Original Article

Knowledge & Awareness regarding colorectal cancer among health and allied students of King Saud Bin Abdulaziz University for Health Sciences, Jeddah

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ABSTRACT

Background: Colorectal cancer (CRC) is one of the pivotal public health issues in Saudi Arabia currently. There is a need to examine the knowledge and awareness of the health professions' students who are going to be the caretakers of the public in years to come. **Objectives:** The aim of this study was to investigate the knowledge and awareness of CRC in health and allied students of our Health Sciences University in Saudi Arabia. **Materials and Methods:** An online predesigned and validated and self-administered Survey/Questionnaire was dispensed to all health and allied students. Descriptive statistics was performed using SPSS. Data were analyzed by demographic distributions to determine if students of these groups displayed any differential awareness and knowledge for CRC. **Results:** A total of 372 of students answered the online questionnaire with a mean age of 20 + 7.3 (SD) years. There was almost an equal distribution of male (47.8%) and female (52.2%) students and majority of them were single (97.3%). In this study, we found that the students were not having any knowledge of the epidemiology of CRC in Saudi Arabia. The knowledge about the various risk factors of CRC was also very dismal; only a minority of them (34.4%) was able to identify 5 out of 12 CRC risk factors correctly. However, 59.7% of students had no idea about the test/examination methods that are used in screening and detection of CRC, but majority (76.1%) of them were aware that people should get screened for CRC. **Conclusions:** A very low level of awareness and knowledge about CRC was observed in this study among all health and allied students. We strongly recommend that there is a dire need of proactive aggressive preventive medicine campaigns, educational programs, and curricular modifications for the students to prepare them for the challenges posed by increasing burden of cancer in the kingdom.

Keywords: Colorectal cancer, early detection, health education, preventive medicine, risk factors, Saudi Arabia

Introduction

Colorectal cancer (CRC) is one of the important solid cancers, characterized by malignancy of colon or rectal lumen cells.[1] CRC incidence rates vary widely according to region, but lately have

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been rising on a yearly basis since last decade[2]; in 2018, it has become third common cancer and second most deadly cancer in the world, after lung and breast cancer[3] in both genders. However, there is a lot of disparity in CRC incidence geographically, Western countries happen to have highest incidences of CRC in comparison to the Asian and middle-east countries.[4-7]

In the Kingdom of Saudi Arabia (KSA), CRC ranks first among males (10.6%) and third in females (8.9%).[8] In 2014, there were 1,347 cases of CRC, which accounted for 11.5% of all newly diagnosed cases, posing a significant health risk to Saudi nationals.[8,9] It has been reported that the median age for the development of CRC in Saudi population is 60 years (95% CI: 57–61 years) for men and 55 years (95% CI: 53–58 years) for women.[10] Furthermore, in Saudi Arabia, CRC tends to affect younger people more and the five-year survival rates have been reported to be lower (about 44.6%) than those expected for matching stages in other populations.[7,10]

In the KSA, it has been reported, by SEER Cancer Statistics Review 1975–2014, that there are huge variations in CRC incidence with Eastern region having the highest rates followed by Riyadh, Makkah, Qassim, and Tabuk. The median age at diagnosis in Saudi Arabia is 60 for men and 57 for women, as compared with worldwide figures of 68 for men and 72 for women (for colon cancer) and 63 for both men and women (for rectal cancer).[11,12]

With the increasing burden of CRC and its direct association of the family heredity, various lifestyle risk factors especially consumption of red meat, presence of precancerous polyps, and smoking, there is a dire need of having a preventive screening programs in KSA.[12] Regular screening of the population, especially the individuals at risk, helps in identification of tumors thereby facilitating the intervention before it develops into full blown cancer.[13] Since in Saudi Arabia, CRC is known to affect young people more avidly than in western countries; therefore, targeting the younger population and educating them about the appropriate lifestyle, screening techniques, and signs and symptoms of the malignancy would eventually prove beneficial in decreasing the rate of mortality and morbidity because of cancer.[11,13,14]

The new clinical practice guidelines, for the screening of CRC as put forth by Alsanea *et al.*,[13] are an excellent first step in controlling the incidence of CRC. However, in order to curb the disease at its foundations, there is a need for a robust and mandatory national policy for CRC screening, which not only will guide the best clinical practices but also will instill a sense of urgency in the medical profession to work proactively for the better screening of the CRC in KSA, taking care of population demand, development of sector, and need to alleviate the burden of society.[15] Aljumah and Aljebreen in their paper vehemently advocated for the compulsory healthcare policy for screening of CRC in KSA, which needs to be administered, endorsed, and monitored by the Ministry of Health (MoH).[15]

The main concept behind the screening program is to be able to identify patients at risk by detection of precancerous and small cancers at the early stages even before their advancements into nontreatable carcinomas.[8,13,15] Much of this is directly dependent upon the level of awareness and knowledge of the disease itself among the masses in general. Since we are a specialized health-centric university catering the medical needs of the kingdom, producing graduates who are proactive in implementation of the learned knowledge and skills at ground level, it is imperative that our graduates are more aware of the CRC, its burden in the kingdom, its risk factors, and the screening strategies available currently.[16]

This study was therefore designed to measure the level of knowledge and awareness among the students and concomitantly by the help of a questionnaire to increase the awareness as a strategy to help in the reduction of CRC prevalence. Secondarily, this study will also identify the source of information from which the students usually get their information.

Materials and Methods

The current cross-sectional study was conducted at King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS) between August and October 2019. The study was carried out on students at different colleges (medicine, applied medicine, health professions, and nursing) in KSAU-HS, National Guard Health Affairs, Jeddah Campus, Saudi Arabia. *The study was approved by Institutional Research Board, KAIMRC, KSAU-HS, Riyadh (SP19-199-J; Dated: 26/05/2019).*

An informed consent was taken from all the participants before participation in this study. All participants were given a self-administered, predesigned, and validated questionnaire (*already used by other studies*) containing structured questions divided in three sections: basic information, awareness, and knowledge of CRC. Basic Information section contained individual's sociodemographic characteristics, such as age, gender, marital status, college, and education level, at KSAU-HS. The awareness section contained questions focusing on signs and symptoms of CRC and knowledge sections contained questions on risk factors of CRC.

Our questionnaire was developed after rigorous literature search and adopting the various published studies of a similar kind.[16-18] However, we also conducted a pilot study on 25 students to assess the reliability and validity of our developed questionnaire, none of the students involved in pilot test were included in the study later on. The final survey was conducted online using Google Forms (Questionnaire Available on Request). None of the names and IDs was taken from the participants and the data were stored within 64-bit encrypted software that was not prone to be breached by nonauthorized persons. The required sample size was calculated at the 95% confidence level with an estimated 40.0%[12,14] prevalence of awareness regarding CRC and a margin of error ± 5%. The necessary determined sample

size must be 206 of the 2546 population of students within KSAU-HS, Jeddah Campus.

The results of this study were expressed in frequencies and percentages for qualitative variables. Independent *t*-test was conducted to compare the awareness and knowledge scores between male and female student participants, and between the students at various colleges in KSAU-HS. The data were entered in MS Excel and before the analysis; the dataset was prepared and checked for missing data. SPSS software was used for the analysis. Chi-square test was used for analysis of data. Descriptive statistics (e.g., mean and standard deviation) were used to describe continuous variables, whereas categorical variables were presented in frequencies and percentages. Independent sample *t*-test was used to determine the mean score differences of the awareness and knowledge sections between genders and medical and nonmedical faculties. The confidence was set at 95%, and statistical significance was determined at $P < 0.05$.

Results

Demographic Profile of Participating Students

A total of 375 students responded to the survey; however, 3 of the students did not agree to participate in the study. So, 372 of the students answered the online questionnaire with a mean age of 20 + 7.3 (SD). There was almost an equal distribution of male (47.8%) and female (52.2%) students and majority of them were single (97.3%). Of the 372 students, 117 (31.5%) were from College of Medicine, 46 (12.4%) from Applied Medical Sciences (AMS), 41 (11%) from Nursing, and 168 (45.2%) from Health Professions (COSHP). A majority of respondents (52.2%) were studying in first year in KSAU-HS, Jeddah Campus [Table 1].

Awareness About CRC and Associated Symptoms

In this study, we found that the majority of the students were unaware of the CRC (54.3%) and it being among the top cause of mortality in world (46.2%); however, 39% of the respondents were aware that CRC is a preventable disease. Furthermore, 59.7% of students had no idea about the test/examination methods that are used in screening and detection of CRC, but majority (76.1%) of them were aware that people should get screened for CRC, which could help in its early detection for its cure (73.7%) [Table 2].

Furthermore, almost 54%–68% of the participants had good awareness level regarding signs and symptoms of CRC; majority of them were able to identify five out of eight CRC symptoms correctly. However, overall awareness of the CRC was measured to be low, as only 41.1% of the respondents were able to answer more than 60% of the questions (9/16) correctly [Table 3].

Knowledge About CRC and Associated Risk Factors

In this study, we found that the students were not having any knowledge of the epidemiology of CRC in Saudi Arabia (39.2%) [Table 4]. However, a minority of the

Table 1: Demographic data of the participating students		
	n	**%**
Gender		
Male	178	47.8
Female	194	52.2
Age category		
Below 20 years	207	55.6
20-25 years	156	41.9
26-30 years	8	2.2
Above 30 years	1	0.3
Marital Status		
Single	362	97.3
Married	10	2.7
College		
Medicine	117	31.5
AMS	46	12.4
Nursing	41	11.0
UPPP	168	45.2
Level/Year		
First year	194	52.2
Second year	35	9.4
Third year	50	13.4
Fourth year	68	18.3
Fifth year or above	25	6.7
Total	372	100

respondents had a family history of one or other cancer (31.7%) and also a small fraction of the participants did have direct relation with CRC patient (7.5%). 64.0% of the participants had knowledge that family history influences the risk of CRC and 62.9% had knowledge that CRC is influenced by persons genetics.

Furthermore, the knowledge about the various risk factors of CRC was very dismal among the participants; only a minority of them (34.4%) was able to identify 5 out of 12 CRC risk factors correctly. Additionally, overall adequacy of knowledge for the CRC was measured to be very low, with majority 65.6% of the respondents failing to identify the risk factors correctly [Table 5].

Gender Differences

We also found that female respondents had better awareness for many questions in this survey like cancer being the top cause of mortality in world ($P < 0.001$), half emptying Gastrointestinal track (GIT), and being important symptom of CRC ($P = 0.06$) [Table 6].

Female respondents had significantly better knowledge for many questions in this study. A significant differences of opinions were evident for two important questions—family history of cancer ($P = 0.04$) and family history influencing CRC predisposition ($P = 0.01$). Also, there was significant difference between male and female in identification of the risk factors of CRC ($P < 0.05$) [Table 6].

College Differences

The proportion of respondents with significantly adequate

Table 2: Response rate of the awareness of the CRC and its associated signs and symptoms

	Yes *n* (%)	No *n* (%)	Don't know *n* (%)
Awareness			
Do you think that cancer is the most top cause of mortality in the world?	149 (40.1)	172 (46.2)	51 (13.7)
Are you aware of colorectal cancer (CRC)?	121 (32.5)	202 (54.3)	49 (13.2)
Are you aware that CRC is preventable?	145 (39)	120 (32.3)	107 (28.8)
Have you ever heard about any test/examination methods that are used in detection of CRC?	119 (32)	222 (59.7)	31 (8.3)
Do you think one should get screened for CRC?	283 (76.1)	24 (6.5)	65 (17.5)
Are you aware that CRC can be cured if detected at an early stage?	274 (73.7)	49 (13.2)	49 (13.2)
Which of the following do you think are the symptoms of CRC? [Chronic abdominal pain]	239 (64.2)	19 (5.1)	114 (30.6)
Which of the following do you think are the symptoms of CRC? [Presence of blood in stool]	254 (68.3)	14 (3.8)	104 (28)
Which of the following do you think are the symptoms of CRC? [Persistent fever]	77 (20.7)	84 (22.6)	211 (56.7)
Which of the following do you think are the symptoms of CRC? [Sudden weight loss]	201 (54)	28 (7.5)	143 (38.4)
Which of the following do you think are the symptoms of CRC? [Anemia]	107 (28.8)	68 (18.3)	197 (53)
Which of the following do you think are the symptoms of CRC? [Nausea]	156 (41.9)	50 (13.4)	166 (44.6)
Which of the following do you think are the symptoms of CRC? [Frequent obstructed/constipated intestine]	231 (62.1)	12 (3.2)	129 (34.7)
Which of the following do you think are the symptoms of CRC? [Half egestion of stools (half emptying of GIT)]	208 (55.9)	16 (4.3)	148 (39.8)
Which of the following do you think are the symptoms of CRC? [Weight gain]	31 (8.3)	129 (34.7)	212 (57)
Which of the following do you think are the symptoms of CRC? [Polyuria]	57 (15.3)	79 (21.2)	236 (63.4)

Table 3: Overall awareness scores among respondents for CRC

	n	%
Aware	153	41.1
Unaware	219	58.9
Total	372	100

Awareness was assessed at >60% knowledge level (9 question correctly answered out of the total of 16)

awareness and knowledge was observed to increase with education level for almost all the items studied [Table 6]. Awareness of the following items was significantly ($P < 0.001$) greater among College of Medicine students compared with other participants: awareness of CRC, CRC being preventable, availability of screening tests for CRC, and for identification of symptoms of CRC correctly like presence of blood in stool, sudden weight loss, and anemia. However, medicine students failed to be aware of the fact that CRC being among the top cause of mortality in world ($P < 0.001$) in contrast to nursing students who were aware of this fact with 61.0% of them responding affirmatively to the question.

With regard to the knowledge, we found that medicine students were significantly more knowledgeable than their counterparts in other colleges for the following questions: CRC predisposition, family history, and genetics role in CRC risk, and for correct identification of various risk factors of CRC like age, gender, and lack of dietary fiber. However, for most of the question related to identification of risk factors of CRC, there was no significant difference between the various streams students.

Furthermore, most of the participants responded with negative (85.8%) to the question "*Has anyone in family been diagnosed with CRC?*" Questions wise scores of awareness and knowledge among respondents have been provided in Table 6.

Discussion

In the current study, we attempted to evaluate the awareness and knowledge of CRC including symptoms, risk factors, and incidence, among health and allied students of KSAU-HS in KSA and to correlate these findings with students' gender and their college.

We found some significant differences among respondents based on their gender as well as education. Contrary to expectations, majority of the respondents were not aware of the four main statements of the awareness questionnaire: fact that cancer is among the topmost cause of mortality (59.9%), of CRC per se (67.5%), of CRC being preventable disease (68%), and lastly of diagnostic tests available for CRC (61%). Furthermore, there existed large awareness gaps when it came to identification of correct symptoms of CRC [Table 6], in which majority of respondents failed to identify most risk factor of CRC. However, 73.7% of respondents agreed to the facts that CRC can be cured if detected at an early stage. These results are consistent with many studies carried out in Asian and Saudi populations.[12,16,19–21]

Among the eight main symptoms of the CRC as listed in Table 2; participants were more or less aware about the five of them with a variance of 55.9% to 68.3% [Table 2]. However, this awareness was significantly ($P < 0.05$) reflected in only medicine students for just three questions: presence of blood in stool, sudden weight loss, and anemia [Table 6]. Furthermore, of the main risk factors for developing CRC as listed in Table 4, the participants were able to correctly identify only 5 out of 12 provided in the questionnaire. With respect to level of education, medical students answered that they knew that genetics and family history predisposes an individual to developing CRC, with significant majority ($P < 0.01$) [Table 6].

Table 4: Response rate of the knowledge of the CRC and its associated risk factors

	Yes *n* (%)	No *n* (%)	Don't know *n* (%)
Knowledge			
Do you think that colorectal cancer (CRC) is common in Saudi Arabia?	131 (35.2)	95 (25.5)	146 (39.2)
Do you have any family history of any type of Cancer?	118 (31.7)	231 (62.1)	23 (6.2)
Do you have anyone in family who was diagnosed with CRC?	28 (7.5)	319 (85.8)	25 (6.7)
Do you know that family history influences the predisposition to CRC?	238 (64)	62 (16.7)	72 (19.4)
Do you know that genetic predisposition influences the onset of CRC?	234 (62.9)	63 (16.9)	75 (20.2)
Which of the following do you think are the risk factors of developing CRC? [Age]	192 (51.6)	96 (25.8)	84 (22.6)
Which of the following do you think are the risk factors of developing CRC? [Gender]	135 (36.3)	124 (33.3)	113 (30.4)
Which of the following do you think are the risk factors of developing CRC? [Family history of cancer]	335 (90.1)	7 (1.9)	30 (8.1)
Which of the following do you think are the risk factors of developing CRC? [High dietary intake of meat]	135 (36.3)	57 (15.3)	180 (48.4)
Which of the following do you think are the risk factors of developing CRC? [High dietary fiber intake]	23 (6.2)	177 (47.6)	172 (46.2)
Which of the following do you think are the risk factors of developing CRC? [Low dietary intake of vegetables and fruits]	108 (29)	88 (23.7)	176 (47.3)
Which of the following do you think are the risk factors of developing CRC? [Lack of exercise]	154 (41.4)	64 (17.2)	154 (41.4)
Which of the following do you think are the risk factors of developing CRC? [Active lifestyle]	70 (18.8)	170 (45.7)	132 (35.5)
Which of the following do you think are the risk factors of developing CRC? [Obesity]	186 (50)	41 (11)	145 (39)
Which of the following do you think are the risk factors of developing CRC? [Diabetes]	90 (24.2)	93 (25)	189 (50.8)
Which of the following do you think are the risk factors of developing CRC? [Prior colon infection]	235 (63.2)	23 (6.2)	114 (30.6)
Which of the following do you think are the risk factors of developing CRC? [Inflammation of GIT/ irritable bowel syndrome]	240 (64.5)	11 (3)	121 (32.5)

Table 5: Overall knowledge scores among respondents for CRC

	n	%
Adequate knowledge	128	34.4
Inadequate knowledge	244	65.6
Total	372	100

Adequate knowledge was assessed at <60% knowledge level (10 question correctly answered out of the total of 17)

Similarly, medical students' level of awareness about the CRC, its preventability, and the availability of the test for its screening was significantly higher than those of other participating students (*P* < 0.01), but they were only knowledgeable about CRC being common in Saudi Arabia (*P* < 0.01) while other students were not. However, overall awareness about the CRC and its various symptoms was dismal, with only 41.1% of the participants aware of all questions (9 out of 16); and overall knowledge about the CRC and its various symptoms was dismal, with only 34.4% of the participants aware of all questions (10 out of 17) [Tables 3 and 5]. These results are comparable to other studies carried out in Saudi Arabia.[14,16,22,23] Zubaidi *et al.*, in a study on general population in Saudi Arabia, reported that awareness and knowledge about CRC were inadequate.[8] But, they reported that females were more aware and knowledgeable than males. These results are same what we have found in our current study.

Moreover, in this study, there were only a fewer significant differences in the answers between gender and on educational levels of students. Thus, there is dire need of targeted educational programs or workshops which should aim both males and females across all educational programs to improve both awareness and knowledge of the cancer, and in particular CRC, its symptoms, and risk factors as also identified by others.[8,17]

In the present study, the majority (59.7%) of the respondents were not aware of any CRC screening test or examinations used in detection of CRC. A possible explanation for this is kind of poor knowledge toward CRC screening among health profession students can be explained only because of the gaps and inadequacy in the curriculum in imparting the community-based health education. This in turn also leads to the absence of any effective promotional activities and workshops targeting students to familiarize them for various screening methods available for CRC. Furthermore, the lack of information and promotion from the public media campaigns also leads to poor knowledge about CRC screening.[17] These results are in concordance with the studies already reported in which a majority of respondents were not aware of various screening tests for early detection of CRC.[16,22,24,25] Furthermore, in one of the reported studies, in order to increase the public awareness, the role of television was established to be of pivotal importance in raising the awareness about a disease.[26]

About 32% of the participating students identified Internet as the main source of information for CRC for domains, awareness, and knowledge, of our survey. Only about 18% of the students identified curriculum as the second source of information, while the role of TV was not identified as the modulator of their knowledge or awareness [Figure 1–3]. These results are similar to the reported one by Imran *et al.*[16] from Saudi Arabia but in contrast to study of Sedrak *et al.*[25] in Egypt. This study therefore identifies a critical gap in our current curriculum for preventative medicine modules, and hence recommends for making the preventative medicine an integral part of the education, training, and practice to the students' of the health profession especially to the medicine students. In addition, specific instruction regarding cancer, especially CRC, screening should also be offered during

Survey query	Options	Gender		P	College				P
		Male	Female		Medicine	AMS	Nursing	COSHP	
Awareness									
Do you think that cancer is the most top cause of mortality in the world?	No	99 (55.6)	73 (37.5)	<0.001*	79 (67.5)	23 (50)	12 (29.3)	58 (34.5)	<0.001*
	Yes	58 (32.6)	91 (46.9)		28 (23.9)	16 (34.8)	25 (61)	80 (47.6)	
	Don't know	21 (11.8)	30 (15.5)		10 (8.5)	7 (15.2)	4 (9.8)	30 (17.9)	
Are you aware of colorectal cancer (CRC)?	No	94 (52.8)	108 (55.7)	0.47*	43 (36.8)	18 (39.1)	26 (63.4)	115 (68.5)	<0.001*
	Yes	63 (35.4)	58 (29.9)		66 (56.4)	20 (43.5)	5 (12.2)	30 (17.9)	
	Don't know	21 (11.8)	28 (14.4)		8 (6.8)	8 (17.4)	10 (24.4)	23 (13.7)	
Are you aware that CRC is preventable?	No	61 (34.3)	59 (30.4)	0.29*	32 (27.4)	16 (34.8)	11 (26.8)	61 (36.3)	0.63*
	Yes	62 (34.8)	83 (42.8)		51 (43.6)	17 (37)	19 (46.3)	58 (34.5)	
	Don't know	55 (3.9)	52 (26.8)		34 (29.1)	13 (28.3)	11 (26.8)	49 (29.2)	
Have you ever heard about any test/examination methods that are used in detection of CRC?	No	100 (56.2)	122 (62.9)	0.42*	53 (45.3)	25 (54.3)	30 (73.2)	114 (67.9)	<0.001*
	Yes	62 (34.8)	57 (29.4)		51 (43.6)	19 (41.3)	8 (19.5)	41 (24.4)	
	Don't know	16 (9)	15 (7.7)		13 (11.1)	2 (4.3)	3 (7.3)	13 (7.7)	
Do you think one should get screened for CRC?	No	12 (6.7)	12 (6.2)	0.94*	8 (6.8)	4 (8.7)	2 (4.9)	10 (6)	0.89*
	Yes	134 (75.3)	149 (76.8)		85 (72.6)	36 (78.3)	31 (75.6)	131 (78)	
	Don't know	32 (18)	33 (17)		24 (20.5)	6 (13)	8 (19.5)	27 (16.1)	
Are you aware that CRC can be cured if detected at an early stage?	No	27 (15.2)	22 (11.3)	0.55*	10 (8.5)	4 (8.4)	4 (9.8)	31 (48.5)	0.17*
	Yes	128 (71.9)	146 (75.3)		94 (80.3)	36 (78.3)	30 (73.2)	114 (67.9)	
	Don't know	23 (12.9)	26 (13.4)		13 (11.1)	6 (13)	7 (17.1)	23 (13.7)	
Which of the following do you think are the symptoms of CRC? [Chronic abdominal pain]	No	9 (5.1)	10 (5.2)	0.86*	4 (3.4)	1 (2.2)	5 (12.2)	9 (5.4)	0.07*
	Yes	112 (62.9)	127 (65.5)		83 (70.4)	32 (69.6)	27 (65.9)	97	
	Don't know	57 (32)	57 (29.4)		30 (25.6)	13 (28.3)	9 (22)	62 (36.9)	
Which of the following do you think are the symptoms of CRC? [Presence of blood in stool]	No	8 (4.5)	6 (3.1)	0.55*	2 (1.7)	2 (4.3)	4 (9.8)	6 (3.6)	<0.001**
	Yes	117 (65.7)	137 (70.6)		96 (82.1)	33 (71.7)	24 (58.5)	101 (60.1)	
	Don't know	53 (29.8)	51 (26.3)		19 (16.2)	11 (23.9)	13 (31.7)	61 (36.3)	
Which of the following do you think are the symptoms of CRC? [Persistent fever]	No	48 (27)	36 (18.6)	0.14*	25 (21.4)	10 (21.7)	7 (17.1)	42 (25)	0.58*
	Yes	36 (20.2)	41 (21.1)		30 (25.6)	9 (19.6)	6 (14.6)	32 (19)	
	Don't know	94 (52.8)	117 (60.3)		62 (53)	27 (58.7)	28 (68.3)	94 (56)	
Which of the following do you think are the symptoms of CRC? [Sudden weight loss]	No	15 (8.4)	13 (6.7)	0.82*	6 (5.1)	2 (4.3)	2 (4.9)	18 (10.7)	<0.001*
	Yes	95 (53.4)	106 (54.6)		86 (73.5)	27 (58.7)	21 (51.2)	67 (39.9)	
	Don't know	68 (38.2)	75 (38.7)		25 (21.4)	17 (37)	18 (43.9)	83 (49.4)	
Which of the following do you think are the symptoms of CRC? [Anemia]	No	31 (17.4)	37 (19.1)	0.30*	16 (13.7)	3 (6.5)	14 (34.1)	35 (20.8)	<0.001*
	Yes	58 (32.6)	49 (25.3)		58 (49.6)	11 (23.9)	4 (9.8)	34 (20.2)	
	Don't know	89 (50)	108 (55.7)		43 (36.8)	32 (69.6)	23 (56.1)	99 (58.9)	
Which of the following do you think are the symptoms of CRC? [Nausea]	No	27 (15.2)	23 (11.9)	0.25*	17 (14.5)	3 (6.5)	7 (17.1)	23 (13.7)	0.18*
	Yes	67 (37.6)	89 (45.9)		49 (41.9)	26 (56.5)	20 (48.8)	61 (36.3)	
	Don't know	84 (47.2)	82 (42.3)		51 (43.6)	17 (37)	14 (34.1)	84 (50)	
Which of the following do you think are the symptoms of CRC? [Frequent obstructed/constipated intestine]	No	6 (3.4)	6 (3.1)	0.27*	2 (1.7)	1 (2.2)	0	9 (5.4)	0.17**
	Yes	103 (57.9)	128 (66)		79 (67.5)	32 (69.6)	28 (68.3)	92 (54.8)	
	Don't know	69 (38.8)	60 (30.9)		36 (30.8)	13 (28.3)	13 (31.7)	67 (39.9)	
Which of the following do you think are the symptoms of CRC? [Half egestion of stools (half emptying of GIT)]	No	12 (6.7)	4 (2.1)	0.06*	3 (2.6)	3 (6.5)	2 (4.9)	8 (4.8)	0.54*
	Yes	93 (52.2)	115 (59.3)		71 (60.7)	28 (60.9)	24 (58.5)	85 (50.6)	
	Don't know	73 (41)	75 (38.7)		43 (36.8)	15 (32.6)	15 (36.6)	75 (44.6)	
Which of the following do you think are the symptoms of CRC? [Weight gain]	No	69 (38.8)	60 (30.9)	0.15*	55 (42)	14 (30.4)	13 (31.7)	47 (28)	0.06*
	Yes	11 (6.2)	20 (10.3)		9 (7.7)	3 (6.5)	4 (9.8)	15 (8.9)	
	Don't know	98 (55.1)	114 (58.8)		53 (45.3)	29 (63)	24 (58.5)	106 (63.1)	
Which of the following do you think are the symptoms of CRC? [Polyuria]	No	40 (22.5)	39 (20.1)	0.74*	30 (25.6)	8 (17.4)	7 (17.1)	34 (20.2)	0.71*
	Yes	25 (14)	32 (16.5)		17 (14.5)	10 (21.7)	6 (14.6)	24 (14.3)	
	Don't know	113 (63.5)	123 (63.4)		70 (59.8)	28 (60.9)	28 (68.3)	110 (65.5)	
Knowledge									
Do you think that colorectal cancer (CRC) is common in Saudi Arabia?	No	42 (23.6)	53 (27.3)	0.58*	15 (12.8)	7 (15.2)	14 (34.1)	59 (35.1)	<0.001*
	Yes	67 (37.6)	64 (33)		72 (61.5)	20 (43.5)	8 (19.5)	31 (18.5)	
	Don't know	69 (38.8)	77 (39.7)		30 (25.6)	19 (41.3)	19 (46.3)	78 (46.4)	

Contd...

Survey query	Options	Gender		P	College				P
		Male	Female		Medicine	AMS	Nursing	COSHP	
Do you have any family history of any type of Cancer?	No	122 (68.5)	109 (56.2)	0.04*	73 (62.4)	29 (63)	21 (51.2)	108 (64.3)	0.21*
	Yes	48 (27)	70 (36.1)		40 (34.2)	13 (28.3)	14 (34.1)	51 (30.4)	
	Don't know	8 (4.5)	15 (7.7)		4 (3.4)	4 (8.7)	6 (14.6)	9 (5.4)	
Do you have anyone in family who was diagnosed with CRC?	No	159 (89.3)	160 (82.5)	0.09*	103 (88)	39 (84.8)	31 (75.6)	146 (86.9)	0.13**
	Yes	8 (4.5)	20 (10.3)		10 (8.5)	5 (10.9)	5 (12.2)	8 (4.8)	
	Don't know	11 (6.2)	14 (7.2)		4 (3.4)	2 (4.3)	5 (12.2)	14 (8.3)	
Do you know that family history influences the predisposition to CRC?	No	41 (23)	21 (10.8)	0.01*	12 (10.3)	9 (19.6)	6 (14.6)	35 (20.8)	<0.001*
	Yes	103 (57.9)	135 (69.6)		92 (78.6)	30 (65.2)	27 (65.9)	89 (53)	
	Don't know	34 (19.1)	38 (19.6)		13 (11.1)	7 (15.2)	8 (19.5)	44 (26.2)	
Do you know that genetic predisposition influences the onset of CRC?	No	37 (20.8)	26 (13.4)	0.03*	13 (11.1)	8 (17.4)	9 (22)	33 (19.6)	0.01*
	Yes	100 (56.2)	134 (69.1)		90 (76.9)	28 (60.9)	25 (61)	91 (54.2)	
	Don't know	41 (23)	34 (17.5)		14 (12)	10 (21.7)	7 (17.1)	44 (26.2)	
Which of the following do you think are the risk factors of developing CRC? [Age]	No	35 (19.7)	61 (31.4)	0.03*	5 (4.3)	6 (13)	21 (51.2)	64 (38.1)	<0.001*
	Yes	98 (55.1)	94 (48.5)		96 (82.1)	33 (71.7)	12 (29.3)	51 (30.4)	
	Don't know	45 (25.3)	39 (20.1)		16 (13.7)	7 (15.2)	8 (19.5)	53 (31.5)	
Which of the following do you think are the risk factors of developing CRC? [Gender]	No	48 (27)	76 (39.2)	0.02*	10 (8.5)	10 (21.7)	23 (56.1)	81 (48.2)	<0.001*
	Yes	66 (37.1)	69 (35.6)		73 (62.4)	25 (54.3)	9 (22)	28 (16.7)	
	Don't know	64 (36)	49 (25.3)		34 (29.1)	11 (23.9)	9 (22)	59 (35.1)	
Which of the following do you think are the risk factors of developing CRC? [Family history of cancer]	No	4 (2.2)	3 (1.5)	0.01**	1 (.9)	0	0	6 (3.6)	0.37**
	Yes	152 (85.4)	183 (94.3)		108 (92.3)	42 (91.3)	40 (97.6)	145 (86.3)	
	Don't know	22 (12.4)	8 (4.1)		8 (6.8)	4 (8.7)	1 (2.4)	17 (10.1)	
Which of the following do you think are the risk factors of developing CRC? [High dietary intake of meat]	No	21 (11.8)	36 (18.6)	0.19*	17 (14.5)	12 (26.1)	8 (19.5)	20 (11.9)	0.28*
	Yes	67 (37.6)	68 (35.1)		46 (39.3)	13 (28.3)	12 (29.3)	64 (38.1)	
	Don't know	90 (50.6)	90 (46.4)		54 (46.2)	21 (45.7)	21 (51.2)	84 (50)	
Which of the following do you think are the risk factors of developing CRC? [High dietary fiber intake]	No	86 (48.3)	91 (46.9)	0.22*	64 (54.7)	27 (58.7)	13 (31.7)	73 (43.5)	0.01*
	Yes	7 (3.9)	16 (8.2)		1 (.9)	4 (8.7)	5 (12.2)	13 (7.7)	
	Don't know	85 (47.8)	87 (44.8)		52 (44.4)	15 (32.6)	23 (56.1)	82 (48.8)	
Which of the following do you think are the risk factors of developing CRC? [Low dietary intake of vegetables and fruits]	No	35 (19.7)	53 (27.3)	0.12*	21 (17.9)	19 (41.3)	11 (26.8)	37 (22)	0.08*
	Yes	50 (28.1)	58 (29.9)		39 (33.3)	11 (23.9)	10 (24.4)	48 (28.6)	
	Don't know	93 (52.2)	83 (42.8)		57 (48.7)	16 (34.8)	20 (48.8)	83 (49.4)	
Which of the following do you think are the risk factors of developing CRC? [Lack of exercise]	No	25 (14)	39 (20.1)	0.07*	18 (15.4)	11 (23.9)	7 (17.1)	28 (16.7)	0.81*
	Yes	69 (38.8)	85 (43.8)		48 (41)	20 (43.5)	15 (36.6)	71 (42.3)	
	Don't know	84 (47.2)	70 (36.1)		51 (43.6)	15 (32.6)	19 (46.3)	69 (41.1)	
Which of the following do you think are the risk factors of developing CRC? [Active lifestyle]	No	90 (50.6)	80 (41.2)	0.12*	63 (53.8)	22 (47.8)	12 (29.3)	73 (43.5)	0.18*
	Yes	27 (15.2)	43 (22.2)		17 (14.5)	10 (21.7)	11 (26.8)	32 (19)	
	Don't know	61 (34.3)	71 (36.6)		37 (31.6)	14 (30.4)	18 (43.9)	63 (37.5)	
Which of the following do you think are the risk factors of developing CRC? [Obesity]	No	15 (8.4)	26 (13.4)	0.31*	10 (8.5)	3 (6.5)	5 (12.2)	23 (13.7)	0.42*
	Yes	91 (51.1)	95 (49)		56 (47.9)	29 (63)	21 (51.2)	80 (47.6)	
	Don't know	72 (40.4)	73 (37.6)		51 (43.6)	14 (30.4)	15 (36.6)	65 (38.7)	
Which of the following do you think are the risk factors of developing CRC? [Diabetes]	No	41 (23)	52 (26.8)	0.70*	22 (18.8)	9 (19.6)	13 (31.7)	49 (29.2)	0.16*
	Yes	44 (24.7)	46 (23.7)		34 (29.1)	15 (32.6)	6 (14.6)	35 (20.8)	
	Don't know	93 (52.2)	96 (49.5)		61 (52.1)	22 (47.8)	22 (53.7)	84 (50)	
Which of the following do you think are the risk factors of developing CRC? [Prior colon infection]	No	11 (6.2)	12 (6.2)	0.34*	3 (2.6)	6 (13)	4 (9.8)	10 (6)	0.26*
	Yes	106 (59.6)	129 (66.5)		79 (67.5)	27 (58.7)	25 (6.1)	104 (61.9)	
	Don't know	61 (34.3)	53 (27.3)		35 (29.9)	13 (28.3)	12 (29.3)	54 (32.1)	
Which of the following do you think are the risk factors of developing CRC? [Inflammation of GIT/irritable bowel syndrome]	No	8 (4.5)	3 (1.5)	0.16*	4 (3.4)	2 (4.3)	1 (2.4)	4 (2.4)	0.47**
	Yes	109 (61.2)	131 (67.5)		78 (66.7)	34 (73.9)	27 (65.9)	101 (60.1)	
	Don't know	61 (34.3)	60 (30.9)		35 (29.9)	10 (21.7)	13 (31.7)	63 (37.5)	
Total		178	194		117	46	41	168	

*Chi-square test. **Fisher exact test

their senior years and in oncology blocks in a similar manner as done in the USA.[8,23,27]

As already mentioned, a number of clear guidelines for CRC screening in Saudi Arabia does exits,[13,15,28] however there is neither any compulsion to follow them nor any organized national level program operated by the MoH for screening of the general population. Therefore, as suggested by many authors, we also recommend that policymakers need to have a proactive attitude in implementing a unified national
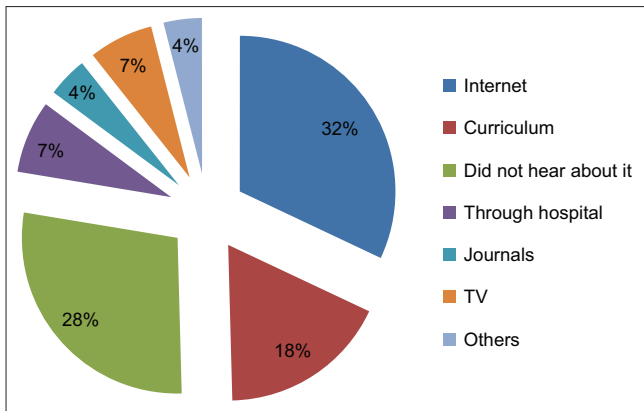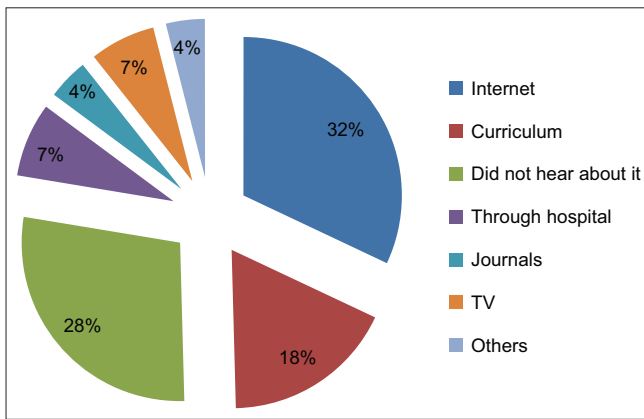
Figure 1: Sources of information for CRC awareness

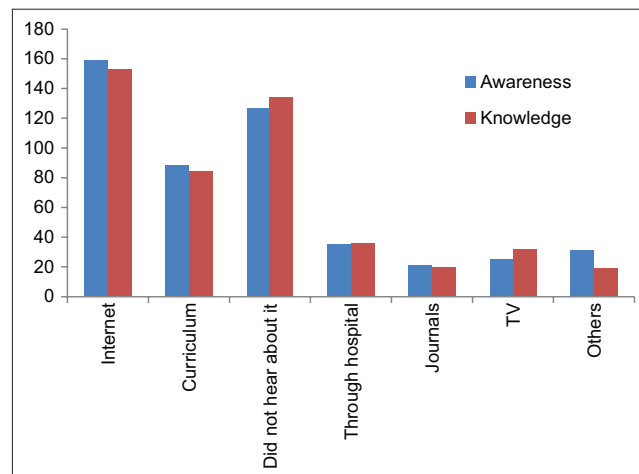**Figure 2:** Sources of information for CRC knowledge

Figure 3: Sources of information for CRC awareness and knowledge

program for not only educating the population but also carry out preventive screening, medicine seminars, workshops, and awareness campaigns for the public about cancers in general and CRC in specific.[13–15,29]

In conclusion, it is disconcerting to report that awareness and knowledge of KSAU-HS health and allied students about CRC is not as good as what is required. However, medical students had somewhat better knowledge than their peers in other

colleges of KSAU-HS, Jeddah Campus. Also, female students had better awareness and knowledge about CRC symptoms and risk factors than their male counterparts. There is dire requirement of proactive aggressive preventive medicine campaigns, educational programs, and curricular modifications for the students in particular and for Saudi population in general. This need gets more important with the fact that the incidence of CRC in the KSA has been on a constant rise over the past few years and more so it has been reported that more young people are affected with CRC in contrast to the western population.[11,12,28]

Study Limitations

1. This study was carried out in Jeddah Campus of KSAU-HS, Saudi Arabia and hence does not necessarily reflect the general population.
2. Study design (cross-sectional) is very sensitive to a variety of biases.
3. Data collection questionnaire was an online self-administered one and hence has an inherent risk of recalling bias or contamination by the participating students.

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Ethical Clearance

This study was approved by the Institutional Review Board of King Abdullah International Medical Research Centre, a research wing of KSAU-HS, Jeddah Campus (Reference No: SP19-199-J; Dated: 26/05/2019).

Declaration of Participant Consent

The authors certify that they have obtained all appropriate participant consent forms. In the form, the participant(s) has/ have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The participants understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of Interest

The authors have no conflict of interests to declare regarding the publication of this paper or the data thereof.

References

1. Sameer AS. Colorectal cancer: Molecular mutations and polymorphisms. Front Oncol 2013;3:114.
2. Weinberg BA, Marshall JL, Salem ME. The Growing challenge of young adults with colorectal cancer. Oncology (Williston

Park) 2017;31:381-9.

3. Globocan, 2018. Available from: http://gco.iarc.fr/today/data/factsheets/cancers/39-All-cancers-fact-sheet.pdf. [Last accessed on 2019 Nov].

4. Globocan, 2018. Available from: http://gco.iarc.fr/today/data/factsheets/cancers/10_8_9-Colorectum-fact-sheet.pdf. [Last accessed on 2019 Nov].

5. Siegel RL, Miller KD, Fedewa SA, Ahnen DJ, Meester RG, Barzi A, *et al*. Colorectal cancer statistics, 2017. CA Cancer J Clin 2017;67:177-93.

6. Kuipers EJ, Grady WM, Lieberman D, Seufferlein T, Sung JJ, Boelens PG, *et al*. Colorectal Cancer. Nat Rev Dis Primers 2015;1:15065.

7. Al-Ahwal MS, Shafik YH, Al-Ahwal HM. First national survival data for colorectal cancer among Saudis between 1994 and 2004: What's next? BMC Public Health 2013;13:73.

8. Zubaidi AM, AlSubaie NM, AlHumaid AA, Shaik SA, AlKhayal KA, AlObeed OA. Public awareness of colorectal cancer in Saudi Arabia: A survey of 1070 participants in Riyadh. Saudi J Gastroenterol 2015;21:78–83.

9. Cancer Incidence Report (Saudi Arabia). Available from: https://nhic.gov.sa/eServices/Documents/2014.pdf. [Last accessed on 2019 Nov].

10. Alsanea N, Abduljabbar AS, Alhomoud S, Ashari LH, Hibbert D, Bazarbashic S. Colorectal cancer in Saudi Arabia: Incidence, survival, demographics and implications for national policies. Ann Saudi Med 2015;35:196–202.

11. Howlader N, Noone AM, Krapcho M, Miller D, Bishop K, Kosary CL, *et al*. SEER cancer statistics review, 1975-2014. National cancer institute; based on November 2016 SEER data submission, posted to the SEER web site, April 2017.

12. Al-Hajeili M, Abdulwassi HK, Alshadadi F, Alqurashi L, Idriss M, Halawani L. Assessing knowledge on preventive colorectal cancer screening in Saudi Arabia: A cross-sectional study. J Family Med Prim Care 2019;8:3140-6.

13. Alsanea N, Almadi MA, Abduljabbar AS, Alhomoud S, Alshaban TA, Alsuhaibani A, *et al*. National Guidelines for Colorectal Cancer Screening in Saudi Arabia with strength of recommendations and quality of evidence. Ann Saudi Med 2015;35:189-95.

14. Almadi MA, Alghamdi F. The gap between knowledge and undergoing colorectal cancer screening using the Health Belief Model: A national survey. Saudi J Gastroenterol 2019;25:27-39.

15. Aljumah AA, Aljebreen AM. Policy of screening for colorectal cancer in Saudi Arabia: A prospective analysis. Saudi J Gastroenterol 2017;23:161–8.

16. Imran M, Sayed alamin Z, Alsulami SS, Atta M, Baig M. Knowledge and awareness of colorectal cancer among undergraduate students at King Abdulaziz University, Jeddah, Saudi Arabia: A survey-based study. Asian Pac J Cancer Prev 2016;17:2479-83.

17. Al-Naggar RA, Bobryshev YV. Knowledge of colorectal cancer screening among young Malaysians. Asian Pac J Cancer Prev 2013;14:1969-74.

18. Almutlaq BA, Bokhari BE, Alharbi HH, Alzayed AS, Abouhamda AS, Alturkstani, *et al*. Assessment of awareness levels toward colorectal cancer. Early detection and prevention in Saudi Arabia. Gastroenterol Hepatol Open Access 2017;6:00195. doi: 10.15406/ghoa.2017.06.00195.

19. Koo JH, Leong RW, Ching J, Yeoh KG, Wu DC, Murdani A, *et al*. Knowledge of, attitudes toward, and barriers to participation of colorectal cancer screening tests in the Asia-Pacific region: A multicenter study. Gastrointest Endosc 2012;76:126-35.

20. Khayyat YM, Ibrahim EM. Public awareness of colon cancer screening among the general population: A study from the Western Region of Saudi Arabia. Qatar Med J 2014;2014:17-24.

21. Othmani MA, ALenzi SM, Atawi FA, Omairi WA, Shehri MA, Merghani TH, *et al*. Awareness of colorectal cancer in Tabuk City, Saudi Arabia. Int J Med Res 2017;3:112-5.

22. Almadi MA, Mosli MH, Bohlega MS, Al Essa MA, AlDohan MS, Alabdallatif TA, *et al*. Effect of public knowledge, attitudes, and behavior on willingness to undergo colorectal cancer screening using the health belief model. Saudi J Gastroenterol 2015;21:71-7.

23. Mosli M, Alnahdi Y, Alghamdi A, Baabdullah M, Hadadi A, Khateery K, *et al*. Knowledge, attitude, and practices of primary health care physicians toward colorectal cancer screening. Saudi J Gastroenterol 2017;23:330-6.

24. Harmy MY, Norwati D, Noor NM, Amry AR. Knowledge and attitude of colorectal cancer screening among moderate risk patients in West Malaysia. Asian Pac J Cancer Prev 2011;12:1957-60.

25. Sedrak AS, Galal YS, Amin TT. Cancer screening knowledge and attitudes of under- and post-graduate students at Kasr Al Ainy School of Medicine, Cairo University, Egypt. Asian Pac J Cancer Prev 2016;17:3809-16.

26. Hazreen AM, Myint MS, Farizah H, Abd Rashid M, Chai CC, Dymna VK, *et al*. An evaluation of information dissemination during the severe acuterespiratory syndrome (SARS) outbreak among selected rural communities in Kuala Kangsar. Med J Malaysia 2005;60:180-7.

27. Boehler M, Advani V, Schwind CJ, Wietfeldt ED, Becker Y, Lewis B, *et al*. Knowledge and attitudes regarding colorectal cancer screening among medical students: A tale of two schools. J Canc Educ 2011;26:147-52.

28. Mosli MH, Al-Ahwal MS. Colorectal cancer in the Kingdom of Saudi Arabia: Need for screening. Asian Pac J Cancer Prev 2012;13:3809-13.

29. Alshammari SA, Alenazi HA, Alshammari HS. Knowledge, attitude and practice towards early screening of colorectal cancer in Riyadh. J Family Med Prim Care 2020;9:2273-80.