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Knowledge of Colorectal Cancer and Acceptance of Screening Colonoscopy at Al-Hussein Salt New Hospital: A Cross-Sectional Study

Sara Haj Ali*, Taqi-eddin Omar Al-Jarrah, Hamza Issa Yousef, Abdullah Hani Al-Nsour, Tuqa Mohammad Damra, Dalal Raed Al-Dabbas, Noat Rajab Qtaish, Mohammad Wael Shammout

Department of Internal Medicine, Faculty of Medicine, Al-Balqa Applied University, Jordan

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Abstract Colorectal cancer represents a leading cause of cancer-related morbidity and mortality in Jordan, yet public awareness and screening adherence remain suboptimal. This study assessed colorectal cancer knowledge, screening awareness, and barriers to colonoscopy among Jordanian adults. A questionnaire-based cross-sectional survey was conducted at Al-Hussein Salt New Hospital, evaluating participants' knowledge of colorectal cancer symptoms and risk factors, awareness of screening methods, and perceived barriers to colonoscopy. Among 222 participants (61.7% male, median age 37.0 years [IQR 28.0-50.0]), 48.2% demonstrated a low knowledge level (median score 5.0 [IQR 1.0-9.0]). Only 23.4% were aware of colorectal cancer screening, with 22.1% familiar with specific methods. Despite this, 81.1% expressed willingness to undergo a colonoscopy if recommended. A family history of colorectal cancer paradoxically correlated with reduced screening intention (p=0.046). The predominant barrier was the misconception that asymptomatic individuals do not require screening (reported by 45.2%). These findings reveal significant gaps in colorectal cancer knowledge and screening awareness in Jordan. While willingness to screen is high when advised by physicians, prevalent misconceptions—particularly the belief that symptoms warrant screening—underscore the need for targeted public health campaigns. Improving education on asymptomatic screening and addressing cultural perceptions could enhance early detection and reduce colorectal cancer burden.

Keywords Colorectal Cancer, Screening, Awareness, Colonoscopy, Barriers

1. Background

Colorectal cancer (CRC) is the third most common cancer worldwide and the second leading cause of cancer-related death, with 1,926,118 new cases and 903,859 deaths in 2022 [1]. According to the 27th annual report on cancer incidence and epidemiology in Jordan, CRC accounted for 7.7% of all newly diagnosed cases among Jordanians in 2022, ranking second among all malignancies in men and women (11.1%) [2].

Many colorectal cancers can be prevented through regular screening, which includes stool tests (e.g., fecal immunochemical tests (FITs) and fecal occult blood tests (FOBTs)), flexible sigmoidoscopy/colonoscopy, or CT colonography. Patients with a positive noncolonoscopy test

will need to undergo colonoscopy. It has been shown that people who undergo screening colonoscopies have cancer mortality rates that are 68% to 88% lower than those who do not [3].

For average-risk individuals, screening for colorectal cancer is recommended at the age of 50 years [4], with some societies (US Preventive Services Task Force, American Cancer Society) recommending screening beginning at the age of 45 years [5]. People at an increased risk of colorectal cancer need to start screening earlier.

Many cross-sectional studies that have been conducted across various Middle Eastern countries, including Jordan, have highlighted significant gaps in awareness and acceptance of CRC screening, particularly colonoscopy [6-8]. To our knowledge, only one previous study from Jordan has reported on the awareness of some CRC symptoms [9]. There have been no previous studies from Jordan that investigated the awareness of people from the Al-Balqa governorate regarding CRC and screening colonoscopy. All previous studies recruited participants from major hospitals of the Ministry of Health prior to the inauguration of the Al-Hussein Salt New Hospital at the end of 2020. The aims of this study were to evaluate the knowledge and beliefs of Jordanians in the Al-Balqa governorate regarding CRC and its screening methods, to gauge the acceptability of screening colonoscopy among them, and to identify the key factors that hinder individuals from undergoing screening colonoscopy.

2. Methods

A cross-sectional study was conducted at Al-Hussein Salt New Hospital, a tertiary referral center and the main hospital serving approximately half a million people in Al Balqa governorate and some areas of western Amman, Jordan, with a capacity of 350 beds. Recruitment was performed between January and March 2024. Participants were randomly chosen from the outpatient department of the hospital via convenience sampling. The inclusion criteria included males and females who were 18 years or older and who spoke Arabic. We excluded patients with a previous history of CRC and those who did not consent to participate. A minimum sample size of 296 participants was required to ensure a 95% confidence level with a 5% margin of error, accounting for a design effect of 1.

2.1. Data Collection and Instrument

Data were collected via a structured questionnaire administered through face-to-face interviews conducted by 6th-year medical students. To minimize bias and ensure consistency, all interviewers underwent a standardized training session prior to data collection. A standard script was used for introducing the study and obtaining informed consent to ensure uniformity. Regular supervision was provided by the principal investigator throughout the data collection period. The questionnaire was developed by adapting items from previously validated instruments used in local and regional studies on CRC awareness [7,9,10] to ensure content validity. It comprised three sections:

1) Socio-demographic data: Including age, sex, education level, smoking status, and marital status.

2) CRC Knowledge Assessment: Items assessing awareness of CRC symptoms (e.g., bleeding per rectum, change in bowel habits, abdominal pain, anorexia/weight loss, fatigue), risk factors (e.g., family history, inflammatory bowel disease, smoking, alcohol consumption, dietary factors, obesity, physical inactivity), and screening modalities. 3) Screening Practices and Perceptions: Questions regarding intention to undergo screening in general, willingness to undergo colonoscopy, and perceived barriers to screening colonoscopy. Responses were recorded on a dichotomous (Yes/No) scale [Appendices 1 and 2]. A knowledge score was calculated for each participant based on correct responses to items on symptoms and risk factors (1 point per correct answer; total possible score: 14). Scores were categorized as low (0–4), moderate (5–9), and high (10–14) for analytical purposes.

The instrument was reviewed for clarity and contextual relevance by two gastroenterologists, leading to minor refinements in wording. A pilot study on 20 participants was conducted to assess question suitability, estimate administration time, and evaluate psychometric properties; data from the pilot study were used to finalize the tool and were excluded from the final analysis.

2.2. Psychometric Validation

The psychometric properties of the knowledge assessment module were evaluated using the pilot data. We assessed the scale's internal consistency reliability, which was found to be excellent (Cronbach's $\alpha = 0.939$). Content validity was established during the development phase through expert review and the use of items from established instruments. Item analysis showed that all corrected item-total correlations were above 0.3, indicating that each item contributed to the overall scale consistency.

2.3. Ethics and Human Subjects

Ethical approval was provided by the institutional review board of Al-Balqa Applied University (IRB number 10912, dated 18/10/2023). The study was conducted in accordance with the ethical standards of the Helsinki Declaration. The privacy rights of participants were observed and informed consent was obtained from all participants in the study.

2.4. Statistical Analysis

Data analysis was performed via SPSS 21 for Windows. Frequencies and percentages were used to describe

categorical variables. Normality was tested using Shapiro-Wilk Test. Medians and interquartile ranges (IQR) were calculated for the continuous variables. The chi-square or Fisher exact tests were used to assess the associations between categorical variables, and binary logistic regression was performed to identify factors associated with intention to undergo screening in general and willingness to undergo a colonoscopy if recommended by a physician on the basis of demographic variables and knowledge levels. To test the robustness of knowledge level categorization, a sensitivity analysis was performed by reclassifying knowledge score into quartiles. A *p* value of <0.05 was considered statistically significant.

3. Results

3.1. Participant Flow and Demographics

A total of 250-275 eligible individuals were approached. An estimated 10-20% declined to participate, resulting in a final sample of 222 participants who completed the survey with no missing data. The majority of participants were males (61.7%) and married (76.1%). Most had a high school education (55.9%) and the median age was 37.0 years (IQR 28.0-50.0). A family history of colorectal cancer was reported by 9.0% of the participants. Table 1 presents the characteristics of the participants.

Table 1. Participant characteristics

Variable	N (%)
Age, years	
<45	137 (61.7)
≥45	85 (38.3)
Sex	
Female	85 (38.3)
Male	137 (61.7)
Marital Status	
Single	53 (23.9)
Married	169 (76.1)
Education	
High school	124 (55.9)
College/university	95 (42.8)
Illiterate	3 (1.4)
Family History of CRC	
Yes	20 (9.0)
No	202 (91.0)
Smoking Status	
Smoker	107 (48.2)
Nonsmoker	115 (51.8)
Knowledge score	
0-4	107 (48.2)
5-9	63 (28.4)
10-14	52 (23.4)
Awareness of CRC screening	
Yes	52 (23.4)
No	170 (76.6)
Awareness of screening methods	
Yes	49 (22.1)
No	173 (77.9)
Doctor recommended FOBT/FIT	
Yes	29 (13.1)
No	193 (86.9)
Doctor recommended colonoscopy	
Yes	26 (11.7)
No	196 (88.3)
General intention to undergo CRC screening in the future	
Yes	76 (34.2)
No	146 (65.8)
Agree to undergo colonoscopy if recommended	
Yes	180 (81.1)
No	42 (18.9)

CRC, colorectal cancer; FOBT, fecal occult blood test; FIT, fecal immunochemical test

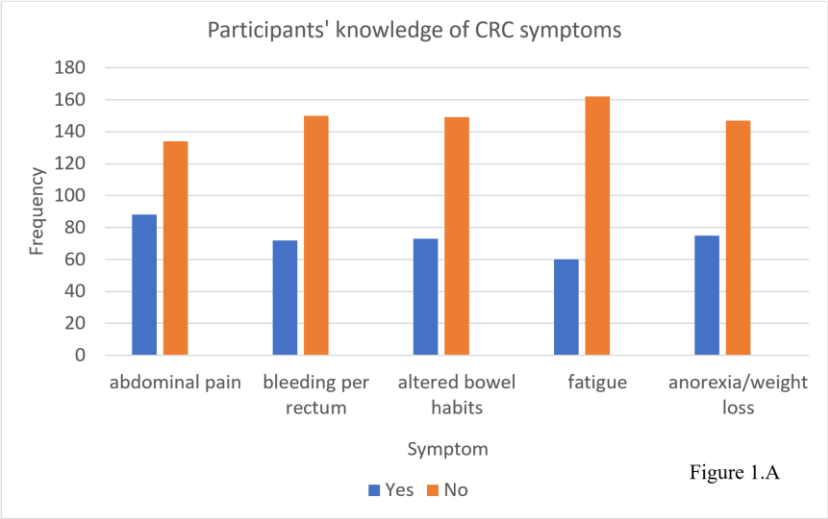
3.2. Knowledge of Colorectal Cancer Symptoms and Risk Factors

When asked about the symptoms and risk factors for CRC, the majority of participants (48.2%) had a low level of knowledge. Additionally, 22.1% of the participants were unable to identify any risk factors or symptoms. The median knowledge score was 5.0 (IQR 1.0-9.0). The most known symptom was abdominal pain (39.6%), and the least known symptom was fatigue (27%). Alcohol consumption was the most recognized risk factor for CRC (50%), and a history of inflammatory bowel disease was the least identified (23.9%). The distribution of all answers regarding knowledge of CRC symptoms and risk factors is shown in Figure 1.

We used the chi-square test to assess the associations between knowledge level and other categorical variables (Table 2), and we found significant associations with age, sex and education level. Higher knowledge levels were more prevalent among males (p=0.034), participants aged ≥ 45 years (p=0.022), and those with college/university education (p=0.002). There was no significant association between knowledge level and family history of CRC (p=0.093).

3.3. Awareness and Attitudes toward Colorectal Cancer Screening

Fewer than one quarter of the participants were aware of CRC screening or screening methods (23.4% and 22.1%, respectively). Among the 222 participants, only 34.2% reported general intention to undergo CRC screening in the future, but the majority (81.1%) expressed willingness to undergo a screening colonoscopy if recommended by a physician. The distributions of other items related to awareness and attitudes toward CRC screening are shown in Table 3.



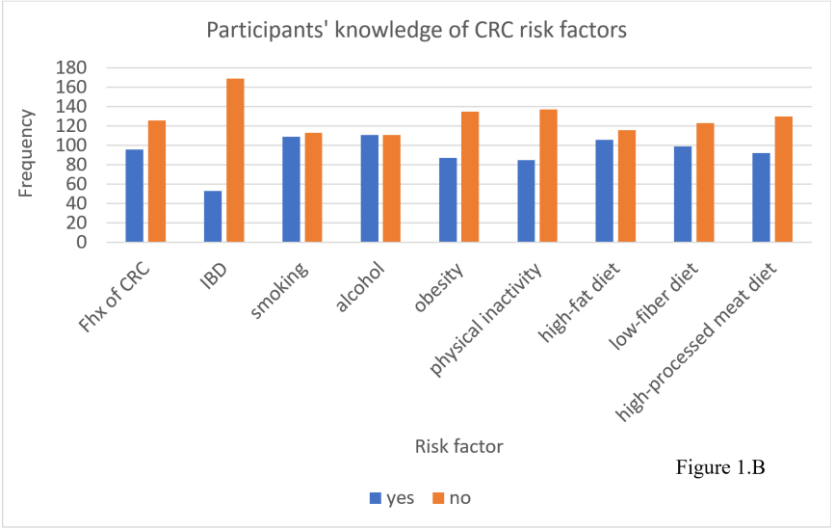


Figure 1.A. Participants' knowledge of CRC symptoms. Figure 1.B. Participants' knowledge of CRC risk factors. Abbreviations: CRC, colorectal cancer; Fhx, family history; IBD, inflammatory bowel disease

Figure 1. Awareness of Colorectal Cancer Symptoms and Risk Factors among Participants

Table 2. Comparison of Participant Characteristics by Knowledge Level

Variable	Knowledge level N(%)			*P* value
	Low (score 0-4)	Moderate (score 5-9)	High (score 10-14)	
Family history of CRC				0.093
Yes	5 (2.3)	8 (3.6)	7 (3.2)	
No	102 (45.9)	55 (24.8)	45 (20.3)	
Education level				0.002
High school	72 (32.4)	34 (15.3)	18 (8.1)	
College/university	33 (14.9)	28 (12.6)	34 (15.3)	
Illiterate	2 (0.9)	1 (0.5)	0 (0.0)	
Sex				0.034
Male	75 (33.8)	36 (16.2)	26 (11.7)	
Female	32 (14.4)	27 (12.2)	26 (11.7)	
Age (years)				0.022
<45	76 (55.5)	33 (24.1)	28 (20.4)	
≥45	31 (36.5)	30 (35.3)	24 (28.2)	
General intention to undergo CRC screening				0.272
Yes	31 (14)	24 (10.8)	21 (9.5)	
No	76 (34.2)	39 (17.6)	31 (14.0)	
Agree to undergo colonoscopy				<0.001
Yes	74 (33.3)	57 (25.7)	49 (22.1)	
No	33 (14.9)	6 (2.7)	3 (1.4)	

CRC, colorectal cancer

Table 3. Awareness and attitudes toward CRC screening

Item	N (%)
Awareness of CRC screening	
Yes	52 (23.4)
No	170 (76.6)
Awareness of screening methods such as stool test or colonoscopy	
Yes	49 (22.1)
No	173 (77.9)
Doctor recommended FOBT/FIT	
Yes	29 (13.1)
No	193 (86.9)
Doctor's recommendation for colonoscopy	
Yes	26 (11.7)
No	196 (88.3)
General intention to undergo CRC screening	
Yes	76 (34.2)
No	146 (65.8)
Agree to undergo colonoscopy if recommended	
Yes	180 (81.1)
No	42 (18.9)

CRC, colorectal cancer; FOBT, fecal occult blood test; FIT, fecal immunochemical test

We performed binary logistic regression analyses to identify factors associated with 1) general intention to undergo CRC screening and 2) agreement to undergo a colonoscopy. Backward stepwise selection with a removal criterion of $p > 0.10$ was used to derive the final models. The initial candidate factors for both models were sex, age group, family history of CRC, knowledge level, and education level.

For general intention to undergo screening, family history of CRC was the only factor retained in the final model. Contrary to expectation, a family history was significantly associated with lower odds of general intention for screening (OR = 0.39, 95% CI: 0.153-0.983, $p = 0.046$). Sensitivity analysis was performed by reclassifying knowledge score into quartiles, which confirmed the stability of our results. Notably, the significant inverse association for family history of CRC persisted despite the change in model specification (OR = 0.39, 95% CI: 0.15–0.98, $p = 0.046$).

For agreement to undergo a colonoscopy, the final model identified three significant factors. Female sex was associated with higher odds of agreement, while a low knowledge level and age less than 45 years were associated with lower odds of agreement (Table 4).

Table 4. Multivariate Analysis of Factors Associated with Willingness to Undergo Screening Colonoscopy

Variable	*P* value	OR	95% CI
Sex (female)	0.009	3.205	1.337-7.686
Knowledge level (low)	0.009	0.185	0.052-0.654
Age (<45 years)	0.01	0.316	0.132-0.759

OR, odds ratio; CI, confidence interval

This model demonstrated good fit (Hosmer and Lemeshow test: $\chi^2(8) = 2.50$, $p = 0.962$) and explained approximately 22.6% of the variance (Nagelkerke $R^2 = 0.226$). The model was statistically significant ($\chi^2(4) = 33.56$, $p < .001$). Events per variable (EPV)=36.

Results of the sensitivity analysis using quartile-based knowledge categories were consistent in the direction, magnitude, and significance of the association, confirming the findings were not sensitive to the cut-points chosen (Table 5).

Table 5. Sensitivity Analysis: Factors Associated with Agreement to Colonoscopy Using Quartile-Derived Knowledge Categories

Variable	*P* value	OR	95% CI
Sex (female)	0.015	2.97	1.239-7.135
Knowledge level (low)	0.007	0.165	0.044-0.614
Age <45 years	0.005	0.286	0.120-0.678

OR, odds ratio; CI, confidence interval

The quartile-based knowledge categories were defined as follows: Low (score ≤ 1, 25th percentile), Moderate (score 2-9), and High (score > 9, 75th percentile). This is compared to the original classification: Low (0-4), Moderate (5-9), High (10-14).

3.4. Exploring Barriers to Colonoscopy

Ninety-six out of 222 participants (43.2%) denied having any barrier that precluded them from undergoing colonoscopy. Among the 126 participants who reported having barriers to colonoscopy, the most prevalent barrier was the absence of symptoms (45.2%), followed by fear of pain (36.5%) and embarrassment (35.7%). Fear of finding cancer (30.2%) was also a significant factor, whereas belief in God's will (4.8%) was reported as the least common barrier. Table 6 shows the distribution of barriers to undergoing screening colonoscopy among participants.

Table 6. Barriers to screening colonoscopy in 126 participants

Barrier	N (%)
Fear of pain	46/126 (36.5)
Fear of cancer diagnosis	38/126 (30.2)
Embarrassment	45/126 (35.7)
Lack of time	17/126 (13.5)
Absence of symptoms	57/126 (45.2)
Belief in God's will	6/126 (4.8)
Fear of complications	24/126 (19.0)
Financial	12/126 (9.5)
It won't make a difference	12/126 (9.5)
Bowel preparation hassle	15/126 (11.9)

The feasibility of constructing a multivariate logistic regression model to identify factors associated with reported barriers was first evaluated. Candidate variables (age group, sex, education level, knowledge level and family history of CRC) were identified based on bivariate associations ($p < 0.25$) derived from chi-square and Fisher exact tests. The Events Per Variable (EPV) ratio was calculated to assess the risk of overfitting. Given an EPV below the recommended threshold of 10, a multivariate approach was considered methodologically unsound. As a result, the final analysis consisted of a series of simple logistic regression models, each evaluating the unadjusted association between a single independent variable and each reported barrier. To adjust for multiple comparisons and minimize the risk of Type I error, we applied a Bonferroni correction, setting the significance threshold at $\alpha = 0.01$ for the five independent variables. The only statistically significant association identified was that a low knowledge level was associated with significantly lower odds of reporting fear of a cancer diagnosis (OR = 0.249, 95% CI: 0.100–0.624, $p = 0.003$). These results should be interpreted as exploratory and warrant validation in future studies.

4. Discussion

Globally, CRC ranks third among the most commonly diagnosed cancers and second as the leading cause of cancer-related mortality [1]. In Jordan, it is the second most common cancer in both sexes [2]. Despite the evidence that CRC screening decreases the mortality of CRC patients, patient participation and adherence remain low [11].

Our study revealed a low level of knowledge about CRC symptoms and risk factors among participants (48.2%), which is consistent with the findings of other local and regional studies [6,7,9]. A previous Jordanian study by Omran and Ismail published in 2010 [6] reported that 74% of participants had never heard or read about CRC, whereas in our study, 22.1% of participants scored 0 out of 14, indicating a complete lack of information about CRC. A recent study from neighboring Palestine revealed better awareness, with 40% of participants having good knowledge and 18% demonstrating poor levels of knowledge [12]. We found that the most commonly recognized risk factors were alcohol consumption and smoking, which is similar to the findings of a previous Jordanian study by Omran et al [9] and another study by Al-Abdouli et al [10] from the UAE. Among the symptoms of CRC, abdominal pain was the symptom that participants were most aware of, whereas fatigue was the least recognized symptom. This contrasts with the findings of Omran et al., where flatulence and rectal bleeding were identified as the most recognized symptoms [9]. Looking at our participants' answers regarding awareness of symptoms, around two-thirds of them were not aware that an alarming symptom such as bleeding per rectum could be a sign of CRC. This indicates a lack of knowledge about CRC, which can lead to delays in diagnosis [13], as patients often relate these symptoms to benign causes such as hemorrhoids. As expected, higher awareness and knowledge of CRC symptoms and risk factors were significantly more common in highly educated participants. We also found that male sex and older age were strongly associated with better CRC awareness. This could be explained by the fact that older people have cumulative life experiences and tend to have chronic diseases [14], which makes them visit health care services more frequently than younger people do, and this can lead to better knowledge of medical conditions, including CRC [15]. Owing to social and cultural factors that play a role, especially in rural areas in Jordan, men might have greater chances for better educational attainment, more opportunities to discuss health-related issues, and more access to resources that can contribute to their better knowledge about CRC. Surprisingly, we found that having a family member with CRC was not associated with better CRC knowledge. One possible explanation for this is the communication gap between family members, who may not openly discuss serious illnesses such as cancer or may not communicate effectively due to generational differences, as cancer patients are usually older. Another possibility is inadequate healthcare engagement, where there is either a lack of sufficient interaction between physicians and patients, especially in public health institutes where work overload leads to shorter consultation times, or a failure of CRC patients to follow up with their healthcare providers as frequently as needed, resulting in less information being delivered to them about their disease. A third explanation is denial or minimization of an individual's own risk of CRC, despite having a family history of the condition, which leads to lower motivation to learn about the disease.

Our study revealed that fewer than a quarter of the participants were aware of CRC screening and its tools, which is in line with the results of a previous study from Oman by Al-Azri et al [8] and a recently published national survey by Abdulelah et al [16]. Only one-third of the participants reported a general intention to undergo CRC screening in the future; however, the majority expressed their willingness to undergo a colonoscopy if recommended by a doctor. Several studies reported that physician endorsement was an important facilitator of CRC screening uptake [17,18]. In Jordan, there is no national screening program for CRC. Screening for CRC is typically suggested to patients by some primary health care providers or when patients present at gastroenterology clinics with gastrointestinal symptoms. This explains the low percentage of participants in our study who were advised by a physician to undergo screening through FOBT/FIT and colonoscopy (13.1% and 11.7%, respectively).

Unfortunately, having a family history of CRC was significantly associated with lower likelihood of intention to undergo screening. This finding is similar to the findings of a previous study by Taha et al., which did not find a significant association between undergoing CRC screening and having a family history of CRC [19]. The negative attitudes toward early screening in those with a family history of CRC could be due to many reasons. First, anxiety and fear of cancer can lead to the avoidance of screening to avoid the possibility of having the disease themselves. Second, a lack of awareness of the necessity of screening and early detection and misconceptions about its efficacy, even in the presence of a higher risk due to family history, might lead to less uptake. Third, social beliefs could play important roles, as cancer diagnosis is often viewed as a source of stigma. Finally, the previous negative experience of family members with their cancer diagnosis or treatment could deter their relatives from screening, as they link it to poor outcomes.

We explored the barriers to undergoing a screening colonoscopy among participants, and the most commonly reported barrier was the absence of symptoms (45.2%). This is similar to the results of two previous local studies [19,20], in which the majority of individuals who did not undergo screening said it was because they 'did not feel sick' or were 'feeling well'. Other barriers that were commonly reported were fear of pain from the procedure, embarrassment and fear of finding cancer. A systematic review of the barriers to and facilitators of CRC screening

in Asia identified lack of knowledge, fear of the procedure, fear of finding cancer, fear of pain, absence of symptoms and high cost as the most common barriers to screening colonoscopy [21]. We found that participants with higher knowledge levels about CRC reported greater fear of a cancer diagnosis as a barrier. This suggests that while knowledge promotes awareness of screening benefits, it may also concurrently increase anxiety about the possibility of a cancer diagnosis and its adverse outcomes.

The primary strength of this study, in addition to being the first conducted at Al-Hussain Salt New Hospital to explore attitudes and awareness toward colorectal cancer screening, lies in the utilization of personal interviews for data collection, which allowed us to explain aspects of the questionnaire and minimize misinterpretation of the questions. In addition, our study was the second study from Jordan that assessed people's knowledge of the symptoms of CRC, rather than assessing their knowledge of the epidemiology of CRC locally. We added symptoms such as abdominal pain, anorexia, weight loss and fatigue, which were not present in the previous study. Moreover, we used colonoscopy as the gold standard for screening and explored barriers to undertaking it at the Al-Balqa governorate, which has not been studied before.

Our study has several limitations. The use of a convenience sampling method and recruiting participants from a single hospital setting limits the generalizability of our findings. This approach introduces a potential for selection bias, as individuals with greater health concerns, higher health literacy, or better access to care may have been overrepresented. Consequently, the observed level of CRC knowledge may overestimate the true awareness in the general community, and our sample likely underrepresents marginalized groups with limited healthcare access. Furthermore, the small sample size (n=222) is below the calculated target (n=296) and effectively lowers the confidence level of our estimates from 95% to 91%. This reduces the statistical power to detect significant associations, limits the precision of our estimates, precludes meaningful subgroup analysis, and introduces a risk that the factor analysis model may be overfitted to the data. Additionally, the dichotomous (yes/no) response format for knowledge questions may have introduced measurement error. The absence of an 'I don't know' option potentially increased correct guessing by chance, and the face-to-face interview format could prompt socially desirable responses, possibly leading to an overestimation of true knowledge levels. Another limitation is the lack of data on important potential confounders such as socioeconomic status, residence, health insurance, and detailed health history. These unmeasured factors could influence both knowledge and screening intentions, meaning the associations we report may be subject to residual confounding. Finally, the generalizability of our findings may be affected by a notable gender imbalance, with fewer female participants, which may be attributed to social factors affecting participation and has been observed in previous local studies.

Despite these limitations, the finding of a low level of knowledge and awareness is consistent with previous regional studies [6,7,9], strengthening the confidence in our core finding that CRC knowledge is a significant public health concern. Future studies on larger, randomly sampled cohorts from diverse community settings are needed to validate these findings. The use of alternative question formats, such as including a 'don't know' option, is also recommended to provide a more nuanced understanding of knowledge gaps.

5. Conclusions

We found low levels of awareness of colorectal cancer and its screening among participants at Al-Hussein Salt New Hospital. In general, there was a negative attitude toward screening, especially among those with a family history of colorectal cancer. Despite this, there was a willingness to undergo a screening colonoscopy if it was recommended by a physician. Multiple barriers to colonoscopy have been identified. These barriers can be addressed by implementing effective health education and adopting national awareness campaigns to address misconceptions and encourage people to undergo screening.

List of Abbreviations

CRC, colorectal cancer; FOBT, fecal occult blood test; FIT, fecal immunochemical test; OR, odds ratio; CI, confidence interval; SD, standard deviation.

Declarations

Ethics Approval and Consent to Participate

Ethical approval was provided by the institutional review board of Al-Balqa Applied University (IRB number 10912). The study was conducted in accordance with the ethical standards of the Helsinki Declaration. A consent form was signed by all the subjects who participated in the study.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interest

The authors declare that they have no competing interests.

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Non declared.

Authors' Contributions

SA designed the study, analyzed data and revised the manuscript, TA collected data and drafted the manuscript, HY collected data and drafted the manuscript, AA collected data and drafted the manuscript, TD collected data and drafted the manuscript, DA collected and analyzed data, NQ collected and analyzed data, MS collected data and drafted the manuscript. All authors have read and approved the final manuscript.

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During the preparation of this work the authors used Microsoft Copilot in order to improve language and readability. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Appendix

Appendix 1. English questionnaire

Age:
Gender:
Marital status:
Education level:
Family history of colorectal cancer:
Smoking status:
Awareness of colorectal cancer symptoms:

Symptom	Yes	No
Abdominal pain		
Rectal bleeding		
Change in bowel habits		
Anorexia/weight loss		
Anemia/fatigue		

Awareness of risk factors for colorectal cancer:

Risk factor	Yes	No
Family history of colorectal cancer		
Inflammatory bowel disease		
Smoking		
Alcohol consumption		
Obesity		
Physical inactivity		
High-fat diet		
Low-fiber diet		
High-processed meat diet		

Awareness of screening for colorectal cancer:

Question Answer	Yes	No
Are you aware of colorectal cancer screening?		
Are you aware of any screening methods for colorectal cancer, such as stool test or colonoscopy?		
Did a doctor ever recommend a stool test (FOBT/FIT) for you?		
Did a doctor ever recommend a screening colonoscopy for you?		
Do you plan to get screened for colorectal cancer in the future?		
If your doctor recommends you undergo CRC screening by inserting a scope into your colon through the anus (a colonoscopy), would you agree to have this procedure performed?		

Barriers to undergoing a colonoscopy: (choose any that applies)

Barrier	
Fear of finding cancer	
Financial	
Embarrassing	
Fear of pain	
Fear of complications	
Hassle of bowel preparation	
I believe in God's will	
I do not think it will make a difference	
I do not have time	
I do not have any symptom	
Other	

Appendix 2. Arabic questionnaire

الجنس:
الحالة الاجتماعية:
المستوى التعليمي:
هل تم تشخيص أحد أقاربك بسرطان القولون؟
هل أنت مدخن؟
المعرفة بأعراض سرطان القولون:

الأعراض	نعم	لا
ألم في البطن		
خروج دم مع البراز		
تغير في نمط الإخراج		
فقدان الشهية أو الوزن		
تعب أو فقر الدم		

المعرفة بالعوامل التي تزيد من خطر الإصابة بسرطان القولون:

عوامل الخطر	نعم	لا
تاريخ مرضي لسرطان القولون في العائلة		
التهابات القولون المزمنة		
التدخين		
شرب الكحول		
السمنة		
عدم ممارسة الرياضة		
الطعام عالي الدهون		
الطعام قليل الألياف		
اللحوم المصنعة		

المعرفة بالكشف المبكر عن سرطان القولون:

السؤال	نعم	لا
هل سمعت بالكشف المبكر عن سرطان القولون؟		
هل لديك معرفة بأدوات الكشف المبكر عن سرطان القولون؟		
هل طلب منك الطبيب فحص البراز للدم الخفي؟		
هل نصحك الطبيب بإجراء تنظير القولون للكشف المبكر عن سرطان القولون؟		
هل تنوي إجراء فحص للكشف المبكرعن سرطان القولون؟		
هل توافق على إجراء تنظير للقولون (عن طريق فتحة الشرج) إذا نصحك الطبيب بذلك؟		

معوقات إجراء تنظير القولون: (اختر أيا من)

المعوق	
الخوف من تشخيص السرطان	
أسباب مادية	
الخجل	
الخوف من الألم	
الخوف من المضاعفات	
الانزعاج من تحضير القولون	
الإيمان بمشيئة الله	
لا أعتقد أنه سيحدث فرقاً	
لا أملك الوقت	
ليس لدي أعراض	
أخرى	

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