# Knowledge, Attitude and Practice of Primary Care Physicians Regarding Colon Cancer in Abha City, Saudi Arabia

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## Abstract

Aim of Study: To assess primary care physicians' knowledge and practices regarding screening for colorectal cancer (CC) in Abha City.

Methodology: Following a cross-sectional design, this study was conducted at primary health care (PHC) centers in Abha City. It included 104 PHC physicians. The data collection sheet included sociodemographic data of participants and a modified form of the National Survey of Primary Care Physicians' Cancer Screening Recommendations and Practices, Colorectal and Lung Cancer Screening Questionnaire.

Results: Fecal occult blood test (FOBT) was the CC screening test most commonly recommended (76%). Cost of screening test is the most influential regarding PHC physicians' recommendations for CC screening (100%). Two-thirds of participants had poor knowledge grade regarding CC screening. The most frequently discussed CC screening test is fecal occult blood test (48.1%). The most frequently recommended test was colonoscopy alone (21.2%) or with FOBT (17.3%). The most frequently practiced item related to CC screening was provision of more than one test option for CC screening (69.2%). Most PHC physicians (81%) had poor practice grade regarding CC screening. Their knowledge grades regarding CC screening were significantly better among female physicians ($p<0.001$), and those with more experience in PHC ($p=0.009$). Practice grades were significantly better among males ($p<0.001$), those with more experience in PHC ($p=0.018$), and those who attended continuing medical education (CME) on cancer screening ($p=0.008$).

Conclusions: About two-thirds of them have poor knowledge grade regarding colorectal screening. FOBT is the CC screening test most commonly discussed and recommended by PHC physicians. Cost of screening test is the most influential regarding PHC physicians' recommendations for colorectal cancer screening. Practice grades are significantly better among those with more experience in PHC and among those who attended CME on cancer screening.

Recommendations: Provision of CME sessions to PHC physicians, with special emphasis on methods of screening for early detection of CC. The establishment of fully electronic medical records system at PHC centers. Fully subsidizing and financially supporting screening for CC.

Key words: Colon cancer; Primary care physicians, Knowledge, attitude, practice.

## Introduction

Colorectal cancer is a term used to refer to malignant cells that develop in the tissues of the colon or the rectum (1). It is the third most common malignancy in the world and the second leading cause of cancer-related death in the United States (2). The highest colorectal cancer rates are observed in North America, Oceania, and Europe where colorectal cancer risk factors (obesity, diabetes, poor diet, physical inactivity, and smoking) are associated with Western culture (3).

Most colon cancers are adenocarcinomas that begin in cells which release mucus and other fluids. Symptoms of colorectal cancer depend on the lesion's location, type, extent and complications, and may include: fatigue and weakness, a change in bowel habit (altering constipation and increased stool frequency), stool streaked or mixed with blood and discomfort or pain in the lower abdomen (1).

Al-Ahwal et al. (4) noted that, despite its relatively low incidence, colorectal cancer is the second most common cancer in Saudi Arabia, ranking first among men (10.6%) and third among women (8.9%).

The Saudi Cancer Registry (5) reported that in 2013, there were 1,387 cases of colorectal cancer, accounting for 11.9% of all newly diagnosed cases, with a male to female ratio of 113:100. The five regions with the highest age-standardized incidence rate for males were in Eastern region at 17.6/100,000, Riyadh at 17.1/100,000, Aseer at 11.4/100,000, Tabuk at 10.5/100,000, and Madinah at 10.3/100,000. In females, the highest age-standardized incidence rates were in Riyadh region at 15.3/100,000, Eastern region at 13.1/100,000 then Makkah at 9.3/100,000, Aseer at 9.0/100,000 and Madinah at 8.9/100,000. The median age at diagnosis was 60 years among males (range between 13 and 98 years) and 56 years among females (range between 12 and 109 years).

Death rate from colorectal cancer in Saudi Arabia is 8.3%. An increase in colorectal cancer incidence occurred between 2001 and 2006, and almost doubled between 1994 and 2003 (6). Moreover, compared with Western countries, Saudi patients are more likely to present at a more advanced stage (7) and at a younger age (8).

Despite the great advances in medical diagnostics, cancer is often detected at advanced and late stages. The main reason for that is the limited understanding of the early symptoms that cancer patients present with in primary care (9-10).

There is growing evidence that screening or early detection of asymptomatic cancer results in a better prognosis for the patient. Not only does this mean a higher chance of being cured, but also less need for toxic treatments, fewer side effects, better quality of life and health–economic-related benefits (11-13).

More than two-thirds of all cancers are diagnosed in primary care (14-15). A general practitioner usually diagnoses the most common cancers (16). Patterns of increasing consultations before cancer diagnosis have been reported from primary care (17).

The professional challenge of general practitioners is to identify the relatively few cancer patients from among the many patients with symptoms that are mostly the same for benign diseases as well as for cancer. Cancer symptoms can present as alarm symptoms, such as a tumor or bleeding (18). Cancer can also present with unspecific symptoms, and it is the general practitioner's task to determine if cancer is an underlying cause (19).

Despite its relatively low incidence, colorectal cancer is the second most common cancer in Saudi Arabia (4), with Aseer Region as one of the highest in the Kingdom of Saudi Arabia with the highest age-standardized incidence rate (5).

Due to the insufficient knowledge of primary care physicians about early symptoms and other clinical signs of cancer colon, it is frequently detected at advanced and late stages (20).

**Aim of Study**

To assess primary care physicians' knowledge and practices regarding screening for colorectal cancer in Abha City in 2019.

## Subjects and Methods

This study followed a cross-sectional research design at primary health care centers in Abha City. The target population for this study included all primary health care physicians at primary care centers in Abha City. The researcher planned to include all primary care physicians in this study (N=108 PHC physicians) (21).

In addition to sociodemographic data of primary health care physicians, data were collected using a modified form of the structured questionnaire of the National Survey of Primary Care Physicians' Cancer Screening Recommendations and Practices, Colorectal and Lung Cancer Screening Questionnaire (22).

The researchers met all primary care physicians at their primary care centers, using the study questionnaire (N=108). A total of 104 PHC physicians responded, with a response rate of 96.3%.

The personal consent of all potential participants was requested prior to pretesting. All participants were clearly informed that their participation in this study was completely optional. The wish of any primary health care physician not to participate was fully respected. Collected data were kept strictly confidential and used only for research purposes. All the necessary official permissions were fully secured before data collection. This study was completely self-funded by the researchers.

The Statistical Package for Social Sciences (SPSS ver 22.0) was used for data entry and analysis. Descriptive statistics were calculated and the appropriate tests of significance (e.g., $X^2$) were applied accordingly. A statistically significant difference was considered if p-values were less than 0.05.

## Results

Table (1) shows that almost half of participants (49%) were aged 30-35 years, while 27.9% were <30 years old, and 23.1% were >35 years old. About two thirds of participants were males (65.4%). Most participants (62.5%) were MBBS qualified, while 16.3% had Master Degree and 21.2% were MD/Fellowship qualified. Most participants (67.3%) had <5 years' experience in primary care. Only 13 participants (12.5%) attended continuing medical education on cancer screening. About two thirds of primary care centers of participants (65.4%) had 6-16 physicians, while 23.1% had <6 physicians and 11.5% had >15 physicians. Most primary care centers of participants (87.5%) had at least two nurse practitioners, while 3.8% had one nurse practitioner and 8.7% had no nurse practitioners. The medical record system of most primary care centers (88.5%) were paper charts, while 11.5% were partial electronic medical records.

Table (2) shows that the fecal occult blood test (FOBT) is the colorectal cancer screening test most commonly recommended by primary care physicians (76%), followed by colonoscopy (75%) and flexible sigmoidoscopy (69.2%). On the other hand, the least recommended screening tests were double contrast barium enema (7.7%), virtual colonoscopy (6.7%) and fecal DNA testing (2.9%).

Table (3) shows that most participant primary care physicians were knowledgeable regarding the starting age for colorectal cancer screening by FOBT, flexible sigmoidoscopy and colonoscopy (92.3%, 93.3% and 92.3%, respectively). However, they were less knowledgeable regarding frequency of testing and age after which testing is not recommended. On the other hand, primary care physicians were least knowledgeable regarding colorectal cancer screening using double contrast barium enema, virtual colonoscopy and fecal DNA testing.

Table (4) shows that almost all participant primary care physicians were knowledgeable regarding colorectal cancer screening of 50-year olds or 65-year olds. However, they had lower knowledge regarding colorectal cancer screening of those 80-years old.

Table (5) shows that the cost of screening test is the most influential regarding primary care physicians' recommendations for colorectal cancer screening (100%), followed by clinical evidence in published literature (89.4%). On the other hand, the least influential factors were cancer screening guidelines (13.5%), and availability of reimbursement by third party payers (29.8%).

Figure (1) shows that about two-thirds of participant primary care physicians had poor knowledge grade regarding colorectal cancer screening.

Table (6) shows that the most frequently discussed colorectal cancer screening test is fecal occult blood test (48.1%), followed by colonoscopy (36.5%) and sigmoidoscopy (17.3%). On the other hand, the most frequently recommended test(s) are colonoscopy alone (21.2%) or with FOBT (17.3%). However, almost half of primary care physicians (46.1%) do not recommend screening tests.

Table (7) shows that the most frequently practiced items related to colorectal cancer screening were: Provision of more than one test option for colorectal cancer screening (69.2%), Referring patients to another provider for screening sigmoidoscopy (42.3%) and Conducting FOBT for screening purposes (35.6%). On the other hand, the least conducted items were implementing guidelines of colorectal cancer screening (19.2%), referring patients for virtual colonoscopy (19.2%), referring patients for double contrast barium enema (17.3%), attending screening by sigmoidoscopy (14.4%) or ordering colorectal cancer screening with fecal DNA (3.8%).

Figure (2) shows that most participant primary care physicians (81%) had poor practice grade regarding colorectal cancer screening.

Table (8) shows that participants' knowledge grades regarding colorectal cancer screening were significantly better among female physicians (p<0.001). Knowledge grades were significantly better among those with more experience in primary care (p=0.009). However, participants' knowledge grades regarding colorectal cancer screening did not differ significantly according to their age group, qualification or attending continuing medical education on cancer screening.

Table (9) shows that participants' knowledge grades regarding colorectal cancer screening were least among those at PHC centers with <6 physicians (p<0.001). Similarly, participants' knowledge grades were least among those at PHC centers with no nurse practitioners (p=0.021). However, their knowledge grades did not differ significantly according to the records system at the PHC center.

Table (10) shows that participants' practice grades regarding colorectal cancer screening were significantly better among male physicians (p<0.001). Practice grades were significantly better among those with more experience in primary care (p=0.018) and among those who attended CME on cancer screening (p=0.008). However, practice grades did not differ significantly according to their age group, or qualification.

Table (11) shows that participants' practice grades regarding colorectal cancer screening were least among those at PHC centers with >15 physicians (p=0.010). Moreover, their practice grades were less among physicians with paper charts medical records systems at their PHC centers. However, participants' practice grades did not differ significantly according to number of nurse practitioners at PHC center.

**Table 1: Personal characteristics of participant primary care physicians**

| Personal characteristics | No. | % |
|---|---|---|
| Age groups | | |
| • <30 years | 29 | 27.9 |
| • 30-35 years | 51 | 49.0 |
| • >35 years | 24 | 23.1 |
| Gender | | |
| • Male | 68 | 65.4 |
| • Female | 36 | 34.6 |
| Qualification | | |
| • MBBS | 65 | 62.5 |
| • Master | 17 | 16.3 |
| • MD/Fellowship | 22 | 21.2 |
| Experience in primary care | | |
| • <5 years | 70 | 67.3 |
| • ≥5 years | 34 | 32.7 |
| Attending CME on cancer screening | | |
| • Yes | 13 | 12.5 |
| • No | 91 | 87.5 |
| No. of physicians at PHC center | | |
| • <6 | 24 | 23.1 |
| • 6-15 | 68 | 65.4 |
| • >15 | 12 | 11.5 |
| No. of nurse practitioners at PHC center | | |
| • 0 | 9 | 8.7 |
| • 1 | 4 | 3.8 |
| • 2+ | 91 | 87.5 |
| Type of medical record system at PHC center | | |
| • Paper charts | 92 | 88.5 |
| • Partial electronic medical records | 12 | 11.5 |

**Table 2: Colorectal cancer screening tests commonly recommended by primary care physicians**

| Recommended screening test | No. | % |
|---|---|---|
| Fecal occult blood test (FOBT) | 79 | 76.0 |
| Colonoscopy | 78 | 75.0 |
| Flexible sigmoidoscopy | 72 | 69.2 |
| Double contrast barium enema | 8 | 7.7 |
| Virtual colonoscopy | 7 | 6.7 |
| Fecal DNA testing | 3 | 2.9 |

**Table 3: Participants' correct responses regarding their recommendations to asymptomatic, average-risk patients (in good health for their age) for colorectal screening**

| Colorectal cancer screening items | No. | % |
|---|---|---|
| Fecal occult blood test (FOBT) | | |
| • Starting age | 96 | 92.3 |
| • Frequency of testing | 64 | 61.5 |
| • Age after which testing is not recommended | 11 | 10.6 |
| Flexible sigmoidoscopy | | |
| • Starting age | 97 | 93.3 |
| • Frequency of testing | 59 | 56.7 |
| • Age after which testing is not recommended | 16 | 15.4 |
| Colonoscopy | | |
| • Starting age | 96 | 92.3 |
| • Frequency of testing | 65 | 62.5 |
| • Age after which testing is not recommended | 20 | 19.2 |
| Double contrast barium enema | | |
| • Starting age | 21 | 20.2 |
| • Frequency of testing | 6 | 5.8 |
| • Age after which testing is not recommended | 2 | 1.9 |
| Virtual colonoscopy | | |
| • Starting age | 19 | 18.3 |
| • Frequency of testing | 14 | 13.5 |
| • Age after which testing is not recommended | 2 | 1.9 |
| Fecal DNA testing | | |
| • Starting age | 17 | 16.3 |
| • Frequency of testing | 2 | 1.9 |
| • Age after which testing is not recommended | 2 | 1.9 |

**Table 4: Participants' correct responses regarding their recommended colorectal cancer screening test**

| Colorectal cancer screening items | No. | % |
|---|---|---|
| Healthy 50-year old | 102 | 98.1 |
| Healthy 65-year old | 103 | 99.0 |
| Healthy 80-year old | 60 | 57.7 |
| 50-year old treated for ischemic cardiomyopathy who experiences dyspnea with ordinary activity | 94 | 90.4 |
| 65-year old treated for ischemic cardiomyopathy who experiences dyspnea with ordinary activity | 101 | 97.1 |
| 80-year old treated for ischemic cardiomyopathy who experiences dyspnea with ordinary activity | 53 | 51.0 |
| 50-year old with unresectable non-small cell lung cancer | 104 | 100.0 |
| 65-year old with unresectable non-small cell lung cancer | 87 | 83.7 |
| 80-year old with unresectable non-small cell lung cancer | 39 | 37.5 |

**Table 5: Participants' responses regarding to what extent different factors are influential in their recommendations for colorectal cancer screening**

| Influencing Factors | No. | % |
|---|---|---|
| Cost of screening tests for patients with no third-party coverage | 104 | 100.0 |
| Clinical evidence in published literature | 93 | 89.4 |
| U.S. Preventive Services Task Force recommendations | 69 | 66.3 |
| Availability of providers to whom patients can be referred for screening other than fecal occult blood test | 47 | 45.2 |
| Patients' preferences for colorectal cancer screening | 37 | 35.6 |
| How colleagues provide colorectal cancer screening for their patients | 32 | 30.8 |
| Availability of reimbursement by third party payers | 31 | 29.8 |
| Cancer screening guidelines | 14 | 13.5 |

**Figure 1: Participant primary care physicians' knowledge grades regarding colorectal screening**

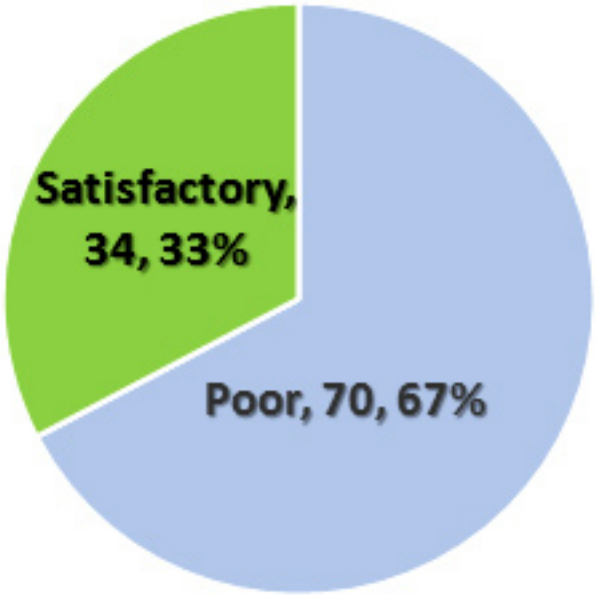


**Table 6: Participants' most frequently discussed and recommended colorectal cancer screening tests to their patients**

| Colorectal cancer screening Tests | No. | % |
|---|---|---|
| Most frequently discussed with patients | | |
| • Fecal occult blood test (FOBT) | 50 | 48.1 |
| • Colonoscopy | 38 | 36.5 |
| • Sigmoidoscopy | 16 | 15.4 |
| Most frequently recommended to patients | | |
| • Colonoscopy | 22 | 21.2 |
| • Fecal occult blood test (FOBT) | 8 | 7.7 |
| • Sigmoidoscopy | 2 | 1.9 |
| • FOBT + Colonoscopy | 18 | 17.3 |
| • FOBT + Sigmoidoscopy | 6 | 5.8 |
| • Nothing | 48 | 46.1 |

**Table 7: Primary care physicians' practices related to colorectal cancer screening**

| Practice items | No. | % |
|---|---|---|
| Provision of more than one test option for colorectal cancer screening to asymptomatic average-risk patients | 72 | 69.2 |
| Refer patients to another provider for screening sigmoidoscopy | 44 | 42.3 |
| Conducting FOBT for screening purposes | 37 | 35.6 |
| Implement guidelines of colorectal cancer screening | 20 | 19.2 |
| Refer patients for virtual colonoscopy | 20 | 19.2 |
| Refer patients for double contrast barium enema | 18 | 17.3 |
| Attend screening by sigmoidoscopy | 15 | 14.4 |
| Order colorectal cancer screening with fecal DNA testing for asymptomatic, average-risk patients | 4 | 3.8 |

**Figure 2: Participant primary care physicians' practice grades regarding colorectal cancer screening**
**Practice grades**

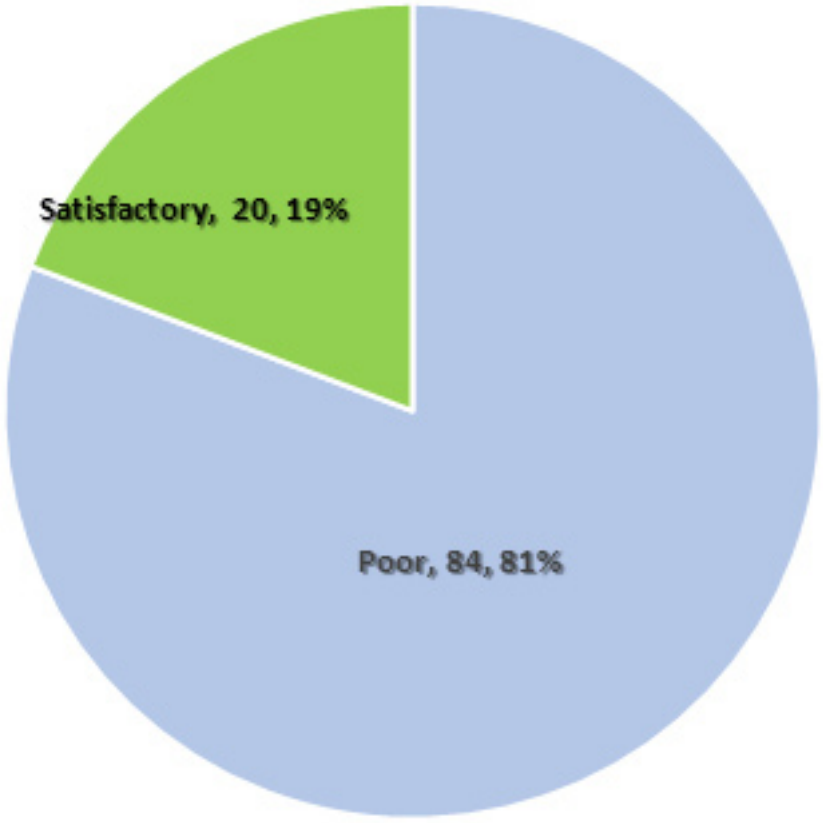

**Table 8: Participants' knowledge grades regarding colorectal cancer screening according to their personal characteristics**

| Personal characteristics | Poor | | Satisfactory | | P Value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Age groups | | | | | |
| • <30 years | 17 | 58.6 | 12 | 41.4 | |
| • 30-35 years | 32 | 62.7 | 19 | 37.3 | |
| • >35 years | 21 | 87.5 | 3 | 12.5 | 0.052 |
| Gender | | | | | |
| • Male | 55 | 80.9 | 13 | 19.1 | |
| • Female | 15 | 41.7 | 21 | 58.3 | <0.001 |
| Qualification | | | | | |
| • MBBS | 39 | 60.0 | 26 | 40.0 | |
| • Master | 14 | 82.4 | 3 | 17.6 | |
| • MD/Fellowship | 17 | 77.3 | 5 | 22.7 | 0.115 |
| Experience in primary care | | | | | |
| • <5 years | 53 | 75.7 | 17 | 24.3 | |
| • ≥5 years | 17 | 50.0 | 17 | 50.0 | 0.009 |
| Attending CME on cancer screening | | | | | |
| • Yes | 10 | 76.9 | 3 | 23.1 | |
| • No | 60 | 65.9 | 31 | 34.1 | 0.429 |

**Table 9: Participants' knowledge grades regarding colorectal cancer screening according to their primary health care center characteristics**

| PHC center characteristics | Poor | | Satisfactory | | P Value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| No. of physicians at PHC center | | | | | |
| • <6 | 24 | 100.0 | 0 | 0.0 | |
| • 6-15 | 37 | 54.4 | 31 | 45.6 | |
| • >15 | 9 | 75.0 | 3 | 25.0 | <0.001 |
| No. of nurse practitioners at PHC center | | | | | |
| • 0 | 9 | 100.0 | 0 | 0.0 | |
| • 1 | 1 | 25.0 | 3 | 75.0 | |
| • 2+ | 60 | 65.9 | 31 | 34.1 | 0.021 |
| Type of records system at PHC center | | | | | |
| • Paper charts | 60 | 65.2 | 32 | 34.8 | |
| • Partial electronic medical records | 10 | 83.3 | 2 | 16.7 | 0.208 |

**Table 10: Participants' practice grades regarding colorectal cancer screening according to their personal characteristics**

| Personal characteristics | Poor | | Satisfactory | | P Value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Age groups | | | | | |
| • <30 years | 24 | 82.8 | 5 | 17.2 | |
| • 30-35 years | 42 | 82.4 | 9 | 17.6 | |
| • >35 years | 18 | 75.0 | 6 | 25.0 | 0.715 |
| Gender | | | | | |
| • Male | 48 | 70.6 | 20 | 29.4 | |
| • Female | 36 | 100.0 | 0 | 0.0 | <0.001 |
| Qualification | | | | | |
| • MBBS | 50 | 76.9 | 15 | 23.1 | |
| • Master | 15 | 88.2 | 2 | 11.8 | |
| • MD/Fellowship | 19 | 86.4 | 3 | 13.6 | 0.433 |
| Experience in primary care | | | | | |
| • <5 years | 61 | 87.1 | 9 | 12.9 | |
| • ≥5 years | 23 | 67.6 | 11 | 32.4 | 0.018 |
| Attending CME on cancer screening | | | | | |
| • Yes | 7 | 53.8 | 6 | 46.2 | |
| • No | 77 | 84.6 | 14 | 15.4 | 0.008 |

**Table 11: Participants' practice grades regarding colorectal cancer screening according to their primary health care center characteristics**

| PHC center characteristics | Poor | | Satisfactory | | P Value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| No. of physicians at PHC center | | | | | |
| • <6 | 22 | 91.7 | 2 | 8.3 | |
| • 6-15 | 56 | 82.4 | 12 | 17.6 | |
| • >15 | 6 | 50.0 | 6 | 50.0 | 0.010 |
| No. of nurse practitioners at PHC center | | | | | |
| • 0 | 9 | 100.0 | 0 | 0.0 | |
| • 1 | 3 | 75.0 | 1 | 25.0 | |
| • 2+ | 72 | 79.1 | 19 | 20.9 | 0.303 |
| Type of records system at PHC center | | | | | |
| • Paper charts | 84 | 91.3 | 8 | 8.7 | |
| • Partial electronic medical records | 0 | 0.0 | 12 | 100.0 | <0.001 |

## Discussion

In Saudi Arabia, cases of colorectal cancer usually present late, with metastasis and obstruction in percentages more than what is reported in western communities (23). Among cases diagnosed with cancer, colorectal cancer ranked the first among males and the third among females (24).

Several studies have been done in Saudi Arabia in regard to colorectal cancer, and all of them concluded and highlighted the importance of screening (7-8; 23; 25). Therefore, primary care physicians should play a key role in screening for early detection of colorectal cancer (26).

The present study aimed to assess primary care physicians' knowledge and practices regarding screening for colorectal cancer in Abha City.

The present study revealed that primary care physicians had poor knowledge grade regarding colorectal cancer screening. Their knowledge gaps were mainly related to colorectal cancer screening according to age, and health status of screened persons. Moreover, they were least knowledgeable regarding screening using double contrast barium enema, virtual colonoscopy and fecal DNA testing.

This finding is in accordance with those reported by several studies. In Nodora et al. (27) 51.7% of primary care physicians correctly reported the recommendations. In Tehran, Iran, Sabet et al. (28) showed that only 17.3% of general practitioners correctly mentioned the appropriate age for screening. In Jordan, Omran et al. (29) reported that 49% of primary care physicians had unsatisfactory knowledge about guidelines for colorectal cancer screening.

In Riyadh, Saudi Arabia, Demyati (23) found that most family physicians in National Guard Health Affairs consider colonoscopy to be the most effective screening test, followed by flexible sigmoidoscopy. Only one-third of family physicians found FOBT to be "very effective." In contrast, FOBT is the most used test followed by colonoscopy, which is similar to what Klabunde et al. (30) and Federici et al. (31) found. This might be due to more patients' acceptance or the availability of the FOBT in comparison to colonoscopy (23).

Sharma et al. (32) argued that despite aggressive continuing medical educational efforts, knowledge of primary care physicians about colorectal cancer screening is still less than optimal. There may also be uncertainty about the most appropriate screening and surveillance tests for particular categories of patients.

Results of this study indicated that most primary care physicians had poor practice grade regarding colorectal cancer screening. FOBT was the screening test most commonly discussed and recommended by primary care physicians, followed by colonoscopy and flexible sigmoidoscopy. The most frequently discussed screening test was FOBT, followed by colonoscopy and sigmoidoscopy. On the other hand, screening tests least recommended by primary care physicians were double contrast barium enema, virtual colonoscopy and fecal DNA testing.

These findings are in agreement with those reported by several studies. Thanapirom et al. (33) stated that only two-thirds of primary care physicians routinely recommend colorectal cancer screening to their asymptomatic average-risk patients. Moreover, they provide suboptimal standard in recommending colorectal cancer screening, e.g., recommending at the inappropriate age or recommending incorrect interval. They explained this finding by the poor distribution of screening guidelines and training programs by professional organizations.

In Malaysia, Norwati et al. (34) reported that only 20% of physicians had been doing colorectal cancer screening based on guidelines. In a survey conducted in Balearic Islands and in a part of the metropolitan area of Barcelona, Spain, Ramos et al. (26) reported that 68% of family physicians advised colorectal screening according to guidelines as the first-line. In a survey conducted in New Jersey, USA, Hudson et al. (35) reported that 82% of patients received recommended screening by their primary care physicians. In Chicago, USA, Brown et al. (36) reported that 87.9% of physicians believed colonoscopy was the best way of colorectal cancer screening, while only 24.6% agreed on stool examination as a screening method.

Although guidelines for effective screening have been published and widely endorsed, compliance remains a major problem, and the physicians' role is crucial (37-38).

Sharma et al. (32) noted that many primary care physicians are basically wrong in their choice of screening tests for colorectal cancer, and their decisions are frequently inappropriate. Kim et al. (39) noted that virtual colonoscopy is an accurate screening method for the detection of colorectal cancer in asymptomatic average-risk adults. It is a minimally invasive imaging examination of the entire colorectal and rectum and requires full cathartic bowel preparation and restricted diet similar to colonoscopy.

In Montreal, Canada, Sewitch et al. (40) reported that primary care physicians lack knowledge of periodicities of recommended screening modalities to screen average-risk individuals. Although 87.6% of physicians knew the correct periodicity for FOBT, only 40% knew it for other screening methods. Moreover, primary care physicians preferred FOBT and colonoscopy more than other screening modalities.

Shapiro et al. (41) reported that only half of the screen-eligible population in USA had either a colonoscopy or sigmoidoscopy. Wong et al. (42) stated that colonoscopy became the test of choice in the general population. However, colonoscopy is associated with an increased cost as it is more expensive than other screening modalities (43).

Cost of screening test in the present study was the most influential regarding physicians' recommendations for colorectal cancer screening, followed by clinical evidence in published literature.

Sharma et al. (32) noted that annual FOBT has the lowest potential effectiveness and is the least costly, whereas colonoscopy every 10 years has the greatest potential effectiveness, but is currently the most costly.

Rex et al. (44) stated that the major disadvantages of the fecal DNA test are a substantial decrease in specificity and the high cost relative to FOBT. The cost of the fecal DNA test is approximately $500-600, i.e., about 10 times the direct costs of annual FOBT. Moreover, there is a further increase in relative costs related to higher numbers of colonoscopies per test.

Practice grades of primary care physicians in the present study were significantly better among those who attended CME on cancer screening. Nevertheless, this study revealed that only 12.5% of participants attended a continuing medical education on cancer screening. Moreover, participants' practice grades were significantly better among those with more experience in primary care and among male physicians. On the other hand, practice grades were least among those at PHC centers with >15 physicians and also among physicians with paper medical records systems at their PHC centers, which was the most common medical records system at primary care centers in Abha City (88.5%).

Continuing medical education of physicians on colorectal cancer screening results in their increased performance (45-46). The low proportion of continuing medical education for primary care physicians in the field of cancer screening may reflect an unjustifiable lack of interest toward cancer prevention among primary care physicians. More training opportunities should be provided to primary care physicians so as to improve their knowledge and practice related to early cancer detection in general and cancer colon screening in particular. This is expected to be reflected on early cancer detection and better prognosis for cancer patients (26).

Thanapirom et al. (33) noted that primary care physicians should be knowledgeable about all available screening methods for colorectal cancer so that patients can be informed about their possible options and make better decisions. Moreover, the availability of electronic medical records system at primary care centers is expected to organize and facilitate screening for cancer of the colon. One of the advantages of electronic medical records system is the easy provision of reminders both to the physician and the patient for both screening and follow up of cases, since commonly reported reasons for non-participation in colorectal cancer screening include forgetting or not getting around to completing the screening test kit or being too busy (47-48).

In addition, the low practice grades among those at primary care centers with >15 physicians may be explained by the greater workload, and consequently more registered patients and more busy primary health care providers at big-sized primary care centers.

Nodora et al. (27) found that female physicians were more in line with the guidelines for cancer colon screening. Similarly, Jacob (1) reported that female primary care physicians were more likely to report compliance with screening guidelines. In contrast, findings of the present study showed that female physicians, who had significantly better knowledge grade than male physicians, had significantly lower practice grade. This may be explained by the fact that, Saudi Arabia is known by its highly conservative community, where more practice and training opportunities may be more readily available for males than females.

In conclusion, about two-thirds of PHC physicians have poor knowledge grade regarding colorectal screening. PHC physicians' knowledge grades regarding colorectal cancer screening are better among females, and those with more experience in PHC, but least among those at PHC centers with <6 physicians. FOBT is the colorectal cancer screening test most commonly discussed and recommended by PHC physicians, followed by colonoscopy and flexible sigmoidoscopy. Most PHC physicians have poor practice grade regarding colorectal cancer screening. Practice grades are significantly better among male physicians, among those with more experience in PHC and among those who attended CME on cancer screening, but least among those at PHC centers with >15 physicians.

- Based on findings of this study, it is recommended to provide CME sessions to PHC physicians, with special emphasis on methods of screening for early detection of colorectal cancer.
- To establish fully electronic medical records system at PHC centers.
- To fully subsidize and financially support screening for colorectal cancer.
- Provide health education to the public through mass media messages so as to raise their awareness regarding colorectal cancer and its early detection

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