ORIGINAL RESEARCH

Colorectal cancer in northern Tanzania: A retrospective, descriptive study of patients with histologically confirmed diagnoses at a tertiary referral hospital

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Abstract

Background
Tanzanian data indicate a sixfold increase in colorectal cancer incidence over the past decade, accompanied by increased morbidity and mortality rates.

Methods
We conducted a retrospective analysis of colorectal cancer cases managed at Arusha Lutheran Medical Centre between January 2015 and December 2020. Data were extracted from clinical records to confirm diagnoses and evaluate outcomes. Analysed variables included symptom duration, tumour stage, surgical and adjunctive treatments, and follow-up. We also investigated associations of treatment-related outcomes with demographics, as well as with provider- and system-level factors, applying chi-square and Student's t-tests with $P<0.05$ as the statistical significance threshold.

Results
The study included 57 patients. Men outnumbered women, with a ratio of 1.2:1. The median age at presentation was 57 years, with the majority aged between 61 and 70 years. Urban residents accounted for 63.2% of patients, 52.6% had health insurance, and 35.1% had comorbid conditions. Elective presentations were most common, accounting for 68.4% of cases, and 71.5% presented with advanced disease (stages 3 and 4). Rectal bleeding (42%) and abdominal pain (23.3%) were the most prevalent symptoms. The mean duration from symptom onset to presentation was 14.6 months. The rectum was the most commonly affected site (47.4%). Adenocarcinoma was the predominant tumour histology (94.7%), with the majority being moderately differentiated (42.1%). Surgical intervention was performed in 59.6% of cases, and 25.9% received adjunctive therapy. The mean postoperative follow-up duration was 5.8 months, as most patients were lost to follow-up.

Conclusions
The low uptake of treatment options, including surgery and adjunctive therapy, calls for deeper investigations into the factors contributing to colorectal cancer in this setting. Additionally, the presentation of patients with advanced disease and subsequent suboptimal patient follow-up underscore the systemic challenges present.

Keywords: colorectal neoplasms, treatment outcomes, clinicopathological characteristics, tumour staging, Tanzania

Introduction

Globally, colorectal cancer (CRC) is the third most commonly diagnosed cancer, accounting for approximately 10% of new cancer cases in 2020; it is the second-leading cause of cancer mortality, representing 9.4% of all cancer deaths.[1] Estimates suggest that CRC incidence may increase by 60% by 2030, particularly in low- and middle-income countries (LMICs).[2],[3]

Modest improvements in patient survival have been observed—attributed to enhanced preoperative staging, surgical techniques, and the delivery of adjunctive therapies, such as chemotherapy and radiotherapy.[4],[5] However, these advancements in cancer management come with an increased financial burden to patients and families, especially when cancers are diagnosed at a late stage.[6]

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In LMICs, the rise in CRC incidence has not been accompanied by the survival improvements seen in high-income countries.[7] The lack of enhanced survival in LMICs is often due to patients presenting at advanced stages (stage 3 or 4 disease) as well as limited access to adjunctive therapies due to financial constraints or a lack of availability.[7] The increased incidence in LMICs is associated with population ageing, owing to increased life expectancy and the adoption of Westernized lifestyles.[8],[9] Reviews conducted in sub-Saharan Africa have noted an increasing CRC incidence.[2],[10] Nevertheless, it is recognized that the lack of comprehensive surveillance in many African countries hinders accurate estimations of the CRC burden in the region.[10],[11]

Challenges to treatment that have been implicated in impeding adequate care for CRC patients in sub-Saharan Africa include patient-level factors, provider-level factors, and system-level factors.[9] Patient-level factors include age, sex, ethnicity, location of residence, education, and income; provider-level factors include skills and attitude; and system-level factors pertain to policy and organizational elements.[9],[12],[13] Additional challenges to treatment in sub-Saharan Africa are aggressive tumour subtypes and undetermined genetic factors.[13]

There has been a sixfold increase in the incidence of CRC in Tanzania, with the Arusha region recording the fourth-highest rate in the country at 4.2 cases per 100 000.[9] This substantial change in CRC epidemiology in Tanzania has been attributed to lifestyle changes and other underinvestigated factors, such as infections, as well as familial and genetic elements.[9],[14] A comprehensive accounting of the true burden of CRC—number of patients, stage at presentation, available treatment options, and treatment challenges—can guide health policy decisions aimed at enhancing public health. An improved understanding of CRC patterns and treatment challenges can enable healthcare stakeholders and researchers to more effectively gauge the disease burden in our region.

The study aimed to characterize the presentation of patients with CRC at the Arusha Lutheran Medical Centre (ALMC) and to evaluate the treatment from 2015 through 2020.

Methods

Study site

ALMC, a tertiary hospital in Arusha, is among the few referral centres in northern Tanzania. While it has an adequate number of general surgeons, it lacks a pathologist and does not have a permanent oncologist.

Study design

This was a retrospective, descriptive study of patients diagnosed with CRC between 2015 and 2020 at ALMC.

Study population, eligibility, and sampling

Our study population consisted of patients admitted to our surgical unit between January 2015 and December 2020 with a diagnosis of CRC. We included patients with histologic diagnoses made at our centre during the study period. The total number of patients diagnosed with CRC was 78, among whom 19 were excluded because of missing histology results, leaving a final cohort of 59 for analysis.

Data collection and data collection tool

We reviewed clinical records, including inpatient records, theatre records, and clinic/outpatient records. CRC was defined as a malignant neoplasm occurring in the colon, rectosigmoid, or rectum. The captured demographic data were age, sex, tribe/ethnicity, presenting symptoms, duration of symptoms, elective or emergency presentation, tumour location and stage, histologic details, type of surgical intervention, adjunctive therapy (chemotherapy and/or radiotherapy) details (or lack thereof), follow-up duration, and mode of payment. Tumour staging was conducted using the seventh edition of the American Joint Committee on Cancer's TNM system, with stages 1 and 2 classified as early disease and stages 3 and 4 as advanced disease. Patients aged ≤40 years were categorized as young.[15]

The diagnosis of CRC was histologically confirmed by tissue biopsies obtained either endoscopically or during laparotomy. Carcinoembryonic antigen levels were obtained for a minority of patients (n=5 of 78) and are thus not reported. Patients were treated with surgery and/or adjunctive therapies, including chemotherapy and radiotherapy, whether neoadjuvant or adjuvant.

Challenges to treatment that impacted patient outcomes were assessed as follows: the duration of symptoms, tumour stage and grade, curative-intent surgical treatment, adjunctive treatment, and patient follow-up. The following patient factors were assessed for associations with treatment challenges: age, sex, and residence (rural vs urban). We also evaluated the following provider- and system-level factors: treatment extent, histology report turnaround time, and healthcare financing.

Data and statistical analysis

Data were collected and processed using Excel 2019 (Microsoft Corp., Redmond, WA, USA), and statistical analyses were conducted using SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, NY, USA). Continuous variables are reported as means with standard deviations, and skewed variables are reported as medians with interquartile ranges. Categorical variables are summarized using frequencies and percentages. The chi-square test was used to assess the statistical significance of associations between categorical variables, and Student's t-test was used for continuous variables. Statistical significance was defined by a P value <0.05.

Ethical considerations

Ethical approval for the study was obtained from the ALMC ethical committee.

Table 1. Sociodemographic characteristics

Characteristic	n (%)
Sex	
Men	31 (54.4)
Women	26 (45.6)
Age group, years	
≤40	9 (15.8)
41-50	11 (19.3)
51-60	12 (21.1)
61-70	17 (29.8)
>70	8 (14)
Residence	
Urban	36 (63.2)
Rural	20 (35.1)
Healthcare spending	
Insurance	30 (52.6)
Out of pocket	24 (42.1)
Unknown	3 (5.3)

Table 2. Mode of patient presentation

Variable	n (%)
Presenting symptom	
Rectal bleeding	20 (35.1)
Abdominal pain	16 (28.1)
Bowel habit change	8 (14.0)
Obstruction	8 (14.0)
Abdominal mass	4 (7.0)
Weight loss	1 (1.8)
Presentation	
Elective	39 (68.4)
Emergency	18 (31.6)
Symptom duration, months	
<1	11 (19.3)
1-6	10 (17.5)
7-12	7 (12.3)
>12	19 (33.3)
Unknown	10 (17.5)
Comorbidities	
Yes	20 (35.1)
No	30 (52.6)
Unknown	7 (12.3)

Results

A total of 78 patients were diagnosed with CRC during the period under investigation; 19 were excluded because of the absence of key data in their records, leaving 57 patients included in the analysis. Table 1 presents the sociodemographic data. Men made up 54.4% of the participants, with a male-to-female ratio of 1.2:1. The ages of patients ranged from 28 to 88 years (median, 57 years). The 61- to 70-year age group (30.4%) had the highest representation, followed by those between 51 and 60 years of age (21.1%). Notably, 15.8% of the patients (n=9) were ≤40 years old. Urban dwellers accounted for 63.2% of the sample. More than half of the patients (52.6%) had health insurance coverage, and 35.1% presented with comorbid conditions.

Table 2 outlines the modes of presentation. A majority (68.4%) presented as nonemergencies, with rectal bleeding being the most common symptom (42%), followed by abdominal pain (23.3%), obstruction (11.6%), and altered bowel habits (11.6%). The mean duration from symptom onset to hospital presentation was 14.6 months (range, 2 days to 6 years).

Tumours were predominantly located in the rectum (47.4%), the sigmoid colon (22.8%), and the ascending colon (12.3%). Adenocarcinomas accounted for 94.7% of all histopathologic diagnoses, followed by gastrointestinal stromal tumours (3.5%) and carcinoid tumours (1.8%). Moderately differentiated tumours accounted for 42.1% of the sample. Out of the adenocarcinomas, 6 were mucinous, and 7 were the signet ring cell type; the remaining 40 had no tumour subtypes documented. Among patients who underwent staging (n=42, 73.7%), the largest proportion (42.9%) was stage 4, while stages 2 and 3 each accounted for 28.6% of the sample. Table 3 details the tumour characteristics.

In this study, 22.8% of patients were lost to follow-up after tumour diagnosis before initiating treatment, 5.3% were referred to other centres for neoadjuvant therapy, and 12.3% declined all forms of treatment. Of those who underwent surgery (n=34, 59.6%), 14% had sigmoidectomies, 12.3% had right hemicolectomies, and 12.3% had solitary diversion procedures. Abdominoperineal resections were performed on 8.8% of patients, left hemicolectomies and anterior resections on 5.3% each, and extended right hemicolectomies were conducted on 3.5% of patients. Of the 27 patients meeting the criteria for preoperative or postoperative radiation therapy, 25.9% (n=7) received it. Chemotherapy was indicated for 42 patients, 19 of whom (45.2%) received it. The average postoperative follow-up duration was 5.8 months (range, 0-24 months), as shown in Table 4, which details the patients' treatment characteristics.

Among those who did not undergo surgery (n=23, 40.4%), 3 had high-surgical-risk conditions, 2 stated that they were not prepared for surgery, 2 needed to resolve 'family issues' first, 4 cited financial constraints, and 12 had no

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Table 3. Tumour characteristics

Characteristic	n (%)
Tumour type	
Adenocarcinoma	54 (94.7)
Carcinoid	1 (1.8)
GIST	2 (3.5)
Tumour grade	
Well differentiated	4 (7.0)
Moderately differentiated	24 (42.1)
Poorly differentiated	6 (10.5)
Unknown	23 (40.3)
Adenocarcinoma subtype	
Mucinous	6 (11.1)
Signet ring	7 (13)
Mixed	1 (1.8)
Unknown	40 74.1()
Tumour stage	
Stage 2	12 (21.1)
Stage 3	12 (21.1)
Stage 4	18 (31.6)
Unknown	15 (26.3)
Tumour location	
Caecum	5 (8.8)
Ascending colon	7 (12.3)
Transverse colon	2 (3.5)
Descending colon	1 (1.8)
Sigmoid colon	13 (22.8)
Rectum	27 (47.4)
Unknown	2 (3.5)

GIST, gastrointestinal stromal tumour

Table 4. Treatment characteristics

Characteristic	n (%)
Surgery performed	
Yes	34 (59.6)
No	7 (12.3)
Unknown	16 (28.1)
Procedure	
Anterior resection	2 (3.5)
APR	5 (8.8)
Right hemicolectomy	7 (12.3)
Extended right hemicolectomy	2 (3.5)
Left hemicolectomy	3 (5.3)
Sigmoidectomy	8 (14)
Diversion	7 (12.3)
None (patient refused)	7 (12.3)
Adjunctive therapy	
Yes	15 (26.3)
No	36 (63.2)
Unknown	6 (10.5)
Radiation therapy	
Yes	3 (5.3)
No	20 (35.1)
Not required	28 (49.1)
Unknown	6 (10.5)
Chemotherapy	
Yes	15 (26.3)
No	27 (47.4)
Unknown	15 (26.3)

APR, abdominoperineal resection

documented reasons for not proceeding with surgery. Of those who underwent surgery (n=34), the most common postoperative complications within 30 days were superficial surgical site infections (n=11, 32.3%) and postoperative death (n=4, 11.8%) ([Figure]).

Among young adults (n=9, 88.9%), adenocarcinoma was the most prevalent tumour type, with the rectum being the most common tumour site (n=7, 77.8%). Among patients who underwent staging, the majority had stage 4 disease (80%), followed by stage 3 (20%). One-third of patients (33.3%) underwent chemotherapy, and 28.6% of those requiring radiotherapy received it. Treatment for young adults

consisted of surgery for tumour resection (n=2, 22.2%) and diversion procedures for unresectable tumours (2: 22.2%). Some young adults did not undergo surgery: 2 (22.2%) were lost to follow-up after diagnosis but before they could undergo surgical intervention, 2 (22.2%) refused surgery, and 1 (11.1%) requested a referral to another facility. A large proportion of young adults (n=7, 77.8%) did not have health insurance coverage.

None of the investigated patient-level variables—age, sex, and residence (rural vs urban)—were significantly associated with the study's outcome measures. Residents of rural areas had comparable rates of surgical treatment, adjunctive treatment, and advanced disease presentation to those from

Figure. Proportions of the postoperative surgical complications encountered
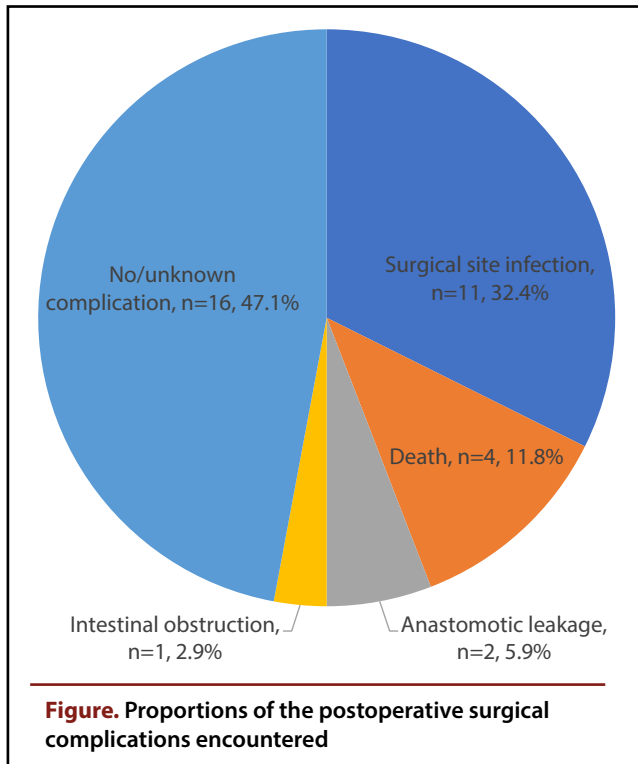
urban settings. However, it was observed that patients from urban areas had a marginally longer mean follow-up duration than those from rural areas (183 days vs 152 days).

Men experienced longer intervals from symptom onset to hospital presentation than women (mean, 485 days vs 401 days), and men had higher rates of surgery (91% vs 72%). Rates of adjunctive therapy, advanced disease presentation, and follow-up were similar between the sexes.

Compared with older adults (67%), young adults (100%) presented more frequently with advanced-stage disease. Young adults also had lower rates of surgery and adjunctive therapy (86% vs 67% and 31% vs 25%, respectively). Furthermore, young adults (89 days) had a shorter mean follow-up period than older patients (186 days) despite having higher rates of poor tumour grade (29% vs 12%, respectively).

The most common provider-level challenge to treatment was the lack of a standardized treatment protocol, evidenced by the observation that patients received varying chemotherapy regimens and that, intraoperatively, tumour margins and lymph nodes were variably addressed; this challenge was noted through observation rather than statistical assessment.

At the system level, challenges were primarily related to healthcare financing methods. Patients with health insurance were significantly more likely to receive adjunctive therapy (P=0.04). However, having health insurance was not significantly associated with other variables, such as surgical treatment, duration of symptoms, and follow-up duration.

Discussion

The treatment challenges observed in this study included advanced-stage cancer presentation and short follow-up durations, particularly among younger patients. There was

low use of adjunctive therapy overall, along with inadequate specialist human resources. There was also a high prevalence of out-of-pocket healthcare expenditure, which again most commonly affected younger patients. Overall, ow levels of surgical treatment were observed.

There is a rapid transition towards urbanization in many Tanzanian communities, contributing to a rapid shift in disease epidemiology.[9] An increase in the prevalence of noncommunicable diseases, including cancer, has been observed, placing additional strain on an already overburdened health system.[8],[9] CRC is among the cancers noted to be on the rise, with a reported prevalence of 3.83 per 100 000.[9],[16] In our setting, however, we did not observe an increased incidence over the 5-year study period.

Several important observations emerged from this study. The first was the low uptake of treatment options, particularly among young patients. The second was the brief duration of patient follow-up, and the third was the extended period patients experienced symptoms before seeking medical attention.

Regarding the low uptake of treatment, CRC management is multidisciplinary, involving surgery, adjunctive therapies (radiation and chemotherapy), and supportive care. Surgery, entailing complete tumour and lymph node resection, remains the mainstay of early-stage disease management, with adjunctive therapies playing a crucial role, especially in the treatment of advanced cancers.[14],[17] Most of our patients presented with advanced disease (stage 3 or 4) and were thus candidates for both surgical therapy and adjunctive treatment. Nevertheless, the rate of surgical therapy in Tanzania is low, as demonstrated by the rate of 59.6% in our study and the 27.5% reported by Kweka and colleagues.[16] Furthermore, a minority of our patients received adjunctive therapy (26.6%), which is comparable to the 16.8% reported by Chalya et al.[14] in Tanzania. The retrospective nature of this study precluded determining the reasons patients did not pursue cancer treatment, underscoring the need for prospective studies.

The factors contributing to low rates of cancer therapy in sub-Saharan Africa include financial constraints, treatment side effects, and religious beliefs.[13],[14] Notably, a minority of our young patients underwent surgery (22.2%) or received adjunctive therapy (22.2%); these were lower proportions than those determined by other studies in both LMICs and high-income countries.[18]-[20] The low uptake of treatment may be associated with the high percentage of patients without health insurance (77.8%) in our study, which could lead to high treatment costs, in contrast with other countries that have lower rates of uninsured patients and higher levels of health service access.[6],[20],[21] Universal health coverage might allow these patients to access the necessary treatments at lower costs, thereby reducing premature mortality and disability-adjusted life years. The low treatment rates among young patients may also stem from their late-stage disease presentation and the aggressive nature of their tumour histology.

Our second observation concerns the short mean follow-up time of 5.8 months in our study. Other settings similar to ours have been reported to have average follow-up durations between 15 and 18 months.[14],[22] We were unable to pinpoint reasons for the high rate of patients lost to follow-up, though it may be associated with the high costs of treating advanced disease and the limited resources in our setting to provide comprehensive cancer care, including the unavailability of radiotherapy and certain chemotherapy agents. This gap underscores the importance of continuous care and comprehensive services for cancer patients in our context. There is a need for further research to uncover the barriers preventing patients from maintaining follow-up after tumour diagnosis and treatment.

Third, studies conducted in Tanzania, including our own, have shown a prolonged mean duration from symptom onset to presentation at a health facility, ranging from 14.6 to 22 months (2 days to 6 years).[14] The most common initial symptoms in these studies—including ours—have been rectal bleeding and abdominal pain.[23],[24] Other presenting features associated with CRC include altered bowel habits, intestinal obstruction, weight loss, abdominal distension, and abdominal masses. The prevalence of rectal bleeding and abdominal pain as initial complaints among patients with CRC across several studies suggests that, to mitigate the extensive delays between symptom onset and diagnosis, primary care physicians should be particularly vigilant when patients present with such symptoms. Failure to thoroughly investigate these symptoms can lead to patients subsequently presenting with advanced-stage disease.

Advanced disease presentation is a prevalent issue in sub-Saharan Africa. The majority of our patients (71.5%), similar to other studies in sub-Saharan Africa, presented with advanced disease.[6]-[8],[14],[22] This underlines the urgency of establishing regionally tailored screening protocols and patient education to promote early healthcare engagement once symptoms emerge. This necessitates regular public awareness campaigns about the disease, encompassing screening and symptom recognition, and demands that primary care doctors consider each patient interaction as an opportunity for health promotion. It has been documented in African communities that many individuals do not seek medical attention until their symptoms become severe, at which point the disease has typically reached an advanced stage.[13]

Treatment challenges in our setting align with those identified by Chalya et al.[14] in a study conducted in northwest Tanzania. These challenges include a majority of patients presenting at an advanced stage, the high cost of treatment and lack of widespread insurance coverage, poor access to adjunctive therapy, and an absence of screening programmes.[14] Additional constraints highlighted by our study, such as inadequate human resources, the absence of tailored therapy, and tumour aggressiveness (particularly in younger patients), have been noted in other studies.[13] The multifaceted nature of these treatment challenges often involves patient-level factors, such as a lack of awareness, poverty, and suboptimal health-seeking behaviours.[13]

Limitations

This study had several limitations concerning case identification, incomplete patient data, loss to follow-up, the study's setting, and the study's design. For case identification, we relied on inpatient registry data due to its reliability. However, this approach likely resulted in missing patients who received CRC diagnoses as outpatients.

Secondly, inherent in the study's retrospective design, many patients were excluded from the study because of missing data. This absence of information was attributable to inadequate medical records, poor documentation, and patient transfers to other centres. The combination of missing data and the high rate of patients lost to follow-up meant that we could not collect sufficient data to report on postoperative outcomes, including morbidity and mortality.

Notably, patient education levels and perceptions of treatment—important patient-level variables—were not assessed in this study.

Finally, the single-centre study setting limits the accurate interpretation and generalizability of the findings. This also contributed to low patient recruitment for the study, resulting in a smaller sample size for data collection.

Conclusions

This study highlighted several patient- and system-level challenges to CRC treatment in our region, including a high prevalence of patients without insurance coverage, a tendency to present at an advanced stage, inadequate symptom recognition by health workers, the absence of context-specific treatment guidelines, and low rates of surgery and adjunctive treatment administration. These issues warrant further investigation to determine strategies to mitigate them and thus enhance patient access to appropriate therapy. Addressing these challenges will require health system strengthening through health education campaigns, the implementation of universal health coverage, and focused research.

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