79	0.56 – 1.12	0.191
Cumulative GPA: Good/pass *	0.43	0.20 – 0.87	**0.026**
Marital status: Single	Ref		
Marital status: Married	0.60	0.23 – 1.40	0.260
Direct relatives with CRC: No			
Direct relatives with CRC: I don't know	0.95	0.50 – 1.71	0.874
Direct relatives with CRC: Yes *	2.94	1.79 – 4.79	<**0.001**

Note: CRC: colorectal cancer; CI: confidence interval; GPA: grade point average.
*P-value < 0.05.

Table 6. Multivariate linear regression analysis for factors associated with knowledge score.

Predictor	Estimate	CI	P
(Intercept) *	3.27	1.48 to 5.06	<**0.001**
Gender: Female	Ref		
Gender: Male *	-0.25	-0.40 to -0.11	<**0.001**
Age	-0.03	-0.11 to 0.04	0.387
Academic year: Fourth year	Ref		
Academic year: Fifth year	0.02	-0.15 to 0.20	0.803
Academic year: Sixth year *	0.63	0.40 to 0.86	<**0.001**
Cumulative GPA: Excellent	Ref		
Cumulative GPA: Very good *	-0.23	-0.37 to -0.09	**0.001**
Cumulative GPA: Good *	-0.76	-1.02 to -0.49	<**0.001**
Cumulative GPA: Pass	-0.66	-1.64 to 0.31	0.182
Marital status: Single			
Marital status: Married	-0.07	-0.41 to 0.28	0.713
Direct relatives with CRC: No	Ref		
Direct relatives with CRC: I don't know	-0.11	-0.34 to 0.12	0.352
Direct relatives with CRC: Yes	0.19	-0.04 to 0.41	0.102

Note: CI: confidence interval; GPA: grade point average; CRC: colorectal cancer.
*P-value < 0.05.

Table 7. Factors associated with higher number of perceived barriers toward CRC screening recommendation.

Predictor	B	CI	P
(Intercept)	0.02	0.00 – 1.51	0.071
Gender: Female	Ref		
Gender: Male *	0.96	0.50 – 1.42	<**0.001**
Age	0.08	-0.17 – 0.34	0.527
Academic year: Fourth year	Ref		
Academic year: Fifth year *	1.22	0.65 – 1.78	<**0.001**
Academic year: Sixth year	-0.17	-0.92 – 0.58	0.654
Cumulative GPA: Excellent	Ref		
Cumulative GPA: Very good	0.34	-0.12 – 0.80	0.152
Cumulative GPA: Good/pass*	0.94	0.10 – 1.78	**0.028**
Marital status: Single	Ref		
Marital status: Married	-0.15	-1.28 – 0.99	0.801
Direct relatives with CRC: No			
Direct relatives with CRC: I don't know	-0.12	-0.88 – 0.64	0.757
Direct relatives with CRC: Yes	0.43	-0.30 – 1.16	0.246

Note: CRC: colorectal cancer; CI: confidence interval; GPA: grade point average.
*P-value < 0.05.

Discussion

Screening plays an essential role in detecting CRC at an early stage and reducing its mortality (9). Physicians recommend CRC screening to their patients to help improve the uptake rate (21,22). Medical students, as future physicians, are progressively involved in the provision of various health promotion interventions and patient education. Their role as health advocates has the potential to improve patients' knowledge and to enhance their health attitude (23). As cancer prevention is a core part of the curriculum of medical students, they are expected to act as CRC screening advocates, especially within their immediate social circle such as their family, as they are often the source of medical information in their household. In order to develop better teaching strategies for medical students, there should be a clear understanding of their knowledge and attitude toward CRC screening. We performed this study in order to evaluate medical students' attitudes and knowledge toward CRC screening and to identify the barriers they face as screening advocates.

Previous studies have evaluated physicians' attitudes and knowledge about CRC screening,(15,24) but studies of medical students' attitudes and knowledge on the same topic are limited (25,26). Our results showed that only a minority of medical students (24.6%) recommended CRC screening to their relatives, suggesting that these students are not receiving early and adequate education regarding the importance of CRC screening. As a result, they are not reaching their full potential as CRC screening advocates. Medical students are usually asked to gather information from patients rather than to counsel them. Previous studies have demonstrated a relationship between students' experience and their competency in counseling patients and recommending CRC screening. Students with more clinical experience perform better in history taking, physical examination, and counseling. Continuous clinical practice has been reported as the preferred educational method for acquiring clinical skills (25,27,28).

In our study, female medical students were more likely to recommend CRC screening to their relatives, which might indicate that female students have better communication with their family members and greater attention to their health care needs than do their male counterparts. A previous meta-analysis found that 57% to 81% of caregivers of the elderly were female relatives.(29) Our finding is in agreement with that of Mosli et al.,(15) who reported that male primary health care physicians (PHCPs) were less likely to recommend CRC screening. Moreover, we demonstrated that a lower GPA is a significant predictor of suboptimal attitude and knowledge toward screening. Students with a lower GPA had a lower knowledge score regarding screening guidelines and were thus were less motivated and confident in recommending CRC screening (30). Health care providers with higher levels of training are stronger CRC screening advocates (15,31). Similarly, we found that senior medical students were more likely to recommend CRC screening. Furthermore, students who had a relative with CRC possessed a better attitude as screening advocates, as they were more likely to recommend CRC screening. Individuals with a family history of CRC are at higher risk than the general population; this might encourage these students to recommend CRC screening to their relatives to detect CRC at an earlier stage.

Numerous studies have reported physicians' knowledge about CRC screening guidelines as a significant predictor of their attitude toward screening(31,32). Students in our study demonstrated a gap in their knowledge about

CRC screening, as evaluated by our study survey. These findings are consistent with the results of previous studies in which investigators reported inadequate knowledge about CRC screening guidelines among medical students, internal medicine residents, and PHCPs (15,25-27,33). The mean knowledge scores for CRC screening guidelines were directly proportional to the level of training (26,33-35). Senior medical students in our study had a higher knowledge score, most likely due to their considerable academic and clinical exposure, which enriches their perception about the value of screening and its importance. Interestingly however, in our study, male students had lower knowledge scores. Previous studies have shown that female PHCPs had better knowledge about CRC screening guidelines and were following the guidelines more strictly than were their male counterparts (15,36).

To better understand why CRC screening is not being more frequently recommended by medical students, we sought to identify the barriers that they might encounter (37). Most medical students in this study thought that their knowledge defect was a barrier to recommending screening. Furthermore, they failed to perceive their role as screening advocates, as the most commonly selected barrier was "I did not think of it." They should be encouraged to recognize their role in tackling this critical health problem. A previous study reported that "fear of discovering a cancer" was a major barrier among patient-related barriers (26).

Our study's strengths are its high response rate. This study is the first to evaluate medical students' attitudes in their role as CRC screening advocates among their family members and to attempt to identify the obstacles that they encounter. Our study also has several limitations. First, it is restricted to one city in Saudi Arabia, which might affect the generalizability of our results. We believe, however, that our results are thought provoking and would be enriched by similar surveys that targeted medical schools internationally. Second, the study was limited by its design, as self-reported data were obtained from the participants and this approach involves an associated recall bias. Third, the fact that different modalities are used in CRC screening and that the guidelines are continually changing may contribute to the various low knowledge assessment scores.

Collectively, our results demonstrated suboptimal knowledge and attitude toward CRC screening among medical students. Their knowledge defect was reported as a major barrier to recommending CRC screening. The study results suggest that medical students are not receiving adequate and early training in CRC screening. In the absence of national screening programs, and with the need to enhance population awareness, medical educators should encourage students to be actively involved in counseling patients and advocating for CRC screening in their communities. Providing this additional training could enhance students' knowledge and clinical skills in CRC screening,(28,38,39) and it may result in a more proactive attitude that continues throughout their future career(40).

Medical students have not reached their full potential as CRC screening proponents for a variety of reasons, including inadequate knowledge and suboptimal attitudes, as well as various barriers that hinder them in this role. Female students in this study were stronger advocates than male students were. Strategies to enrich students' knowledge and help them overcome the barriers that they face should be offered through educational sessions and training to enhance their role as CRC screening champions.

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