

A Pilot Study of Systematic Colorectal Cancer Screening Using FIT in Primary Care: A Single-Center Study in the Nepalese Population

Abstract

Introduction: Colorectal cancer (CRC) is the third most common cancer worldwide and the fourth most common cancer in Nepal. The global burden of CRC is increasing in Low- and Middle-income Countries (LMIC), creating a significant public health concern. Therefore, it is high time to implement screening programs that help reduce the rising incidence of CRC. Since there is no published research on systematic CRC Screening (CRCS) programs in Nepal, Gurkha Welfare Trust Nepal (GWTN) aimed to collect and analyze data from a newly introduced screening service and share these with other healthcare professionals in Nepal and globally.

Objectives: The primary goal of this study is to document the uptake of CRCS, measure positive FIT test results, record the outcomes of the positive findings, and evaluate the subjective experiences of medical staff and patient participants.

Methodology: This is a prospective mixed-method study conducted at the GWTN from October 2024 to December 2024. The study included patients aged 45 to 85 years. The screening method used was a stool sample tested for occult blood via a Fecal Immunochemical Test (FIT). All FIT-positive patients were referred to a tertiary center for colonoscopy, with guidance to follow up within one week of receiving the colonoscopy report. A structured set of questionnaires was administered to 70 randomly selected patients to inquire about their prior knowledge of CRCS, participation, awareness, and overall experience. A different set of structured questionnaires was distributed to the staff to evaluate their subjective experience. All data were initially recorded in Microsoft Excel and later analyzed using the Statistical Package for Social Science (SPSS).

Result: A total of 1,166 patients were counseled for CRCS, of which 1,029 (88.23%) provided a sample. Among these, 105 (10.2%) had FIT-positive results. Of the FIT-positive patients, 90 (85.7%) underwent colonoscopy. 36 (40%). Patients had a normal colonoscopy. Hemorrhoids were observed in 29 (32.2%) patients and terminal ileitis in 2 (2.2%) patients. Notably, 24 (26.6%) had colonic polyps and 5 (5.5%) had rectal polyps, findings of clinical significance. Of the 24 colonic polyps, 12 (50%) were tubular adenomas (2 high grade, 10 low grade), 3 (12.5%)

had low-grade tubulovillous adenomas, 6 (25%) had inflammatory polyps, and 1 (4.1%) had a hyperplastic polyp.

A total of 70 patients were interviewed to explore their awareness and understanding of CRCS. While 32.9% had heard of CRCS previously, only 11.4% were aware of the available screening options, and 20% had previously undergone screening. Despite this, 100% expressed willingness to participate in the future and to recommend it to peers, with nearly all rating their experience as very good.

Fifteen GWTN healthcare staff involved in CRCS were questioned on their subjective experiences. The majority of staff reported having clear guidelines, strong teamwork, and a positive impact from the CRCS program on patient outcomes. Some noted stress levels and administrative burdens, particularly in remote settings. Overall, staff expressed high satisfaction and found the program meaningful.

Conclusion: The CRCS program demonstrated high participation and diagnostic yield, with notable detection of adenomatous polyps and other relevant findings. Feedback from both patients and staff highlighted strong acceptance, satisfaction, and perceived value of the screening initiative.

Introduction

CRC is a significant global health burden, ranking as the third most common cancer worldwide and the second leading cause of cancer-related mortality (1). In 2020, more than 1.9 million new CRC cases and 930000 deaths were estimated, with projections anticipating an increase to 3.2 million new cases and 1.6 million deaths by 2040 (2). CRC accounts for 10% of global cancer incidence and 9.4% of cancer-related mortality (3). This issue is progressively impacting Asian countries, which have relatively fewer research data compared to Western countries; incidence rates have rapidly risen in Asian populations over the past two decades, prompting concerns and recommendations for implementing screening programs (4). Data on CRC incidence and prevalence in Nepal are limited, with no screening studies conducted to date. CRC is the fourth most common cancer in Nepal. Diagnosis is often delayed: a retrospective cross-sectional study using five years of hospital records from the largest tertiary cancer hospital in Nepal showed that the incidence of CRC is increasing in Nepal, with a 1.4% annual rise in the age group less than 45-year-old and a 6.7% yearly rise in the age group that are more than 45-year-old (5). A study conducted at one of the tertiary care centers presents clinicopathological data on CRC, highlighting a significant number of cases diagnosed at advanced stages (6,7). These findings underscore the necessity for screening and early detection to tackle the impact of CRC within the country.

GWTN provides primary care to around 20,000 mostly elderly Gurkha veterans, retired Singapore police officers, and their dependents living in Nepal and has recently completed a pilot for CRCS with an accompanying research project aimed at collecting and analyzing data from the screening service and sharing it with other health actors in Nepal and globally. The primary objective of this study is to document the uptake of CRCS, quantify the proportion of positive FIT tests, record the outcome of positive screening tests, and evaluate the subjective experiences of medical staff and patient participants.

While many guidelines recommend an upper age limit for screening of 74 years (8–11) or 75 years (12), a few countries, such as Japan and South Korea, have no upper age limit. In our study, we included older adults up to the age of 85, due to the high average age profile of our target population and their lack of previous exposure to CRCS. This approach aimed to address the missed opportunity for early detection in the unscreened population.

Methodology

This mixed-methods study was conducted at the GWTN. This charity organization provides free medical services to Gurkha veterans, retired Singapore police officers, and their dependents residing in Nepal. The pilot study lasted for four months, from August 2024 to December 2024. The expected sample size was between 700 and 1000, which was achieved by opportunistically enrolling individuals who attended the clinic for reasons other than the study. The target age group was 45 to 85 years. The age category was further stratified into age groups 45- 54 years, 55- 64 years, 65-74 years, and 75-85 years. The exclusion criteria for the study were:

- Age <45 and >85 year
- Severe comorbidities where the risk of screening outweighs the benefit
- Unwilling patient
- Terminal illness with limited life expectancy
- Patients who had a recent CRCS

The screening method involved a single stool sample tested for occult blood using a FIT. Under the following circumstances, patients were referred directly for colonoscopy instead of FIT:

- Patients who reported any symptoms suggestive of CRC when being counseled for the screening.
- Patient with a strong family history of CRC.
- Patient with a previous diagnosis of colonic polyps.

To ensure uniformity in the test, all stool samples for FIT were sent to the same laboratory, and all patients with FIT-positive reports were referred to one designated tertiary center for colonoscopy.

Nurses informed the patients about normal test results, while doctors communicated abnormal results and arranged a referral for a colonoscopy at the tertiary care center. All patients were followed up within two weeks of referral, with histopathology where appropriate.

For the subjective part of the study, a structured questionnaire was administered at follow-up to 70 randomly selected patients to inquire about their prior knowledge and awareness of CRCS, overall experience with the service, intentions for future participation, and peer recommendations. The questionnaires primarily consisted of closed-ended questions and one open-ended question inviting additional comments on the experience of participating in CRCS. The interview was conducted after obtaining consent from all patients. Further, 15 staff members completed an online survey designed to capture their subjective experiences with CRCS. The survey included Likert-scale items and a single open-ended question to explore their perceptions, experiences, and challenges associated with CRCS.

All data were recorded in Microsoft Excel on a secure server owned by the GWTN, with access restricted to researchers and study staff. Patient consent forms and data collection sheets were collected in hard copy and stored securely. Quantitative data were analyzed using the Statistical Package for Social Science (SPSS). Frequency, percentage, mean, and standard deviation were calculated. The chi-square test was used to associate different variables. A P-value less than 0.05 was considered statistically significant. Qualitative data collected from open-ended questions were thematically analyzed, and major themes were identified. This study has received ethically approval by the Nepal Health Research Council (Reg.no. 419-2024).

Result

A total of 1,166 patients were counseled for the CRCs pilot study, of whom 1,064 (91.25%) agreed to participate, including 43 from Gorkha and 79 from Okhaldhunga. Among these, 35 (3.28%) were excluded, resulting in a final sample size of 1,029 participants (88.23% of those counseled). Of the 1,029 patients, 573 (55.7%) were female and 456 (44.3%) were male. The mean age was 65 years $\pm$ 10.07. The FIT was positive in 105 patients (10.2%), with a higher positivity rate in males, 55 (12.1%), compared to females, 50 (8.7%). The highest proportion of FIT positivity (12.3%) was observed in the youngest age category (45-54 year), the FIT positivity rate across age groups of 55- 64 years, 65- 74 years, and 75-85 years remained relatively consistent at around 9.8% to 10 %. In our study, the difference in FIT positivity across gender and age categories was not statistically significant. (Tables 1 and 2).

Of these 105 FIT-positive individuals, 90 underwent colonoscopy. Twelve patients declined the procedure in spite of counselling, and 3 were lost to follow-up. Among the 90 patients who completed the colonoscopy, 36 had normal findings, 29 had hemorrhoids (13 with first-degree and 16 with second-degree hemorrhoids), 24 had colonic polyps, 5 had rectal polyps, and 6 had other findings. Of the 24 colonic polyps, 16 were neoplastic, 5 were inflammatory, 1 was hyperplastic, and 2 patients were lost to follow-up. Among the 5 rectal polyps, 3 were neoplastic, and 2 patients refused a biopsy. Other findings included 2 cecal diverticula, 2 cecal polyps, 2 intestinal diverticula, and 3 cases of terminal ileitis. Histologically, the 16 neoplastic colonic polyps included 12 tubular adenomas (10 low-grade and 2 high-grade) and 4 low-grade tubulovillous adenomas. Among the 3 neoplastic rectal polyps, 2 were low-grade tubular adenomas and 1 was a high-grade tubular adenoma (Table 3).

A total of 70 participants were interviewed to assess their awareness, prior participation, willingness to participate in the future, peer recommendation, and subjective experience with CRCs. Of the respondents, 23 (32.9%) reported having heard of CRCs, while only 8 (11.4%) were aware of available screening options, and 14 (20%) had previously undergone screening. A total of 67 (95.7%) rated their experience as very good, and the remaining 3 (4.3%) rated it as good.

No negative experiences were reported. One hundred percent of participants expressed a willingness to participate in CRCS in the future. Furthermore, all respondents indicated that they would recommend the screening test to others. Participants also provided subjective feedback regarding their experiences. The commonest comment 45.7%, was that they were happy with the service, while others expressed gratitude and found the experience to be meaningful, motivating, and lifesaving (Table 4).

A total of 15 staff members, comprising 6 doctors and 9 nurses, participated in the survey to share their subjective experiences with CRCS. There was an overall positive perception of the program's design, teamwork, and its impact on patients. Ninety-three percent of the respondents either strongly agreed or agreed that the program guidelines were clear and easy to follow. Over a third of staff reported experiencing a moderate emotional burden. Eighty-seven percent of participants agreed that there was adequate teamwork and communication, which they highlighted as a key strength of the program. Most staff members felt that patients were informed clearly about the importance of screening. Almost all staff members perceived the program as having a positive impact on early detection and patient outcomes. Thematic analysis of 11 qualitative responses revealed several recurring themes. Staff described the program as fruitful, educational, and a valuable opportunity to gain experience with cancer prevention strategies. Staff in remote locations highlighted difficulties in transporting samples and coordinating follow-up colonoscopies after a positive FIT. Some mentioned challenges in maintaining accurate records. A few staff noted that persuading patients to follow through with colonoscopy remained a challenge, despite initial compliance with FIT. Table 5 shows the distribution of responses across all five survey questions, grouped by response category.

Table 1. Characteristics of the patient population and FIT result

Age Category (year)	n (%)
45- 54	146 (14.2%)
55-64	327 (31.8%)
65-74	305 (29.6%)
75-85	251 (24.4%)
Gender	
Female	573 (55.7%)
Male	456 (44.3%)
FIT Result	
Positive	105 (10.2%)
Negative	924 (89.8%)

Table 2. Classification of age category and gender according to the FIT result

Age Category (year)	FIT Positive n (%)	FIT Negative n (%)	Total
45- 54	18 (12.3%)	128 (87.7)	146
55-64	32 (9.8%)	295(90.2%)	327
65-74	30 (9.8%)	275(90.2%)	305
75-85	25 (10%)	226 (90%)	251
Gender			
Female	50 (8.7%)	523 (91.3%)	573
Male	55 (12.06%)	401 (87.94)	456

*P Value - 0.418 for Age category

* P Value - 0.79 for Gender

Table 3. Colonoscopy Findings

Hemorrhoid (29)	
First degree hemorrhoid	13
Second degree hemorrhoid	16
Colonic polyp (24)	
Tubular adenoma (low grade)	10
Tubular adenoma (high grade)	2
Tubulovillous adenoma (low grade)	4
Inflammatory polyp	5
Hyperplastic polyp	1
Missed reports follow up	2
Rectal polyp (5)	
Tubular adenoma (low grade)	2
Tubular adenoma (high grade)	1
Refused biopsy	2
Other findings (9)	
Cecal diverticula	2
Cecal polyp (inflammatory)	2
Intestinal diverticula	2
Terminal ileitis	3

Table 4. Assessment of subjective experiences of patient participants (n=70)

	Yes	No
Heard of CRCS before	23 (32.9%)	47 (67.1%)
Know CRCS options	8 (11.4%)	62 (88.6%)
Screened for CRC before	14 (20%)	56 (80%)
Any Question regarding CRC		70 (100%)
Overall experience	Good -3 (4.3%), Very good- 67 (95.7%)	
Future participation	70 (100%)	
Recommend test to Peers	70 (100%)	

Table 5. Summary of Staff Responses to CRCS Experience (n =15)

Survey Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The programmes guidelines and protocols are clear and easy to follow	9	6	0	0	0
I experience a high level of stress when conducting or managing CRCS	1	3	5	6	0
There's adequate teamwork and communication among staff involved in the screening process	7	6	1	1	0
I perceive that patient are well informed about the importance of CRCS	8	5	1	1	0
I believe that the CRCS. Programme has a positive impact on early detection and patient outcome.	10	5	0	0	0

Discussion

CRC represents a growing public health concern in Nepal, where shifting lifestyle patterns, urbanization, and an aging population contribute to an increasing disease burden. Although CRC is preventable by screening and treatable when detected early, systematic screening programs remain underdeveloped in the Nepalese healthcare system. There are no national guidelines for CRCS in Nepal. This pilot study assessed the feasibility and outcomes of CRCS in primary healthcare centers in Nepal. Our screening program targeted individuals at average risk between the ages of 45 and 85. Our pilot study demonstrated a high participation rate in CRCS using FIT among the population with a mean age of 65 years $\pm$ 10.07. Of the 1,166 patients counseled, 91.25% agreed to participate and 88.2% completed the screening process, a remarkably high uptake rate. This high level of participation may reflect the trust in primary care professionals, effective awareness raising, and accessibility of the service. A systematic review and meta analysis that included 69 studies reported CRCS participation rates ranging from 6.8% to 95.98%, with an overall average of 54.0%, while analysis of 74 studies indicated that FIT positivity range ranged from 1.09% to 30.01%, averaging 7.28%, influenced by factors such as geographical location, age and the number of FITs (13). Our study's FIT positivity rate of 10.2% fits in with the existing literature. The observed male predominance in FIT positivity (12.1% in males vs. 8.7% in females) aligns with known sex-based differences in colorectal neoplasia risk, where men historically show a higher prevalence of advanced adenomas and CRC (14,15). This gender difference was not statistically significant. In our study, the FIT positivity rates across age categories were relatively consistent, with a slight variation ranging from 9.8% to 12.3%. The highest FIT positivity rate was observed in the 45-54 year age group (12.3%), while the 55-64 and 65-74 year age groups showed a rate of 9.8%, and the 75-85 year age group had a rate of 10%. However, these variations were not statistically significant. These findings contrast with the general expectation of increasing FIT positivity with age. Among the 105 FIT-positive patients, 85.7% underwent colonoscopy, with relatively low rates of refusal (11.4%) and missed follow-up (2.9%). Forty percent had normal findings during colonoscopy. Patients with normal colonoscopy findings were followed up separately to assess the need for further upper GI investigations. More polyps were found in the colon compared to the rectum. Colonic polyps were detected in 24 (26.7%) patients, with neoplastic potential confirmed in a significant proportion of 16 (66.7%) of colonic polyps and 3 (60%) of rectal polyps. These findings underscore the clinical benefit of FIT as an essential screening tool. The histological analysis revealed 12 tubular adenomas (two with high-grade dysplasia) and four tubulovillous adenomas (all low-grade), consistent with data from large screening cohorts, which show that tubular adenomas are the most common polyps detected in an average-risk population (16–18). The detection of high-grade lesions emphasizes the importance of timely screening, early detection, and cancer prevention. In addition to polyps, colonoscopy also identified other

pathologies, such as cecal polyps, diverticulosis, and terminal ileitis. In our study, hemorrhoids were observed in 32.2% of patients, highlighting their common occurrence during colonoscopy. This prevalence is somewhat lower than that reported in other studies. An extensive US-based study involving nearly 10000 patients documents a hemorrhoid prevalence of 51.7% (19). Similarly, another study found hemorrhoids in 38% of patients undergoing screening colonoscopy (20). Nevertheless, our findings reinforce that hemorrhoids are a frequent incidental finding during CRCS and highlight the importance of differentiating benign anorectal lesions from more serious pathology, such as colorectal neoplasia. Overall, the detection of advanced adenomas in 15% of patients undergoing colonoscopy (19 out of 90) and high- grade dysplasia in 3 patients underscores the clinical value of this screening for early detection and cancer prevention.

Understanding the subjective experience of patients regarding CRCS is essential. Our findings showed that the vast majority (95.7%) of respondents rated their screening experience as “very good”. This overwhelming positive feedback underscores the essential driver for future participation and peer recommendation, both of which were reported at 100%. Despite the favorable experience, only 20% had been screened before, 32.9% had heard of screening, whereas only 11.4% reported knowing about the screening options. The large gap between high participation and satisfaction on the one hand, and low prior engagement on the other, suggested that awareness remains a potential barrier to participation. These findings align with studies that highlight a lack of knowledge and understanding as the most common patient-related factors (21,22). The 88.6% who are unaware of screening options highlights the need for health education and awareness. Encouragingly, all participants' willingness to participate in the future and recommend the program to their peers reflects the positive experience and empowerment they gained from their first screening episode; hence, it appears essential for the service to be informative, supportive, and empathetic to promote future adherence. 45.7% of the participants described themselves as “happy with the service,” and others expressed emotional responses such as gratitude, a sense of being blessed, and finding the experience motivating and lifesaving. An overwhelmingly positive response not only improves health benefits but also promotes trust. 41.4% of participants offered no additional comment, which could reflect satisfaction without the need for elaboration or reluctance in giving feedback. The absence of negative response, positive feedback, participation, willingness to participate in the future, and peer recommendation confirms the success of the screening.

We also examined the subjective experiences of 15 primary care staff members involved in the CRCS program. The overall opinions among staff were positive, with many reporting the experience as rewarding and impactful. Most respondents reported that the program’s guidelines were clear and easy to follow, reflecting the importance of structured protocols. Despite overall satisfaction, some staff members reported a moderate level of stress related to

transferring samples, making follow-up arrangements, and documentation. Multiple studies from various parts of the world have highlighted the multifaceted challenges that primary care staff face in CRCS programs, which have a significant impact on their workload (23,24). Staff were motivated by the perceived positive effects of the program on early detection and patient outcomes. In our study, teamwork and interprofessional collaboration were identified as strong enablers of program success, which is consistent with the findings from a study that highlighted the effectiveness of a team-based model of care in cancer screening among primary care professionals, along with positive patient outcomes through increased screening rates (25). The overall experience of staff revealed a high level of professional satisfaction, a strong sense of purpose, and confidence in the program's impact on early detection.

Limitation

A key limitation of this pilot study is the small sample size and single-centered design, which may affect generalizability. Additionally, 15 patients who refused colonoscopy and missed follow-up should be reviewed to identify potential barriers that need to be addressed in the future.

Conclusion

This pilot study confirms that a FIT-based CRCS program followed by colonoscopy is feasible and well-accepted in a primary care setting in Nepal. The screening model effectively detected clinically significant lesions, including high-grade adenomas, and was associated with high patient engagement and adherence to follow-up. Patient experiences highlighted the acceptability of non-invasive testing and increased awareness of colorectal health, while staff feedback underscored the importance of teamwork and supportive systems for follow-up and patient education. Given the increased burden of CRC in Asian LMIC populations, this study adds to the growing call for scalable screening strategies.

Recommendations

- Strengthen patient navigation to reduce missed follow-up after positive FIT results.
- Enhance community education to raise awareness about myths and fears surrounding colonoscopy.
- Provide staff training in communication and counseling strategies.
- Develop strong tracking systems to ensure continuity of care and follow-up.
- Scale the program to other regions, adapting for local resources and population needs.

Overall, this pilot supports the integration of CRCS into routine care in GWTN, highlighting the potential for impactful early detection and prevention of colorectal cancer in resource-limited settings.

Acknowledgments

We are grateful to all the team members of the GWTN, Area Welfare Center Bagmati, and its cluster for their continuous support. Special thanks to Durga Chongabang and Samiksha Karki for their invaluable input.

References

1. WHO. Colorectal cancer. 2023.
2. Morgan E, Arnold M, Gini A, Lorenzoni V, Cabasag CJ, Laversanne M, et al. Global burden of colorectal cancer in 2020 and 2040: incidence and mortality estimates from GLOBOCAN. *Gut*. 2023 Feb;72(2):338–44.
3. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin*. 2021 May 4;71(3):209–49.
4. Mohamad Amin Pourhoseingholi. Epidemiology and burden of colorectal cancer in Asia-Pacific region: what shall we do now? 2014 Oct 22 [cited 2025 Mar 22];3(4). Available from: https://tgc.amegroups.com/article/view/4445/5581?utm_source=chatgpt.com
5. Shrestha G, Khanal S, Mulmi R, Sapkota G. Five-year trend of colorectal cancer incidence in B.P. Koirala Memorial Cancer Hospital of Central Nepal: a cross-sectional study. *International Journal of Surgery: Global Health*. 2020 Nov;3(6):e30–e30.
6. Magar CBP, Bhatta RR, Pandey G, Uprety S, Dhungana I, Jha N. An Overview of Colorectal Cancer in Tertiary care Cancer Center of Nepal. *Nepalese Journal of Cancer*. 2022 Oct 6;6(2):40–5.
7. Khatiwada S, Belbase NP, Timilsina B, Yadav P, Bhujel S, Shrestha N, et al. Clinicopathological Profile of Colorectal Cancers in a Tertiary Care Hospital of Central, Nepal. *Journal of College of Medical Sciences-Nepal*. 2023 Jun 30;19(2):159–66.
8. Recommendations on screening for colorectal cancer in primary care. *Can Med Assoc J*. 2016 Mar 15;188(5):340–8.
9. <https://www.health.gov.au>. Australian Government, Department of Health and Aged Care. 2024. Who should do the bowel screening test.
10. NZ Ministry of Health. <https://www.cancer.org.nz/about-us/our-advocacy-work/position-statements/bowel-screening/>. 2025. Bowel Screening Program.
11. NHS. <https://www.nhs.uk/conditions/bowel-cancer-screening/>. 2024. Bowel cancer screening.
12. Davidson KW, Barry MJ, Mangione CM, Cabana M, Caughey AB, Davis EM, et al. Screening for Colorectal Cancer. *JAMA*. 2021 May 18;325(19):1965.

13. Ding H, Lin J, Xu Z, Chen X, Wang HHX, Huang L, et al. A Global Evaluation of the Performance Indicators of Colorectal Cancer Screening with Fecal Immunochemical Tests and Colonoscopy: A Systematic Review and Meta-Analysis. *Cancers (Basel)*. 2022 Feb 21;14(4):1073.
14. Kapidzic A, van der Meulen MP, Hol L, van Roon AHC, Looman CWN, Lansdorp-Vogelaar I, et al. Gender Differences in Fecal Immunochemical Test Performance for Early Detection of Colorectal Neoplasia. *Clinical Gastroenterology and Hepatology*. 2015 Aug;13(8):1464-1471.e4.
15. Sarakarn P, Promthet S, Vatanasapt P, Tipsunthonsak N, Jenwitheesuk K, Maneenin N, et al. Preliminary Results: Colorectal Cancer Screening Using Fecal Immunochemical Test (FIT) in a Thai Population Aged 45-74 Years: A Population-Based Randomized Controlled Trial. *Asian Pac J Cancer Prev*. 2017 Oct 26;18(10):2883–9.
16. Xiaojuan Li MHZWML& YC. Prevalence of diverse colorectal polyps and risk factors for colorectal carcinoma in situ and neoplastic polyps. *J Transl Med*. 2024 Apr 17;22:361.
17. Norouzi A, Besharat S, Isapanah Amlashi F, Nasrabadi M, Gharanjik I, Ashkbari A, et al. Detection Rate of Colorectal Polyps in Symptomatic Candidates of Colonoscopy: When Should We Do a Total Colonoscopy? *Middle East J Dig Dis*. 2021 Oct;13(4):314–20.
18. Abdelnaby HB, Abuhussein AA, Fouad AM, Alhashash WA, Aldousari AS, Abdelaleem AM, et al. Histopathological and epidemiological findings of colonoscopy screening in a population with an average risk of colorectal cancer in Kuwait. *Saudi J Gastroenterol*. 2021;27(3):158–65.
19. Ebner DW, Rushlow D, Mou J, Porter K, Finney Rutten LJ, Limburg P, et al. Stool-Based Colorectal Cancer Screening Test Performance Characteristics in Those With and Without Hemorrhoids. *Mayo Clin Proc Innov Qual Outcomes*. 2023 Aug;7(4):320–6.
20. Peery AF, Sandler RS, Galanko JA, Bresalier RS, Figueiredo JC, Ahnen DJ, et al. Risk Factors for Hemorrhoids on Screening Colonoscopy. *PLoS One*. 2015;10(9):e0139100.
21. Hatamian S, Hadavandsiri F, Momenimovahed Z, Salehiniya H. Barriers and facilitators of colorectal cancer screening in Asia. *Ecancermedicalscience*. 2021 Sep 13;15.
22. Lee J, Ewing B, Holmes D. Barriers and Facilitators to Colorectal Cancer Screening in South Asian Immigrants: A Systematic Review. *Asian Pacific Journal of Cancer Prevention*. 2023 May 1;24(5):1463–75.
23. Jepson R, Weller D, Alexander F, Walker J. Impact of UK colorectal cancer screening pilot on primary care. *Br J Gen Pract*. 2005 Jan;55(510):20–5.
24. Wu W, Huang J, Wong MCS, Xu W. Reducing workloads of public health workers in organised colorectal cancer screening in China. *Eur J Cancer Care (Engl)*. 2022 Sep 22;31(5).

25. Ruco A, Khalil A, Ledwos C, Tinmouth J, Kiran T, Lofters A. Exploring barriers and enablers to implementation of cancer screening among primary care professionals seeing marginalized patients. BMC Public Health. 2025 Apr 28;25(1):1578.