

Colorectal Cancer: Knowledge, Attitude and Challenges among Port Harcourt Residents

Rex Friday Ogoronte Alderton Ijah¹, Sarah T. Aberu², Itekena E. Wakama³, Solomon Uchenna Obioha⁴

¹Senior Lecturer, Rivers State University / Honorary Consultant General Surgeon, Department of Surgery, Rivers State University Teaching Hospital, Port Harcourt, Nigeria.

²Senior Lecturer, Rivers State University / Honorary Consultant Gastroenterologist, Department of Internal Medicine, Rivers State University Teaching Hospital, Port Harcourt, Nigeria.

³Senior Lecturer, Rivers State University / Honorary Consultant General Surgeon, Department of Surgery, Rivers State University Teaching Hospital, Port Harcourt, Nigeria.

⁴Lecturer, Rivers State University / Honorary Consultant Anatomical Pathologist, Department of Anatomical Pathology, Rivers State University Teaching Hospital, Port Harcourt, Nigeria.

*Correspondence: Rex Friday Ogoronte Alderton Ijah

Received: 30 Mar 2024; Accepted: 19 Nov 2024; Published: 30 Dec 2024

Citation: Ijah RF, et al. Colorectal Cancer: Knowledge, Attitude and Challenges among Port Harcourt Residents. AJMCRR. 2024; 3(12): 1-12.

Abstract

Colorectal cancer (CRC) is the third most common cancer among men, and the second most common cancer among women. This study aimed at evaluating public knowledge and attitude to colorectal cancer, and the challenges encountered with screening services in Port Harcourt within the first half of the year 2022.

A cross-sectional analytical study was carried out among Port Harcourt City residents. Data was analysed with the Statistical Package for the Social Sciences (SPSS) version 23.0. There were 209 (47.0%) males and 236 (53.0%) female respondents, and the mean age was 31.74±10.8 years. Three hundred and sixty-three (81.6%) had not heard about CRC, and about two-third (above 60%) were unaware of the risk factors for CRC. Only about a third of respondents were aware of the symptoms of CRC, 360 (80.9%) had no knowledge of CRC screening, and 228 (51.2%) qualified respondents had not done screening. About 379 (85.2%) respondents were willing to undergo CRC screening if it was free. Four hundred and eleven (78.1%) had monthly income of less than 72 USD, and 398 (89.4%) had no health insurance coverage. CRC awareness was higher among female than male respondents, and this increases as age increases, and the relationship was statistically significant (gender: $p=0.042$; age: $p=0.006$).

Awareness of CRC, knowledge of risk factors, symptoms and screening for CRC were low. Half of respondents who were qualified had not done screening, and financial challenge was a significant constraint against compliance.

Keywords: Attitude, Colorectal Cancer, Knowledge, Challenges, Port Harcourt Residents, Nigeria.

Introduction

A report on the global burden of cancer worldwide, adapted from the international agency on cancer, described colorectal cancer as the third most common cancer among men, and the second most common cancer among women.[1, 2] Globally, the probability of occurrence of colorectal cancer is about 4 to 5%, and the mortality ranks fourth place among cancer-related deaths.[3] The causes of colorectal cancer can be sporadic, inherited and familial in origin, with inherited cancer accounting for 5% and the sporadic 70%.[3] Age from the fifth decade is reported to be the main risk factor followed by personal history of colorectal cancer, inflammatory bowel disease, Crohn's disease, and familial history of colorectal cancer.[4-7] Lifestyle-related risk factors have also been associated with colorectal cancer: sedentary lifestyle, obesity, tobacco smoking, and alcohol consumption;[8-12] and dietary factors such as consumption of red meat, low fiber diet, and alcohol (however, controversially) have also been found to be risk factors.[3, 13-15] Young adults in high-income countries in three continents have been reported to experience an increase in colorectal cancer incidence, implying a change in pattern.[16]

Screening and early diagnosis are some of the approaches deployed to combat this pathologic condition using fecal occult blood test, barium enema / double contrast barium enema, computed tomography, colonography, colonoscopy, biomarkers, and more recently capsule endoscopy / magnetically controlled capsule endoscope – NaviCam, etc.[3,

17, 18] Recommended in the Nigerian setting for asymptomatic average risk individuals are biennial screening with fecal immunochemical test (high-sensitivity gFecal Occult Blood Test), computerized colonography screening every 5 years, and colonoscopy every 10 years, achievable through organized outreaches and public awareness.[19] In a recent Western Nigeria study, the acceptability of use of fecal immunochemical screening among average-risk individuals was found to be very high, with detected positive test found among 432 individuals out of 2109 screened participants.[20] In this study, after subjecting those who had positive fecal immunochemical screening test to colonoscopy, 47 participants were found with polyps and colorectal cancer in three persons. In another study in Western Nigeria, although 6 out of 10 respondents had heard about colorectal cancer, low knowledge of the meaning and symptoms of colorectal cancer was reported.[21]

Some differences have been reported in the presentation, metastatic pattern, and outcomes of colorectal cancer seen among West Africans (Nigerians) and North Americans (New York City).[22] Although screening services for colorectal cancer in Nigeria is operational on a limited scale, it is largely undefined or a poorly quantified program implementation.[23] Screening for colorectal cancer through an opportunistic approach has been recommended for asymptomatic average-risk Nigerian patients aged 40 years and above (using sequential biennial FIT and endoscopic method).[19] Also, patients tests selection based on preference, afford-

ability, and availability was advocated as a way out into groups of similar socio-economic status; then in a resource-poor environment such as ours. How field officers were sent out with the study instrument to randomly collect data from willing residents within these strata over a three-month period from July to September 2022.

compliant are the actions and experiences of the public towards achieving this? What is the state of screening services in Port Harcourt and public compliance? This study was aimed at evaluating public knowledge and attitude to colorectal cancer, and the challenges encountered with screening services in Port Harcourt within the first half of the year 2022.

Materials and Methods

Research Design: A cross-sectional descriptive study was done

Study Area: The study area was Port Harcourt, the capital of Rivers State, in Southern Nigeria.

Study Sites: The study was carried out in public facilities (fast food eateries, state secretariat, universities, etc.).

Study Population: The study was carried out among residents of Port Harcourt City.

Sample Size Determination: The minimum sample size for the survey was determined using the formula developed by Yaro Yamen based on estimated population of Port Harcourt inhabitants taken to be 1,865,000 projected from 2006 census. $n = \frac{N}{1 + Ne^2}$ n = minimum sample size, N = Total population size and e = desired precision/level of significance, usually 5% (0.05) at 95% Confidence Interval (CI). Hence, we have $n = 399.9$ Approximately 400.

Sampling Method: The multistage sampling technique was used. Port Harcourt city was divided into four (4) strata using major landmarks - the East West Road and the Aba Road dividing population

Study Instrument: Semi-structured self-administered questionnaire was used

Study variables: Sociodemographic variables, Knowledge / awareness of colorectal cancer, attitude to colorectal cancer, and challenges to colorectal cancer screening and treatment.

Data Analysis: Though 500 questionnaires were administered, approximately 455 were retrieved. Information on knowledge/awareness on colorectal cancer, screening, and challenges encountered were collated. Data was analyzed with the Statistical Package for the Social Sciences (SPSS) version 23.0, using.

Validity/Reliability of Instrument: The study instrument was pre-tested in a similar environment before use. Obtained data was scrutinized by the authors before analysis. The Cronbach alpha (in SPSS) was used for the validity of the study instrument and a score of 0.927 was obtained.

Results

A total of 455 respondents were recruited in the study.

Table 1 shows the demographic characteristics of the respondents. There were 209 (47.0%) males and 236 (53.0%) female respondents. The mean age of the respondents was 31.74 ± 10.8 years, youngest was 15 years, and oldest was 85 years. Two hundred and forty-six (55.3%) were single and 196 (44.0%)

were married. Four hundred and thirty-nine (98.7%) respondents were Christians. Two hundred and forty-seven (55.5%) respondents attained tertiary education and 189 (42.5%) had completed secondary education. Only 86 (19.3%) work as professional, 216 (48.5%) were into business, 39 (8.8%) were artisan, 19 (4.3%) were working as supporting staff, and 82 (18.4%) were unemployed.

Variables	Number	Percentage
<i>Sex</i>		
Male	209	47.0
Female	236	53.0
<i>Age (mean=31.74±10.8 years, min= 15 years, max=85 years)</i>		
Less than 21 years	49	11.0
21 - 30 years	204	45.8
31 - 40 years	116	26.1
41 - 50 years	53	11.9
51 - 60	15	3.4
More than 60 years	8	1.8
<i>Marital Status</i>		
Single	246	55.3
Married	196	44.0
Separated/Divorced	3	0.7
<i>Educational qualification</i>		
Primary	9	2.0
Secondary	189	42.5
Tertiary	247	55.5
<i>Religion</i>		
Christianity	439	98.7
Islam	3	0.7
Traditional	3	0.7
<i>Place of employment</i>		
Civil service	30	6.7
Company (worker) service	70	15.7
Self employed	261	58.7
Political office	2	.4
Unemployed	82	18.4
<i>Type of work</i>		
Professionals (Medicine, Nursing, Finance, Legal service, etc)	86	19.3
Business (Manufacturing, Trading, transporting)	216	48.5
Artisan	39	8.8
Farmer	3	0.7
Unemployed	82	18.4
Supporting staff (Attendant, cleaner, Security etc)	19	4.3

Table 1: Socio-demographic characteristics of respondents ([n = 455](#))

Table 2 shows respondents' awareness on colorectal cancer. Three hundred and sixty-three (81.6%) had not heard about colorectal cancer. Three hundred and fifty-three (79.3%) respondents did not know what colorectal cancer is. However, 309 (69.4%) agreed that there is need for concern (to worry about) colorectal cancer. Two hundred and seventy-two (61.1%) respondents did not know the risk factors of colorectal cancer, while 42 (9.5%) were not sure. Three hundred and eighty-seven (87%) did not know any-

one who had suffered from colorectal cancer, while 8 (1.8%) respondents had suffered from colorectal cancer.

Variables	Number	Percentage
<i>Ever heard about Colorectal Cancer</i>		
Yes	82	18.4
No	363	81.6
<i>What colorectal cancer is</i>		
Cancer of the Colon	70	15.7
Colon and rectal cancer	10	2.2
Intestinal cancer	6	1.3
Cancer of the anus	6	1.3
Don't Know	353	79.3
<i>Need to worry about colorectal cancer</i>		
Yes	<u>309</u>	69.4
No	50	11.2
Not sure	86	19.3
<i>Knew risk factors of colorectal cancer</i>		
Yes	131	29.4
No	<u>272</u>	61.1
Not sure	42	9.5
<i>Know anyone who have suffered from colorectal cancer</i>		
Yes	9	2.0
No	387	87.0
Not sure	49	11.0
<i>Ever suffered from colorectal cancer</i>		
Yes	8	1.8
No	399	89.7
Not sure	38	8.5

Table 2: Knowledge/awareness on colorectal cancer (n = 455)

Table 3 shows the awareness of respondents on risk factors of colorectal cancer. About two-third (above 60%) of the respondents did not know about the risk factors for colorectal cancer (older age, previous illness in the large intestine, life style, type of diet, and occurrence of colorectal cancer among family members).

Variables	Agree	Do not Agree	Don't know
	Freq (%)	Freq (%)	Freq (%)
Older Age (e.g. from 50 years)	151 (33.9)	9 (2.0)	285 (64.1)
Previous illness in the large intestine	74 (16.6)	15 (3.4)	356 (80.0)
Life style (e.g. sedentary lifestyle obesity, tobacco smoking)	149 (33.5)	11 (2.5)	285 (64.0)
Type of diet (e.g. red meat, low fiber diet, and alcohol)	115 (25.8)	16 (3.6)	314 (70.6)
Occurrence of colorectal cancer among family members	62 (13.9)	31 (7.0)	352 (79.1)
Low or lack of fruits and vegetables intake	73 (16.4)	53 (11.9)	319 (71.7)

Table 3: Colorectal cancer risk factors known or indicated (awareness) by respondents (n = 455)

Table 4 shows respondents' knowledge of the complaints / body changes that would demand or necessitate screening for colorectal cancer. Over 70% of respondents either did not know or did not agree with the possible complaints or body changes that would make someone to desire to go for colorectal cancer screening. Awareness was only 173 (38.9%) for change in bowel habit, 118 (26.5%) for passage of fresh blood in stool, 108 (24.3%) for passing black stool through the anus, 100 (22.5%) for pain in back passage (anus).

Variables	Agree	Do not Agree	Don't know
	Number (%)	Number (%)	Number (%)
Change in bowel habit (e.g frequent or hard stool)	173 (38.9)	13 (2.9)	259 (58.2)
Passage of fresh blood in stool	118 (26.5)	12 (2.7)	315 (70.8)
Passing black stool through the back passage (anus)	108 (24.3)	20 (4.5)	317 (71.2)
Unexplained weight loss	103 (23.1)	85 (19.1)	257 (57.8)
Pain in back passage (anus)	100 (22.5)	17 (3.8)	328 (73.7)
Tiredness	154 (34.6)	31 (7.0)	260 (58.4)
Abdominal pain	166 (37.3)	20 (4.5)	259 (58.2)
Lump in the abdomen	107 (24.0)	23 (5.2)	315 (70.8)

Table 4: Complaints/changes requiring for screening or medical check-up for colorectal cancer (n = 455)

Table 5: Some knowledge of colorectal cancer and attitude to screening (n = 455)

Variables	Number	Percentage
<i>Ever experienced colorectal cancer complaints of body changes</i>		
Yes	119	26.7
No	298	67.0
Not sure	28	6.3
<i>Known anyone that suffered colorectal cancer complaints of body changes</i>		
Yes	93	20.9
No	300	67.4
Not sure	52	11.7
<i>Action taken for the complaints of body changes</i>		
Rest and Sleep	85	19.1
Pain Relief Management (Drugs)	73	16.4
Adequate nutrition	4	0.9
Stooling control drugs	7	1.6
Nothing	8	1.8
No response	268	60.2
<i>Have knowledge about colorectal cancer screening</i>		
Yes	62	13.9
No	360	80.9
Not sure	23	5.2
<i>Done screening for colorectal cancer (if 40 years and above)</i>		
Yes	24	5.4
No	228	51.2
Not sure	20	4.5
No response	173	38.9
<i>Will do colorectal cancer screening if asked to do so (≥ 40 years)</i>		
Yes	352	79.1
No	75	16.9
Not sure	18	4.0
<i>Reasons for not doing colorectal cancer screening if asked to</i>		
Because of additional high cost	27	6.1
Need money for food first	19	4.3
Do not want to be told I have cancer	29	6.5
It will take time	15	3.4
No response	355	79.8
<i>Will do colorectal cancer screening if free of charge</i>		
Yes	379	85.2
No	32	7.2
Not sure	28	6.3
No response	6	1.3

Some knowledge of colorectal cancer and attitude of respondents to colorectal cancer screening is shown in Table 5. One hundred and nineteen (26.7%) respondents had experienced symptoms suggestive of colorectal cancer, and 93 (20.9%) respondents knew someone that had similar symptoms. Three hundred and sixty (80.9%) respondents had no knowledge of colorectal cancer screening, and 228 (51.2%) were already 40 years and above and had not done. Three hundred and fifty-two (79.1%) respondents were willing to undergo CRC screening if asked to do so. Although 355 (79.8%) did not respond when asked about the reason(s) for unwillingness to go for screening, 379 (85.2%) of respondents were willing to undergo CRC screening if it was free of charge.

Table 6: Challenges associated with colorectal cancer screening and treatment (n = 455)

Variables	Number	Percentage
<i>Monthly income (in USD: 1 USD = ₦1400)</i>		
No Income	60	13.5
2.4 USD	135	30.3
21.4 – 35.7USD	131	29.4
36.4 – 71.4USD	85	19.1
72.1 – 142.9USD	22	4.9
>142.9USD	12	2.7
<i>Have health insurance coverage</i>		
Yes	28	6.3
No	398	89.4
Not sure	19	4.3
<i>Go for regular physician/medical check-up even when not sick</i>		
Yes	76	17.1
No	352	79.1
Not sure	17	3.8
<i>Heard or participated in any organized free colorectal cancer screening</i>		
Yes	27	6.1
No	403	90.5
Not sure	15	3.4

Table 6 highlights some challenges associated with colorectal cancer screening and treatment. Four hundred and eleven (78.1%) respondents earned less than 72 USD as monthly income. Three hundred and ninety-eight (89.4%) respondents had no health insurance coverage, and 352 (79.1%) had not gone for medical check-up. Four hundred and three (90.5%) respondents had not participated in any organized free colorectal cancer screening.

Table 7: Relationship between “ever heard of colorectal cancer” and gender & age (n = 455)

	Ever heard of colorectal cancer			(X ²)	P-Value
	Yes	No	Total		
<i>Gender</i>				3.387	0.042
Male	31 (14.8%)	178 (86.2%)	209		
Female	51 (21.6%)	185 (78.4%)	236		
<i>Age</i>				16.345	0.006
Less than 21 years	5 (10.2%)	44 (89.8%)	49		
21 - 30 years	36 (17.6%)	168 (82.4%)	204		
31 - 40 years	34 (29.3%)	82 (70.7%)	116		
41 - 50 years	5 (9.4%)	48 (90.6%)	53		
51 - 60	2 (13.3%)	13 (86.7%)	15		
More than 60 years	0 (0.0%)	8 (100.0%)	8		
Total	82	363	445		

Table 7 shows the relationship between “ever heard of colorectal cancer”, and gender and age. Awareness of colorectal cancer appears to be higher among females than males as the proportion of females who had “ever heard of colorectal cancer” were more than that of male respondents, and the relationship was statistically significant (P=0.042). The awareness of respondents on CRC increases as the age increases from less than 21 years to 40 years, and this relationship was statistically significant (p=0.006).

Table 8: Relationship between ever heard of colorectal cancer and educational status (n = 455)

<i>Educational status</i>	Ever heard of colorectal cancer			<i>(X²)</i>	<i>P-Value</i>
	<i>Yes</i>	<i>No</i>	<i>Total</i>		
Primary	0 (0.0%)	100 (100.0%)	9	2.088	0.352
Secondary	36 (19.0%)	153 (81.0%)	189		
Tertiary	46 (18.6%)	201 (81.4%)	247		
Total	82	363	445		

Table 8 shows the relationship between “ever heard of colorectal cancer” and level of education. The chi-square analysis of relationship between “ever heard of colorectal cancer” and level educational status shows that all those with only primary education have never heard about colorectal cancer. However, the proportion of those aware or ever heard about colorectal cancer was similarly distributed between those with secondary and tertiary education and the relationship between awareness colorectal cancer and educational qualification was not statistically significant (p=0.352).

Discussion

The incidence of CRC in Sub-Saharan Africa has been reported to be on the rise,[24-27] including in Nigeria,[28, 29] hence, the need for up-scaling of screening services cannot be overemphasized. Although opportunistic screening approach has been recommended for asymptomatic average-risk Nigerian patients aged 40 years and above,[19, 30] its implementation or the impact of its implementation is uncertain in our environment. Our study examined Port Harcourt residents for what they know about CRC, their attitude to screening, and the likely challenges encountered by residents. The demographic characteristics of the study revealed that there were relatively more male respondents, and a young mean age (31.74±10.8 years). Majority of the respondents were Christians. The mean age of our respondents is lower than that of 42+1.26years reported by Adeoti et al. in a sub-urban study in Western Nigeria.[21] It is also lower than the value of 60.3±8.6 years in the United States of America.[31] Almost half of the respondents had tertiary education, and about the same had secondary education.

Generally, more than two-third of respondents were unaware of CRC, or knew what it meant. Awareness of colorectal cancer was higher among females and there was a statistically significant relationship between awareness and gender of respondents. This finding differs from the observation of Ugbe et al. in a study conducted in Obudu Cross Rivers State in Nigeria where males were found to have more knowledge of CRC than females.[32] The awareness of CRC increases as the age increases, and the relationship was also statistically significant. Unlike the high level of knowledge of CRC reported in the United States (96% awareness, 74% screening),[31] more than two third respondents had no knowledge

of colorectal cancer screening; more than half of the respondents did not know the risk factors for CRC; and knowledge of the complaints or symptoms was found among only a third of respondents or less. Our study findings are similar to the general low level of knowledge of CRC reported by Adeoti et al. in Western Nigeria.[21]

More than two third respondents had not done CRC screening, but were willing to undergo CRC screening especially if it was free of charge. Our finding share some similarity with a Malaysian study where majority of moderate risk patients were found not to have undergone CRC screening, [33] however, the respondent population of non-screeners was higher than the report of another study in Pakistan where only 24.4% of study participants were noted not to have participated in screening for CRC.[34] It seems reasonable to deduce therefore, that the reason for not undergoing screening is related to ability to afford or pay for the service, hence the willingness to undergo the screening services if it was free. Two-third of respondents in our study had a monthly income of less than 72 USD, and this may partly explain the reason for the attitude. The findings of another study in Nigeria buttressed this line of thought because in that study it was found that financial constraint accounted for the reason why 22% of respondents did not seek for care for rectal bleeding. [35] Almost a third of our study respondents had experienced symptoms suggestive of CRC, almost 2% of respondents were suffering (diagnosed with) from CRC already. Another reason for this attitude could be poor knowledge and unavailability of screening services.

Our study revealed that more than two-third of respondents had not participated in any organized

free colorectal cancer screening. This implies that either organized colorectal cancer screening exercises were not being carried out, or the residents of Port Harcourt were not benefiting enough from opportunistic screening exercises. Although opportunistic screening has been recommended for resource-limited health systems like ours,[19] some authors have questioned the appropriateness of some CRC screening methods/exercises – faecal immunochemical test (FIT) - in our environment where parasitic infections are endemic and the likelihood of false positive test would be high.[23] Yet some other authors have conducted CRC screening with FIT with good outcome - 21% overall positivity rate. [36] Two-third of respondents had a monthly income of less than 72 USD, did not have health insurance coverage, and had never gone for medical check-up. These findings are also reported as part of the challenges bedeviling cancer screening services in Nigeria.[37] In Kenya, their Ministry of Health had commenced the development of new guidelines for CRC screening including endoscopic screening for gastrointestinal malignancies.[25] More recently in Nigeria, the barriers to CRC were identified and use of faecal immunochemical tests, training for health care providers, and health education for patients, including religious & community leaders, were recommended.[38]

Study Limitations: Our study was carried out among random selection of accessible residents within different strata. It is possible that the data would have been be different if the study population is also different.

Conclusion

Majority of respondents had no awareness CRC, did not know the risk factors and symptoms of CRC. Knowledge of CRC screening was also poor

among two-third of respondents. Age and sex were important determinants of awareness of CRC as more females had more awareness of CRC than men, and the awareness increases as age increases. Majority of respondents had a monthly salary of less than 72 USD, and unfortunately did not have health insurance. About half of the respondents who were 40 years and above had not undergone screening for CRC. Although respondents were willing to undergo screening for CRC, financial challenge was a significant constraint against compliance.

Recommendations: There is need for effort to be directed at improving awareness and knowledge of Port Harcourt residents on the menace of CRC. Corporate organizations are encouraged to include colorectal cancer screening as part of corporate social responsibility in the interest of humanity. Governmental and non-governmental organizations should also consider colorectal cancer awareness and screening campaigns as a veritable option to channel funds in the interest of the public.

Other Information

Acknowledgement: We acknowledge the contributions of our trained field officers – Miss Maureen Ogudoro, Miss Mmesioma Favour Anaekperechi, Dr grace Oyimoieni Makpa, and Mrs. Isabella Didi Hector who labored round the different sectors of Port Harcourt to ensure collection of data used for this study.

Ethical Considerations: The approval of the Research Ethics Committee of the PAMO University of Medical Sciences was obtained before the commencement of the study.

Study Funding: The study was funded privately by

the researchers.

Conflict of Interest: None declared.

Appendices

Institutional Research Ethics Approval

Study Questionnaire

References

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. 2018;68(6):394-424.
2. Guren MG. The global challenge of colorectal cancer. *The Lancet Gastroenterology & Hepatology*. 2019;4(12):894-895.
3. Mármol I, Sánchez-de-Diego C, Dieste AP, Cerrada E, Yoldi MJR. Colorectal Carcinoma: A General Overview and Future Perspectives in Colorectal Cancer. *Int J Mol Sci*. 2017;18:197.
4. Levin B, Lieberman DA, McFarland B, Andrews KS, Brooks D, Bond J, et al. Screening and surveillance for the early detection of colorectal cancer and adenomatous polyps, 2008: a joint guideline from the American Cancer Society, the US Multi-Society Task Force on Colorectal Cancer, and the American College of Radiology. *Gastroenterology*. 2008;134(5):1570-1595.
5. Eaden J, Abrams K, Mayberry J. The risk of colorectal cancer in ulcerative colitis: a meta-analysis. *Gut*. 2001;48(4):526-535.
6. Canavan C, Abrams K, Mayberry J. Meta-analysis: colorectal and small bowel cancer risk in patients with Crohn's disease. *Alimentary pharmacology & therapeutics*. 2006;23(8):1097-1104.

7. Johns LE, Houlston RS. A systematic review and meta-analysis of familial colorectal cancer risk. *The American journal of gastroenterology*. 2001;96(10):2992-3003.
8. Botteri E, Iodice S, Bagnardi V, Raimondi S, Lowenfels AB, Maisonneuve P. Smoking and colorectal cancer: a meta-analysis. *Jama*. 2008;300(23):2765-2778.
9. Cross AJ, Boca S, Freedman ND, Caporaso NE, Huang W-Y, Sinha R, et al. Metabolites of tobacco smoking and colorectal cancer risk. *Carcinogenesis*. 2014;35(7):1516-1522.
10. Liang PS, Chen TY, Giovannucci E. Cigarette smoking and colorectal cancer incidence and mortality: Systematic review and meta-analysis. *International journal of cancer*. 2009;124(10):2406-2415.
11. Robertson DJ. ABC of colorectal cancer. *Gastroenterology*. 2012;143(3):868-869.
12. Martinez-Useros J, Garcia-Foncillas J. Obesity and colorectal cancer: molecular features of adipose tissue. *Journal of translational medicine*. 2016;14(1):1-12.
13. Pöschl G, Seitz HK. Alcohol and cancer. *Alcohol and alcoholism*. 2004;39(3):155-165.
14. Willett WC. Diet and cancer: an evolving picture. *Jama*. 2005;293(2):233-234.
15. Bailén M, Bressa C, Martínez-López S, González-Soltero R, Montalvo Lominchar MG, San Juan C, et al. Microbiota features associated with a high-fat/low-fiber diet in healthy adults. *Frontiers in nutrition*. 2020;7:583608.
16. Siegel RL, Torre LA, Soerjomataram I, Hayes RB, Bray F, Weber TK, et al. Global patterns and trends in colorectal cancer incidence in young adults. *Gut*. 2019;68(12):2179-2185.
17. Diamandis EP. Cancer biomarkers: can we turn recent failures into success? *Journal of the National Cancer Institute*. 2010;102(19):1462-1467.
18. Ludwig JA, Weinstein JN. Biomarkers in cancer staging, prognosis and treatment selection. *Nature Reviews Cancer*. 2005;5(11):845-856.
19. Alatise OI, Olasehinde O, Olokoba AB, Duduyemi BM, Famurewa OC, Adeyemi OF, et al. Colorectal cancer screening guidelines for Nigeria in 2019. *Nigerian Journal of Gastroenterology and Hepatology*. 2019;11(2):42-45.
20. Olusegun I Alatise AJD, Patrick A Akinyemi, Fatimah B Abdulkareem, Samuel A Olatokun, Gregory C Knapp, T Peter Kingham. Colorectal cancer screening with fecal immunochemical testing: a community-based, cross-sectional study in average-risk individuals in Nigeria. *Lancet Glob Health* 2022. 2022;10:e1012–1022.
21. Adeoti M, Oguntola S, Olugbenga-Bello A, Oladimeji O, Jegede S. Colorectal cancer: knowledge and risk factors among adults in a sub urban Nigeria community. *J Med Sci Clin Res*. 2016;4(9):12478-12491.
22. Saluja S, Alatise OI, Adewale A, Misholy J, Chou J, Gonen M, et al. A comparison of colorectal cancer in Nigerian and North American patients: is the cancer biology different? *Surgery*. 2014;156(2):305-310.
23. Knapp GC, Alatise OI, Olasehinde OO, Adeyeye A, Ayandipo OO, Weiser MR, et al. Is colorectal cancer screening appropriate in Nigeria? *Journal of Global Oncology*. 2019;5:1-10.
24. Wismayer R, Kiwanuka J, Wabinga H, Odida M. Increasing Trends, Late Presentation and Challenges of Colorectal Cancer in Uganda. 2023.
25. Parker RK, Ranketi SS, McNelly C, Ongondi M, Topazian HM, Dawsey SM, et al. Colorectal cancer is increasing in rural Kenya: challenges

-
- and perspectives. *Gastrointestinal endoscopy*. 2019;89(6):1234-1237.
26. Awedew AF, Asefa Z, Belay WB. Burden and trend of colorectal cancer in 54 countries of Africa 2010–2019: a systematic examination for Global Burden of Disease. *BMC gastroenterology*. 2022;22(1):204-216.
27. Anugwom C, Braimoh G, Sultan A, Johnson WM, Debes JD, Mohammed A, editors. *Epidemiology and genetics of early onset colorectal cancer—African overview with a focus on Ethiopia*. *Seminars in Oncology*; 2023: Elsevier.
28. Irabor DO. Diet, environmental factors and increasing incidence of colorectal cancer in Nigeria. *Ann Nigerian Med*. 2014;8(2):58-64.
29. Ray-Offor E, Abdulkareem FB. Screening colonoscopy in port harcourt, Nigeria. *Gastroenterology Insights*. 2019;10(1):7987. <https://doi.org/10.4081/gi.2019.7987>
30. May FP, Anandasabapathy S. Colon cancer in Africa: primetime for screening? *Gastrointestinal endoscopy*. 2019;89(6):1238-1240.
31. Brandt HM, Dolinger HR, Sharpe PA, Hardin JW, Berger FG. Relationship of colorectal cancer awareness and knowledge with colorectal cancer screening. *Colorectal Cancer*. 2012;1(5):383-396.
32. Ugbe UM-J, Mark TA, Ubi OF. Colorectal Cancer Risk and Prevention Knowledge among Adults Attending Public Health Facilities in Obudu, Cross River State, Nigeria. *AJMAH*. 2020; 18(10): 131-143. DOI: 10.9734/AJMAH/2020/v18i1030260
33. Harny M, Norwati D, Noor NM, Amry A. Knowledge and attitude of colorectal cancer screening among moderate risk patients in West Malaysia. *Asian Pac J Cancer Prev*. 2011;12(8):1957-1960.
34. Hussain I, Majeed A, Rasool MF, Hussain M, Imran I, Ullah M, et al. Knowledge, attitude, preventive practices and perceived barriers to screening about colorectal cancer among university students of newly merged district, Kpk, Pakistan—A cross-sectional study. *Journal of Oncology Pharmacy Practice*. 2021;27(2):359-367.
35. Alatise OI, Fischer SE, Ayandipo OO, Omisore AG, Olatoke SA, Kingham TP. Health-seeking behavior and barriers to care in patients with rectal bleeding in Nigeria. *Journal of global oncology*. 2017;3(6):749-756.
36. Alatise OI, Dare AJ, Akinyemi PA, Abdulkareem FB, Olatoke SA, Knapp GC, et al. Colorectal cancer screening with fecal immunochemical testing: a community-based, cross-sectional study in average-risk individuals in Nigeria. *The Lancet Global Health*. 2022;10(7):e1012-e1022.
37. Sharma A, Alatise OI, O'Connell K, Ogunleye SG, Aderounmu AA, Samson ML, et al. Healthcare utilisation, cancer screening and potential barriers to accessing cancer care in rural South West Nigeria: a cross-sectional study. *BMJ Open*. 2021;11:e040352. doi:10.1136/bmjopen-2020-040352
38. Lee R, Holmes D. Barriers and recommendations for colorectal cancer screening in Africa. *Glob Health Action*. 2023; 16(1):2181920. doi: 10.1080/16549716.2023.2181920. PMID: 36820646; PMCID: PMC9970240.
-