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A Retrospective Audit of Compliance with International Standards in Colorectal Cancer Pathology Reporting in a National Referral Hospital in Tanzania

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Abstract

Background

Accurate grossing and histopathological reporting of colorectal cancer (CRC) resection specimens are critical for staging, prognostication and treatment planning. International guidelines such as those developed by the International Collaboration on Cancer Reporting (ICCR) provide standardized datasets to improve reporting quality. However, implementation of these standards remains inconsistent in many low- and middle-income countries (LMICs).

Methods

We conducted a retrospective cross-sectional audit of colorectal cancer resection specimens reported at the Central Pathology Laboratory of Muhimbili National Hospital, Tanzania, between January 2019 and December 2021. Histopathology reports, archived slides and clinical request forms were reviewed. Data were extracted using the ICCR colorectal cancer reporting checklist to assess adequacy of pre-analytical clinical information, grossing practices and histopathological reporting.

Results

A total of 183 colorectal cancer resections were included. The mean age of patients was 52.7 (± 14.9)years and 59% were male. Clinical information accompanying specimens was generally adequate with clinical impression provided in 83.6% of cases and type of colectomy documented in 91.3%. However, neoadjuvant therapy history (57.4%) and intraoperative tumor extent (50.8%) were frequently missing. Grossing documentation was satisfactory for tumor location (90.7%) and margin sampling of proximal (95.1%) and distal margins (99.5%). Major deficiencies were observed in lymph node harvesting (44.8%) and radial margin sampling (45.9%). Histopathology reports consistently included histologic subtype and tumor extension (92.3%), but lymph node status (67.2%), pathological staging (71%) and radial margin status (45.9%) were incompletely reported. Provision of detailed intraoperative findings was significantly associated with improved grossing and reporting quality.

Conclusion

Significant gaps exist in the pathology handling and reporting of colorectal cancer resections at a national referral hospital in Tanzania. Deficiencies in lymph node assessment, circumferential margin evaluation and standardized staging may compromise prognostic assessment and treatment planning. Adoption of ICCR synoptic reporting and strengthened multidisciplinary communication are urgently needed to improve pathology quality standards in resource-limited settings.

Background

Colorectal cancer (CRC) is among the leading causes of cancer morbidity and mortality worldwide and represents a growing public health concern in low and middle-income countries (LMICs). Recent global cancer estimates indicate that CRC ranks among the top three most commonly diagnosed malignancies and is a major contributor to cancer-related deaths globally(1–3). While historically considered a disease of high-income countries, the incidence of CRC is increasing rapidly in many parts of Africa and other LMICs due to demographic transitions, urbanization and lifestyle changes(4, 5).

Accurate pathological evaluation of resected colorectal cancer specimens remains the cornerstone for staging, prognostication and therapeutic decision-making. Pathology reports provide essential information including tumor histologic subtype, depth of invasion, lymph node status, margin involvement and other prognostic factors that guide multidisciplinary cancer management(6, 7). These parameters are critical for determining disease stage and for selecting patients who may benefit from adjuvant chemotherapy or radiotherapy(8).

To improve reporting quality and consistency, several international organizations have developed standardized datasets for cancer pathology reporting. The International Collaboration on Cancer Reporting (ICCR), the College of American Pathologists (CAP) and the Royal College of Pathologists have established structured reporting templates that define the minimum required elements for colorectal cancer pathology reports(9–11). Synoptic reporting systems derived from these datasets have been shown to significantly improve completeness, reduce reporting variability and enhance communication within multidisciplinary cancer teams(12, 13).

Despite these advances, substantial disparities in pathology capacity and reporting quality persist worldwide. Many LMIC pathology laboratories rely on narrative reporting systems that may omit critical prognostic parameters(14, 15). Limited human resources, infrastructure constraints and high diagnostic workloads often restrict the ability of laboratories to implement standardized reporting systems(16).

Pathology services are increasingly recognized as a critical bottleneck in global cancer care. The Lancet Oncology Commission on Pathology highlighted severe shortages of trained pathologists and laboratory infrastructure across sub-Saharan Africa, emphasizing that inadequate pathology capacity can compromise accurate diagnosis, staging and treatment planning(17, 18). Without reliable pathology reporting, clinicians may face significant challenges in making evidence-based therapeutic decisions.

In colorectal cancer specifically, inadequate lymph node retrieval, incomplete margin assessment and inconsistent staging documentation are among the most frequently reported quality gaps in pathology audits worldwide(19, 20). International guidelines recommend evaluation of at least 12 lymph nodes for accurate staging and emphasize the importance of circumferential resection margin assessment, particularly in rectal cancers(21–23). Failure to document these parameters may result in under staging and suboptimal treatment planning.

In sub-Saharan Africa, few studies have systematically evaluated compliance with international colorectal cancer pathology reporting standards. Existing reports suggest that pathology systems across the region face significant structural limitations including workforce shortages, limited training opportunities and absence of standardized reporting frameworks(24–26). Strengthening pathology quality is therefore a key priority for improving cancer outcomes in the region.

Tanzania has experienced a gradual increase in colorectal cancer diagnoses over the past decade. However, data evaluating the quality and completeness of pathology reporting for colorectal cancer in the country remain scarce. Muhimbili National Hospital (MNH) serves as the national referral hospital and one of the largest pathology centers in Tanzania, receiving specimens from multiple regions across the country.

This study aimed to audit the grossing practices and histopathological reporting of colorectal cancer resection specimens at MNH using the ICCR standardized dataset as a benchmark. Specifically, the study evaluated the adequacy of clinical information accompanying specimens, assessed compliance with recommended grossing and reporting standards and identified gaps that may affect clinical decision-making in colorectal cancer management.

Materials and Methods

Study design and setting

This retrospective cross-sectional study was conducted at the Central Pathology Laboratory (CPL) of Muhimbili National Hospital in Dar es Salaam, Tanzania. MNH is the largest tertiary referral hospital in the country and a major teaching institution affiliated with Muhimbili University of Health and Allied Sciences.

Study population

All colorectal carcinoma cases that underwent surgical resection that were submitted to the CPL between January 2019 and December 2021 were eligible for inclusion.

Inclusion and exclusion criteria

Resection cases were included if they had a confirmed diagnosis of colorectal carcinoma, available histopathology reports and archived formalin-fixed paraffin-embedded tissue blocks with corresponding pathology request forms. All cases submitted for colonoscopy biopsies, second opinion and or limited diagnostic biopsies were excluded.

Data collection

Clinical request forms, pathology reports and archived slides were retrieved and reviewed. Data were extracted using the ICCR colorectal cancer reporting checklist. The variables assessed included: Clinical information provided by clinicians, grossing dataset elements. Histomorphological reporting parameters, pathological staging. Slides were re-evaluated by the primary investigator and confirmed by a junior and senior pathologist to ensure data accuracy.

Data analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 27. Descriptive statistics were used to summarize categorical variables as frequencies and percentages and continuous variables as means and standard deviations. Associations between clinical information and reporting adequacy were assessed using chi-square tests with a p-value < 0.05 considered statistically significant.

Ethical consideration

The study proposal was submitted to the MUHAS ethical clearance committee for approval permission was granted with reference number **MUHAS-REC-03-2022-1054**. A waiver of informed consent was requested and granted since the study involved archived FFPE tissue blocks and medical records without any contact with study participants. To ensure the confidentiality of all the patient information collected for study purposes, we used research codes for all data collected without any identifiers and kept the Excel sheet with the data in a password-protected computer with a document password as additional security. Following approval, permission to conduct the study at CPL, was sought from the MNH Management and the Head of Anatomical Pathology with reference number **MNH/TRCU/Perm/2022/120**.

Results

Patient demographics

A total of 183 colorectal cancer cases met the inclusion criteria. The mean age of the patients was 52.7 years (15–84 years) (Fig. 1) with a male predominance of 59%.

Clinical information provided with specimens

Most request forms contained essential clinical details. Clinical impression was provided in 83.6% of cases, while type of colectomy procedure was documented in 91.3%. Previous biopsy history was recorded in 73.8% of cases. Several important parameters were frequently missing. Documentation of neoadjuvant therapy was absent in 42.6% of cases, while intraoperative tumor extent was not reported in nearly half of submissions (49.2%). Surgical orientation of specimens was provided in only 21.3% of cases (Table 1).

Table 1
Clinical information provided with biopsy.

Variable	Category	Frequency	Percent
Clinical impression stated	No	30	16.4%
	Yes	153	83.6%
The history of previous biopsy	Not Stated	48	26.2%
	Stated	135	73.8%
Neoadjuvant therapy history	Stated	105	57.4%
	Not Stated	78	42.6%
Site of the tumor on intraoperative	Stated	167	91.3%
	Not stated	16	8.7%
Intraoperative tumor extent	Stated	93	50.8%
	Not stated	90	49.2%
Type of colectomy surgery	Stated	167	91.3%
	Not stated	16	8.7%
Surgical orientation on receipt	No	144	78.7%
	Yes	39	21.3%

NB :

YES – Agreeing with the variable

No – Disagreeing with the variable

Grossing analysis

Documentation of tumor location during gross examination was present in 90.7% of cases. Tumor distance from surgical margins was reported in 87.4% of specimens. Sampling of proximal and distal surgical margins was performed in 95.1% and 99.5% of cases respectively. Radial margin sampling was performed in only 45.9% of specimens. Lymph node harvesting was performed in less than half of the cases (44.8%), indicating significant limitations in nodal assessment (Table 2).

Table 2
Grossing dataset elements

Variable	Category	Frequency	Percent
Site of the tumor on gross examination	Ascertained	166	90.7%
	Not ascertained	17	9.3%
Tumor distance from resection margins stated	No	23	12.6%
	Yes	160	87.4%
Length of colonic reflection (Mesentery) documented	No	139	76.0%
	Yes	44	24.0%
Tumor size greatest dimensions stated	No	55	30.1%
	Yes	128	69.9%
Macroscopic tumor perforation	Absent	88	48.1%
	Not stated	81	44.3%
	Present	14	7.7%
Gross involvement of serosa surface	Absent	63	34.4%
	Not stated	78	42.6%
	Present	42	23.0%
Proximal margin tissue sampled	No	9	4.9%
	Yes	174	95.1%
Distal margin tissue sampled	No	1	0.5%
	Yes	182	99.5%
Radial margin tissue sampled	No	99	54.1%
	Yes	84	45.9%
Lymph node sampled tissue	No	101	55.2%
	Yes	82	44.8%

NB :

YES – Agreeing with the variable

No – Disagreeing with the variable

Histopathological reporting

Histological subtype was reported in all cases, reflecting consistent recognition of tumor classification. Tumor extension was documented in 92.3% of reports and histologic grade in 83.6%. Proximal and distal margin status were well reported (95.1% and 97.3%, respectively). However, radial margin status was reported in only 45.9% of cases. Lymph node status was reported in 67.2% of reports, while pathological staging was documented in 71%. Among cases with staging information, different systems were used, including TNM and Modified Dukes classification (Table 3).

Table 3
Histomorphological reports

Variable	Category	Frequency	Percent
Histologic grade	Stated	153	83.6
	Not stated	30	16.4
Vascular invasion	No	71	38.8
	Yes	8	4.4
	Not stated	104	56.8
Tumor extension reported	No	14	7.7
	Yes	169	92.3
Proximal margin reported	No	9	4.9
	Yes	174	95.1
Distal margin reported	No	5	2.7
	Yes	178	97.3
Radial margin reported	No	99	54.1
	Yes	84	45.9
Lymph node status reported	No	60	32.8
	Yes	123	67.2
Pathological Staging reported	No	53	29.0
	Yes	130	71.0
Staging system used	TNM	76	41.5
	Modified DUKE'S	54	29.5
	Not reported	53	29.0

NB :

YES – Agreeing with the variable

No – Disagreeing with the variable

Association between clinical information and reporting quality

Documentation of clinical diagnosis and intraoperative tumor site were associated with likelihood of satisfactory grossing with *p-values* of 0.024 and 0.006 respectively. Similarly, when documentation of intraoperative tumor extent and type of colectomy surgery where documented the likelihood of adequate grossing occurred with *p-values* the < 0.001 and 0.03 respectively (Table 4) .

Table 4
Association between clinical information supplied and satisfactory grossing elements.

Variable	Category	Satisfactory grossing		p-value*
		No	Yes	
Clinical diagnosis	No	24 (80.0%)	6(20.0%)	0.024
	Yes	88 (57.5%)	**65(42.5%)**	
Intraoperative tumor site	Not Stated	15 (93.7%)	1 (6.3%)	0.006
	Stated	97 (58.1%)	**70(41.9%)**	
Previous biopsy	No	44 (53.7%	38(46.3%)	0.724
	Yes	26(49.1%)	27(50.9%)	
Intraoperative tumor extension	Not Stated	82 (91.1%)	8 (8.9%)	< 0.001
	Stated	30 (32.3%)	**63 (67.7%)**	
Type of colectomy surgery	Not Stated	14 (87.5%)	2 (12.5%)	0.030
	Stated	98 (58.7%)	**69 (41.3%)**	
Surgical orientation on receipt	No	92 (63.9%)	52 (36.1%)	0.195
	Yes	20 (51.3%)	19(48.7%)	

NB :

YES – Agreeing with the variable

No – Disagreeing with the variable

Discussion

This study provides one of the few systematic audits evaluating compliance with international colorectal cancer (CRC) pathology reporting standards in a sub-Saharan African tertiary hospital(9). Using the International Collaboration on Cancer Reporting (ICCR) dataset as a benchmark, the findings reveal

important strengths in basic diagnostic reporting but also substantial deficiencies in parameters essential for accurate staging and optimal oncologic management(27). These findings highlight persistent structural gaps in pathology systems in low- and middle-income countries (LMICs) and underscore the urgent need for standardized reporting frameworks.

Histologic subtype and tumor invasion depth were reported in more than 90% of cases indicating reliable recognition of fundamental morphologic features by reporting pathologists. Similar levels of completeness for basic tumor characterization have been reported in pathology audits from other LMIC settings, suggesting that diagnostic competence is generally preserved even in resource-constrained environments(28). However, accurate cancer management increasingly depends not only on tumor identification but also on detailed reporting of prognostic and staging variables. International standards emphasize the need for structured reporting systems that ensure inclusion of all clinically relevant parameters(10, 29, 30). In settings where narrative reporting predominates, omission of key variables remains common.

One of the most significant deficiencies identified in this study was suboptimal lymph node assessment. Less than half of cases demonstrated adequate lymph node harvesting during gross examination and lymph node status was incompletely documented in pathology reports. Lymph node evaluation represents a cornerstone of CRC staging because nodal metastasis is a major determinant of prognosis and adjuvant therapy decisions(20, 29, 31). International guidelines recommend examination of at least 12 lymph nodes to minimize the risk of under staging. Failure to retrieve an adequate number of lymph nodes may lead to stage migration, potentially depriving patients of appropriate adjuvant chemotherapy. Similar challenges with lymph node retrieval have been reported across several African and Asian pathology laboratories and are often attributed to limited grossing time, lack of standardized protocols and variable surgical specimen handling. Improving lymph node yield requires coordinated efforts between surgeons and pathologists, including adequate specimen fixation, standardized dissection techniques and targeted training in lymph node identification.

Another major gap identified in this audit was the low rate of circumferential (radial) margin assessment. Less than half of specimens had documented evaluation of the radial margin. In rectal and some colonic cancers, the circumferential resection margin is a critical prognostic indicator associated with local recurrence risk and long-term survival. Incomplete assessment of this margin may compromise postoperative management, particularly decisions regarding adjuvant radiotherapy or intensified surveillance. In many LMIC laboratories, radial margin evaluation may be overlooked due to absence of standardized grossing templates or limited awareness of its prognostic significance. Incorporating structured grossing protocols aligned with ICCR recommendations could substantially improve completeness of margin assessment(32).

The study identified inconsistency in staging terminology with both TNM and Modified Dukes systems appearing in reports. While the Dukes classification historically played an important role in CRC staging, the TNM system has become the globally accepted standard because of its greater prognostic precision

and compatibility with modern oncologic treatment algorithms. Inconsistent staging terminology may introduce ambiguity in multidisciplinary discussions and complicate clinical decision-making. Adoption of standardized TNM staging within synoptic reporting frameworks would enhance clarity and ensure alignment with international clinical guidelines.

An important observation from this study was the association between availability of detailed intraoperative information and improved completeness of pathology reporting. Cases accompanied by clear surgical descriptions and tumor localization were more likely to demonstrate adequate grossing documentation and comprehensive histopathology reporting. This finding underscores the importance of effective multidisciplinary communication between surgeons, pathologists and oncologists. In many settings, pathology request forms provide limited clinical information, which may hinder optimal specimen orientation and margin evaluation. Strengthening communication channels and improving clinical documentation can therefore have a measurable impact on pathology quality.

The study reflects broader systemic challenges affecting pathology services across many LMICs. Pathology laboratories frequently operate under substantial constraints, including workforce shortages, limited laboratory infrastructure and high diagnostic workloads. These pressures can reduce the time available for meticulous specimen grossing and comprehensive reporting(33). Global oncology initiatives increasingly recognize pathology as a critical component of cancer control strategies. Without accurate and standardized pathology reporting, effective staging, treatment planning and cancer surveillance become difficult to achieve. Strengthening pathology capacity therefore represents a key priority for improving cancer outcomes in resource-limited settings.

Implementation of synoptic reporting systems based on ICCR or College of American Pathologists datasets has been shown to significantly improve completeness of pathology reports. Synoptic templates reduce variability, minimize omission of critical parameters and facilitate integration of pathology data into cancer registries and research databases.

Several practical interventions could substantially improve pathology reporting quality in the study setting. First, introduction of standardized synoptic reporting templates for colorectal cancer would ensure systematic documentation of all essential elements. Second, targeted training workshops focused on specimen grossing and lymph node retrieval techniques could enhance staging accuracy. Third, improved communication between surgical and pathology teams may facilitate better specimen orientation and margin identification.

Digital pathology platforms and structured electronic reporting systems may also offer long-term solutions for improving data quality and enabling national cancer surveillance. As cancer incidence continues to rise in sub-Saharan Africa, investments in pathology infrastructure and workforce development will be critical for strengthening oncology care systems.

Conclusion

This study demonstrates important deficiencies in the grossing and histopathological reporting of colorectal cancer resection specimens at a national referral hospital in Tanzania. Key gaps include inadequate lymph node assessment, low rates of radial margin evaluation and inconsistent pathological staging. Adoption of standardized synoptic reporting aligned with ICCR guidelines, improved multidisciplinary communication and targeted training in specimen grossing are essential steps to improve pathology quality in resource-limited settings. Strengthening pathology systems will play a critical role in addressing the growing cancer burden in sub-Saharan Africa and improving outcomes for patients with colorectal cancer.

Abbreviations

ADASP
Association of Directors of Anatomic and Surgical Pathology
AJCC
American Joint Committee on Cancer
CAP
College of American Pathologists
CPL
Central Pathology Laboratory
CRM
Circumferential Resection Margin
CRC
Colorectal Cancer
FFPE
Formalin Fixed Paraffin Embedded
H & E
Haematoxylin and Eosin staining
ICCR
International Cancer Collaboration
GIT
Gastrointestinal Tract
MNH
Muhimbili National Hospital
MUHAS
Muhimbili University of Health and Allied Sciences
NPS
Non-Peritonealised Surface
ORCI
Ocean Road Cancer Institute
SOP

Standard Operating Procedure
SPSS
Statistical Analysis for Social Sciences
TNM
Tumor Nodal Metastasis
UICC
Union of International Cancer Collaboration
UICC
Union of International Cancer Collaboration
U.S.A
United States of America
W.H.O
World Health Organization

Declarations

Ethics approval and consent to participate

The study protocol was reviewed and approved by the Muhimbili University of Health and Allied Science's institutional review board and informed consent was waived given that no contact was made with participants with the use of medical records and archived tissue blocks and slides.

Competing interests

The authors declare no competing interests.

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No funds were received.

Authors' contributions

Abdulrahman Shomvi - conceptualization, methodology, data curation and writing- original draft.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figures

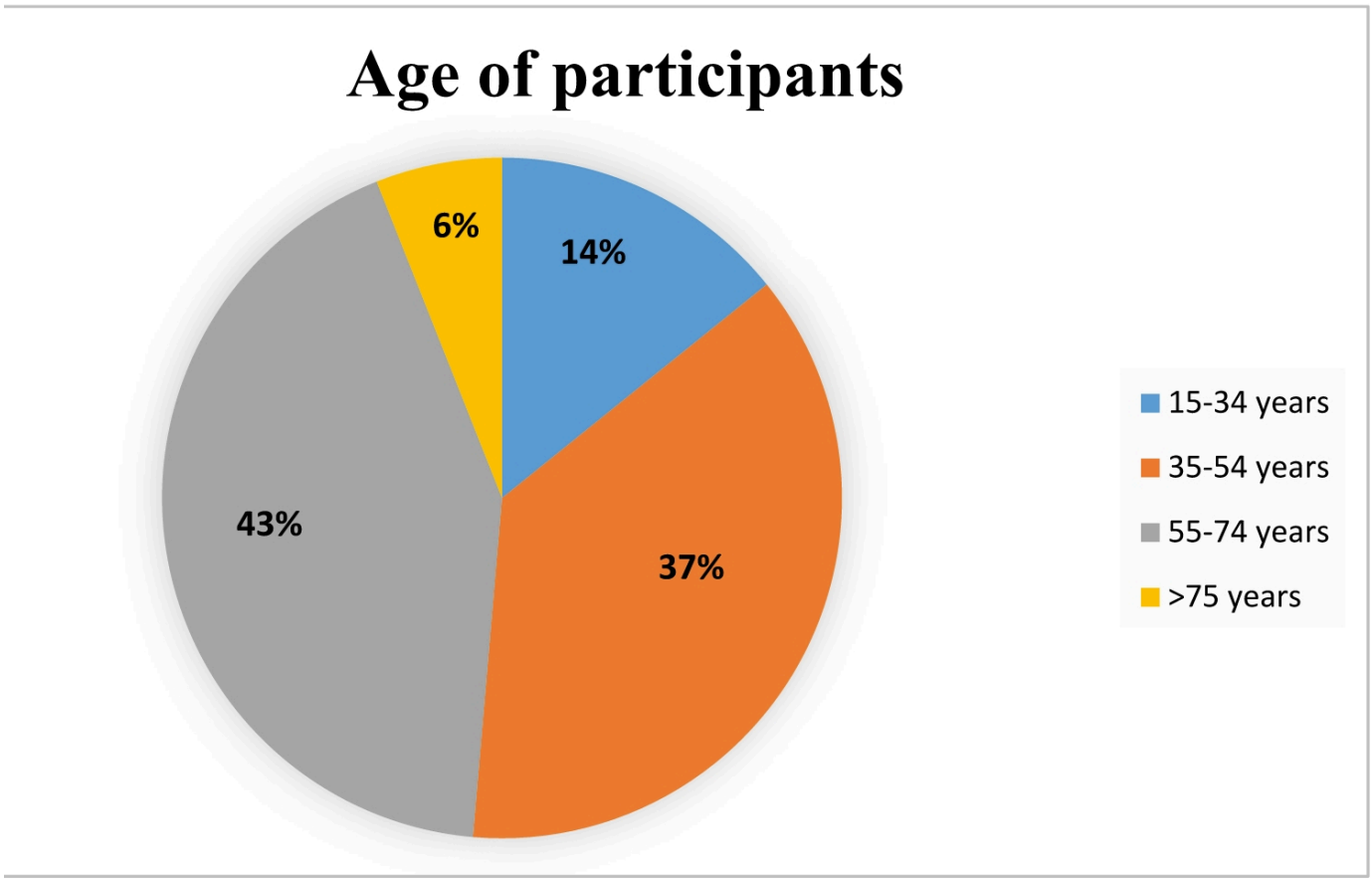


Figure 1

Age distribution of participants.