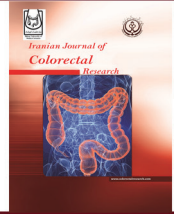


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Clinical and Epidemiological Profiles of Patients with Colorectal Cancer Diagnosed on Colonoscopy in Nigeria, a Retrospective Study

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Abstract

Background: Colorectal cancer (CRC) is the third most common cancer globally, and the second most common cause of cancer death. CRC incidence is increasing in Nigeria, while its national demographic data distribution is limited. We aimed to determine the frequency of CRC found on colonoscopies in various parts of Nigeria.

Methods: This was a retrospective study of all CRCs diagnosed in Nigeria between 2021 and 2023. Data obtained from endoscopy registers include patients' demographics, regional location, preparation, scope used, tumour location, and histology. A Google form was used for data collection from all contributors. The data was analysed using SPSS software, version 20, means and standard deviations were used to summarise continuous variables, while frequencies and percentages were used for categorical variables. Categorical variables were compared using chi-square or Fisher exact tests. P values less than 0.05 were considered significant.

Results: 2387 procedures were performed in 8 centers. Epsom salt with Dulcolax was the most commonly used cleansing agent with an average preparation score of 6.6. 322 (13.5%) patients had suspected colonic tumors. After censoring for missing data, 272 patients were analyzed. The mean±SD age was 56.3±15.5 years. 53.3% of the participants were women with a male-to-female ratio of 1:1.14. No significant difference was observed between sexes across the country regions (P=0.068). The most common indication was bleeding pre-rectum (38.24%) while screening colonoscopy was done only in 10 (3.8%). The most common tumor location was a recto-sigmoid colon (48.16%), while the most common tumor histology was adenocarcinoma.

Conclusion: Our study provides important data on the prevalence of colon cancer in Nigeria. The findings suggest bleeding per rectum as an important warning feature. This emphasizes the need for early detection via screening of average-risk individuals and prompt treatment of cases.

Keywords: Nigeria, Colonic neoplasms, Colonoscopy, Adenocarcinoma

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Introduction

Colorectal cancer (CRC) is the third most common cause of cancer-related morbidity and the second cause of oncogenic mortality globally (1-4). It was reported to have similar mortality and morbidity in the United States and Canada (4-6). However, it was described as the second cause of cancer-related morbidity and mortality in China (7). These figures are projected to rise significantly to more than twice the current ones, with an estimated respective increment in incidence and mortality of 2.2 million and 1.1 million by 2030 (4, 8), with a subsequent rise in incidence and mortality by 3.2 million and 1.6 million respectively by 2040 (8, 9). The age-standardized CRC global incidence in both sexes per 100,000 population was reported to be 19.8, with males and females having 23.4 and 16.2 respectively (10). Predominant occurrence of these new cases is projected in developing countries including Nigeria where late presentation predominates (8-10). CRC mostly affects individuals aged 50 or older, especially in developed nations (3, 10). Males are more affected than women with average age of occurrence of 68 and 72 years respectively (8, 10). However, CRC has been reported to be increasingly diagnosed in young adults before the age of 50, especially in developing nations, Nigeria inclusive (2, 3, 10).

The GLOBOCAN 2020 estimate of cancers in Africa ranked CRC the 5th commonest cancer in the region with a total incidence of about 66,198 and mortality of about 42,875. The respective age-standardized incidence and mortality rates per 100,000 population were 8.4, and 5.6, while its mortality to incidence ratio was 0.65 (11). Africa recorded 31,000 incidences, and 25,000 deaths from CRC in men, 27,000 incidences, and 23,000 deaths in women in the year 2019 (8). The average annual percentage increment in CRC morbidity and mortality was 4.4% from 2010 to 2019 in both sexes (8).

According to the 2019 global burden of disease in Africa, Nigeria was reported to have the highest CRC morbidity in the continent with an estimated incidence of 7,080 (8). Various local studies were done in many Nigerian centers with variable figures. A prevalence of CRC was reported in 16.2% and 20% of patients that had colonoscopy in Kano and Zaria respectively, (12, 13) while a study from two centers in Imo reported a prevalence of 16.4% among patients who underwent colonoscopy (14). Similarly, an audit of colonoscopy practice among nine colonoscopy centers in Lagos reported CRC and colonic polyp in 13.4% of their patients (15).

Despite its large global burden, CRC is largely preventable and treatable, especially when appropriate and timely facilities are in place (16). This may be attributed to the availability of various screening tools necessary for early detection of CRC (5, 10, 12, 13, 17-19). Colonoscopy reduces mortality from CRCs with odds ratio ranging from

0.43 to 0.69 (6, 20). The effect is more with screening colonoscopies than when patients are symptomatic, especially as cancers are picked up at earlier stages (19, 21). Consequently, death rates have been declining progressively since the 1980s in many high-income countries (22, 23). Unfortunately, the death toll from colorectal cancer in Africa, including Nigeria appears to be rising (11). Many reasons have been adduced for this, of note is poor cancer infrastructure as defined by low progress in CRC standard care diagnosis, treatment, and primary prevention of modifiable risk factors (8, 11, 12).

An important step to reducing the morbidity and mortality from colon cancer is to provide national data on the epidemiology and clinical profiles of CRC and highlight the status of available CRC screening modalities currently practiced in Nigeria. This will draw the attention of stakeholders to put more effort into preventive aspects of CRC in Nigeria.

The objectives of the study were to determine the frequency of CRC found on colonoscopies performed in various parts of Nigeria, and describe the demographic distribution and locations of such tumors within the colon.

Patients and Methods

Study Design

It was a retrospective cross-sectional study.

Study Locations

This study was conducted at eight centers performing colonoscopies across four geo-political zones of Nigeria from January 2021 to June 2023.

Study Population

All patients found to have endoscopic evidence of suspected tumor mass in the anal canal, rectum, and other parts of the colon from the 8 study centers were included in the study.

Eligibility Criteria

All patients with findings of suspected colorectal tumor (cancer and polyp) on colonoscopy during the period under review were included in the study. However, those patients with missing data were removed eventually during data analysis.

Definition of Terms

Adenoma Detection Rate (ADR): This connotes the percentage identification of at least one histologically confirmed adenoma or cancer in an average-risk asymptomatic patient presenting for the first time for screening colonoscopy (24, 25).

Caecal Intubation Rate: This defines the percentage ability to visualize the caecum by the colonoscopist or reach an anastomosis during colonoscopy (24, 25).

Boston Bowel Preparation Score (BBPS): BBPS was employed as the bowel cleansing monitoring

tool, it evaluates the three colonic segments while withdrawing the scope. Has a maximum score of three and a minimum score of one per segment. The overall total scores range from three to nine in a complete procedure (26).

Study Protocol

The study retrospectively examined the endoscopy records of patients diagnosed with suspected CRC from 8 different centers in Nigeria from January 2021 to June 2023 making about 30 months of studied data.

Qualified endoscopists were contacted personally via phone calls, emails, and other social media groups of professionals for the intention to participate in the study. Only those professionals that showed interest were eventually briefed about the details of the study.

A seventeen-question survey form was developed that included the patient's age, gender, and country region. Similarly, the bowel preparation agents used presentations, or indications for the procedure were recorded. The make of colonoscopes used, bowel preparation scores using BBPS, and lesions identified on colonoscopy were recorded accordingly. The site of the suspected tumor, caecal intubation, adenoma presence, biopsy taken, and histological findings were recorded as well. The survey instrument was pilot-tested for clarity and feasibility by distributing it to 4 independent clinicians.

All participants in this study consented to partake in this study before sharing the survey form.

The ethical approval was obtained from the Federal Teaching Hospital Katsina review board, the center where the lead investigator is domiciled with ethics code number FTHKTHREC. REG.24/06/22C/158. To ensure confidentiality of the information provided no identifying information was collected, password-protected and encrypted laptops were used for the study, and only research team members had access to the primary study data.

Statistical Analysis

The generated data was recorded on an Excel sheet 2013 (Microsoft Corporation, United States) and the data was cleaned for subsequent analysis. Using SPSS (International Business Machines Corporation,

United States) version 20, the generated data was analyzed accordingly.

Means and standard deviations were used to summarise continuous variables, while frequencies, percentages, and ratios were used for categorical variables. Categorical variables were compared using Chi-square or Fisher's exact tests. $P < 0.05$ was considered significant.

Results

In this study, 322 patients' records were captured from 2387 colonoscopies conducted over 30 months from eight different centers across the four geo-political zones of Nigeria. This made the overall prevalence of colonic tumor to be 13.5%. However, after censoring for missing information or incomplete entries, 272 patients' records were finally analyzed leaving 50 patients (15.3% of suspected cancer patients) with incomplete data. The net prevalence of CRC after excluding missing data was found to be 11.4%. Details of the analysis are shown as follows.

The mean \pm standard deviation (SD) age was 56.3 ± 15.5 years (range=4 to 95 years). There were more females among the subjects (53.3%) with M: F ratio of 1:1.14. No significant difference was observed when the patient's gender ($P=0.068$) and age ($P=0.354$) were compared with region of the country. Details socio-demographic attributes are shown in Table 1, while the relationship of patients' demography with regional location is shown in Table 2.

The most common presentations necessitating colonoscopy were bleeding per rectum (38.24%) and abdominal pain (13.24%). However, about 4% of study subjects have no clear indication stated. The least common presentations were suspected intestinal obstruction, anemia, melena, anal pain, fecal incontinence, and entero-cutaneous fistula which were all grouped as others shown in Figure 1. A Statistically significant difference was observed when the clinical indications for colonoscopy were compared across the country's four regions ($P=0.017$), see Table 3.

Only seven centers reported their bowel preparation scores, the mean bowel preparation score using the Boston scoring system was 6.6 (ranging from 5 to 8). Similarly, 3 centers had a record of fecal

Table 1: Age and regional distribution of subjects

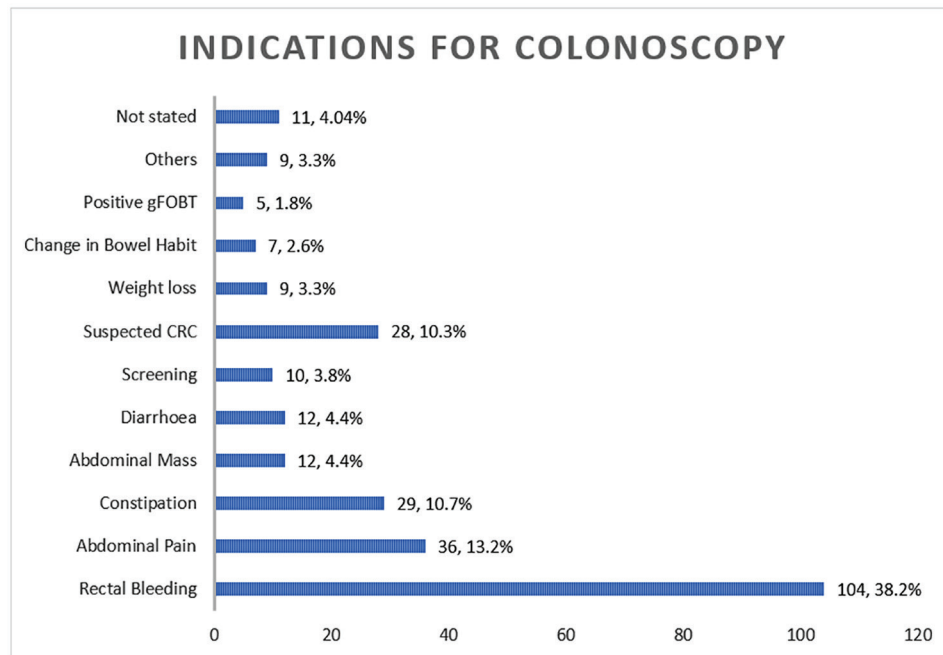
Attributes		Frequency	Percentage	
Age Groups (Years) N=271	<40	33	12.18	
	40-59	125	46.13	
	≥ 60	≥ 60	113	41.70
		<50	78	28.78
		≥ 50	193	71.22
Regional location N=272	North-Central	86	36.62	
	North-West	36	13.24	
	South-East	76	27.94	
	South-West	74	27.21	

There was one missing data.

Table 2: Relationships between Patients' Demography and Regional Location

Regional Location Versus Demography	Regional Location				P value	
	North W N (%)	North C N (%)	South East N (%)	South West N (%)		
Sex	Male N=127	21 (16.54)	47 (37.01)	31 (24.41)	28 (22.05)	0.068
	Female N=145	14 (9.66)	39 (26.9)	45 (31.03)	46 (31.72)	
Age Categories (In Years)	<40 N=33	8 (24.24)	10 (30.30)	7 (21.21)	8 (24.24)	0.497
	40-59 N=125	17 (13.6)	39 (31.2)	33 (26.40)	36 (28.80)	
	≥60 N=113	10 (8.85)	37 (32.74)	36 (31.86)	30 (26.55)	
Age Category (CRC Onset)	<50 N=78	15 (19.23)	23 (29.49)	19 (24.36)	21 (26.92)	0.354
	≥50 N=193	20 (10.36)	63 (32.64)	57 (29.53)	53 (27.46)	

North W: North-West, North C: North-Central. Statistical analyses were conducted using the Chi-square test. There was one missing data.

**Figure 1:** Indications for colonoscopy among study subjects**Table 3:** Relationships Between Indications for Colonoscopy and Regional Locations

Indications	Regional location				P value
	North-Central N (%)	North-West N (%)	South-East N (%)	South-West N (%)	
C B H	0 (0)	0 (0)	5 (71.4)	2 (28.6)	0.017*
A Mass	5 (41.7)	1 (8.3)	0 (0)	6 (50)	
A Pain	5 (13.9)	6 (16.7)	9 (25)	16 (44.4)	
Weight Loss	2 (22.2)	1 (11.1)	5 (55.6)	1 (11.1)	
Susp CRC	18 (64.3)	2 (7.1)	6 (21.4)	2 (7.1)	
Diarrhea	6 (50)	3 (25)	2 (16.7)	1 (8.3)	
PR Bleeding	34 (32.7)	12 (11.5)	28 (26.9)	30 (28.8)	
Constipation	5 (17.2)	8 (27.6)	6 (20.7)	10 (34.5)	
Screening	3 (30)	1 (10)	2 (20)	4 (40)	
FOBT ⁺	2 (40)	1 (20)	0 (0)	2 (40)	
Others	7 (77.8)	0 (0)	2 (22.2)	0 (0)	
Not Stated	1 (9.1)	0 (0)	10 (90.9)	0 (0)	

C B H: Change in Bowel Habit, A mass: Abdominal mass, A pain: Abdominal Pain, Susp. CRC: Suspected colorectal cancer, PR bleeding: Per rectal bleeding, FOBT⁺: Positive fecal occult blood test, * Statistically Significant according to the Fisher's exact test.

intubation rate with a mean percentage of about 94% (ranging from 87% to 98.1%). The adenoma detection rate (ADR) was only reported by 4 centers where screening procedures were well established. The mean ADR was about 17% (9.8% to 23%).

The most common bowel cleansing agents employed in preparation for colonoscopy were Epsom salt in combination with Dulcolax, while rectal washout/enema was the least utilized. Some agents were used as adjuvants in combination with polyethylene glycol

(PEG), Picolax, Coloprep, Epsom salt, and Castor Oil. These adjuvant agents include mannitol and Dulcolax in most cases. Details of various agents used for preparation are shown in Figure 2. There was a statistically significant difference in various bowel cleansing agents used in different regions of the country as shown in Table 4 ($P < 0.001$).

Out of the 272 total entries analyzed, 51 subjects (18.8% of suspected CRCs) were reported to have colonic polyps, while the remaining 221 (81.2% of suspected CRCs) subjects had recorded endoscopic findings of suspected cancers. Thus, the overall prevalence of colonic tumors (cancer and polyp) was 11.4%, while that of suspected CRC was 9.3% across all the study centers. The respective endoscopic regional prevalence of colonic tumors (cancer and polyp) was 11.3% in North-Central,

14.4% in the North-West, 16.96% in the South-East, and 7.1% in the South-West. Similarly, the respective regional prevalence of CRC on endoscopy was 8.83% in the North-Central, 6.7% in the South-West, 12% in the North-West, and 12.1% in the South-East. Recto-sigmoid colon is the modal location for CRC occurrences. Details of tumor location and nature are shown in Table 5, while the picture CRC seen on endoscopy is shown in Figure 3:

The histological specimens were mostly unavailable in some centers, however, of those analysed 59 (21.7%) were confirmed cases of adenocarcinoma (See Figure 4). Most confirmed cases were reported from the North-Western region with 93.3% of their suspected CRC cases being confirmed, making up about 47.5% of the total histology.

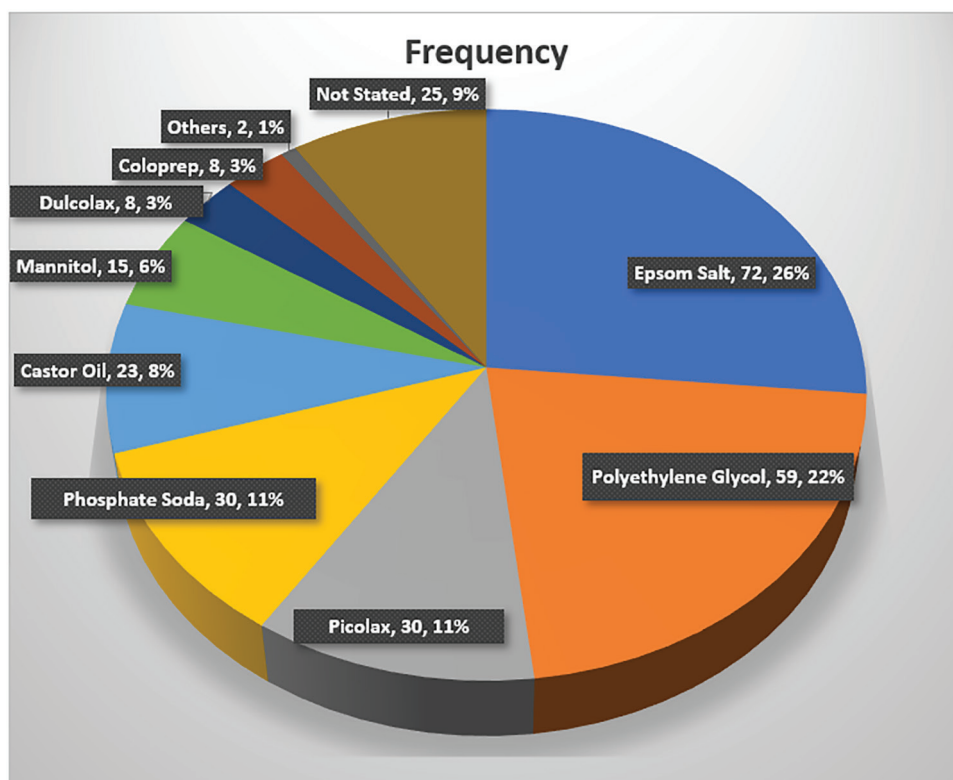


Figure 2: Bowel preparation agents used

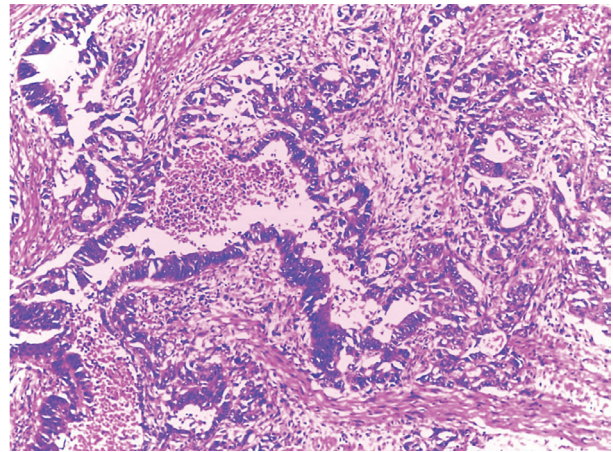
Table 4: Relationship Between Bowel Cleansing Agents and Regions of the Country

Cleansing Agents	Regional Location				P value
	North C N (%)	North W N (%)	South East N (%)	South West N (%)	
Bowel Cleansing Agent Used					<0.001*
Castor Oil	1 (4.35)	20 (86.96)	1 (4.35)	1 (4.35)	
Coloprep	7 (87.50)	0 (0)	1 (12.50)	0 (0)	
Dulcolax	7 (100)	0 (0)	0 (0)	0 (0)	
Epsom Salt	0 (0)	0 (0)	0 (0)	72 (100)	
Enema	0 (0)	1 (100)	0 (0)	0 (0)	
Mannitol	15 (100)	0 (0)	0 (0)	0 (0)	
Not Stated	1 (3.85)	1 (3.85)	24 (92.31)	0 (0)	
PEG	56 (94.92)	2 (3.39)	0 (0)	1 (1.70)	
PH	0 (0)	0 (0)	30 (100)	0 (0)	
Pic	0 (0)	11 (36.67)	19 (63.33)	0 (0)	

*Statistically significant according to the Fisher's exact test, North W: North-West, North C: North-Central, PEG: Polyethylene Glycol, PH: Phosphate Soda, Pic=Picolax

Table 5: Distribution and sites of the identified lesions

Attributes		Frequency (n=272)	Percentage (%)
Site of the lesions	Anorectum	40	14.71
	Recto-Sigmoid	131	48.16
	Descending colon	17	6.25
	Transverse colon	13	4.78
	Ascending colon	42	15.44
	Multiple sites	9	3.31
	Not stated	20	7.35
Nature of the lesions	Non-obstructing mass	168	61.76
	Obstructing mass	41	15.07
	Ulcerated lesion	12	4.41
	Polyps	51	18.75

**Figure 3:** An Original picture of endoscopic finding of suspected CRC**Figure 4:** Original photomicrograph showing infiltrating well-differentiated malignant glands within the muscular layer (H&E ×100)

Discussion

Despite Nigeria being the country with the highest burden of CRC in Africa based on a global report on cancers in 2019 (8), the actual national burden is still yet to be elucidated. Our research provided the prevalence and demographic attributes of patients with suspected CRC findings on colonoscopy in four geo-political zones of Nigeria. The mean±SD age of 56.3±15.5 years among our participants signifies that CRC is still commoner in people of more than 50 years of age as seen in developed communities (10, 17), though a sizable percentage fell below the age of 50 years (>28%). This may be related to the increased adoption of the Western lifestyle that predisposes to CRC in Nigeria. There were slightly more females than males in this study with a M: F ratio of 1:1.14. This is similar to the findings of Uchendu et al, (27) but differs from other studies in Nigeria where males predominate (1, 13, 15, 28).

The most common indication for colonoscopy among the studied subjects was rectal bleeding, with less than 5% of patients coming for screening colonoscopy. Rectal bleeding was similarly reported by many researchers as the prime reason for presenting for colonoscopy in Nigeria and beyond (1, 12, 14, 15, 29). The high rate of rectal bleeding as an indication for colonoscopy suggests late presentation of patients with CRC when symptoms

are more pronounced. The extremely low rate of screening colonoscopy poses a major health concern, leaving many Nigerians un-screened for CRC until symptoms develop. Our findings therefore should be an eye opener; hence, early detection and treatment of CRC should be promoted at all levels as an essential tool for improved CRC outcomes in Nigeria regardless of family history of colon cancer.

The overall recorded prevalence of CRC (9.3%) was lower than studies reported from Kano, Zaria, North-Western Nigeria (12, 13), and Imo South-Eastern Nigeria (14). However, an audit of 12 colonoscopy centers in Lagos, South-Western Nigeria reported a finding of polyps and colonic cancers similar to ours (15).

This study found that colon cancer is a significant public health problem in Nigeria, among patients who underwent colonoscopy. Recto-sigmoid colon was the most common tumor location with no statistically significant difference in tumor occurrence by such locations when stratified by age <50 or ≥50, and sex. This finding of recto-sigmoid as a modal tumor location corresponds to previous studies in some parts of Nigeria (1, 12, 28).

This study was not without some limitations. These include challenges with histological confirmation of lesions identified on colonoscopy or non-availability of the histology. Also, two of the six geo-political zones were not part of this study because of non-

responders from such zones. Moreover, the study only looked at colonic cancers seen on colonoscopy, so other cases diagnosed via other means were not captured in this study.

This calls for more robust inter-disciplinary collaborations comprising Gastroenterologists, Surgeons, Pathologists, and other stakeholders concerned with managing CRC to have an all-encompassing figure of this deadly but preventable cancer in our dear nation. There is a need for a national action plan on CRC through the federal government and professional groups such as the Society of Gastroenterology and Hepatology in Nigeria (SOGHIN). This will ensure an all-encompassing colorectal cancer registry, screening strategy, and treatment plan to provide an everlasting solution for this deadly preventable disease.

Conclusion

This study provides important data on the prevalence of CRC in Nigeria. The findings suggest that colon cancer is a significant public health problem in the country and bleeding per rectum is an important warning feature. This emphasizes the need for early detection via screening of average-risk individuals and prompt treatment of cases as an essential means of improving patients' outcomes. Deliberate efforts should therefore be made to avoid late presentation of the disease with its consequent higher morbidity and mortality.

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Authors' Contribution

All authors are guarantors and participated in the study design; all authors participated in data acquisition, while Musa Y, Davwar PM, and Okonkwo KC made the analysis, and interpretation of the data, and drafted the initial manuscript; all authors revised the article critically for important intellectual content. All authors approved the final version to be published and Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflict of interest: None declared.

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