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Predictive Value of Rectal Cancer Alarm Symptoms: Sudanese Population-Based Study

Samah Abdelhameed[1], Omer Elfaroug Salim[1], A. Albakre[1], Anas Elshafia M. Elsheikh[2], Mohammed A. Adam[1], Alaa A. Salih[1] and Nasser Alrashidi[3,*]

***Corresponding author:**
Nasser Alrashidi, M.D.
Department of Surgery
Unaizah College of Medicine and Medical Sciences, Qassim University
Buraydah P.O. Box 6688, Al-Qassim
Saudi Arabia
E-mail: nasser.alrashidi@ucm.edu.sa

[1]Faculty of Medicine, Soba University Hospital, Sudan
[2]Faculty of Medicine, Omdurman Islamic University, Sudan
[3]Department of Surgery, Unaizah College of Medicine and Medical Sciences, Qassim University, Buraydah P.O. Box 6688, Al-Qassim, Saudi Arabia

ABSTRACT

Background: Rectal cancer is the most frequent malignancy of the gastrointestinal tract. However, statistical data are scarce regarding colonic tumor prevalence, location, or racial distribution in Sudan. Therefore, the main objective of this study is to identify the pattern of rectal cancer in Sudanese patients and to evaluate the symptoms or combination of symptoms that have a more significant prediction of rectal cancer.
Methods: A descriptive cross-sectional hospital-based study with a total of 200 patients was confirmed to have rectal cancer in the period between December 2013 and February 2016.
Results: A total of 200 patients were included. The number of males was 113(56.3%), and the mean age of patients in this study was 48 (±6.7). Rectal bleeding was found in 91.5% of the patients (n=183). The mean duration of rectal bleeding before seeking medical advice was 12 months ± 4 months. Half of the patients had rectal bleeding mixed with stool, 50.3% (n=100). Tenesmus (difficulty to pass stool) was found in 60.8% (n=121), and mucus discharge was found in 72.4% (n =144). The rectal bleeding and change in bowel habits, when combined, were found in 80.9% (n=161) (P value=0.04). When mucous discharge is added, the percentage jumps to 82.6 % (P value=0.01). Patients who had palpable rectal tumors were 78.9% (n=157). The location of the tumor, rectum, 64.3% (n=128).
Conclusion: Rectal bleeding, blood mixed with stool, change in bowel habits, tenesmus, and mucus discharge were the most typical presenting symptoms for rectal cancer. The combination of these symptoms has a higher prediction for rectal cancer.
Key words: rectal cancer; Sudanese patients; prediction; symptomatology; rectal bleeding.

INTRODUCTION

Colorectal cancer (CRC) is seen more in developed countries with a Western culture, where it is a significant source of morbidity and mortality worldwide (1-2). The highest CRC incidence rates are seen in New Zealand and Australia, then in the Americas, Europe, and Eastern Asia (3-5). In 2018, it is anticipated that 1,096,000 new cases of colon cancer will be diagnosed, compared to 704,000 new cases of rectal cancer (6). These represent 1.8 million new cases of CRC collectively. In 10 of the 191 countries throughout the world, CRC is the

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most common cancer among men to be diagnosed (7). Although colon cancer represented 5.4% of all new cases in Sudan in 2018, it has gotten less attention despite being the fourth most prevalent cancer overall due to less available data about incidence, demographic, clinical, and pathological features (8-9). Due to its more significant burden, breast cancer has received the majority of government attention in the fight against cancer in our country's strategies. The disease stage at diagnosis has a significant impact on the CRC prognosis (10). For CRC patients with localized stage disease, the 5-year survival rate is 90%, while for those with distant metastases is 10% (11-12). Consequently, improvements in screening and treatment have contributed to a decrease in disease-related deaths among the global population (1,13). Many countries have developed cancer screening guidelines and fast-track endoscopy for patients with alarm symptoms suggestive of CRC, like rectal bleeding, weight loss, and change in bowel habits in those more than 40 years of age, to accelerate early diagnosis and improve survival rates (14-15). The range of symptoms experienced by patients with colonic tumors is broad, ranging from very healthy patients with minor symptoms to those in danger of fecal peritonitis and bowel obstruction, which can be fatal (16-17). All studies available locally addressed the symptoms and signs of colorectal cancer in general. Furthermore, there is no clear hospital-based or population-based rectal cancer registry in our country. Therefore, epidemiologic hospital-based studies are of imperative importance since they may assist in planning wide-scale population-based studies. In addition, such studies can provide better insight and awareness of the changing nature and symptoms of tumors and differentiate them from benign colorectal conditions as early as possible (11,18). GPs have difficulty distinguishing symptoms that need an urgent professional evaluation from those that do not, such as those that could indicate colorectal cancer or other benign illnesses (19). Although frequently nonspecific, lower gastrointestinal symptoms are widespread in the general population and general practice. The issue is made more difficult by infectious disease signs on our side of the globe. Therefore, the main objective of this study is to identify the pattern of rectal cancer in Sudanese patients and to evaluate the symptoms or combination of symptoms that have a more significant prediction of rectal cancer (20).

MATERIALS AND METHODS

This cross-sectional descriptive hospital-based study on predictive symptoms of rectal cancer was carried out at Soba University Hospital, which has a high-volume center for overseas patients and referred oncological patients to colorectal surgeons in Sudan. The data covers all patients with rectal cancer who attended Soba University Hospital between December 2013 and February 2016, all patients with a histologically confirmed diagnosis of rectal cancer, and all patients who were diagnosed with carcinoma rectum attended the referring clinic, endoscopy unit, and surgical ward between December 2013 and February 2016. In addition, the data includes patients with no precise established pathological diagnosis of rectal cancer, patients with rectal cancer but cannot respond to questions, and patients with other colonic tumors. To collect data, the questionnaire's Arabic version was translated from its original English version. Cronbach's alpha was used to evaluate internal consistency, and kappa statistics was used to determine test-retest reliability for each item between the first and final surveys. To be considered internally consistent, our questionnaire required a Cronbach's value of >0.7. The English version was then translated into Arabic by a specialist fluent in both languages. Finally, a second independent translator, unaware of the original English version, reverse-translated the Arabic version into English. The principal investigator compared the primary translator and the back-translated version of the questionnaire. Data regarding their presenting symptoms and signs (i.e., perianal pain, discharge, itching, swelling, abdominal pain, diarrhea, constipation, tenesmus, weight loss, and anorexia), bedside examination, endoscopy results, and histopathology investigation were also recorded. patients' demographic data (i.e., age and gender), as well as the clinical (i.e., rectal bleeding amount, duration, and color) and histopathological (i.e., location, distance of tumor from anus and histology) features were evaluated. Microsoft Excel (Microsoft Corporation, Redmond, WA) was used to record all of the responses that were collected accurately. The responses were then coded and imported into the IBM Statistical Package for Social Sciences, Version 23 (SPSS Inc., Chicago, IL, USA) for data analysis. An impartial bio-statistician conducted the data analysis. Categorical data were represented using descriptive statistics in the form of frequencies and percentages utilizing appropriate tables and figures. The association between categorical variables was tested using Pearson's chi-square, and a p-value of 0.05 was considered statistically significant.

RESULTS

In this study, a total of 200 patients were included. The number of males was 113(56.3%) and females 87(43.7%), with a ratio of male to female 1.3:1. The mean age of the patients was 48 (±6.7) with 6% less than 25 (n=12), see *table 1*, with the majority of patients found between the age group of 45 to 65 years 41.2% (n=82).

Rectal bleeding was found in 91.5% of the patients (n=183). The mean duration of rectal bleeding before seeking medical advice was 12 months ± 4 months. It was bright red in 64.8% (n=129) and melaena in 24.1% (n=48). The amount of bleeding was categorized; 36.7 (n=73) described their bleeding as moderate in amount, 28.6% was small (n=57), and 21.6% (n=43) was a significant amount.

In half of the patients with rectal bleeding, the bleeding was mixed with stool at 50.3% (n=100). In addition, 23.6% have related bleeding to stool but not mixed with it (n=47), and 15.1% had rectal bleeding not related to stool (n=30).

Perianal symptoms: perianal pain was found in 68.8 % of patients (n= 137). Mucus discharge was reported in 72.4% (n =144), and Perianal itching was found in 16.1% (n=32).

Change in bowel habits was found in 87.9% of the patients (n=175). Tenesmus was found in 60.8% (n=121). Constipation alone was found in 48.7% (n=97), diarrhea only in 27.1% (n=54), and alternating diarrhea with constipation was found in 14.1% (n=28). The sensation of incomplete evacuation was mentioned by 40.7% (n=81).

Table 1 - Demographic characteristics

	Variables	Patients (%)
Age	15-25	12 (6)
	26-35	34 (17.1)
	36-45	41 (20.6)
	46-55	46 (23.1)
	56-65	36 (18.1)
	>65	30 (15.1)
Gender	Male	113 (56.3)
	Female	87 (43.7)

The rectal bleeding and change in bowel habits, when combined, were found in 80.9% (n=161) with a P value of 0. 004, see *fig. 1*. When mucous discharge was combined with rectal bleeding and a change in bowel habits, the percentage increased to 82.6 % (P value=0.001), see *fig. 2*. Abdominal pain was found in 74.9% of the patients (n=149), and all the patients described it as lower quadrant pain. Anorexia was found in 58.8% (n=117), while weight loss in 68.3% (n=136).

The patients with a previous diagnosis (misdiagnosis) for the same symptoms were 40.7%. They were diagnosed with dysentery (n=81) and 27.1 % with irritable bowel syndrome (IBS) (n=57). Only 14.1% of the patients have a positive family history of colorectal cancer (n=28). Digital rectal examination was done for all patients by inspection; 20.1% had perianal swelling (n=40), and the patients had palpable rectal mass 78.9% (n=157). The location of the tumor was as follows: rectum 64.3% (n=128), rectosigmoid 10.6% (n=21), anorectum 9% (n=18), and only 4% at the anus (n=8), see *table 2*.

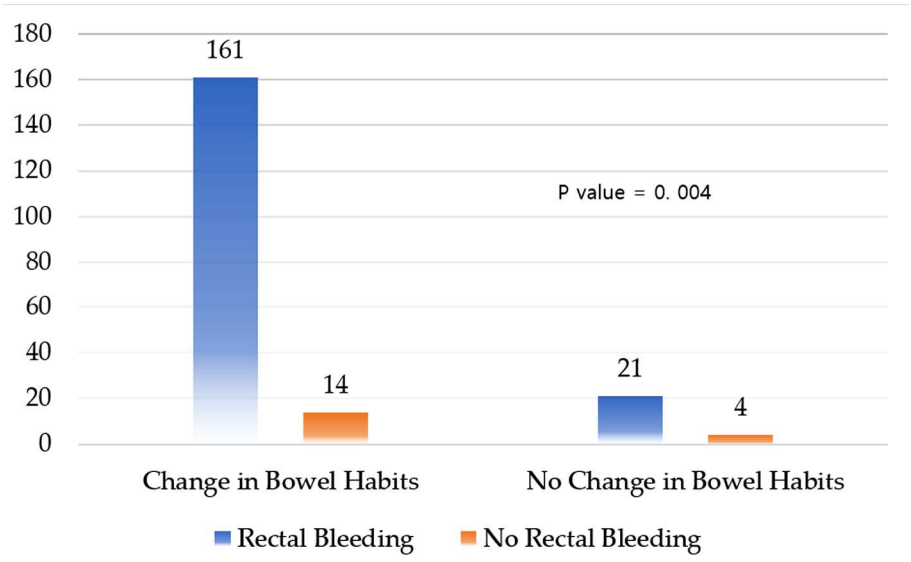
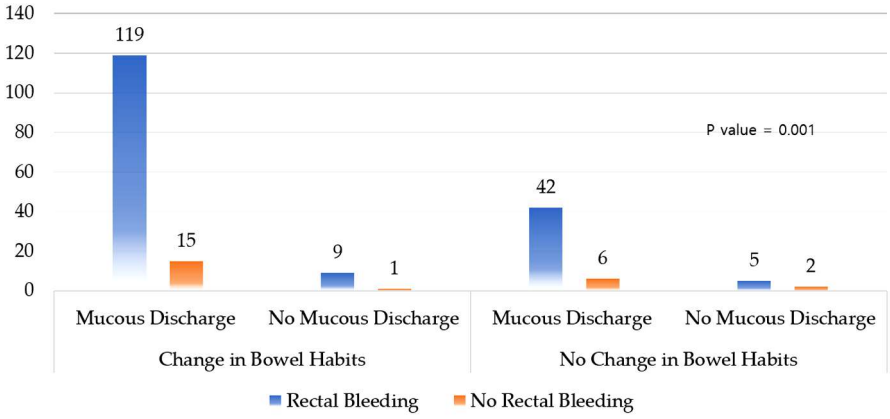


Figure 1 - Combined symptoms of rectal bleeding and change in bowel habits

Figure 2 - Combined symptoms of rectal bleeding, change in bowel habits, and mucous discharge



The digital rectal examination was done in all patients; the palpable tumor was found in 39.7% (n=79) up to 5 cm and more than 6 cm in 34.6% (n=69).

Table 2 - Clinical characteristics

Variables		Patients (%)
Rectal Bleeding		183 (91.5)
Duration (Year)		
	≤ 1	115 (62.8)
	1 >, ≤5	67 (36.6)
	5 >, ≤10	1 (0.6)
Amount		
	Large	43 (21.6)
	Moderate	73 (36.7)
	Small	57 (28.6)
Color		
	Bright red	129 (64.8)
	Melaena	48 (24.1)
Associated Symptoms		
Relation to Stool		
	Non	21 (10.6)
	Not related	30 (15.1)
	Mixed	100 (50.3)
	Related but not mixed	47 (23.6)
Perianal pain		137 (68.8)
Perianal discharge		144 (72.4)
Perianal swelling		40 (20.1)
Perianal itching		32 (16.1)
Change in bowel habits		175 (87.9)
Mainly diarrhea		54 (27.1)
Constipation		97 (48.7)
Alternating diarrhea		28 (14.1)
Tenesmus		121 (60.8)
Sensation of incomplete emptying		81 (40.7)
Abdominal pain		149 (74.9)
Anorexia		117 (58.8)
Weight loss		136 (68.3)
Dysentery		81 (40.7)
IBS		54 (27.1)
Family history of colorectal disease		28 (14.1)

Regarding the histopathology subtypes of cells, the result was as follows: well-differentiated adenocarcinoma in 28.1% (n=56), moderately differentiated adenocarcinoma found in 45.7% (n=91), poorly differentiated adenocarcinoma 10.1% (n=20), the mucinous adenocarcinoma 13.1%(n=26), and only 3% had small cell carcinoma (n=6), see *table 3*.

DISCUSSION

Colorectal cancer in Sudan is a dilemma. Although most previously published local and even international papers address the symptoms of colorectal cancer as all one disease, few works of literature focus on the symptoms of rectal cancer as a separate entity (3,8). In this study, we addressed the symptoms that have a high prediction of rectal cancer and studied the combination of these symptoms. The main difficulties facing our study were collecting data regarding the details of the symptoms and their duration before

Table 3 - Histopathology characteristics

Variables		Patients (%)
Histology		
	Well	56 (28.1)
	Moderate	91 (45.7)
	Poor	20 (10.1)
	Mucinous	26 (13.1)
	Small Cell	6 (3)
Palpable rectal mass		157 (78.9)
Site of Tumor		
	Rectum	128 (64.3)
	Anus	8 (4)
	Anorectal	18 (9)
	Rectosigmoid	21 (10.6)
Distance of Tumor (cm)		
	≤ 5	79 (39.7)
	6>, ≤ 10	69 (34.7)
	>10	21 (10.6)

patients sought medical advice.

The total number of patients diagnosed with rectal cancer included in this study was 200 patients who attended Soba University Hospital in the last three years. This number of patients is considered significant when compared to a previous study done by Suliman et al. at the same hospital between 2004 and 2009. They reported 138 patients of colorectal cancer, 63.8% of them at the rectum (9). The increase in the number of patients is due to the establishment of a colorectal unit and team with a new development in the hospital theatre and the increase in the capacity of the refer clinic and endoscopy unit. The rise in number is also due to the increased number of patients referred from all over the country.

The male-to-female ratio is 1.3:1. It is similar to the previous two studies done by Mutaz et al. at Ibn Sina Hospital (Khartoum) (8) and Husam et al. at Wad Madni Hospital (Gazira state) (3). According to Wu et al., in 28 population-based central cancer registries around the world that included 134 724 cases of colorectal cancer, the male-to-female ratios increased over time as people became older, and the ratios of proximal-to-distal CRC also increased over time (21). A second study by Saltzstein and Behling, using data from the California Cancer Registry and 213 383 cases, reached the same conclusion (22-23). They also claim that the left-to-right shift is stronger in Whites than in other racial/ethnic groups.

The age group in this study was between 15 years and 70 years. The mean of this age group is 48±6.7, with 6% of the patients less than 25 (n=12). Most patients are between 46 to 65 years, 41.2% (n=82). Several studies searched the age distribution among colorectal patients. According to Svensson et al., who conducted an age-period-cohort survey of 32 981 and 32 812 cases, respectively, for men and women, the age distribution varies for subsites and between the genders. Women are more likely to get proximal colon cancers than men are to develop distal colon and rectal cancers (24-25).

In the Middle East, a study from Egypt done by Gado et al. concluded that CRC rates among individuals under the age of 40 are relatively higher than those reported in the West (26). Locally, Ahmed et al. at the University of Gazira studied the pattern of colorectal cancer in Gazira state and noted that Sudanese patients were shown to be more likely to develop colorectal cancer at younger ages, with a peak frequency occurring in the fifth and sixth decades (27).

The most typical symptom in this study was rectal bleeding, which is a common symptom of colorectal cancer in general. In this study, 91.5% (n=183) of the patients had rectal bleeding. We study the rectal bleeding characteristics and duration before attending primary care. The duration of rectal bleeding was 12 months ± 4 months, which is a relatively long period. The patients reported the bleeding was bright red in 64.8% and dark in color in 24.1%. The amount of bleeding was also studied and categorized as large, moderate, or small. 36.7% described it as moderate bleeding, 28.6% as small, and 21.6% as significant.

There was 50.3% of patients had blood mixed with stool, 23.1% related but not mixed, and 15.1% had bleeding not related. In Wad Medani Hospital in Gazira state, Ahmed et al. described rectal bleeding as the main presenting symptom in 97.2%, as in this study (27).

A study conducted in Edinburgh by Roma et al. about predicting the risk of CRC in patients with rectal bleeding studied 604 patients referred to an access sigmoidoscopy clinic. They found that 22 patients have CRC, and they reported that rectal bleeding has low prediction in the primary care population, but when the blood is mixed with stool, there is a significant prediction for CRC (28). They also stated that the bright red bleeding not mixed with stool has a lower prediction for CRC, mainly when the hemorrhoid is found, but did not eliminate it; cancer was present in 2% of patients with these symptoms (28). In addition, a large meta-analysis conducted by Jellema et al. about the value of symptoms and another diagnostic test for predicting CRC in primary care found rectal bleeding in 13 studies from 47 primary diagnostic studies (19). According to a comparison of those with positive test results to those with negative test results, individuals with rectal bleeding and/or patients who have blood mixed with their stool have a slightly increased risk of developing colorectal cancer than those without. Additionally, it was noted that people with dark blood have a noticeably higher risk than those with normal blood (29). The above literature supports our findings that half the patients with bleeding had mixed with stool.

The change in bowel habit was reported in 87.9%, tenesmus was found in 60.8% of the patients, constipation in 48.7%, diarrhea in 27.1%, alternating diarrhea with constipation in 14.1%, and feeling of incomplete evacuation in 40.7%. Muatz et al. studied the presentation in IbnSina Hospital, and they found that 90.5% of 63 patients have a change in bowel habits and address it as the first symptom, more than rectal bleeding (8), while Ahmed et al. reported that rectal bleeding is more common than the change in bowel habit. Jellema et al., in their meta-analysis of 47 papers, 18 indicated a

high risk of CRC in patients with a change in bowel habits. Tenesmus is the most common symptom of the change in bowel habits in our study. This is the same for Mutaz et al., who found 63.5% of the patients with tenesmus (8). Furthermore, Ahmed et al. reported tenesmus in 77.8% of patients with rectal cancer (27).

In this study, mucous discharge was found in 72.4%. The perianal symptoms were also addressed in detail in this study. Anorectal pain is found in 68.8%, while perianal itching in 16.1%. Mutaz et al. reported mucus discharge in 77.8% of patients (8). He also reported perianal pain in 42.9%. In addition, five studies reported by Jellema studied the perianal symptoms. They categorize it into perianal itching, anal protrusion, and anal eczema (perianal changes due to itching and infection). These have a lower risk for CRC alone, but when eczema is found, the risk is high. Although mucous discharge is a common and essential symptom of rectal cancer, they reported mucus discharge as an informative significant risk for CRC (29).

Abdominal pain was reported in 75% of the patients, and all have lower abdominal pain. Mutaz et al. reported abdominal pain in 54.0% of the patients (8). They include both the left and right colon. Jellema et al. claimed that abdominal pain has lower sensitivity and specificity for CRC (29).

We also include anorexia as a symptom of cancer in general. We found it in 58.8% of the patients. We reported it early in the course of the disease before they started the neoadjuvant treatment. Weight loss was found in 68.3% of the patients. Ahmed et al. reported it to 26% of their patients (27). Family history for CRC was found positive in 14.1% of the patients. Ahmed et al. found it positive in 11.1% of the patients (8). Li et al. studied CRC as three distinct entities and revealed that the familial types varied. The two main familial types of CRC, FAP and HNPCC, indicate a propensity for proximal and distal locations, respectively (30).

The few investigations in the evaluation by Jellema et al. that included data on family history produced inconsistent diagnostic performance (29). To conclusively demonstrate the diagnostic performance of family history in a symptomatic patient, a precise definition of "positive family history" that details the number, age, and severity of afflicted family members is required (29).

In this study, as most patients presented late during the disease, we asked them if they had any medical consultation before primary care. We found that 40.7% of the patients were diagnosed as having dysentery, and 27.1% had irritable bowel syndrome (IBS). In addition, Roma et al. reported that IBS has a lower risk of colorectal cancer (28), though the patients in our study may have missed diagnoses.

A digital rectal examination was done for all patients. Palpable mass was found in 78.9% of patients; 39.7% of the tumor was below 5 cm, and 34.7% was above 6 cm. This stated that about half of the tumors could be detected by examination. This is an important fact that warns the doctor at the primary care level about the crucial role of digital rectal examination for any patient with lower abdominal symptoms. In addition, regarding the tumor's location, the rectum was found in 64.3%, rectosigmoid in 10.6%, anorectal in 9%, and anus in 4%. Suliman et al. reported in their study that 63.8% of the CRC tumor at the rectum and rectosigmoid. *Figs. 3* and *4* display the tumor location through colonoscopy and radiology evaluation (31). Also, Mutaz et al. reported that 54.1% of tumors were found in the rectum. This all supports that rectal tumors are the most common tumors. However, Ahmed et al. found rectal tumors in 29.0% of the patients (8).

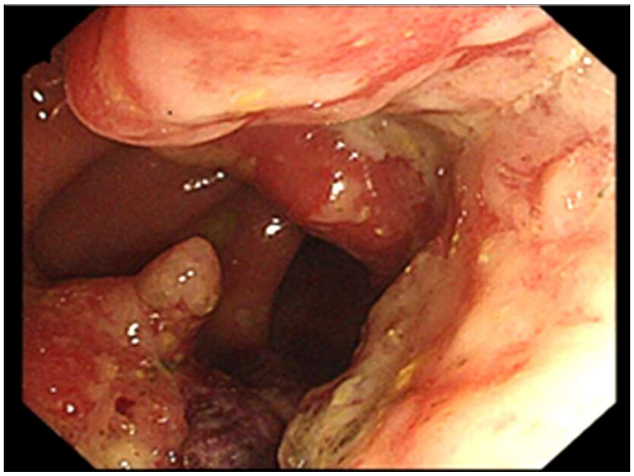


Figure 3 - The mass at rectosigmoid colon through colonoscopy (31)

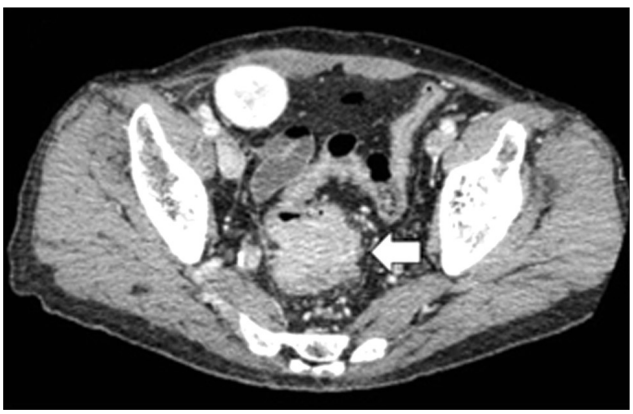


Figure 4 - The mass at the rectosigmoid colon through computerized tomography (31)

In addition, the most commonly diagnosed histopathology subtype is moderately differentiated adenocarcinoma at 45.7%, followed by well-differentiated adenocarcinoma at 28.1%, poorly differentiated adenocarcinoma at 10.1%, mucinous at 13.1%, and small cell in only 3%. Ahmed et al. found that well-differentiated adenocarcinoma is commonest (27).

In this study, we study the percentage of patients with combined symptoms. We found that of patients who had rectal bleeding, 92.0% of them had a change in bowel habits. The patients with two combined symptoms account for 80.9% of the total patients in the study (n=200). Roma et al. reported that the only symptoms connected to a higher risk of colorectal cancer were black blood, blood mixed with stool, or both of these (28). He also reported further that a mixture of dark blood and mixed blood with stool showed a higher positive likelihood for colorectal cancer. Roma et al. added further that alteration in bowel habits is another typical sign of colorectal cancer, but sensitivity and specificity are not high (28).

Several studies focused on patients diagnosed by their GP with rectal bleeding exhibit that the changes in bowel habits have been strongly linked to a diagnosis of colorectal cancer (28). In addition, Hamilton and Sharp concluded that rectal bleeding and changes in bowel habits have a substantial predictive value for colorectal cancer (29), (18). Thompson et al. also reported that when rectal bleeding is associated with a change in bowel habits, the probability of colorectal cancer rises from 6% to 12% (29).

In this study, we found that 93.1% of patients with a change in bowel habits and rectal bleeding had a mucous discharge. They account for 82.9% of the total (P values ‹0.005). According to Thompson et al., the probability rose to 20% when more details about perianal symptoms were gathered. However, the risk of colorectal cancer dropped from 6% to 1% when perianal symptoms were accompanied by rectal bleeding but not by a change in bowel habits.

Despite the limited diagnostic performance of individual signs and symptoms, Jellema et al. showed that because combinations of symptoms are frequent in primary care, they increase sensitivity at the expense of specificity. This also supports our results (29).

In conclusion, rectal bleeding is the primary symptom that colorectal cancer patients in Sudan most frequently experience, particularly those who are between the ages of 45 and 65. Furthermore, due to the great variety of symptoms, colorectal cancer is frequently misdiagnosed. Therefore, it is recommended that all physicians be made more aware of the potential for rectal cancer in this age range. Furthermore, more investigation is required to establish a connection between rectal bleeding in young people and rectal cancer.

Conflicts of interest

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Rajan R, Clark DA. Current management of large bowel obstruction: a narrative review. Ann Laparosc Endosc Surg 2022;7:23.
2. Safiri S, Sepanlou SG, Ikuta KS, Bisignano C, Salimzadeh H, Delavari A et al. The global, regional, and national burden of colorectal cancer and its attributable risk factors in 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet Gastroenterol Hepatol. 2019;4(12):913-933.
3. Khougali HS, Albashir AA, Daffaalla HN, Salih M. Demographic and Clinicopathological Patterns of Colorectal Cancer at the National Cancer Institute, Sudan. Saudi J Med Med Sci. 2019; 7(3):146-150.
4. Chalya PL, Mchembe MD, Mabula JB, Rambau PF, Jaka H, Koy M, et al. Clinicopathological patterns and challenges of management of colorectal cancer in a resource-limited setting: a Tanzanian experience. World J Surg Oncol. 2013;11(88):1-9.
5. Coleman MP, Forman D, Bryant H, Butler J, Rachet B, Maringe C, et al. Cancer survival in Australia, Canada, Denmark, Norway, Sweden, and the UK, 1995-2007 (the International Cancer Benchmarking Partnership): an analysis of population-based cancer registry data. Lancet. 2011;377(9760):127-38.
6. Rawla P, Sunkara T, Barsouk A. Epidemiology of colorectal cancer: incidence, mortality, survival, and risk factors. Prz Gastroenterol. 2019;14(2):89-103.
7. Pramesh CS, Badwe RA, Bhoo-Pathy N, Booth CM, Chinnaswamy G, Dare AJ, et al. Priorities for cancer research in low- and middle-income countries: a global perspective. Nat Med. 2022; 28(4):649-657.
8. Mohammed MM, Musaad A. elmagid M, Eltayeb E, elaziz MA. Colorectal carcinoma in Sudanese patients. Int J Med (Dubai). 2015; 3(2):98-102.
9. Abdelgadir Amin AA, Salim OE. Colorectal Cancer in Sudan; Clinicopathology and Surgical from (January 2014 to January 2019). Gezira Journal of Health Sciences. 2019;15(1):32-42.
10. Jarbøl DE, Hyldig N, Möller S, Wehberg S, Rasmussen S, Balasubramaniam K, et al. Can National Registries Contribute to Predict the Risk of Cancer? The Cancer Risk Assessment Model (CRAM). Cancers (Basel). 2022;14(15):3823.
11. Alghamdi AG, Almuhanna ZJA, Bu Hulayqah ZHM, Algharsan FAG, Alghamdi HA, Alzahrani HMA. Public Awareness of Colorectal Cancer Screening in the Al-Baha Region, Saudi Arabia, 2022. Cureus. 2022;14(12):e32386.
12. Booth R, Carten R, D'Souza N, Westwood M, Kleijnen J, Abulafi M. Role of the faecal immunochemical test in patients with risk-stratified suspected colorectal cancer symptoms: A systematic review and meta-analysis to inform the ACPGBI/BSG guidelines. Lancet Reg Health Eur. 2022;23:100518.
13. Weller D, Vedsted P, Rubin G, Walter FM, Emery J, Scott S, et al. The Aarhus statement: improving design and reporting of studies on early cancer diagnosis. Br J Cancer. 2012;106(7):1262-7.
14. Sandhu GS, Anders R, Blatchford P, Walde A, Leal A, King G, et al. High incidence of prolonged rectal bleeding and advanced stage cancer in early-onset colorectal cancer patients. Future Medicine. 2020;9(3):200–2005.
15. Pedersen AF, Hansen RP, Vedsted P. Patient delay in colorectal cancer patients: associations with rectal bleeding and thoughts

about cancer. PLoS One. 2013;8(7):e69700.
16. Lee JY, Choi S, Park S, Lee SU, Lee S, et al. Improvement of Cancer Bleeding in Rectal Cancer Patient with a Herbal Decoction, Inhyungtang: A Case Report. J Korean Medicine. 2014;35(4):116–122.
17. Koo MM, Swann R, McPhail S, Abel GA, Elliss-Brookes L, Rubin G P, et al. Presenting symptoms of cancer and stage at diagnosis: evidence from a cross-sectional, population-based study. Lancet Oncol. 2020;21(1):73-79.
18. Rasmussen S, Haastrup PF, Balasubramaniam K, Elnegaard S, dePont Christensen R, Storsveen MM, et al. Predictive values of colorectal cancer alarm symptoms in the general population: a nationwide cohort study. Br J Cancer. 2019;120(6):595-600.
19. Kidney E, Greenfield S, Berkman L, Dowswell G, Hamilton W, Wood S, et al. Cancer suspicion in general practice, urgent referral, and time to diagnosis: a population-based GP survey nested within a feasibility study using information technology to flag-up patients with symptoms of colorectal cancer. BJGP Open. 2017;1(3):1-12.
20. Granados-Romero JJ, Valderrama-Treviño AI, Contreras-Flores E H, Barrera-Mera B, Herrera Enríquez M, et al. Colorectal cancer: a review. Int J Res Med Sci. 2017;5 (11):4667.
21. Wu X, Chen VW, Correa CN, Martin J, Roffers S, Groves FD, et al. Subsite-specific colorectal cancer incidence rates and stage distributions among Asians and Pacific Islanders in the United States, 1995 to 1999. Cancer Epidemiol Biomarkers Prev. 2004; 13(7):1215-22.
22. Saltzstein SL, Behling CA. Age and time as factors in the left-to-right shift of the subsite of colorectal adenocarcinoma: a study of 213,383 cases from the California Cancer Registry. J Clin Gastroenterol. 2007;41(2):173-7.
23. Li FY, de Lai M. Colorectal cancer, one entity or three. J Zhejiang Univ Sci B. 2009;10(3):219-29.
24. Svensson E, Grotmol T, Hoff G, Langmark F, Norstein J, Tretli S. Trends in colorectal cancer incidence in Norway by gender and anatomic site: an age-period-cohort analysis. Eur J Cancer Prev. 2002;11(5):489-95.
25. Delattre O, Law DJ, Remvikos Y, Sastre X, Feinberg AP, Thomas G. Multiple genetic alterations in distal and proximal colorectal cancer. Lancet. 1989;2(8659):353-6.
26. Gado A, Ebeid B, Abdelmohsen A, Axon A. Colorectal cancer in Egypt is commoner in young people: Is this cause for alarm? Alexandria Journal of Medicine. 2014;50(3):197–201.
27. Taha MOA, Elrahman Abdalla AA, Mohamed RS. Pattern & presentation of colorectal cancer in central Sudan, a retrospective descriptive study, 2010-2012. Afr Health Sci. 2015;15(2): 576–580.
28. Robertson R, Campbell C, Weller DP, Elton R, Mant D, Primrose J, et al. Predicting colorectal cancer risk in patients with rectal bleeding. Br J Gen Pract. 2006;56(531):763-7.
29. Jellema P, van der Windt DAWM, Bruinvels DJ, Mallen CD, van Weyenberg SJ, Mulder CJ, et al. Value of symptoms and additional diagnostic tests for colorectal cancer in primary care: systematic review and meta-analysis. BMJ. 2010;340:c1269.
30. Li M, Li JY, Zhao AL, Gu J. Colorectal cancer or colon and rectal cancer? Clinicopathological comparison between colonic and rectal carcinomas. Oncology. 2007;73(1-2):52-7.
31. Fujinaga A, Akagi T, Etoh T, Tada K, Itai Y, Kono Y, et al. Laparoscopic two-stage operation for rectal cancer with refractory obstructive colitis after kidney transplantation: a case report. Surg Case Rep. 2020;6(1):33.