

AWARENESS ABOUT COLORECTAL CANCER SCREENING AND RISK FACTORS
AMONG MEDICAL STAFF IN MOSUL CITY

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ABSTRACT

Background: Colorectal cancer (CRC) is one of the most common malignancies worldwide and, in Iraq, is the leading cancer among men after lung cancer and among women after breast cancer. Awareness among medical staff of screening methods and risk factors is central to early detection and improved cure rates. **Aim:** To assess awareness of colorectal cancer screening and risk factors among medical staff in Mosul City, Iraq. **Methods:** A cross-sectional study was conducted among 400 medical staff (100 physicians, 100 dentists, 100 pharmacists, and 100 nurses) across four hospitals and two dental centers in Mosul City. Data were collected via direct interviews using a pre-validated structured questionnaire after verbal consent. Awareness was scored and categorized as good (8-12), intermediate (4-7), or low (0-3); group differences were tested with the chi-square test. **Results:** The largest proportions of participants were aged 20-30 years (58.3%) and female (58.7%); 10.5% reported a family history of CRC. Awareness of risk factors was intermediate in 46.5%, good in 37.5%, and low in 16.0% of participants, with the highest awareness for family history of CRC (69.0%) and the lowest for type 2 diabetes mellitus as a risk factor (24.8%). Awareness of screening was intermediate in 55.5%, good in 30.0%, and low in 14.5%; colonoscopy was the most recognized method (76.2%) and CT colonography the least (30.5%). Physicians showed the highest awareness of both risk factors (57.0% good) and screening (45.0% good), while nurses showed the lowest (21.0% and 11.0% good, respectively; $p < 0.001$ for both comparisons). **Conclusion:** Awareness of colorectal cancer screening methods and risk factors among medical staff in Mosul City is predominantly intermediate, with marked differences among professional groups. Targeted educational interventions, particularly for nurses and dentists, are recommended to strengthen early detection efforts.

KEYWORDS: Colorectal cancer; Awareness; Screening; Risk factors; Medical staff; Mosul.

1. INTRODUCTION

1.1 Background and Rationale

Colorectal cancer (CRC) is among the most common malignancies worldwide and is a growing public health concern in low- and middle-income countries. In Iraq, CRC accounts for approximately 6.5% of all malignancies and is the most common cancer among men after lung cancer and among women after breast cancer, with a reported incidence of 6.18 per 100,000 population in 2019.^[1-3] Global cancer statistics likewise place CRC among the leading causes of cancer incidence and mortality, with both non-modifiable factors (age,

family history, and genetic predisposition) and modifiable lifestyle factors contributing to disease risk.^[4, 5] Early detection through regular screening substantially improves survival and treatment outcomes. Because medical staff are typically the first point of contact for the public and play a central role in recommending screening and communicating risk information, their own level of awareness of CRC risk factors and screening options directly shapes community screening uptake and, ultimately, early diagnosis rates.

1.2 Clinical Presentation

CRC presents with a broad spectrum of clinical features that vary with tumor location (right-sided colon, left-sided colon, or rectum), stage, and extent of spread. Rectal bleeding is a common presenting symptom, with bright red blood per rectum typically arising from distal tumors and occult bleeding, often leading to iron-deficiency anemia, more common with proximal lesions. Other frequent features include altered bowel habits, abdominal pain or cramping, and, in advanced right-sided tumors, a palpable abdominal mass. Constitutional symptoms such as unintentional weight loss and fatigue may accompany advanced disease, and signs such as hepatomegaly, jaundice, ascites, and lymphadenopathy may indicate metastatic spread. Because early CRC is frequently asymptomatic, screening rather than symptom recognition is the primary route to early diagnosis, further underscoring the importance of screening awareness among frontline medical staff.

1.3 Risk Factors of Colorectal Cancer

CRC is a multifactorial disease arising from an interplay of non-modifiable and modifiable factors. Among non-modifiable factors, risk rises sharply after age 50 through age-related accumulation of genetic and epigenetic changes; a first-degree relative with CRC, particularly when diagnosed before age 50, substantially increases individual risk, as does a personal history of adenomatous polyps. Inherited syndromes such as Lynch syndrome and familial adenomatous polyposis carry a markedly elevated lifetime risk, and chronic inflammatory bowel disease (ulcerative colitis and Crohn's disease) increases risk in proportion to disease duration and severity, which is why endoscopic surveillance is recommended in these high-risk groups.^[5, 7, 8]

Modifiable risk factors include a diet high in fat and red or processed meat, which raises colonic bile-acid concentrations; obesity, which promotes carcinogenesis through chronic low-grade inflammation and hyperinsulinemia; long-term smoking, which introduces mutagenic carcinogens into colorectal tissue; alcohol consumption, through oxidative stress and impaired folate metabolism; physical inactivity; and type 2 diabetes mellitus, which increases CRC risk independently of shared obesity-related pathways through the mitogenic effects of hyperinsulinemia and insulin-like growth factor 1.^[5, 6] Because most of these factors are amenable to lifestyle modification, accurate awareness among medical staff is a prerequisite for effective patient counseling and risk-reduction advice.

1.4 Screening and the Role of Medical Staff Awareness

Because most colorectal cancers arise from adenomatous polyps, screening allows both early detection and true prevention through polypectomy and can reduce CRC-related mortality by up to 60%.^[9] The three principal screening tests are colonoscopy, the fecal occult blood

test (FOBT), and flexible sigmoidoscopy; colonoscopy examines the entire colon and allows immediate removal of polyps, FOBT is typically repeated every one to two years, and additional options such as CT (virtual) colonoscopy and stool DNA testing are also available, although the former involves radiation exposure and cannot remove detected lesions.^[9, 10] International guidelines generally recommend that average-risk screening begin between the ages of 45 and 50 years, with earlier initiation, typically around age 40, for individuals at increased risk.^[10, 11]

Despite the demonstrated effectiveness of these tools, screening uptake remains suboptimal in many low- and middle-income settings, partly reflecting gaps in awareness among both the public and healthcare providers.^[11, 12] Medical staff are usually the first point of contact for patients and play a central role in recommending screening and communicating risk information; their own level of awareness of CRC risk factors and screening options therefore directly shapes community screening uptake and, ultimately, early diagnosis rates. Although a substantial body of literature addresses CRC screening and risk-factor awareness, comparatively little data are available on awareness among the diverse medical staff of Iraq and the wider Middle East, a region with distinct sociocultural characteristics that may influence screening behavior.

1.5 Aim of the Study

The present study aimed to assess awareness of colorectal cancer screening methods and risk factors among medical staff (physicians, dentists, pharmacists, and nurses) in Mosul City, Iraq, and to compare awareness levels across these professional groups.

2. Subjects and Methods

2.1 Study Design and Setting

A descriptive, cross-sectional study was conducted among medical staff in Mosul City. Data were collected over six months, from January to June 2025, across four hospitals (Al-Jamhory Teaching Hospital, Mosul General Hospital, Ibn Sena Teaching Hospital, and Al-Salam Teaching Hospital) and two specialized dental centers (Al-Noor and Al-Ayser). Administrative approval was obtained from the Scientific Council of the Arab Board for Health Specializations and the Nineveh Health Directorate, and the study was approved by the ethics committee of the Nineveh Health Directorate (approval no. 2025057, dated 12/2/2025). Verbal informed consent was obtained from every participant after a brief explanation of the study objectives, and confidentiality of personal information was assured.

2.2 Study Population and Sampling

The study population comprised physicians, dentists, pharmacists, and nurses; laboratory technicians, radiographers, ambulance drivers, and staff previously diagnosed with colorectal cancer were excluded. A non-probability convenience sample of 400 participants (100

from each professional group) was recruited using the standard prevalence-study sample-size formula ($n = Z^2P(1-P)/d^2$, with $Z = 1.96$ for a 95% confidence level and $d =$ the desired precision), assuming an expected prevalence of 20% for the outcome of interest. Equal quota sampling across the four professional groups was used to allow meaningful comparison of awareness between groups, which would not have been possible with proportional sampling given the differing staffing ratios of physicians, dentists, pharmacists, and nurses in the participating institutions. A pilot study on 20 participants, who were not included in the final analysis, confirmed the clarity, cultural appropriateness, and feasibility of the data-collection tool before full-scale data collection began.

2.3 Data Collection Tool

Data were collected by direct interview using a structured questionnaire developed by the authors based on previously validated instruments and approved by the Scientific Council of the Arab Board for Health Specializations in Family Medicine. The questionnaire comprised three parts: (1) sociodemographic characteristics (age, sex, marital status, education, employment category, and family history of CRC); (2) awareness of 12 established CRC risk factors; and (3) awareness of CRC screening practices, including recommended screening modalities and the appropriate age and interval for testing.

2.4 Statistical Analysis

Data were coded, tabulated, and analyzed using Microsoft Excel and SPSS version 26. For each awareness domain, a total score was derived from the number of correctly answered items and categorized into

three levels: good (8-12), intermediate (4-7), and low (0-3) awareness, applied identically to both the risk-factor and screening domains. Descriptive statistics (frequencies and percentages) were used for categorical variables, and the chi-square test was used to compare awareness levels among physicians, dentists, pharmacists, and nurses. A two-tailed p -value < 0.05 was considered statistically significant.

3. RESULTS

3.1 Sociodemographic characteristics of study participants

The study included 400 medical staff, equally distributed among physicians, dentists, pharmacists, and nurses (100 each). Most participants were aged 20–30 years (58.3%) and female (58.7%); 51.0% were single. The majority held a bachelor's degree (69.2%), followed by diploma (16.0%), master's (7.8%), and Ph.D. (7.0%) holders. Among physicians, residents, permanent staff, and specialists were similarly represented (34.0%, 33.0%, and 33.0%, respectively). A family history of colorectal cancer (CRC) was reported by 10.5% of participants (Table 1).

3.2 Awareness of colorectal cancer risk factors

Awareness of individual CRC risk factors is presented in Table 2. Awareness was highest for family history of CRC (69.0%), inflammatory bowel disease (62.7%), and smoking (62.0%), all with highly significant associations ($p < 0.001$), followed by low intake of fruits, vegetables, and fiber (61.5%), colon polyps (57.8%), and aging (57.0%; $p < 0.05$). Awareness was lowest for the association between type 2 diabetes mellitus and CRC (24.8%), physical inactivity (38.3%), and excessive red or processed meat consumption (41.5%).

Table 1: Sociodemographic characteristics of study participants (n = 400).

Variable	Category	No.	(%)
Age (years)	20–30	233	58.3
	30–40	123	30.7
	40–50	32	8.0
	50–60	12	3.0
Sex	Male	165	41.3
	Female	235	58.7
Marital status	Married	196	49.0
	Single	204	51.0
Education	Diploma	64	16.0
	Bachelor	277	69.2
	Master	31	7.8
	PhD	28	7.0
Employment	Physician	100	25.0
	Dentist	100	25.0
	Pharmacist	100	25.0
	Nurse	100	25.0
Physician subgroup (n=100)	Resident	34	34.0
	Permanent	33	33.0
	Specialist	33	33.0
Family history of CRC	Yes	42	10.5
	No	358	89.5

Table 2: Awareness of colorectal cancer risk factors among study participants (n = 400).

Risk factor	Yes		No		P-value
	No.	(%)	No.	(%)	
Presence of colon polyps	231	57.8	169	42.2	0.002
Family history of CRC	276	69.0	124	31.0	<0.001
Smoking	248	62.0	152	38.0	<0.001
Overweight / obesity	183	45.8	217	54.2	0.089
Inflammatory bowel disease	251	62.7	149	37.3	<0.001
Physical inactivity	153	38.3	247	61.7	<0.001
Low fiber/fruit/vegetable intake	246	61.5	154	38.5	<0.001
Alcohol consumption	255	63.7	145	36.3	<0.001
Stress	253	63.2	147	36.8	<0.001
Aging	228	57.0	172	43.0	0.005
Type 2 diabetes mellitus	99	24.8	301	75.2	<0.001
Excess red / processed meat consumption	166	41.5	234	58.5	0.001

3.3 Awareness of colorectal cancer screening

Awareness of CRC screening is shown in Table 3. Most participants recognized screening as a good method for early detection (80.2%) and knew that routine screening is necessary for prevention (71.5%) (both $p < 0.001$). Colonoscopy was the most recognized screening method (76.2%), followed by the fecal occult blood test (60.5%) and flexible sigmoidoscopy (51.0%); awareness was lowest for CT (30.5%), ultrasound (31.8%), and MRI (38.0%). Two-thirds of participants (66.2%) correctly identified the one-year interval for repeating the fecal occult blood test, while only about one-third knew the recommended starting age for the fecal occult blood test (39.5%), flexible sigmoidoscopy (36.3%), and colonoscopy (34.2%).

3.4 Awareness of colorectal cancer risk factors among physicians

Among physicians (Table 4), awareness was highest for family history of CRC (92%), smoking (87%), low

intake of protein, fiber, fruits and vegetables (79%), inflammatory bowel disease (78%), and alcohol consumption and aging (77% each). More than two-thirds recognized colon polyps (74%) and stress (68%), while half recognized overweight/obesity (50%). Awareness was lowest for physical inactivity (38%) and type 2 diabetes mellitus (18%).

3.5 Awareness of colorectal cancer risk factors among dentists

Among dentists (Table 5), awareness was highest for family history of CRC and alcohol consumption (70% each). More than half recognized stress (63%), colon polyps (58%), aging (57%), smoking (56%), inflammatory bowel disease (56%), and low fiber/fruit/vegetable intake (54%). Less than half recognized overweight/obesity (47%), physical inactivity (35%), excessive red/processed meat consumption (31%), and type 2 diabetes mellitus (24%).

Table 3: Awareness of colorectal cancer screening among study participants (n = 400).

Screening item	Yes		No		P-value
	No.	(%)	No.	(%)	
CRC screening tests are good methods for early diagnosis.	321	80.2	79	19.8	<0.001
Regular screening is essential to prevent CRC.	286	71.5	114	28.5	<0.001
Screening methods used:					
Ultrasound	127	31.8	273	68.2	<0.001
CT	122	30.5	278	69.5	<0.001
MRI	152	38.0	248	62.0	<0.001
Fecal occult blood test	242	60.5	158	39.5	<0.001
Flexible sigmoidoscopy	204	51.0	196	49.0	0.689
Colonoscopy	305	76.2	95	23.8	<0.001
Correct knowledge (True / False):					
FOBT should be repeated every 1 year.	265	66.2	135	33.8	<0.001
Correct starting age – FOBT	158	39.5	242	60.5	<0.001
Correct starting age – flexible sigmoidoscopy	145	36.3	255	63.7	<0.001
Correct starting age – colonoscopy	137	34.2	263	65.8	<0.001

Table 4: Awareness of colorectal cancer risk factors among physicians (n = 100).

Risk factor	Yes		No		P-value
	No.	(%)	No.	(%)	
Presence of colon polyps	74	74.0	26	26.0	<0.001
Family history of CRC	92	92.0	8	8.0	<0.001
Smoking	87	87.0	13	13.0	<0.001
Overweight / obesity	50	50.0	50	50.0	1.000
Inflammatory bowel disease	78	78.0	22	22.0	<0.001
Physical inactivity	38	38.0	62	62.0	0.016
Low fiber/fruit/vegetable intake	79	79.0	21	21.0	<0.001
Alcohol consumption	77	77.0	23	23.0	<0.001
Stress	68	68.0	32	32.0	<0.001
Aging	77	77.0	23	23.0	<0.001
Type 2 diabetes mellitus	18	18.0	82	82.0	<0.001
Excess red / processed meat consumption	63	63.0	37	37.0	0.009

Table 5: Awareness of colorectal cancer risk factors among dentists (n = 100).

Risk factor	Yes		No		P-value
	No.	(%)	No.	(%)	
Presence of colon polyps	58	58.0	42	42.0	0.110
Family history of CRC	70	70.0	30	30.0	<0.001
Smoking	56	56.0	44	44.0	0.230
Overweight / obesity	47	47.0	53	53.0	0.549
Inflammatory bowel disease	56	56.0	44	44.0	0.230
Physical inactivity	35	35.0	65	65.0	0.003
Low fiber/fruit/vegetable intake	54	54.0	46	46.0	0.424
Alcohol consumption	70	70.0	30	30.0	<0.001
Stress	63	63.0	37	37.0	0.009
Aging	57	57.0	43	43.0	0.162
Type 2 diabetes mellitus	24	24.0	76	76.0	<0.001
Excess red / processed meat consumption	31	31.0	69	69.0	<0.001

3.6 Awareness of colorectal cancer risk factors among pharmacists

Among pharmacists (Table 3.6), stress was the most recognized risk factor (75%), followed by inflammatory bowel disease (62%) and family history of CRC (61%). About half recognized smoking (55%), low fiber/fruit/vegetable intake (54%), colon polyps (51%), and alcohol consumption (50%). Awareness was lower for aging (48%), overweight/obesity (45%), excessive red/processed meat consumption (42%), physical inactivity (37%), and type 2 diabetes mellitus (29%).

3.7 Awareness of colorectal cancer risk factors among nurses

Among nurses (Table 7), more than half recognized low fiber/fruit/vegetable intake (59%), alcohol consumption (58%), inflammatory bowel disease (55%), and family history of CRC (53%). Smoking was recognized by half (50%), while colon polyps, stress, aging, physical inactivity, and overweight/obesity were recognized by less than half (48%, 47%, 46%, 43%, and 41%, respectively). Awareness was lowest for excessive red/processed meat consumption (30%) and type 2 diabetes mellitus (28%).

Table 6: Awareness of colorectal cancer risk factors among pharmacists (n = 100).

Risk factor	Yes		No		P-value
	No.	(%)	No.	(%)	
Presence of colon polyps	51	51.0	49	49.0	0.841
Family history of CRC	61	61.0	39	39.0	0.028
Smoking	55	55.0	45	45.0	0.317
Overweight / obesity	45	45.0	55	55.0	0.317
Inflammatory bowel disease	62	62.0	38	38.0	0.016
Physical inactivity	37	37.0	63	63.0	0.009
Low fiber/fruit/vegetable intake	54	54.0	46	46.0	0.424
Alcohol consumption	50	50.0	50	50.0	1.000
Stress	75	75.0	25	25.0	<0.001
Aging	48	48.0	52	52.0	0.689

Type 2 diabetes mellitus	29	29.0	71	71.0	<0.001
Excess red / processed meat consumption	42	42.0	58	58.0	0.110

3.8 Awareness of colorectal cancer screening among physicians

Among physicians (Table 8), 88% recognized screening as a good method for detection, and 83% knew that routine screening is necessary for prevention. Colonoscopy (89%) and the fecal occult blood test (85%) were the most recognized methods, followed by flexible

sigmoidoscopy (63%); awareness was lowest for CT (23%), MRI (24%), and ultrasound (32%). Most (80%) knew the correct one-year FOBT interval, while just over half knew the correct starting age for the fecal occult blood test (59%) and colonoscopy (53%), and 47% knew it for flexible sigmoidoscopy.

Table 7: Awareness of colorectal cancer risk factors among nurses (n = 100).

Risk factor	Yes		No		P-value
	No.	(%)	No.	(%)	
Presence of colon polyps	48	48.0	52	52.0	0.689
Family history of CRC	53	53.0	47	47.0	0.549
Smoking	50	50.0	50	50.0	1.000
Overweight / obesity	41	41.0	59	59.0	0.072
Inflammatory bowel disease	55	55.0	45	45.0	0.317
Physical inactivity	43	43.0	57	57.0	0.126
Low fiber/fruit/vegetable intake	59	59.0	41	41.0	0.072
Alcohol consumption	58	58.0	42	42.0	0.110
Stress	47	47.0	53	53.0	0.549
Aging	46	46.0	54	54.0	0.424
Type 2 diabetes mellitus	28	28.0	72	72.0	<0.001
Excess red / processed meat consumption	30	30.0	70	70.0	<0.001

Table 8: Awareness of colorectal cancer screening among physicians (n = 100).

Screening item	Yes		No		P-value
	No.	(%)	No.	(%)	
CRC screening tests are good methods for early diagnosis.	88	88.0	12	12.0	<0.001
Regular screening is essential to prevent CRC.	83	83.0	17	17.0	<0.001
Screening methods used:					
Ultrasound	32	32.0	68	68.0	<0.001
CT	23	23.0	77	77.0	<0.001
MRI	24	24.0	76	76.0	<0.001
Fecal occult blood test	85	85.0	15	15.0	<0.001
Flexible sigmoidoscopy	63	63.0	37	37.0	0.009
Colonoscopy	89	89.0	11	11.0	<0.001
Correct knowledge (True / False):					
FOBT should be repeated every 1 year.	80	80.0	20	20.0	<0.001
Correct starting age – FOBT	59	59.0	41	41.0	0.072
Correct starting age – flexible sigmoidoscopy	47	47.0	53	53.0	0.549
Correct starting age – colonoscopy	53	53.0	47	47.0	0.549

3.9 Awareness of colorectal cancer screening among dentists

Among dentists (Table 9), 72% recognized screening as a good method for detection, and 77% knew that routine screening is necessary for prevention. Colonoscopy (76%) and the fecal occult blood test (58%) were the most recognized methods; flexible sigmoidoscopy was known by 43%, and awareness was lowest for ultrasound and CT (30% each) and MRI (48%). Most (65%) knew the correct one-year FOBT interval, while about one-third knew the correct starting age for the fecal occult blood test (35%) and flexible sigmoidoscopy (34%) and

27% for colonoscopy.

Table 9: Awareness of colorectal cancer screening among dentists (n = 100).

Screening item	Yes		No		P-value
	No.	(%)	No.	(%)	
CRC screening tests are good methods for early diagnosis.	72	72.0	28	28.0	<0.001
Regular screening is essential to prevent CRC.	77	77.0	23	23.0	<0.001
Screening methods used:					
Ultrasound	30	30.0	70	70.0	<0.001
CT	30	30.0	70	70.0	<0.001
MRI	48	48.0	52	52.0	0.689
Fecal occult blood test	58	58.0	42	42.0	0.110
Flexible sigmoidoscopy	43	43.0	57	57.0	0.162
Colonoscopy	76	76.0	24	24.0	<0.001
Correct knowledge (True / False):					
FOBT should be repeated every 1 year.	65	65.0	35	35.0	0.003
Correct starting age – FOBT	35	35.0	65	65.0	0.003
Correct starting age – flexible sigmoidoscopy	34	34.0	66	66.0	0.001
Correct starting age – colonoscopy	27	27.0	73	73.0	<0.001

3.10 Awareness of colorectal cancer screening among pharmacists

Among pharmacists (Table 10), 89% recognized screening as an effective detection method, and 69% knew that routine screening is necessary for prevention. Colonoscopy (81%) was the most widely recognized method, followed by the fecal occult blood test (65%) and flexible sigmoidoscopy (64%); awareness was lowest for ultrasound (36%), CT (38%), and MRI (52%). Just over half (57%) knew the correct one-year FOBT interval, while 41% knew the correct starting age for the fecal occult blood test, 28% for colonoscopy, and 24% for flexible sigmoidoscopy.

3.11 Awareness of colorectal cancer screening among nurses

Among nurses (Table 11), 72% recognized screening as a good method for detection, and 57% knew that routine screening is necessary for prevention. Colonoscopy (59%) was the most recognized method, followed by the fecal occult blood test and flexible sigmoidoscopy (34% each); awareness was lowest for ultrasound (29%), MRI (28%), and CT (31%). Most (63%) knew the correct one-year FOBT interval, while 40% knew the correct starting age for flexible sigmoidoscopy, 29% for colonoscopy, and 23% for the fecal occult blood test.

Table 10: Awareness of colorectal cancer screening among pharmacists (n = 100).

Screening item	Yes		No		P-value
	No.	(%)	No.	(%)	
CRC screening tests are good methods for early diagnosis.	89	89.0	11	11.0	<0.001
Regular screening is essential to prevent CRC.	69	69.0	31	31.0	<0.001
Screening methods used:					
Ultrasound	36	36.0	64	64.0	<0.001
CT	38	38.0	62	62.0	0.016
MRI	52	52.0	48	48.0	0.689
Fecal occult blood test	65	65.0	35	35.0	0.003
Flexible sigmoidoscopy	64	64.0	36	36.0	0.005
Colonoscopy	81	81.0	19	19.0	<0.001
Correct knowledge (True / False):					
FOBT should be repeated every 1 year.	57	57.0	43	43.0	0.162
Correct starting age – FOBT	41	41.0	59	59.0	0.072
Correct starting age – flexible sigmoidoscopy	24	24.0	76	76.0	<0.001
Correct starting age – colonoscopy	28	28.0	72	72.0	<0.001

Table 11: Awareness of colorectal cancer screening among nurses (n = 100).

Screening item	Yes		No		P-value
	No.	(%)	No.	(%)	
CRC screening tests are good methods for early diagnosis.	72	72.0	28	28.0	<0.001
Regular screening is essential to prevent CRC.	57	57.0	43	43.0	0.162
Screening methods used:					
Ultrasound	29	29.0	71	71.0	<0.001
CT	31	31.0	69	69.0	<0.001
MRI	28	28.0	72	72.0	<0.001
Fecal occult blood test	34	34.0	66	66.0	0.001
Flexible sigmoidoscopy	34	34.0	66	66.0	0.001
Colonoscopy	59	59.0	41	41.0	0.072
Correct knowledge (True / False):					
FOBT should be repeated every 1 year.	63	63.0	37	37.0	0.009
Correct starting age – FOBT	23	23.0	77	77.0	<0.001
Correct starting age – flexible sigmoidoscopy	40	40.0	60	60.0	0.046
Correct starting age – colonoscopy	29	29.0	71	71.0	<0.001

3.12 Overall awareness scores for colorectal cancer risk factors

Regarding overall awareness of CRC risk factors, 46.5% of participants showed intermediate awareness, 37.5% showed good awareness, and 16.0% showed low awareness (Table 12).

Table 12: Overall awareness score for colorectal cancer risk factors (n = 400).

Total risk-factor score	No.	(%)
Good awareness (8–12)	150	37.5
Intermediate awareness (4–7)	186	46.5
Low awareness (0–3)	64	16.0
Total	400	100.0

3.13 Overall awareness scores for colorectal cancer screening

Regarding overall awareness of CRC screening, 55.5% of participants showed intermediate awareness, 30.0% showed good awareness, and 14.5% showed low awareness (Table 13).

Table 13: Overall awareness score for colorectal cancer screening (n = 400).

Total screening score	No.	(%)
Good awareness (8–12)	120	30.0
Intermediate awareness (4–7)	222	55.5
Low awareness (0–3)	58	14.5
Total	400	100.0

3.14 Comparison of awareness among physicians, dentists, pharmacists, and nurses

Comparison of overall awareness scores among the four professional groups (Table 14) showed highly significant differences for both domains ($p < 0.001$). For risk factors, good awareness was highest among physicians (57.0%), followed by dentists (41.0%), pharmacists (31.0%), and nurses (21.0%); physicians had the lowest proportion of low awareness (1.0%), while pharmacists had the highest (24.0%). For screening, good awareness was highest among physicians (45.0%), followed by pharmacists (38.0%), dentists (26.0%), and nurses (11.0%); nurses had the highest proportion of low awareness (24.0%).

Table 14: Comparison of awareness of colorectal cancer risk factors and screening among physicians, dentists, pharmacists, and nurses (n = 100 each).

Domain	Awareness level	Physicians No. (%)	Dentists No. (%)	Pharmacists No. (%)	Nurses No. (%)	Total No. (%)	P-value
Risk factors	Good (8–12)	57 (57.0)	41 (41.0)	31 (31.0)	21 (21.0)	150 (37.5)	<0.001
	Intermediate (4–7)	42 (42.0)	41 (41.0)	45 (45.0)	58 (58.0)	186 (46.5)	
	Low (0–3)	1 (1.0)	18 (18.0)	24 (24.0)	21 (21.0)	64 (16.0)	
Screening	Good (8–12)	45 (45.0)	26 (26.0)	38 (38.0)	11 (11.0)	120 (30.0)	<0.001
	Intermediate (4–7)	50 (50.0)	57 (57.0)	50 (50.0)	65 (65.0)	222 (55.5)	
	Low (0–3)	5 (5.0)	17 (17.0)	12 (12.0)	24 (24.0)	58 (14.5)	

* Chi-square test.

4. DISCUSSION

This study assessed awareness of colorectal cancer screening and risk factors among 400 medical staff in Mosul City, a setting where CRC represents a growing but under-recognized public health burden.^[1–3] Overall,

awareness of both risk factors and screening was predominantly intermediate, a pattern broadly consistent with reports from Iraqi adults and from healthcare workers in neighboring countries.^[13, 14]

The predominance of participants aged 20-30 years and the female preponderance mirror findings reported among healthcare workers in India and Saudi Arabia, respectively, while the high proportion of bachelor's-degree holders is consistent with the typical academic profile of the healthcare workforce in the region.^[15-17] A family history of CRC was uncommon in this sample (10.5%), similar to patterns reported elsewhere, underscoring the greater relative importance of modifiable and behavioral risk factors in this population.^[18]

Awareness of family history, alcohol use, stress, inflammatory bowel disease, and smoking as CRC risk factors was comparatively high, whereas awareness of the association between obesity, physical inactivity, and type 2 diabetes and CRC risk was noticeably lower. This gap parallels findings from Saudi Arabia, where awareness of obesity as a risk factor was reported in only about one-third of healthcare workers, and awareness of the diabetes-CRC link was similarly limited among physicians.^[18, 19] Such gaps are important because these modifiable factors are amenable to preventive counseling by medical staff themselves.

Awareness of screening was generally better for the rationale of screening (importance and necessity) than for practical details such as the recommended starting age for each test. Colonoscopy was the best-recognized modality, consistent with its central role in national and international guidelines, while awareness of imaging-based options such as CT colonography remained low. Comparable studies from Lebanon and Türkiye have similarly reported that, while general awareness of screening is often reasonable, knowledge of specific screening schedules and starting ages lags.^[20, 21]

The comparison among professional groups was the most striking finding of this study. Physicians consistently demonstrated the highest awareness of both risk factors and screening, while nurses showed the lowest awareness in both domains, with dentists and pharmacists occupying an intermediate position. This pattern is consistent with studies from Saudi Arabia and the United States reporting that physicians typically outperform other health professions in CRC-related knowledge and that nurses in particular may benefit from more targeted educational input given their frequent direct contact with patients.^[19, 22-24] Because nurses and other non-physician staff often have greater opportunity for sustained patient contact, closing this awareness gap could meaningfully strengthen community-level screening promotion.^[24]

Among physicians, awareness of family history, smoking, and dietary risk factors was high (74-92%), broadly comparable to reports from the United States, but awareness that physical inactivity and type 2 diabetes mellitus are CRC risk factors remained low (38% and 18%, respectively), a gap also observed among

physicians in Saudi Arabia.^[20] For screening, physicians showed strong recognition of colonoscopy and the fecal occult blood test but poor recognition of cross-sectional imaging options, a pattern paralleled in Saudi Arabia, where only around one-quarter of physicians recognized CT as an early screening tool.

Dentists and pharmacists showed comparable, intermediate awareness overall, but with distinct weak points: dentists had particularly low awareness of the diabetes-CRC link and of the correct starting age for colonoscopy (24% and 27%, respectively), while pharmacists showed relatively strong awareness of inflammatory bowel disease and family history but limited awareness of physical inactivity as a risk factor (37%). These discrepancies may reflect differences in how colorectal cancer content is covered across the dental and pharmacy curricula in Iraq, where topics such as genetic risk, cancer screening technology, and chronic disease comorbidities receive comparatively little emphasis.

Nurses had the lowest awareness scores overall, with particularly limited recognition of excess red/processed meat consumption and diabetes mellitus as risk factors (30% and 28%) and of most individual screening modalities other than the fecal occult blood test interval. Given that nurses often have the most frequent and sustained contact with patients in both hospital and community settings, this gap is a priority target for continuing education, consistent with calls in the nursing literature for an expanded nurse-led role in colorectal cancer prevention and screening promotion.^[24]

Taken together, these findings suggest that while medical staff in Mosul City possess a reasonable general understanding of colorectal cancer, important gaps persist for specific modifiable risk factors and screening logistics, and awareness is unevenly distributed across professional groups. Continuing professional education, standardized in-service training, and closer integration of CRC screening guidance into pre-service curricula for all four professional groups may help narrow these gaps, consistent with recommendations from similar settings.^[25]

From a public-health perspective, these findings indicate that improving CRC awareness among medical staff cannot rely on a uniform, one-size-fits-all training approach. Physicians may benefit most from focused updates on imaging-based screening modalities and metabolic risk factors, dentists and pharmacists from structured modules covering genetic and chronic-disease risk factors, and nurses from broader foundational training spanning both risk-factor recognition and screening logistics. Embedding such profession-specific content within continuing medical education and institutional training programs in Mosul City could help align awareness across the healthcare team and, in turn, support more consistent screening advice to the public.

5. CONCLUSION AND RECOMMENDATIONS

Awareness of colorectal cancer screening methods and risk factors among medical staff in Mosul City is largely intermediate and is frequently limited by insufficient knowledge of specific screening examinations. Awareness differed significantly among professional groups: physicians demonstrated the highest awareness of both risk factors and screening, followed by dentists and pharmacists, while nurses showed the lowest awareness in both domains.

Based on these findings, the following are recommended: (1) structured health-education programs on CRC risk factors and screening methods for all medical staff categories; (2) development and dissemination of educational materials, including videos, on screening procedures; (3) expansion of screening-service capacity and equipment; (4) facilitation of knowledge exchange between physicians and other professional groups; (5) regular in-hospital awareness campaigns and workshops across all healthcare sectors; and (6) incorporation of colorectal cancer and early-screening content into the core curricula of all healthcare disciplines.

REFERENCES

1. Alrubaie A, Alkhalidi N, Abd-Alhusain S. A clinical study of newly diagnosed colorectal cancer over 2 years in a gastroenterology center in Iraq. *J Coloproctology*, 2019; 39(3): 217–222. doi:10.1016/j.jcol.2019.05.010
2. Ibrahim S, Ahmed H, Zangana S. Trends in colorectal cancer in Iraq over two decades: Incidence, mortality, topography and morphology. *Ann Saudi Med*, 2022; 42(4): 252–261. doi:10.5144/0256-4947.2022.252
3. Al Dahhan SF, Al Lami FH. Epidemiology of colorectal cancer in Iraq, 2002–2014. *Gulf J Oncol*, 2018; 1(26): 23–26.
4. Siegel RL, Miller KD, Wagle NS, Jemal A. Colorectal cancer statistics, 2023. *CA Cancer J Clin*, 2023; 73(1): 17–48. doi:10.3322/caac.21763.
5. Renehan AG, Tyson M, Egger M, Heller RF, Zwahlen M. Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancet*, 2008; 371(9612): 569–78. doi:10.1016/S0140-6736(08)60269-X
6. Botteri E, Iodice S, Bagnardi V, Raimondi S, Lowenfels AB, Maisonneuve P. Smoking and colorectal cancer: a meta-analysis. *JAMA*, 2008; 300(23): 2765–78. doi:10.1001/jama.2008.839
7. Jawad N, Direkze N, Leedham SJ. Inflammatory bowel disease and colon cancer. In: *Inflammation and Gastrointestinal Cancers. Recent Results Cancer Res*, 2011; 185: 99–115. doi:10.1007/978-3-642-03503-6_6
8. Kastrinos F, Samadder N, Burt R. Use of family history and genetic testing to determine risk of colorectal cancer. *Gastroenterology*, 2019. doi:10.1053/j.gastro.2019.11.029
9. Issa IA, Nouredine M. Colorectal cancer screening: an updated review of the available options. *World J Gastroenterol*, 2017; 23(28): 5086–96. doi:10.3748/wjg.v23.i28.5086
10. Rex DK, Boland CR, Dominitz JA, et al. Colorectal cancer screening: recommendations for physicians and patients from the U.S. Multi-Society Task Force on Colorectal Cancer. *Am J Gastroenterol*, 2017; 112(7): 1016–30. doi:10.1038/ajg.2017.174
11. Li JN, Yuan SY. Fecal occult blood test in colorectal cancer screening. *J Dig Dis*, 2019; 20(2): 62–4. doi:10.1111/1751-2980.12712
12. Gupta S, Bharti B, Ahnen DJ, et al. Colorectal cancer screening in low- and middle-income countries: present status and future directions. *World J Gastroenterol*, 2017; 23(10): 1743–1754. doi:10.3748/wjg.v23.i10.1743
13. Mohammad BF, Andsoy II. Health behaviors, knowledge, screening, and attitudes toward colorectal cancer among Iraqi adults. *Public Health Nurs*, 2024; 41(3): 514–524. doi:10.1111/phn.13302
14. Alhuzaim WM, Almubarak MM, Alamer A, et al. Knowledge, attitudes, and practices toward colorectal cancer and its screening among healthcare workers in Saudi Arabia: a cross-sectional study. *J Family Med Prim Care*, 2021; 10(2): 938–944. doi:10.4103/jfmpc.jfmpc_1684_20
15. Sharma A, Kothari N, Jain A, Bansal S. Screening for colorectal carcinoma in India: real-world scenario, pitfalls and solutions. *J Gastrointest Cancer*, 2020; 51(4): 1021–6. doi:10.1055/s-0045-1802655
16. Alharbi M, Alghamdi F, Alamer A, et al. Knowledge and barriers to screening for colorectal cancer among individuals aged 40 years or older visiting primary healthcare clinics in Al-Khobar, Eastern Province. *J Family Community Med*, 2024; 31(1): 41–7. doi:10.4103/jfcm.jfcm_291_23
17. Yilmaz H, et al. The role of education in cancer prevention in Turkey, 2021.
18. Alptekin H, Küçükaya B. Level of information and awareness about colorectal cancer and its screening program in Türkiye: a community-based cross-sectional study. *Public Health Nursing*, 2024; 42. doi:10.1111/phn.13519
19. Al Wutayd O, et al. Knowledge and awareness of colorectal cancer among healthcare workers in Riyadh, Saudi Arabia, 2020.
20. Alkhayyat M, Ahmed A, Qasem A, et al. Knowledge and awareness of colorectal cancer risk factors among physicians in Saudi Arabia: a cross-sectional study. *Saudi J Gastroenterol*, 2022; 28(1): 55–61. doi:10.4103/sjg.SJG_517_21
21. Tfaily M, Naamani D, Kassir A, Sleiman S, Ouattara M, Moacdieh M, Jaffa M. Awareness of colorectal cancer and attitudes towards its screening guidelines in Lebanon. *Annals of Global Health*, 2019; 85. doi:10.5334/aogh.2437

22. Alharbi NS, et al. Awareness of colorectal cancer risk factors among healthcare professionals in Saudi Arabia. *Asian Pac J Cancer Prev*, 2020; 21(5): 1357–1362. doi:10.31557/APJCP.2020.21.5.1357
23. Anderson JC, et al. Health professionals' knowledge of modifiable colorectal cancer risk factors in the USA. *Cancer Causes Control*, 2018; 29(6): 543–552. doi:10.1007/s10552-018-1033-6
24. Nguyen LH, Goel A, Chung DC. Awareness and knowledge of colorectal cancer screening among healthcare workers: a cross-sectional study. *BMC Public Health*, 2020; 20: 414. doi:10.1186/s12889-020-08596-3
25. Hashemi N, Bahrami M, Tabesh E, Arbon P. Nurse's roles in colorectal cancer prevention: a narrative review. *J Prim Prev*, 2022; 43: 759–782. doi:10.1007/s10935-022-00694-z