Auditing Colorectal Cancer Histopathological Reporting in Two Centers from Sudan against the Dataset of the UK Royal College of Pathologists (RCPath); A Proposal For Improving Pathology Practice in Resource -Limited Countries

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Abstract:

Background: International pathology professional bodies set and frequently update guidelines and data items for reporting histopathological cancer specimens. This study aimed to audit colorectal cancer (CRC) reporting in two centers in Sudan against The Royal College of Pathologists (RCPath) (UK) Dataset for reporting CRC. **Material and Methods**: CRC specimen received and reported from Jan 2012 to Dec 2014) in Soba University hospital and the National Health Laboratories (Stak) were studied. The content of 257 CRC patients' reports were extracted and audited against both core and non-core macroscopic and microscopic dataset items of the 4the edition of the RCPath for reporting CRC**. Results:** Audit results regarding core macroscopic items revealed: Nature of specimen and type of operation were reported in 91.1%, Site of tumor 98.8 %, Maximum tumor diameter 95.9%, Distance to the nearer longitudinal resection margin 66.9 %, Tumor perforation 3.3% and Relation of rectal tumor to the peritoneal reflection in 2.9%. None (0%) reported Grade of the plane(s) of surgical excision for rectal tumors (Anterior Resection (AR) and Anterior Peritoneal Excision (APE) specimens) and Distance of the tumor from the dentate line (for APE rectal specimens only) in 0.4%. Audit data for core microscopic items; Histological tumor type 97.3%, Histological differentiation 58.8%, Maximum extent of local invasion 62.4%, Grade of tumor regression following pre-operative (neoadjuvant) therapy 37.5%, Resection margins (longitudinal 96.6% and circumferential margins 9.1%) , Lymph node status (number present 90.8% , number involved 90.7%, Venous invasion 16.3% . Histologically confirmed distant metastatic disease reported in 8.9% and Separate abnormalities in 26.8%. **Conclusion**: Results of this audit can be used to improve national CRC reporting. National pathology professional regulatory bodies can improve cancer histological diagnosis and consequently services by setting national guidelines and standardized cancer reporting.

Keywords: CRC, Dataset, Rcpath, Histopathology , Reporting

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Introduction

Colorectal carcinoma (CRC) is one of the most common cancers worldwide and the 4th most common malignancy in Sudan (1). Histopathological reporting is essential for confirming the presence of malignancy, subtyping, grading, staging, guiding management and prognosis. Furthermore, accurate and complete reporting will guide services planning , cancer registries, research priorities and therapeutic efficiency for all malignant tumors including colorectal carcinoma(2-4) .

The Royal college of pathologists of UK (RCPath) and other pathology regulatory bodies have acknowledged the need for accurate and complete histopathology reporting. Consequently, these professional bodies set standard reporting protocols to be used by pathologists aiming to guaranty complete reporting for all pathological specimens (5-11).

Evaluating the quality of CRC reporting was well documented in the literature with the ultimate goal of improving CRC patients management: Earlier in 1976 Blenkinsopp et al reviewed 2046 CRC reports at the Department of Histopathology and the Academic Surgical Unit, St Mary's Hospital Medical School, London aiming to investigate the minimal level of information needed for patient management (12). Bull et al evaluated 1242 CRC reports in Wales(UK) during the year 1993 against standards agreed upon by Wales pathologists and standards considered to be minimally required for patient management (8).

Nambiar et al (India) audited histopathology reports of LAR (low anterior resection) during 2004-2005 against the minimal data set of the Royal college of pathologist for reporting CRC5 Cross et al audited CRC reporting at five points between April 1993 and November 1997 at the Royal Hallamshire Hospital, Sheffield (UK) against 10 selected items during 5 audit periods starting with free text in period 1 and ending with template proforma in periods 4 and 5. (13)

International pathology regulatory bodies set and regularly update guidelines and data items to be followed for histopathology reporting. Some countries adopt guidelines and data items set by international bodies, while other countries set their own national reporting data items (14) Nevertheless many countries have not yet set their national reporting data items nor adopted any

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Adherence to standardized data items for pathology reporting have great implications on cancer patient managements (9, 15, 16,17, 18, 19,20 ,21).

Sudan is a country with limited health resources that have not officially followed any international data items nor set national ones for cancer histopathology reporting.

This study aimed to audit histopathology reporting of colorectal cancer specimens from two centers in Sudan against the Royal college of pathologists of UK (RCPath) dataset for reporting colorectal cancer (the 3rd edition 2014). The dataset items of the RCPath are supported by robust published evidence and are required for cancer staging, optimal patient management and prognosis (22).

Auditing pathology cancer reporting in countries with limited resources against international regulatory bodies guidelines is proposed to be a relatively low cost model for improving pathology practice as it puts these countries in the global pathology practice frame, shows how far is local practice from the international standards and guides developing national pathology reporting, and consequently improve cancer patients management .

Materials and methods

This was a descriptive, retrospective, observational, cross-sectional standard-based study. The study was conducted in two histopathology diagnostic laboratories in Khartoum state within 3 years' duration (Jan 2012 to Dec 2014). Histopathology reports of all patients with histological diagnosis of colorectal carcinoma were included. Data from reports were collected from records by the investigators. Variables include presence or absence of information regarding the core and none-core macroscopic and microscopic items set by the Royal Collage of Pathologist in reporting colorectal carcinoma, (the 3rd edition 2014), (Tables 1&2) Ref (22).

Additional items analyzed shown in table 3 include Immunohistochemical testing and the pathological TNM staging (the 8th edition) (23). Classification of colorectal tumors used in this study was the WHO classification of Digestive System Tumors the 5th edition (24). Data regarding histopathological reporting of CRC from both centers (Soba & Stak) was compared.

Ethical considerations:

Ethical clearance was obtained from the ethical board committee Faculty of medicine Omdurman Islamic University.

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Table (1): Core items of the RCPath dataset for colorectal cancer:

Core data items of the RCPath data set for colorectal cancer Reporting:

Macroscopic core data items:

1/ Nature of specimen and type of operation.
2/ Site of tumor.
3/ Maximum tumor diameter.
4/ Distance to the nearer longitudinal resection margin.
5/ Tumor perforation.
6/ Relation of the tumor to the peritoneal reflection (rectal tumors only).
7/ Grade of the plane(s) of surgical excision (AR and APE specimens).
8/ Distance of the tumor from the dentate line (for APE specimens only).

Microscopic core data items:

1/Histological tumor type.
2/Histological differentiation.
3/Maximum extent of local invasion (pT stage) and maximum distance of extramural Spread.
4/Grade of tumor regression following pre-operative (neoadjuvant) therapy.
5/Resection margins (longitudinal and circumferential margins(CRM)).
6/ Lymph node status (number present, number involved, highest lymph node status).
7/ Venous invasion
8 / Histologically confirmed distant metastatic disease
9 /Separate abnormalities

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Table (2): None Core items of the RCPath dataset for colorectal cancer :

Non-core data items of the RCPath data set for colorectal cancer Reporting

Macroscopic None core items:

1/Specimen dimensions.

2/ Precise anatomical (quadratic)

location of circumferential margin involvement (rectal tumors).

3-Block index (Block index denotes sites of sampling with indication of blocks demonstrating important staging and other pathological features and blocks suitable for 'on demand' molecular testing.)

Microscopic None core items:

1 /Nature of advancing margin (infiltrative *versus* expansive).

2/ Tumor budding.

3 Lymphatic invasion:

4 Extramural tumor nodules less than 3 mm in diameter

(These are defined as discrete macroscopic or microscopic nodules of cancer of any size in the per- colorectal adipose tissue's lymph drainage area of a primary carcinoma that are discontinuous from the primary and without histological evidence of residual lymph node or identifiable vascular or neural structures.)

5 /Perineural invasion

Table (3) ***Table 3: other items included in the study***

Other included items :

Immunohistochemical and molecular data needed for CRC patient management:

- Mismatch repair status by immunohistochemistry or microsatellite instability (MSI) testing

- Mutation status in K-RAS codons 12, 13, 61 and 146,

- N-RAS codons 12, 13 and 61

- BRAF V600E

- anti-epidermal growth factor receptor (EGFR).

- Sequencing of specific genes may be appropriate if familial adenomatous polyposis (FAP), Lynch syndrome or other genetic diagnoses are suspected.

Pathological staging:

Pathologic staging p TNM staging the 8the edition was applied .

Duke classification:

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Result

The number of colorectal reports included in this study was 257; 154 were from Soba University Hospital and 103 were from the Stak laboratories, 122 reports were resection specimens and the 135 were biopsies. The age distribution was concentrated in the middle age group (Figure 1). One hundred fortythree 143(55.6%0) were males and 114(44.4%) were females (Figure 2).

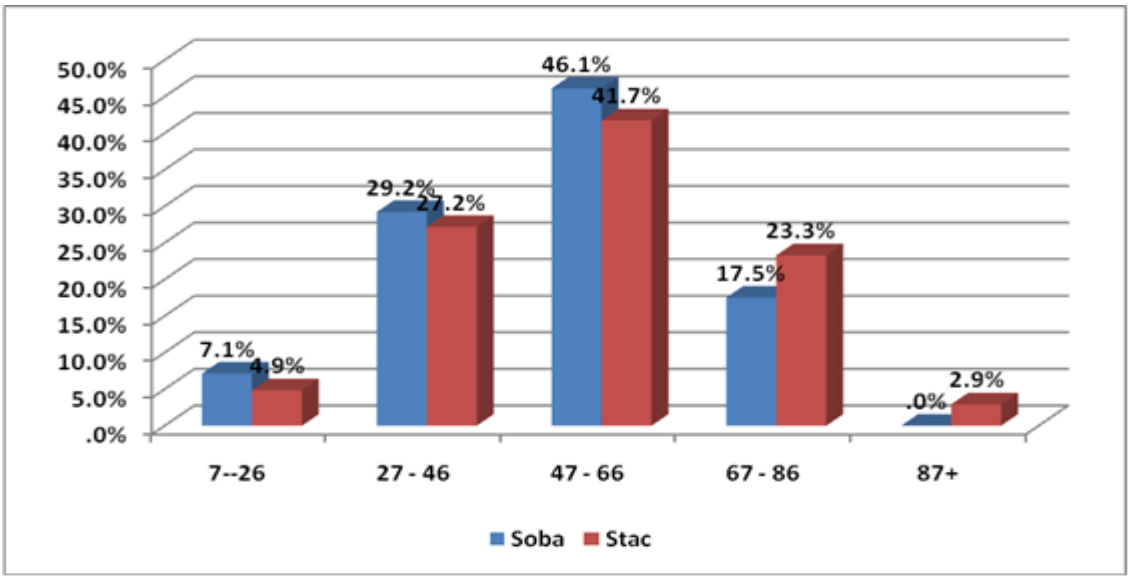

Figure 1: Age distribution

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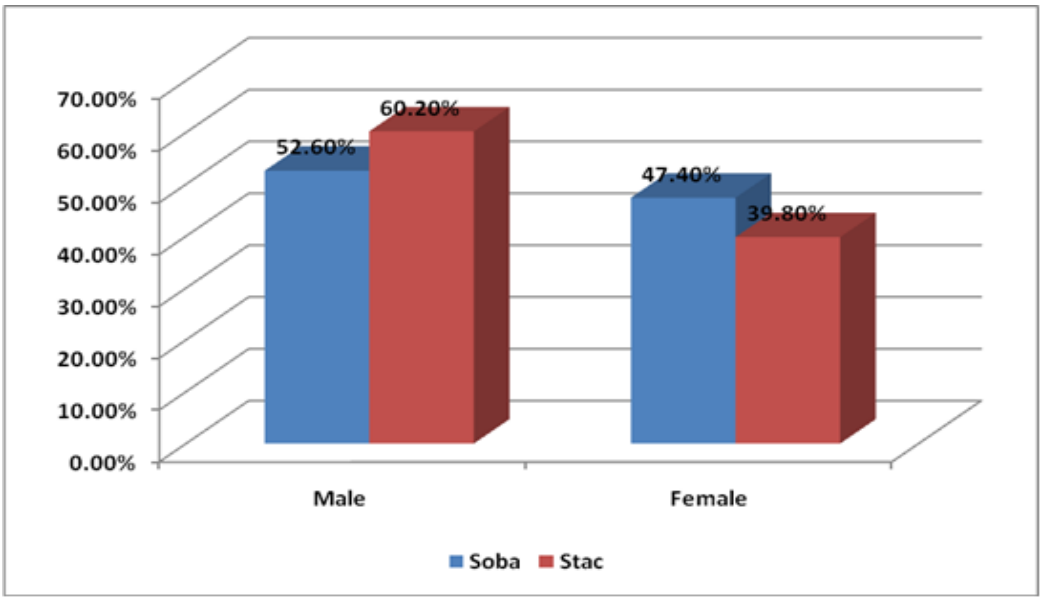

Figure 2: Gender distribution:

1/Core data items :

1/1: Macroscopic core data items: table 4

Nature of specimen and type of operation was reported in 91.0% (234) of the audited reports. The Site of tumor was mentioned in 98.8 %(254) of the studied reports. The clinical history was provided in 63.8 %(164). The imaging studies were included in 8.2 %(21) of reports. Endoscopy finding mentioned in 15.6% (40) of reports. The tumor anatomic location was provided in 10.1% (26) of the complete resection specimens. Maximum tumor diameter was reported in 95.9 % (117) of the complete resection sample (117/122). Distance to the nearer longitudinal resection margin was reported in 66.9 %(81) of the cases. Tumor perforation was reported in only 3.3%(4) of the reports. The relation of the tumor to the peritoneum reflection in rectal tumor was reported in one report (2.9%) of 35 rectal tumors. The Grade of plan(s) of surgical excision (AR and APE) specimen was not mentioned in any applicable specimen report in this study. Distance of the tumor from the dentate line (applied for APE specimens only) was reported in 0 .4% (one report) of the applicable samples (54) .

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Table : (4) Core Macroscopic data items:

Macroscopic core data items:	Total
1/ Nature of specimen and type of operation	91.1% (234)
2/ Site of tumor.	98.8 %(254)
3/ Maximum tumor diameter.	95.9%(117/122)
4/Distance to the nearer longitudinal resection margin	66.9 %(81)
5/ Tumor perforation.	3.3%(4)
6/ Relation of the tumor to the peritoneal reflection (rectal tumors only).	(2.9%) of 35
7/ Grade of the plane(s) of surgical excision (AR and APE specimens).	0%
8/ Distance of the tumor from the dentate line (for APE specimens only).	0.4%(one report) of the applicable samples(54) .

1/2 Microscopic core data items: Table 5

Histological tumor type was identified in 97.3%(250). Histological differentiation was reported in 58.8%(151) of the audited cases. Maximum extent of local invasion (pT stage) and maximum distance of extramural Spread was reported in 62.4%(138) of cases. Grade of tumor regression following preoperative Neoadjuvant therapy was reported in 37.5 %(6) of the 16 reports that received neo-adjuvant therapy. Longitudinal resection margin was reported in 96.6%(115) of reports. The circumferential margin status was reported in only 9.1%(11) of sample.

The lymph node status and number of LNs present was reported in 90.8% (108) of audited reports. Almost all reports providing lymph node mentioned the number involved nodes reported in 90.7%(107) of cases. Reports stating ≥12 lymph nodes harvest were 32.8 % of reports. The highest

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lymph node status was reported in only 1.5% (3). Venous invasion: was reported in 16.3 %(42). Histologically confirmed distant metastatic disease: was reported in 8.9%(23). Presence or absence of separate abnormality was mentioned in 26.8%(69) of audited reports.

Table 5 Core Microscopic data items of the RCPath for CRC:

Microscopic core data items	Total
1/Histological tumor type.	97.3%(250)
2/Histological differentiation.	58.8%(151)
3/Maximum extent of local invasion (pT stage) and maximum distance of extramural Spread.	62.4%(138)
4/Grade of tumor regression following pre-operative (neoadjuvant) therapy.	37.5%(6) of the 16
5/Resection margins (longitudinal and circumferential margins).	Longitudinal 96.6%(115) circumferential 9.1%(11)
6/ Lymph node status (number present, number involved, highest lymph node status).	LN status90.8%(108) %LN90.7%(107) LNs ≥12:32.8 % Highest LNs 1.5%(3).
7/ Venous invasion	16.3 %(42)
8/Histologically confirmed distant metastatic disease	8.9%(23)
9/Separate abnormalities	26.8%(69)

2/None core data set items:

Table 6 None-core macroscopic & microscopic data items

None: core macroscopic data items: included Specimen dimensions: was reported in 94.2% (242) of sample. Precise anatomical (quadrantic) location of CRM involvement (rectal tumors: was not reported in any rectal tumor. Providing data on Block index were recorded in 98.8%(254) of the audited reports.

Microscopic none core data Items: included Nature of advancing margin (infiltrative versus expansive) was reported in 52.5% (63) of cases. None of the audited reports included data on the presence or absence of tumor budding phenomena. Data on Lymphatic invasion was reported in

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14.5 % (37) of the audited reports. Extramural tumor nodules less than 3 mm in diameter were reported in 2.5% (3) of reports. Data commenting on perineural invasion is mentioned in 7.0% (18) of the audited reports.

Table 6: Non-core macroscopic &microscopic data items :

Macroscopic None core items: 1/Specimen dimensions.	94.2%(242)
2/ Precise anatomical (quadrantic) location of circumferential margin involvement (rectal tumors).	0%
3/Block index	98.8%(254)
Microscopic None core items: 1 /Nature of advancing margin (infiltrative *versus* expansive).	52.5% (63)
2/ Tumor budding.	0%
3/ Lymphatic invasion	14.5 % (37)
4/ Extramural tumor nodules less than 3 mm in diameter:	2.5% (3)
5/ Perineural infiltration	7.0% (18)

3/Auditing of other data items:

Immunohistochemical and special stain were mentioned in 3.5% (9) of the audited reports.

Molecular data was not used nor recommended in any of the reports in this studies.

Pathological (TNM) staging was used in 38.5%(95) of the reports. The Dukes classification was used in 36.2.6%(93) of reports. Tumor Histological subtypes were detailed as follows adenocarcinoma 86.7% (221), squamous cell carcinoma 4.3%(11), carcinoid tumor 1.6%(4) , carcinoma not typed 4.3% (11), carcinosarcoma 0.4%(1) ,basal cell carcinoma 0.4%(1), malignant melanoma 0.4%(1), non -Hodgkin's lymphoma 0.8 (2) , others 1.2%(3). The histological differentiation was reported as follow: Well differentiated 36.7% (56), moderately differentiated 31.5% (81) and poorly differentiated 5.4% (14).

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4/ Comparing data auditing between Soba Hospital and STAK laboratories:

The following tables compare the auditing of study variables between the two centers (Soba &Stak) shown in tables 7,8,9,10,11,12) and figures (3,5, 6).

Table 7: The site of specimen and clinical history reporting.

	Yes [n=257]			
	Soba	**Stak**	**Total**	**PV**
Site of specimens	54(100.0%)	100(97.1%)	254(98.8%)	.033
Clinical	99(64.3%)	65(63.1%)	164(63.8%)	.847

Table 8: Imaging, Endoscopy and Nature of specimen (type of operation)

	CENT (YES = N=257)		**Total**	**PV**
	Soba	**Stak**		
Imaging	19(12.3%)	2(1.9%)	21(8.2%)	.003
Endoscopy	33(21.4%)	7(6.9%)	40(15.7%)	.002
Nature	150 (97.4%)	84 (81.6%)	234 (91.1%)	.000

Table 9: Distance of nearest surgical margin to tumor:

[N= 122]			
	CENTER		
Distance of tumor	Soba	Stak	Total
Yes	61 (85.9%)	20(40.0%)	81(66.9%)
No	11(14.1%)	30(60.0%)	41(33.1%)
Total	72(100.0%)	50(100.0%)	122(100.0%)
PV= .000			

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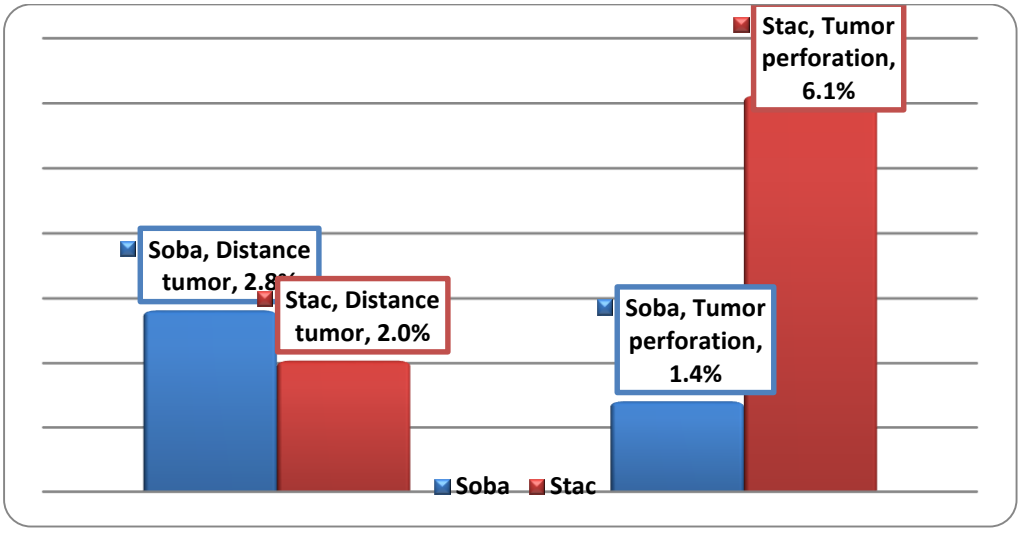

Figure 3: Distance of tumor to closest circumferential margin, and tumor perforation:

Table 10: Macroscopic tumor perforation reporting.

	CENTER		
	Soba	**Stak**	**Total**
Yes	1 1.4%	3 6.1%	4 3.3%
No	71 98.6%	47 93.9%	118 96.7%
Total	72 100.0%	50 100.0%	122 100.0%
PV= .157			

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Table 11: Rectal tumors: Relation to peritoneal reflection and distance from dentate line.

	CENTER		
	Soba	**Stak**	**Total**
Relation of tumor to peritoneum reflection	0 .0%	1 10.0%	1 2.9%
Distance tumor from the dentate line With biopsy included	1 0.6%	0 0.0%	1 0.4%

Table 12: reporting of histological Subtype and differentiations of tumor and maximum extend of local invasion:

	Soba N=154	Stak N=103	Total N=257
Histological type reported	97.4%	97.1%	97.3% (250)
Histological .differentiation	57.8%	60.2%	58.8%(151)
Maximum extend of local invasion (pT) and distance of extra mural spread	55.3%	78.3%	62.4%(138)

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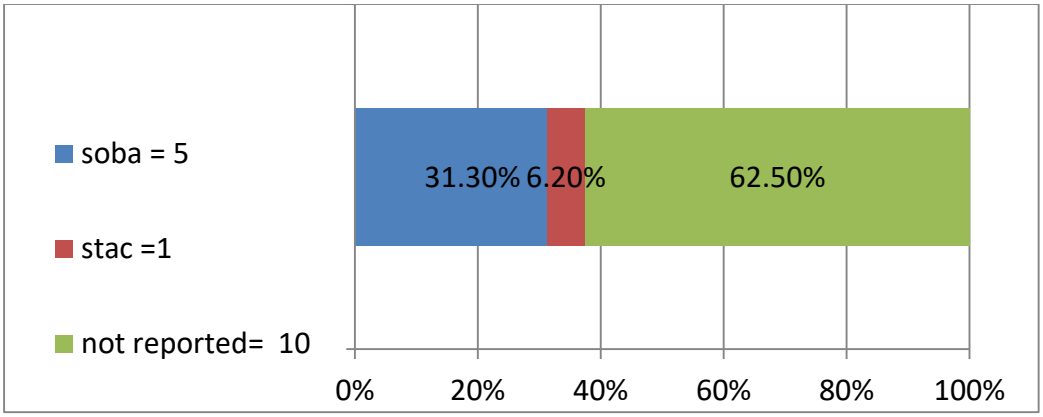

Figure 4: Tumor grading after Receiving neoadjuvant therapy :

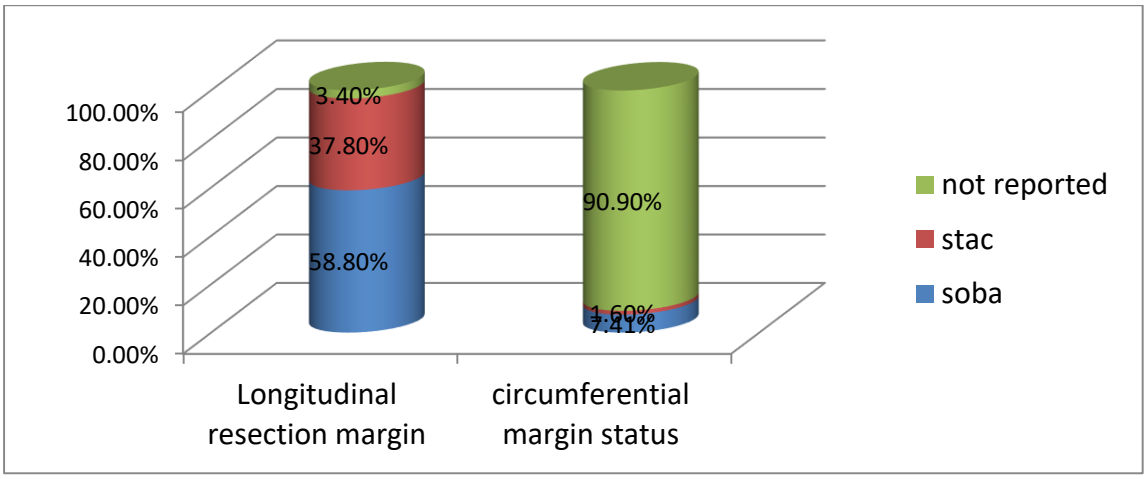

Figure 5: Microscopic reporting of longitudinal and circumferential surgical margin:

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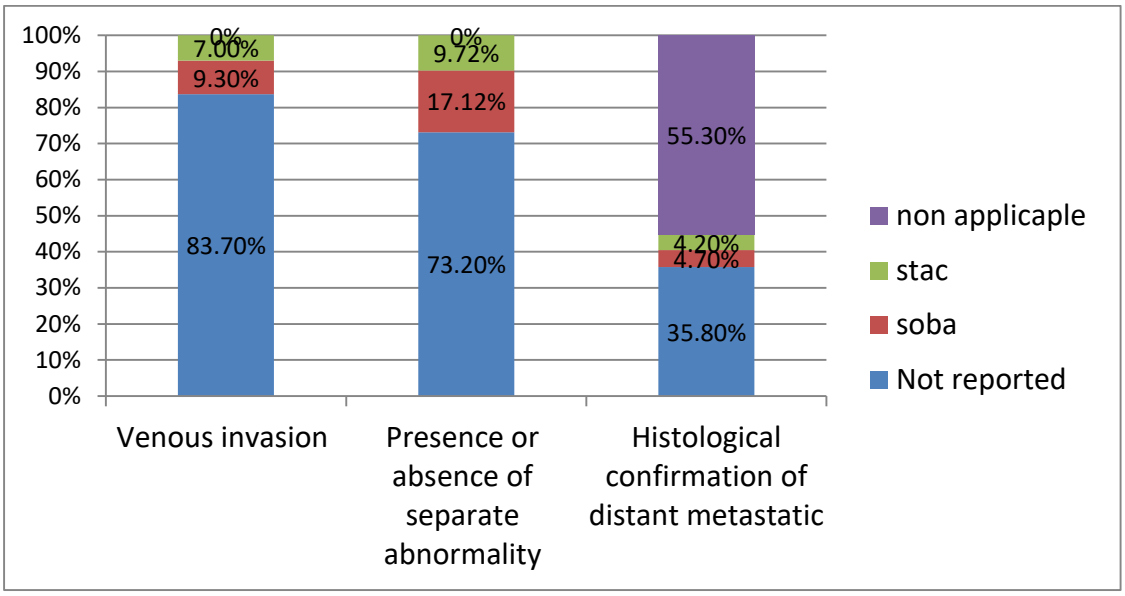

Figure 6: Reporting of venous invasion, presence of separate abnormality and histological confirmation of distant metastatic.

Table 13: Reporting of nature of advance tumor margin and lymph node with its status:

	CENTER (YES = N=257)		Total	PV
	Soba	Stak		
Lymph node	69(97.2%)	39(81.3%)	108(90.8%	**.003**
Number. Involved	69(97.2%)	38(80.9%)	107(90.7%)	**.002**
Nature The nature of advancing margin	60(85.7%)	3(6.0%)	63(52.5%)	**.000**

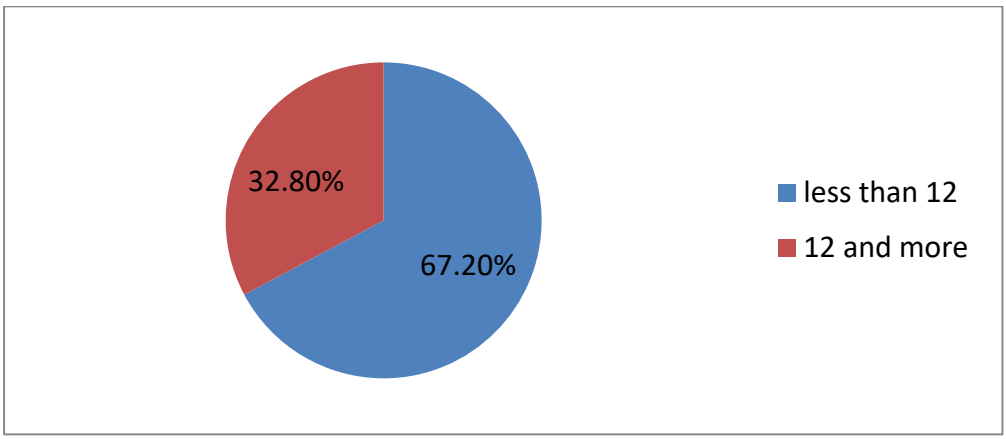

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Figure7: Number of lymph node detected

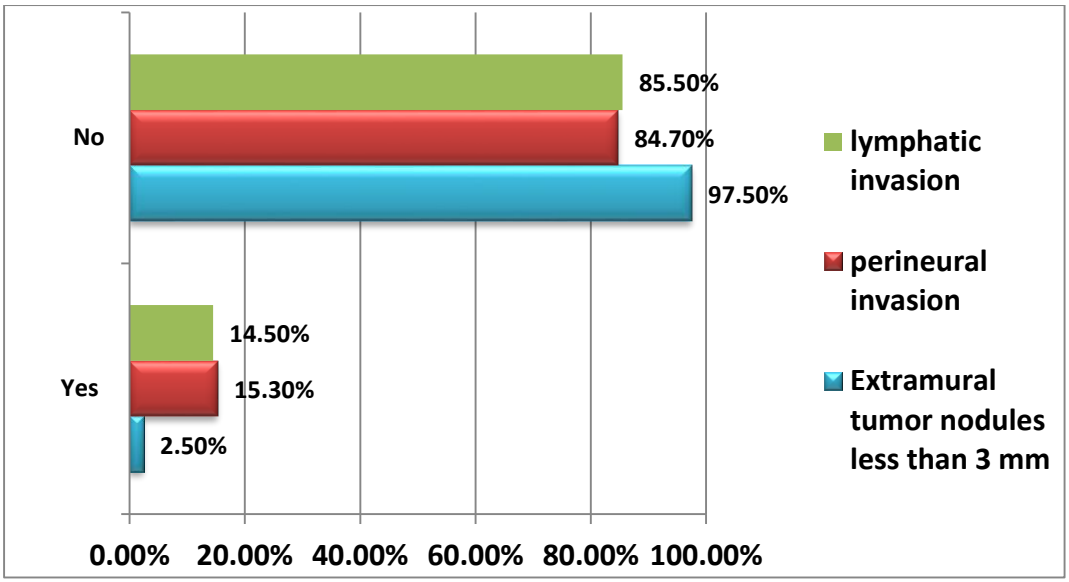

Figure 8: Reporting of, lymphatic vessels invasion, perineural invasion and extramural tumor nodules less than 3 mm.

Discussion

This study audited the reporting of colorectal carcinoma in Sudan represented by two centers in Khartoum. The number of reports included in this study was 257; 154 from Soba university hospital histopathology department and 103 reports from the national laboratory histopathology and cytology department (STAK). The study duration was 3 years extended from Jan 2012 to Dec 2014. 122 reports were for resection specimens and 135 were biopsy specimens.

The patient's personal data were almost complete in all reports; this may be attributed to the fact that complete personal data is mandatory for receiving the sample in both centers. Clinical data was reported in (63.8 %) of the reports, this may be explained by lack of request forms or to incomplete filling of available request form. Only 8.2% of the reports provided radiological findings, only (15.6%) of samples taken through endoscopy procedure provided endoscopic information.

Of the 8 core macroscopic items, 4 items were well reported and 4 were poorly reported: the well reported are: Tumor anatomic site 98.8%, nature of specimen and type of operation, maximum tumor diameter 95.9% and nearest longitudinal resection margin 66.9%. The maximum tumor dimension of

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(95.9%)reported in this audit is close to a median of (94.4%) reported by the audit conducted by Bull et al in 17 laboratories in Wales. (8)

The nearest surgical margins distance was reported in (66.9%) of cases in this study which is less but somehow close to the median reported by Bull et al (75.2%) in the Wales audit (8)

Four out of the 8 macroscopic core data items were poorly reported: tumor perforation (3.3%). The other 3 poorly reported items were related to rectal tumors: Relation of the tumor to the peritoneal reflection (reported only in 2.9%) of our cases. Grade of the planes of surgical excision for AR and APE resection specimens which was not reported in any case. Distance of the tumor from the dentate line (this item is peculiar to APE resection specimens), reported only in one case 0.4%.

The data about the three poorly reported macroscopic items peculiar to rectal tumors are in concordance with other similar studies, Bull et al in the wales audit reported a Circumferential plane involvement with a median of 57.6% and measured circumferential plane clearance with a median of only 7.7%, they concluded that one of the most important deficiencies is related to inadequate description of the circumferential resection plan for rectal tumors (8). Similarly Cross et al in their 5 cycles audit reported circumferential resection margin of 31% in the first cycle which raised to 100% in the final cycle (13). In the same context Nambiar et al reported completeness of excision at the circumferential resection margin of only 30.5% Ref (5)

The circumferential resection margin (CRM) is a strong prognostic factor for rectal cancer resection, as CRM involvement is associated with increased local recurrence and increased rate of distant metastasis. Ref (5&11&25). Moreover CR may identify patients for whom post -operative adjuvant therapy can be beneficial. Ref 5

Of the 9 core microscopic data, there are some 5 well documented items (>50%): histologic tumor type 97.3%, tumor differentiation 58.8%, pT stage 62.4%, longitudinal resection margin 96.6%, and LNs data regarding the LNs present 90.8% and the LNs involved 90.7%. Similarly, Nambiar et al in their audit reported well documentation of almost 100% data about tumor type and differentiation (5). Bull et al in the Wales audit reported 100% throughout all audit cycles regarding both histologic type and grade (8) . Similar to Bull et al, Cross et all reported 100% regarding both type and grade of the tumors. The Tumor stage (pT) reported in this study was 62.4% , while Nambiar et al reported 100% concerning tumor stage (5). Similarly, *the* Wales audit reported extent of tumor invasion of 98.6% (8). Our data regarding tumor stage is far less compared to both these

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studies but can be accepted as good. We reported longitudinal resection margin of 96.6%, Nambiar et al (Indian audit) showed similarly well reporting regarding completeness of longitudinal excision margins (94.9%), (5). This study reported data regarding LNs presence of 90.8% and LNs involvement by tumor of 90.7% on the contrary Bull et al reported data about LNs involvement in 95.3 % of the cases only 27.5% mentioned the number of LNs involved (8)

Microscopic core data items that were poorly reported included: Grade of tumor regression following pre-operative neoadjuvant therapy 37.5%, while Nambiar et al (India) reported radiation changes of 3.38%. We reported circumferential resection margin of 9.1%, while Nambair et al reported 30.5% (5). Wales audit (Bull et al) reported Circumferential plane involvement 57.6%, & Measured circumferential plane clearance 7.7%. (8) Cross et al reported 31% circumferential margin resection at the first cycle of audit that mounted to 100% in the final cycle (13). This study indicated status of LNs identified >12 of 32.8%, and highest LNs of 1.5% . Nambair et al reported 20.3% of apical (highest) LN . Cross and Bull didn't include highest LN in their auditing items. This study mentioned Venous invasion of 16.3%, Cross et al reported no available data in the first audit cycle that reached to 100% in the 5th audit cycle. Nambair (5) and Bull (13) didn't included vascular invasion in their items. This audit showed comment on background separate abnormalities in 26.8% of the reports while Nambair et al commented on almost all reports (5). Cross et al reported no available data on mucosal abnormalities in the first cycle that mounted to 99% in the final cycle. We reported histologically confirmed metastatic disease in 8.9% of the reports, but our search failed couldn't didn't provide comparable data.

Two of the 3 None core macroscopic data items set by the Rcpath were well documented : Specimens dimension (94.2%) compared to 98.4% reported by Bull et al . Data on block index was (98.8%). However, the third none-core macroscopic item, Precise anatomical (quadrantic) location of CRM involvement (peculiar to rectal tumors only) was not provided in any report

The 4th edition of the Rcpath on reporting CRC selected 5 items as Non-core microscopic reporting items, all these were sub optimally indicated in the study.

The nature of advancing margin (52.5%). None of the reports mentioned the presence or absences of tumor budding. Lymphatic invasion was reported in (14.5%) of cases. Extramural tumor nodules less than 3mm in diameter were reported in (2.5%), perineural invasion was reported in 7% .Immunohistochemical and special stains indicated in (3.5%) of the audit reports.

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No molecular testing was reported in any of the cases subject to audit. The scarcity of data on special stains, immunohistochemistry and molecular testing can be explained by the limited resources provided for diagnostic histopathology services in countries of limited resources.

The Dukes histological staging was provided in (38.5%) compared to a median of 73.6%) reported by Bull et al. The pathological Tumor, Node, Metastasis (pTNM) classification was used in (5%) of the reports.

Limitations

This study provided detailed data resulting from auditing local histopathology reporting against both core and non-core macroscopic and microscopic items set by the Royal college of pathologists of UK for colorectal cancer. Nevertheless; this study is not without limitations: the study used the 4the edition of the dataset as at the time of reporting these cases the 5the edition was not released. Data obtained from this study was compared with studies dating back and from different settings, this can be explained by the paucity of similar research in our settings and the lagging behind of histopathology research and practice in countries with limited resources like Sudan.

Conclusion

To the best of our knowledge; this is the first study auditing colorectal cancer reporting in Sudan against international standardized reporting. This study highlighted areas of deficiency in grossing and reporting CRC specimens. This study is suggested to be a cornerstone for improving histopathology diagnostic services and consequently impact positively CRC management. Local pathology professional bodies and specialized cancer care authorities need to harmonize efforts by setting uniform standardized reporting profrorma that can be extracted from other international counterparts. Despite the limited resources allocated to improving diagnostic pathology in Sudan, much improvements can be implemented through providing standardized cancer reporting formatting.

Conflict of interest:
Authors declare No conflict of interest
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