

Knowledge Attitude and Practices of Health Care Workers towards Colorectal Cancer Screening in Primary Care Settings in Durban, South Africa: A Cross-Sectional Survey

Sphindile Magwaza¹, Guido Van Hal¹ & Muhammad Hoque²

¹ Social Epidemiology and Health Policy, University of Antwerp, Antwerp, Belgium

² Research Department; Management College of Southern Africa, Durban, South Africa

Correspondence: Sphindile Magwaza, PO Box 2612, Pietermaritzburg, 3200, South Africa. Tel: 27-83-218-8713.
E-mail: snkmagwaza@gmail.com

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Abstract

Background: South Africa has the highest number of colorectal cancer (CRC) patients in sub-Saharan Africa, with the CRC projected new cases at 8 000 per 100 000 population by 2030. Screening assists with the early detection and control of cancer. This study determined knowledge, attitude, and practices (KAP) related to CRC among Health Care Workers (HCWs).

Methods: A cross-sectional descriptive study was conducted between April and November 2021 using a self-administered close-ended questionnaire. Data was collected from 109 HCWs in public primary health care facilities in Durban, South Africa. Summary descriptive and association analysis were conducted using IBM SPSS vs. 28.

Results: Overall CRC screening knowledge score was 12% (mean 13) with 39% that were familiar with the National Department of Health Cancer Control framework. Only 15% of participants perceived the Perceived the National Cancer Control Guidelines to be influential for the implementation of colorectal cancer screening. 70% of participants would recommend CRC screening to patients. Over one-fifth, (22%) of participants felt that fecal occult blood, flexible sigmoidoscopy, and colonoscopy were effective for CRC screening. Over a third (44%) preferred a structured CRC screening programme. Most participants (81%) were willing to recommend CRC screening to their patients. Only 10% of participants had ever conducted colorectal screening before. The vast majority were unfamiliar with the types of CRC screening tests. Lack of CRC screening guidelines, training, equipment and CRC low burden were identified as barriers to screening.

Conclusion: The vast majority of HCWs lacked knowledge of the CRC screening programme and its procedures. However, the vast majority of HCWs were willing to conduct screening once trained. This study also highlighted perceived health systems barriers affecting CRC screening. Currently, South Africa does not have national guidelines for CRC screening in South Africa, hence, a national risk differentiation CRC screening guideline is needed to guide implementation at the PHC level. Health systems strengthening interventions, including training of HCWs, availability of screening tests and materials to facilitate the integration of CRC screening noting that PH already implements screening programmes for other cancer types.

Keywords: Colorectal cancer, cancer screening, South Africa, nurses, knowledge, attitude, practices

1. Introduction

1.1 CRC Status in South Africa

There were almost 2 million new cases and 940 000 deaths, globally, of colorectal cancer (CRC) as reported by globocan 2020 (Ferlay et al., 2022). According to the Ferlay in the Global Cancer Report in 2020, the Southern Africa region ranked 14th among the 21 sub-continental regions when comparing the CRC age-standardized incidence rate (ASR_i). Further, the report estimated that the new CRC cases in South Africa (SA) will increase to 8,000 per 100,000 population by 2030 (Ferlay et al., 2022; The National Institute for Communicable Diseases 2017). Rawla (2019) reported the age-standardized incidence rate of CRC in SA to be 18.1 for men and 12.0 for women per 100,000 population for the year 2018. South Africa (SA) has been reported to have the highest CRC

age-standardized world incidence rate in sub-Saharan Africa (Ferlay et al., 2022). The SA National Cancer Association (CANSA) stated that CRC is the second most common cancer in men and the third most common cancer in women based on the 2017 data from the national cancer registry (The Cancer Association of South Africa, 2017). The CRC burden affects individuals and their families and negatively impacts the health care system due to the high demand for screening, treatment, and care. The screening programmes will assist with early detection of cancer using different screening methods and treatment plans to reduce morbidity and mortality (Kumar et al., 2021; Duraiyarasan et al., 2022).

1.2 Ministry of Health Response and Health Systems Challenges

The National Cancer Policy Framework (NCPF) 2017-2022, developed by the Department of Health in South Africa, identified five cancer types in adults as a priority: lung cancer, colorectal cancer, cervical carcinoma, prostate, and breast cancer. The NCPF outlines the service delivery platform for cancer prevention and care, mainly prevention services at the district level provided by the primary health care facilities with treatment and care provided by the regional and palliative care with support from the community partners (The National Department of Health, 2017).

The screening guidelines were developed by the SA CRC Society (SACRS) and are based on the WHO guidelines and the latest evidence on CRC Screening. Schreuders reported in 2015 that targeted screening using colonoscopy with treatment is cost-effective in Sub-Saharan Africa (Schreuder, 2017). Colonoscopy, previously used as a diagnostic tool, is now used for screening along with guaiac faecal occult blood (gFBOT), flexible sigmoidoscopy, and to a limited extent, the faecal immunohistochemically test (FIT) that is piloted in selected facilities that are part of a clinical trial (Thomson et al., 2020; Helsingen et al., 2019).

The World Bank ranks South Africa as an upper-middle-income country (Hamadeh et al., 2021). Despite the availability of CRC services, inequalities prevail regarding the quality of health care services and access to CRC screening services between private and public health sectors. For example, Thomson (2020) reported that there were 150 000 colonoscopies conducted in the private sector compared to only 70 000 in public health facilities. Even though the private sector only covers about 14% of the total population of South Africa (59 million). The CRC screening services offered in private health facilities are static, mobile, and funded by medical insurance organizations. In contrast, those provided by the public health systems are funded through the public finance framework by the government and are located at regional and tertiary levels (Ntombela, 2017).

A national population-based screening program for colorectal cancer is not recommended for developing countries such as South Africa, noting low CRC burden and other competing health needs (Schreuder et al., 2017; Lambert, 2009; National Cancer Policy Framework Department of Health, 2017; Lambert, 2009). However, the lack of population-based cancer registries denies collecting and monitoring data for all new cancer cases in a well-defined population, preventing accurate measurement of national CRC incidence, prevalence, and mortality in the country. Hence the Health Ministry is unable to prioritize the needs for planning and allocating appropriate prevention and treatment interventions to people at high risk for CRC.

There are four regional and one tertiary public health facilities that offer screening tests in Durban metropole city. At least 2 030 colonoscopy procedures are estimated annually in each of the four facilities. A study that determined the adequacy of endoscopic services in the KwaZulu-Natal province, including Durban, found that there are 0.06 registered gastroenterologists (GEs) per 100 000 population against one per 50 000 as recommended by the World Gastroenterology Organisation (Telleman, 2009). The same study called for a reduction in the average waiting period for colonoscopy to 29 (range 7-90) days compared to that in high-income countries, which compromises the patient's quality of care (Loots, 2017). Besides the issue of waiting times, Ntombela (2017) found that patients accessing public health care settings differed in terms of cancer progression (advanced) and health outcomes (poor) when compared to those accessing private health care (with early detection and good outcomes).

Further, some challenges affecting service delivery for cancer prevention and treatment services in South Africa include poor awareness of the risks and burden, limited implementation of public health awareness and control interventions, late presentation of clients for care, and poor healthcare pathways.

1.3 Importance of the Study

Based on literature searches, no studies on knowledge, attitude, and practice of CRC screening have been conducted among health care workers at the district level in South Africa. To reduce missed opportunities for CRC prevention education and screening, the district-level service platform is most suitable to provide screening as it has been found to assist with the early detection and control of cancer. Obesity, smoking and lack of exercise are some of the factors that have been shown to increase the risk of CRC (obesity, lack of physical exercise, and

smoking increase the risk of colorectal cancer (Dekker, 2019; Duraiyaranan et al., 2022). In addition, changes in the gut microbiome have also been shown to contribute to inflammation, development, and progression of CRC (Siddiqui et al., 2022).

The screening services are mainly driven by health care workers that play a significant role in terms of demand creation and provision of quality screening. Currently, at this level, CRC screening is not conducted. Hence it is expected that most of the participants will have poor knowledge of CRC screening, although all public health PHC facilities are currently conducting screening for other types of cancers including breast, prostate, cervical and lung cancer. Nonetheless, the National Department of Health has received proposals from the national CRC society and technical cancer working group to consider targeted CRC screening, based on risk determination, at this level to ensure early detection and appropriate referral to tertiary institutions.

Hence, KAP study was conducted to identify health care provider knowledge, attitude, and practices and their characteristics that may influence the country's screening and control of CRC, as global studies have reported a significant association between knowledge of CRC and uptake of screening tests (Brandt, 2012). The secondary objectives included determining any association between variables with knowledge, attitudes, or practices as well as identifying barriers to screening. This was done to provide baseline data and to inform the preparation of CRC screening guidelines development and roll-out at the PHC level. In addition, the findings of this study will inform the design of the health promotion and educational programs for patients, capacity and support programs for HCWs, and assist with health systems strengthening to facilitate the implementation of CRC screening in PHC settings in South Africa

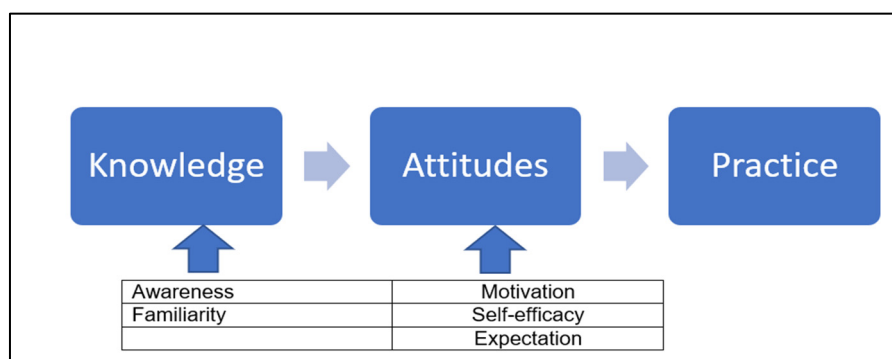
1.4 Implications of the Study

The purpose of assessing KAP among health care workers and the population is to determine awareness of CRC burden and progress in implementing preventive interventions (health education and screening tests) at PHC level regardless of the lack of national CRC screening guidelines, including.

- There is poor knowledge of CRC screening among HCW in the district, which could reflect the status quo in general among HCW in South Africa
- Attitudes and practices could be influenced by other factors such as the lack of awareness, and system barriers like lack of policy, SoPs, and training, which are not perceived as a priority in the country. The shift to positive practice starts with raising awareness and empowering HCW with knowledge and evidence-based CRC screening strategies.
- There are currently missed opportunities for promoting and screening patients by HCWs however, greater opportunities to integrate CRC screening with other cancer screening programs already implemented in PHC and CHCs to increase coverage through existing headcount in facilities.
- The role of health leadership is critical and essential to drive targeted CRC screening programs and address potential barriers such as gaps in training, lack of equipment, and job aids.
- It is equally important to generate demand through health promotion and public awareness of CRC at the community level by developing targeted educational programs for both HCWs and patients to improve the CRC screening rates for prevention and early detection for control.
- The study forms a baseline and facilitates opportunities for further research to better understand KAP from patient perspectives, those already exposed to other types of cancers, and other health care workers in both public and private health care in similar settings across South Africa.

1.4 State Hypotheses and Their Correspondence to Research Design

The study uses the knowledge, attitude, and practice models developed by Kwol (2020), which implies that knowledge has a direct effect and impact on a person's attitude which in turn has a direct impact on the person's practices or behavior. Awareness and familiarity with CRC burden and CRC screening policy, inform the knowledge possessed. Possessing such knowledge drives the importance of screening and enhances motivation and self-efficacy for screening. There is also an expectation that screening will lead to early detection and prevention and ultimately control of CRC, hence this conviction influences practice.



Source: Adapted from Relationship Between Knowledge Attitude and Practice – Knowledge, Walls 2021 blogspot.comblogspot.com

Figure 1. Relationship between Knowledge, Attitude, and Practice

Table 1. Key Research Questions

Model	Questions 1	Questions 2	Questions 3	Questions 4
Knowledge	How common is CRC in South Africa?	How much do healthcare workers know about CRC to assess clients or screening?		
Attitude	Is screening policy justified?	Once trained, is it the HCW responsibility to initiate demand for and conduct screening?	How skilled and competent is the HCW to conduct screening?	Can routine screening lead to early detection, prevention, and control?
Practices	What health systems enablers and barriers affect the HCW from conducting screening?	What are the personal barriers preventing the screening of clients?		

2. Method

2.1 Study Design

This cross-sectional descriptive study was conducted from April 2021 to December 2021 in twenty-one public primary health care facilities (4 community health centers (CHCs), 13 primary health care linked to CHCs, and three gateway facilities) located in Durban metropole district, KwaZulu-Natal province, South Africa. The city of Durban is one of the second-highest density metropole districts with almost 4 million people residing in the city and 85% of the population seeking health care from public health facilities.

2.2 Participant (Subject) Characteristics

Participation was extended to all Health Care Workers (HCWs) in the linked PHC, but a limited number of participants responded from the facilities. All facility managers, doctors, and professional nurses managing and delivering PHC services in selected CHC and linked PHC and gateway facilities were recruited to understand the current colorectal cancer screening practices within the public primary health care facilities. However, only one hundred nine (n = 109) HCWs consented to and completed the self-administered questionnaires. Inclusion criteria were consenting registered professional nurses, medical doctors, and ancillary health care professionals working in selected public primary health care facilities. We also included professionals providing community-based services linked to the facility with a formal district referral pathway and the program managers providing oversight at the selected facilities or sub-regional or district levels. Health promotion and non-communicable diseases program managers at district, regional, or cluster levels linked to the selected facilities were invited to participate.

2.3 Sampling Procedures

Purposive sampling was used to select the community health centers and gateway facilities to participate in the

study as these are few, are high-volume and specific numbers are located within the three regions of the city of Durban.

2.3.1 Study Setting

Twenty-one facilities were purposely selected to participate in the study. The facilities are categorized by type of facility described by the national district health system framework: primary health care facilities (PHCs), community health centers (CHCs), and gateway facilities. The facilities were located in the west, south, and northern regions, and the number per region is also outlined in Table 2. The selected CHC and their linked PHC facilities are currently servicing a catchment population of approximately 1.3 million. The PHC facilities are usually located about 5 kilometers from catchment community areas and provide health promotion, acute and chronic care, and school and community mobile services to the catchment area. The population of each catchment area was extracted from Statistics South Africa's urban and regional population estimates through the community survey published in 2016 (Statistics South Africa. Community Survey 2016) and is presented as part of the facility description (Table 2 below). The PHC services are free of charge to the community. The gateway facilities are located at the premises of either the district or regional hospitals. The PHC and gateway facilities are usually open five days a week for 8-hours a day.

Only the CHCs offer 24-hour health care services seven days a week, including emergency and maternal services. The PHC services are mainly provided by two or three professional nurses daily, with a maximum of three medical doctors roving or stationed at the facilities. The community health centers and gateway facilities have up to 3 resident medical doctors and seven professional nurses with only key ancillary health workers, such as social workers, dentists, or dieticians. The doctors and ancillary staff provide specialized medical services on the selected day and consult for complicated PHC conditions referred by nurse practitioners specifically from PHC facilities, within CHCs and gateway facilities. The service package includes screening for both communicable and non-communicable diseases, including HIV, Tuberculosis, sexually transmitted diseases, and cancer screening, such as breast, cervical, and prostate cancer.

The study only focused on public health facilities managed by the KZN provincial Health Department and excluded those managed by the local municipality. The reasons are that the provincial facilities have a higher headcount; diverse types of facilities; and serve a larger catchment area than the municipal facilities that are mainly fixed PHC clinics ($n = 59$). In total, there are 8 CHCs, 42 fixed PHCs, and 5 gateway provincial clinics in the city. Each community center has between 6 and 8 fixed PHC facilities linked to it. Overall, the percentage of the total number of staff was 175 in 21 facilities. Of these 109 (62%) consented to participate in the study

2.3.2 Assessment Tool

A questionnaire containing 54 closed-ended and multiple choice (with 4-6 options, including "I do not know") type questions to describe knowledge attitudes and practices was used. The questionnaire was developed based on previously published articles on the topic. It was self-administered with demographic items age, sex, and items describing the health care workers such as type of profession, years since graduation and since working at the facility; the number of hours and average number of clients seen per day, population catchment number, type and location of the facility. No self-identifiable data was collected.

The questionnaire was adapted from the CRC KAP based in Brazil Perin (2015) to compare findings, between the two countries. The results have been reported elsewhere (Magwaza, 2023). The KAP questionnaire is further divided into three components, namely:

- Knowledge components contained 11 items aimed to ascertain basic information, including familiarity with the national cancer framework, CRC guidelines, screening criteria for symptomatic and average-risk individuals, training completed, and CRC screening tests, intervals, and start and stop screening age.
- Attitude components contained six items aimed at ascertained views on the effectiveness of CRC screening methods, preference of the type of screening program; views on the influence of guidelines; confidence and willingness to promote, recommend and conduct CRC screening
- Practice components contained 15 items: types of cancer screening currently provided ascertained implementation of CRC screening related to equipment, training, and job aid, patient education, and practical screening, and factors affecting promotion, uptake, and implementation of screening

The questionnaire was prepared in English and pre-tested among HCWs whose part of the study was not for language, clarity, or clinical alignment with WHO guidelines and structure. Experts also reviewed the research instrument on CRC before being distributed to study participants

2.3.3 Data Collection

The questionnaires were distributed to HCWs after completing an 8-minute summary group presentation on the study. The presentation focused on the study purpose, aims, objectives, data collection, and analysis method, and how the feedback will be provided. The facility manager appointed a questionnaire collation coordinator in each facility, and the potential participant and a researcher jointly approved a due date.

The HCWs that asked for a copy of a questionnaire and submitted a completed copy to the facility coordinator were classified as fully participating and consented to the study. Once most submissions have been obtained, based on the number distributed, the facility coordinators inform the researcher to collect a week or two after distribution. On three occasions, the questionnaires were only collected after a month due to the isolation or quarantine of staff in the facility due to COVID-19 infection.

Some participants also submitted via email to reduce the risk of covid19 infection through a paper trail, specifically those on sick leave, annual leave, or being redirected to conduct covid 19 vaccination in the community. Three reminders were sent via facility coordinators, and the lack of submission post the reminders was regarded as a withdrawal of consent from participating in the study.

2.3.4 Data Synthesis and Analysis

After collection, each questionnaire was reviewed for completeness (95% completion rate), and the study identification number was given using the facility's name as part of the code before data were captured on the worksheet by Microsoft Office Excel 2007™ document in preparation for analysis. Only five questionnaires had missing data about selecting known types of CRC screening tests. Hence, the missing data were coded under "I do not know" as an option for those questions that had missing data. Data entry errors, quality assurance, and validation were conducted using the Excel data validation rules.

2.3.5 Measures and Covariates

Using Microsoft Office Excel 2007™, data were exported to IBM SPSS version 28 (SPSS Inc., Chicago, IL, USA) software to generate the descriptive summary statistics. Descriptive categorical data are presented as mean with standard deviation. Frequencies and percentages are presented for all categorical variables. Chi-square or Fisher's exact was used where appropriate.

To compare the differences among participants on demographic and KAP-related variables, the chi-square test was used to describe the association between categorical variables, assuming a two-sided test at a 5% level of significance.

2.3.5.1 Measured outcomes

Knowledge outcomes measured included the following items, reported as a number, frequency, percentage, and mean score where appropriate:

- Familiar with the National Department of Health Cancer Control framework
- Aware of colorectal cancer national or provincial colorectal screening guidelines
- Ever been trained to conduct CRC screening
- Know the start age for routine CRC screening
- Know the stop age for routine CRC screening
- Know the types of tests recommended for CRC screening (combination of gFBOT, flexible sigmoidoscopy, colonoscopy, and FIT)
- Know the FBOT screening intervals (every year)
- Know the flexible sigmoidoscopy screening intervals (every 5 years for average risk)
- Know the colonoscopy screening intervals (every 10 years for average risk)

The overall knowledge score, percentage, and mean were calculated for all domains measuring CRC screening knowledge. We outlined the scores by health care worker type to highlight knowledge variation across HCWs, using absolute numbers.

2.4 Ethical Considerations

Ethical approval was obtained from the University of Antwerp, Belgium, and Pretoria, South Africa (Reference numbers: 20/11/127 and 434/2020). The study was also approved by the provincial Department of Health, supported by the Durban district health office, and approved by facility managers or facility-based ethics committees. Three researchers, SM, GVH, and MH, were involved in the conceptualization of the study, and SM and GVH in the development of the questionnaires, and all authors were responsible for data analysis and report writing.

3. Results

3.1 Participant and Facility Characteristics

Table 2. Profile of the study population

Variable	Category	Frequency	Percentage
Type of Health Care Workers	Facility manager	5	5%
	Professional Nurse	76	70%
	Medical doctor	10	9%
	Other: District and Cluster Programme Manager	18	17%
Gender	Male	13	12%
	Females	96	88%
Age	20-29 years	14	14%
	30-39 years	33	33%
	40-49 years (50% Percentile)	28	28%
	50-59 years	23	23%
	60-65 years	2	2%
Median in years		45	
Years since Graduation	0-1 years	6	6%
	2-4years	20	18%
	5-7years	15	14%
	8-10years (50% Percentile)	16	15%
	More than 10 years	52	47%
Median in years		9	
Type of Facility	Community Health Centre (CHC) or Primary Health Care clinic (PHC)	63	58%
	Gateway Clinic	40	37%
	District or Area Management Level	6	6%
Geographic area of the facility	West	22	20%
	South	64	59%
	North	17	16%
	District	6	10%
Number of years worked in this facility	0-1 years	27	25%
	2-4years	26	24%
	5-7years	19	17%
	8-10years	13	12%
	More than 10 years	24	22%

Median in years		6	
Number of patients seen by each clinician per week	50 and less	16	15%
	51-200	47	43%
	201-400	9	8%
	More than 400	19	17%
	Not applicable-at management level	18	17%
Mean in number		282	
Population Catchment Area	Less than 200 000	17	16%
	200 000-400 000	57	52%
	More than 400 000	29	27%
	District (est. 4 million)	6	6%
	TOTAL	109	

The total number of returned questionnaires was 109. The response rate was 53% from PHC and gateway clinics and 62% from CHCs. The study participants and facilities characteristics are shown in (Table 2). Of the 109 participants, the majority (n = 96; 88%) were females and professional nurses (n = 76; 70%). The median age was 45 years (range: 20 and 65 years, std. deviation = SD:1.038). Almost half (n = 52; 48%) of participants had worked as professionals for more than ten years since graduation; had worked four years or less in the facility (n = 53; 49%; median six years SD:1.490), and most (n=90; 83%) of the participants had worked 40-hours in each week. Sixty-three (59%) of participants worked in public primary health care facilities in the South region of the city of Durban. Sixty-four (58%) of participants worked in public primary health care facilities and CHCs, and over half (n = 57; 52%) provided services to a population catchment area between 200 000 to 400 000.

3.2 Knowledge

The overall knowledge score was 118 (12%) with a mean of 13, as shown in Table 3. Different responses to knowledge items are presented in Table 1 stratified by HCW type, with professional nurses scoring higher than other HCW types. Over a third (39%) of participants were aware of the colorectal cancer screening guidelines (national or provincial colorectal). Seventeen (16%) of participants knew the start age for routine CRC screening and were also familiar with the types of tests recommended for CRC screening.

Table 3. Knowledge of colorectal cancer policy or guidelines, training history and type and frequency of CRC tests used for screening

Knowledge Items	Medical Doctors	Professional Nurses	Management (facility, sub-district/district)	TOTAL (Correct Responses per domain)	Percentage (Correct Responses per domain)	Mean Score
TOTAL Participants				109		
Aware of any the colorectal cancer screening guidelines (national or provincial colorectal)	1	34	8	43	39%	14
Aware of the colorectal cancer national or provincial colorectal screening guidelines	2	5	2	9	8%	3
Ever been trained to conduct CRC screening	2	3	1	6	6%	2
Know the start age for routine CRC screening	3	11	3	17	16%	6

Know the stop age for routine CRC screening	0	2	2	4	4%	1
Know the types of tests recommended for CRC screening (combination of gFBOT, flexible sigmoidoscopy, colonoscopy, and FIT)	4	10	7	17	16%	7
Know the FBOT screening intervals (every year)	1	7	0	8	7%	3
Know the flexible sigmoidoscopy screening intervals (every 5 years for average risk)	1	9	1	11	10%	4
Know the colonoscopy screening intervals (every 10 years for average risk)	1	1	1	3	3%	1
Overall, Knowledge Scores	15	82	25	118		
Total Knowledge Percentage				12%		
Mean Score				13		

The HCW characteristics such as the number of years since graduation, years working in the facility, facility type, facility geo-location, and type of health worker did not show any association with knowledge of start or stop age for CRC screening. However, there were significant associations between sex ($p = 0.030$) and knowledge of colonoscopy screening tests interval and the association of age ($p = 0.002$) with knowledge of colonoscopy screening tests interval. Similarly, there was a significant association between knowledge of start age for CRC screening and the age of participants ($p = 0.037$).

Table 4. Attitudes towards colorectal cancer Screening programme

Component	Category	Frequency (n=109)	Percentage (%)
Perceived the National Cancer Control Guidelines to be influential for the implementation of colorectal cancer screening	Not very influential	26	24%
	Influential	16	15%
	Not applicable (as there are no guidelines)	12	11%
	I do not know	55	50%
Willingness to recommend CRC screening to patients	Yes	76	70%
	No	5	5%
	I do not know	28	26%
Confidence in promoting colorectal cancer screening with your patients	Not confident	51	47%
	Confident	20	18%
	Not applicable as there are no guidelines	9	8%
	I do not know	29	27%
Preference on the type of colorectal cancer Screening programme*	No preference	17	16%
	Structured screening	48	44%
	Opportunistic screening	11	10%
	I do not know	33	30%

Willing to screen patients for colorectal cancer after training	Not willing	7	6%
	Willing	90	83%
	I do not know	12	11%
Perceived Effectiveness of colorectal cancer Screening Tests	Colonoscopy	57	53%
	Flexible sigmoidoscopy	45	41%
	Faecal occult blood test (guaiac)	36	33%
	Faecal immunochemical test (FIT)	23	21%

Notes. Preferred type of CRC screening programme (*P-value: <0.005 significant level)

- Professional nurses preferred mostly the structured colorectal cancer screening programme compared to other HCW type (p=0.016)
- Health care workers in Primary health care facilities or in community health centre facilities) preferred the structured colorectal cancer screening programme than those working in gateway clinics (p=0.028)

Out of 109 participants, most (n=66; 61%) were unfamiliar with the National Cancer Control Framework for South Africa. More than half (n=59; 54%) of participants did not know the CRC screening tests used for both (a)symptomatic patients, with (n=33;30%) of participants selecting “none” when asked about the type of tests used for CRC screening for symptomatic patients. Almost two-thirds (n=69; 63%) of participants did not know the starting age of CRC screening (50 years and above based on the SACRS guidelines), and the vast majority (n=88; 81%) of participants did not know the age for stopping CRC screening. When asked about the CRC screening test intervals, only eight (7%) of participants knew that guaiac faecal occult blood (gFBOTs) must be done annually, ten (11%) of participants knew that flexible sigmoidoscopy must be performed every five years and three (3%) of participants knew that colonoscopy is performed every ten years for average-risk patients. The participants that never received training lacked knowledge on the age of screening cessation and knowledge of the different types of CRC screening testing intervals (p<0.010); p<0.001 respectively) (Table 4).

3.3 Attitude and Perceptions

Only sixteen (15%) participants perceived the National Cancer Control Guidelines to be influential on the implementation of cancer screening, while half of the participants (n = 55;50%) did not know if it had any influence.

Table 5. Frequency of patient education on colorectal cancer screening during your clinical assessment stratified by health care worker and facility characteristics

CRC Education Frequency	Always	Often	Rarely	Never	I cannot remember	p-value
Health Worker Type (N=109)						0.621
Facility Manager	0	0	2	1	2	
Professional Nurse	2	3	14	39	18	
Medical doctor	0	1	2	7	0	
Other: District and Cluster Programme Manager	1	0	2	9	6	
Years since Graduation						0.349
0-1 years	0	0	1	3	2	
2-4years	2	2	4	6	6	
5-7years	0	0	0	12	3	
8-10 years (50% Percentile)	0	0	3	8	5	
More than 10 years	1	2	12	27	10	
Type of Facility						0.034*
Community Health Centre or Primary Health Care clinic	0	1	7	36	19	

Gateway Clinic	3	3	12	16	6	
District or Area Management Level	0	0	1	4	1	
Number of years worked in this facility						0.080
0-1 years	0	1	7	13	6	
2-4years	2	0	5	12	7	
5-7years	0	0	2	16	1	
8-10years	0	3	3	4	6	
More than 10 years	1	0	3	11	6	
Number of patients seen by each clinician per week						0.448
50 and less	1	0	1	9	5	
51-200	1	4	11	25	6	
201-400	0	0	1	4	4	
More than 400	0	0	5	9	5	
Not applicable-at management level	1	0	2	9	6	

**P-value: <0.005 significant level.

Concerning willingness to recommend CRC screening to patients, the majority (n=81; 74%) of participants were willing, and seventy-six (70%) of participants also indicated their willingness to implement CRC screening once trained to perform it (Table 5). On confidence in promoting colorectal cancer screening, nearly half (n=51; 47%) of participants perceived themselves as lacking the confidence to promote CRC screening, while twenty-seven (29%) were unsure if they had the confidence to promote CRC screening.

Forty-eight (44%) participants preferred a structured program, while eleven (10%) participants preferred an opportunistic screening program in PHC settings. The association between willingness to implement the CRC programme and the structured CRC screening programme was statistically significant ($p = 0.004$). Thirty-eight (35%) of participants preferred a colonoscopy screening test for their patients, while thirty-three (30%) of participants indicated that they did not have adequate knowledge to voice out their preferences (Table 5).

On the effectiveness of the CRC screening tests, most of the participants perceived colonoscopy, flexible sigmoidoscopy, and gFBOT as effective. The FIT was the least effective of the four CRC screening tests (Table 4). Over half (n = 62; 52%) of participants did not know much about the four CRC screening tests to have any perceived effectiveness. Participant characteristics were not significantly associated with the perception of the effectiveness of CRC screening tests. The preferred type of CRC screening programme was significantly associated with health worker type professional nurses ($p = 0.028$) type and facility type, PHC or CHC ($p=0.037$), as shown as part of the note in Table 5.

3.4 Practices

Thirty (28%) participants felt prepared to talk to patients about CRC screening, and forty (37%) participants felt able to provide education and counseling. However, (n = 76; 70%) of participants never educated patients on or recommended CRC screening during clinical assessment.

Table 6. Reported practice towards colorectal cancer screening

Component	Category	Frequency (n=109)	Percentage (%)
Ever trained on colorectal cancer screening	No	103	94%
	Yes	6	6%
Conducted colorectal screening before	No	98	90%
	Yes	11	10%
Familiar with colorectal screening methods Faecal occult blood test (guaiac)	Not familiar	77	71%
	Somewhat familiar	15	14%
	Familiar	12	11%
Familiar with colorectal screening methods-flexible sigmoidoscopy	Very familiar	5	5%
	Not familiar	71	65%
	Somewhat familiar	21	19%
	Familiar	13	12%
Familiar with colorectal screening methods-colonoscopy	Very familiar	4	4%
	Not familiar	61	56%
	Somewhat familiar	26	24%
	Familiar	15	14%
Familiar with colorectal screening methods-FIT	Very familiar	7	6%
	Not familiar	93	85%
	Somewhat familiar	9	8%
	Familiar	6	6%
Able to provide education and counselling on colorectal cancer screening	Very familiar	1	1%
	Yes	47	43%
	No	40	37%
	I do not know	22	20%

Table 6 above reports the frequency of patient education on colorectal cancer screening during your clinical assessment stratified by health care worker and facility characteristics. Although there was no statistically significant difference between educating patients on CRC screening during clinical assessment and the type of health workers, facility and number of years with clinical experience and number of patients seen per week. However, there was a statistically significant association between the PHC and frequency of patient education, as shown in Table 6. Most participants (n = 89; 82%) had indicated that CRC screening services were not currently available in their facilities.

As per Table 6, practice towards colorectal cancer screening. Of the 109 participants, only (n = 11; 10%) had conducted CRC screening before, and six (6%) participants had staff trained on CRC screening in their facilities. Although ninety-eight (90%) of participants had conducted cancer screening on eligible patients for other types of cancers including breast, cervical, lung, and prostate cancer based on the national guidelines; only 11 (10%) had ever conducted CRC screening. Only one participant reported having equipment for CRC screening in the facility, which was recorded as a barium endoscopy. When asked about their familiarity with different colorectal screening methods, more than half were unfamiliar with the four types of tests used for CRC screening, as shown in Table 6.

3.5 Association between Training History and Knowledge of Key Components of CRC Screening Guidelines

Table 7. Relationship between training on CRC screening and knowledge of CRC screening eligibility criteria and screening intervals

Association of knowledge with Training (N=109)	p-value
Knowledge of start age for CRC screening	0.52
Knowledge of stop age for CRC screening	<0,001
Knowledge of Interval for gFBOT	<0,001
Knowledge of Interval for flexible sigmoidoscopy	<0,001
Knowledge of Interval for colonoscopy	<0,001

There was also a significant association between CRC screening criteria and training history. The participants that never received training lacked knowledge of the start age of screening; the age of cessation and CRC screening testing intervals (p<0.001) (Table 7).

3.6 Association between Screening Practices and Perceived Effectiveness of CRC Screening Tests

Table 8. Association between screening practices and perceptions of CRC screening tests effectiveness

	Health Care Workers who do not screen for CRC (n = 98)		Health Care Workers who screen for CRC (n = 11)		p-value	
		Number	%	Number		%
Perception of NCCF recommendations for CRC screening	Very influential	3	3%	3	27%	0.336
	Not very influential	25	26%	1	9%	
Familiarity with FOBT	More familiar	3	3%	2	18%	<0.001
	Less familiar	88	90%	4	36%	
Familiarity with sigmoidoscopy	More familiar	2	2%	2	18%	<0.001
	Less familiar	87	89%	5	45%	
Perception of FOBT effectiveness	Very effective	8	8%	4	36%	<0.001
	Not very effective	8	8%	2	18%	
Perception of flexible sigmoidoscopy effectiveness	Very effective	15	15%	5	45%	0.003
	Not very effective	5	5%	2	18%	
Perception of colonoscopy effectiveness	Very effective	27	28%	6	55%	0.002
	Not very effective	3	3%	0	0%	

In relation to familiarity with all CRC screening tests, those with CRC screening experience (18%) were very familiar with the different tests used for CRC screening compared to 3% among those that never screened before (3%)(p<0.001). Over a third with CRC screening experience perceived gFBOT to be very effective as compared to those without experience 8% (p<0.001). Nearly half (45%) of those with CRC screening experience perceived flexible sigmoidoscopy to be very effective as compared to those without experience 15% (p = 0.003). Over half

(55%) of participants with CRC screening experience perceived colonoscopy to be very effective as compared to 28% of those without any experience ($p= 0.002$).

3.7 Barriers to Screening and Greatest Impediments to the Promotion of CRC Screening

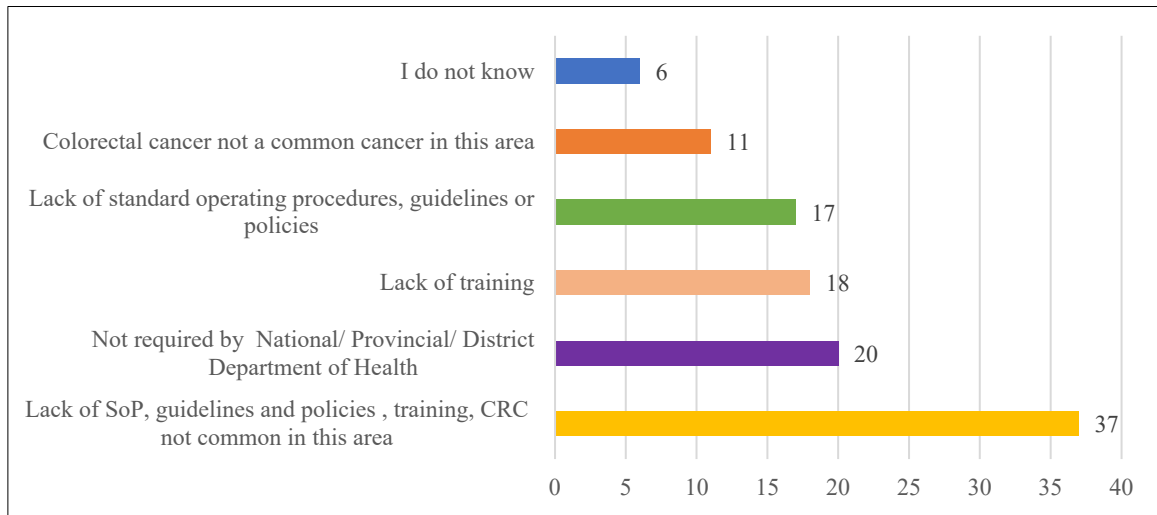


Figure 2. Reported barriers to screening patients for colorectal cancer in public primary health care facilities (N = 109)

In response to a question on what prevented CRC screening among patients, the most cited barriers by over a third ($n = 37$; 34%) of participants included lack of Standard Operating Procedures (SoPs) or guidelines; lack of training, and that CRC not being common cancer within the facility catchment area (Figure 2).

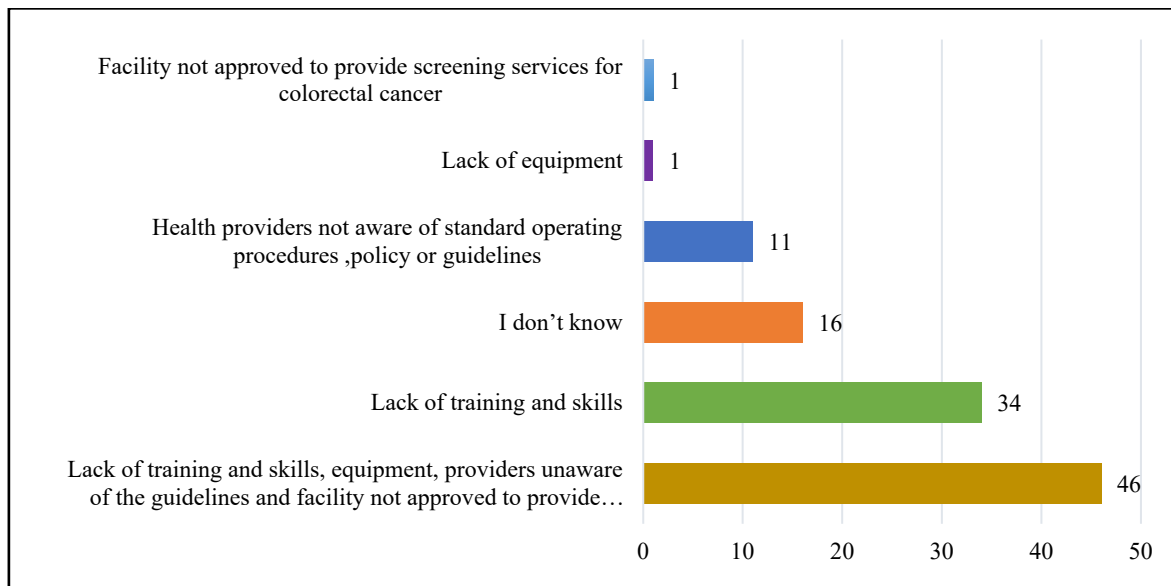


Figure 3. The greatest impediments in promoting colorectal cancer screening reported by participants (N = 109)

Similarly, lack of training and skills, equipment, providers unaware of the SoPs, and facilities not approved to provide CRC screening services by the district/province /national Department of Health were perceived to limit the promotion of CRC screening to patients in the facilities (42%.31% and 15%, respectively as depicted in Figure 3).

4. Discussion

CRC is the fifth most common cause of cancer deaths in South Africa. The study findings point to poor knowledge and practice of CRC screening. However, there is a willingness to implement screening once trained. The lack of SoPs, training and exclusion of CRC screening as part of the PHC service package were some of the reasons cited by participants that prevent CRC screening in PHC settings. These findings have also been found in similar studies conducted in other countries (Al-Thafar, 2017; Al Mutawah et al., 2018; Soyler et al., 2019).

Ferlay (2020) projected an increase in the number of new CRC cases by 2030 in South Africa. Hence, exploring the knowledge, attitude, and practices of HCWs on CRC screening in public primary health care facilities is critical, as this service platform remains a cornerstone for delivering health care services to millions of medically uninsured people in South Africa (Ferlay, 2022). Moreover, at this level, health promotion, education, and initial screening or clinical assessment occur before patients are referred to a higher level of care. Hence, empowering HCWs in the PHC setting through training and mentorship using different media platforms will improve CRC screening (Mahmoud, 2020; Taha, 2019).

More participants were familiar with gFBOT and colonoscopy than FIT. The gFBOT is found to be less expensive and can be available in primary and regional laboratories in South Africa, as advocated in Iran (Bouter, 2020; Mahmoud, 2020). Moreover, the colonoscopy test was perceived to be effective, mostly by those that have received training. In addition, colonoscopy was identified to be the most preferred for patients by some participants when compared to other tests. The advantage of colonoscopy is the ability to detect and remove lesions at the same time (Castiglione, 2000), and is the oldest method, is perceived to be a gold standard, for screening when compared to other modalities (Levin, 2018). In recent years, there are efforts to improve the tolerance of bowel preparation for a colonoscopy that may improve the acceptability of this screening method. (Millien, 2020).

Unfamiliarity and insufficient knowledge of different types of CRC screening tests, and eligibility criteria such as start age, screening intervals, and stop age calls for training that will facilitate many dispositions to promote and practice CRC screening in the future. Training can change attitudes regarding the perceived effectiveness of the tests, boost confidence to talk more about screening, and motivate HCWs to recommend and conduct CRC screening during clinical assessment with patients (Taş, 2020; Pancar, 2021; Hatamian, 2021). Poor CRC knowledge and practices were expected at this level, even though most participants performed screening for other types of cancer, due to the lack of national CRC screening guidelines and despite the recognition of CRC as one of the priority cancers in the country as outlined in the NCCF. However, the National Institute of Communicable Disease of South Africa (2017) planned to establish a national cancer surveillance programme using the population-based cancer registry, which is not yet operationalised, but will go a long way to accurately report on CRC in the future. However, local surveillance system development efforts are also underway in selected hospitals within the country (Mbeje, 2021).

Almost half of the participants (43%) preferred a structured CRC screening program. This finding is supported by large community-based population studies showing that organized colorectal cancer screening positively reduced cancer incidence and mortality (Kaminski, 2019; Levin, 2018). However, to gain optimal screening effectiveness, it is recommended that patients, providers, and health systems-related factors be addressed together (Ladabaum, 2020). Further, a risk-stratified and individualized screening was recommended to efficiently use resources for improved outcomes (Robertson, 2019). CRC screening conducted at 45 years for the average risk population is cost-effective (Ahnen, 2019). This assists with early detection, and treatment and improves treatment outcomes and survival. Hence, it is important to raise awareness, promote early screening of patients, and ensure appropriate service provider referrals (Levin, 2018).

The main reasons preventing HCWs from promoting CRC screening to their patients included the lack of screening guidelines, training, and equipment and; the exclusion of screening as part of the PHC package of service. However, the vast majority indicated their willingness to promote and conduct screening once trained. Poor knowledge of the CRC screening tests and guidelines could be due to a low level of knowledge of the CRC epidemiology, lack of national guidelines, and lack of knowledge regarding the benefits of screening, prevention, and control of CRC. However, knowledge alone does not translate to action (Hussain, 2020). Many studies report that clients rely on the primary physician as the main source of information on CRC screening. Hence, ensuring training on CRC among HCWs improves patient awareness of the screening and in turn may raise demand for screening (Campioni-Norman, 2021; Katsidzira, 2019; Tfaily, 2019). Other studies have reported the importance of recommending the benefits of CRC screening to patients to improve uptake (Al Mutawah, 2018; Soyler, 2019; Carcaise-Edinboro, 2008; Alshammari, 2020), while some also recommend using reminder systems, personalized reminders, doctor validation, using relatives or friends with a history of cancer, television, and community education to increase

uptake of CRC screening (Hatamian, 2021; Healthy People, 2019; Kaminski, 2020; Xu, 2022). Focused community awareness programs and CRC prevention and screening policy development are recommended by other studies in developing countries such as Iran and Ethiopia (Alshammari, 2020; Hamza, 2021).

In South Africa, to address this awareness gap, CANSA, in collaboration with the CRC Society for SA, launched April 2021 a programme that aims to raise awareness of CRC; support those affected by CRC, educate the public about CRC signs and symptoms, educate about screening options and advocate for the national CRC screening policy (CANSA, 2017).

4.1 Strengths and Limitations

The study's strengths include that it is the first KAP study on CRC screening in South Africa, with over 50% response rate in each facility selected to participate. However, there are several weaknesses posed by our study design (cross-sectional descriptive study) that is time-bound, and the responses, especially knowledge, may change over time and could be affected by recall bias. Further, at the PHC level, no CRC screening is currently taking place, hence it was expected that most of the participants had poor knowledge and the findings can be generalized noting the lack of national screening guidelines at this level of care.

Nonetheless, the National Department of Health based on the NCCF is considering targeted CRC screening, at this level to ensure early detection and appropriate referral to tertiary institutions. Hence, KAP study was conducted to inform planning.

Even though the questionnaires were self-administered, the likelihood that the participants provided socially desirable answers may have the potential to create social desirability bias. Regardless, the instruments used have been validated in other countries and found to be reliable. Small sample size from selected public primary health care facilities (excluding hospitals) may have introduced selection bias, limiting the study findings' generalizability to all HCWs in the country. A larger sample size with all healthcare facilities including hospitals targeted at both HCWs and patients may be considered in the future to determine the current KAP CRC screening status in South Africa. Further, lifestyles and behavioral information were not included. Hence, the influence of these variables on KAP could not be assessed.

Despite shortfalls, the study makes a significant contribution to CRC screening knowledge, attitude, and practices and points towards specific interventions that can be considered at the primary health care level in support of CRC screening in South Africa and similar countries with similar health services platforms.

5. Conclusion and Recommendations

The study highlights severe gaps in knowledge, affecting attitudes and practices relating to CRC screening in South Africa. Both personal, facility and health systems factors also need to be considered to effectively respond comprehensively.

Hence, it is recommended that CRC screening be added as part of NCPF, and that screening be integrated with other cancer screening practices, such as cervical, prostate, and breast cancer, to ensure adequate coverage to control morbidity and reduce mortality.

Training programmes are developed targeted at various HCWs that consist of CRC epidemiology, types of CRC, CRC tests and how they work, eligibility criteria for screening, and provide job aids to assist with risk assessment based on critical risk factors for South Africa that can be used during the clinical consultation. Additionally, mentorship after training must also be considered with a focus on motivational counseling to assist HCWs in promoting CRC screening. It can also include a roving oncologist support visit, conducted monthly, from a regional hospital to the PHC level to provide on-site education, assessment, and screening practices; provision of and orientation on CRC-related guidelines and role clarity for each cadre of HCWs on CRC screening continuum and referral pathways from primary health care level).

To drive demand, a risk-stratified targeted social marketing campaign must be developed and implemented. To expand coverage and address inequities, the screening services may be offered at various service platforms and programme entry points within the district health care system, including PHC, CHC, district hospital, and mobile services.

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Authors Contribution

Conceptualisation SM GVH MH; methodology – SM, MH, GVH; analysis SM, GVH, MH writing review and editing SM, GVH, MH.

Data Availability Statement

The data is available in full from the referenced source documents of this systematic review.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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