Clinico-pathological Profile of Colorectal Cancer: A Retrospective Observational Study

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ABSTRACT

Background: Colorectal cancer (CRC) is the third most commonly diagnosed cancer worldwide, constituting approximately 9.6% of all cancer cases. Its incidence is rising globally, particularly in developing countries undergoing rapid socioeconomic transitions. Despite increasing global data on CRC, limited hospital-based data exist from Bangladesh regarding clinico-pathological characteristics and surgical outcomes of CRC patients. This study aimed to evaluate the clinico-pathological profile, surgical management and perioperative outcomes of colorectal cancer patients at a tertiary care hospital in Bangladesh over five years. **Methods & Materials:** This retrospective observational study was conducted at Enam Medical College & Hospital, Savar, Dhaka, from January 2020 to December 2024. A total of 276 histologically confirmed colorectal cancer patients were enrolled using a purposive sampling technique. Data on demographics, clinical presentation, tumor characteristics, histopathological findings, TNM staging, surgical procedures and postoperative outcomes were collected and analyzed using IBM SPSS. Categorical data were analyzed using the chi-square test; $p<0.05$ was considered statistically significant. **Results:** The mean age was 56.8 ±13.4 years, with male predominance (60.9%). Altered bowel habits (65.9%) and rectal bleeding (56.5%) were the most common presenting symptoms. The rectum was the most frequent tumor site (47.8%) and left-sided lesions constituted approximately 75% of cases. Conventional adenocarcinoma was the predominant histological type (85.5%), with moderate differentiation in 58.7% of cases. Most patients presented in advanced stages (Stage III + IV: 57.3%). Anterior resection was the most common surgical procedure (37.0%). Postoperative complications occurred in 22.5% of patients, with an in-hospital mortality of 2.9%. Tumor stage was significantly associated with tumor differentiation ($p=0.0004$) and lymph node involvement ($p<0.0001$). **Conclusion:** Colorectal cancer in this tertiary care setting predominantly affects middle-aged males, with late-stage presentation and rectal tumor predominance. Strengthening early detection programs and expanding surgical capacity are critical for improving patient outcomes.

Keywords: *Colorectal cancer, clinico-pathological profile, TNM staging, adenocarcinoma.*

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INTRODUCTION

Colorectal cancer (CRC) is a major global health burden, ranking third in cancer incidence and second in cancer-related mortality worldwide. According to GLOBOCAN 2022, there were approximately 1.93 million new CRC cases and over 904,000 deaths globally, with colorectal cancer accounting for 9.6% of all newly diagnosed cancers [1]. The burden of CRC continues to grow, with projections indicating 3.2 million new cases and 1.6 million deaths annually by 2040, predominantly affecting high and very high-human development index (HDI) countries [2]. In Asia, CRC is rapidly increasing due to urbanization, dietary westernization and socioeconomic transitions, with an estimated 50.2% of global CRC burden occurring in Asia in 2022 [3].

Epidemiological patterns of CRC show marked geographic variation. Incidence rates are highest in Australia/New Zealand and European regions and lowest in South Asia and Sub-Saharan Africa [2]. However, low- and middle-income countries (LMICs), including those in South Asia, are witnessing a rising trend attributable to rapid lifestyle changes, growing urbanization and increasing adoption of Western dietary patterns [4]. This rising incidence in transitioning countries has prompted global calls for strengthened CRC prevention and early detection strategies.

Traditionally, CRC was considered a disease of older adults, predominantly affecting those above 60 years of age. However, a striking global trend towards early-onset CRC (EOCRC), defined as CRC diagnosed in individuals under 50 years of age, has been documented across multiple countries [5]. Early-onset CRC incidence rates are rising in 27 of 50 countries examined, with several studies identifying modifiable risk factors, including obesity, sedentary lifestyle, dietary patterns and environmental exposures as potential drivers [6]. In South Asian populations, including Bangladesh, a disproportionately higher incidence of early-onset CRC has been observed compared to Western cohorts, warranting specific investigation [7].

The epidemiology of CRC also shows distinct gender differences. Male predominance has been consistently observed across global studies, attributed to higher exposure to lifestyle-related risk factors such as smoking, alcohol use, obesity and physical inactivity [8]. In terms of tumor location, a gradual shift from left-sided to right-sided CRC has been noted in Western countries, particularly driven by widespread colonoscopic screening. In contrast, studies from the Indian subcontinent and other Asian countries continue to report predominance of left-sided and rectal tumours [9].

Histopathologically, conventional adenocarcinoma constitutes the majority of CRC cases globally, while mucinous and signet ring cell variants are associated with worse prognosis and frequently occur in younger patients [10]. The extent of lymphovascular invasion (LVI) and perineural invasion (PNI) is a well-recognized adverse pathological prognostic

feature strongly correlated with advanced stage, nodal metastasis and poorer survival [11]. Late-stage presentation at diagnosis remains a persistent challenge in resource-limited settings due to a lack of systematic CRC screening programs, limited diagnostic facilities and low public awareness [12].

In Bangladesh, CRC data remain limited, with most available reports coming from single-center retrospective studies. A study from Bangabandhu Sheikh Mujib Medical University (BSMMU) highlighted clinico-pathological features, including a younger age at presentation and a predominance of advanced-stage disease, in the local population [13]. The study from Royal London Hospital also highlighted that Bangladeshi patients with CRC present with a significantly younger median age and have a disproportionately high rate of early-onset disease, underscoring unique genetic or environmental susceptibility factors [14]. However, comprehensive hospital-based data on the clinico-pathological profile, surgical management and perioperative outcomes of CRC patients from Bangladesh remain scarce.

Therefore, this study was conducted to evaluate the complete clinico-pathological profile, surgical management and perioperative outcomes of colorectal cancer patients at a tertiary care hospital in Dhaka, Bangladesh, over five years. The findings are intended to contribute to the existing literature, inform local clinical practice and strengthen the evidence base for CRC screening and management strategies in Bangladesh.

MATERIALS & METHODS

This was a retrospective observational study conducted at the Department of Surgery, Enam Medical College & Hospital, Savar, Dhaka, Bangladesh. The study period extended from January 2020 to December 2024, covering five years of clinical data. The hospital is a 500-bed tertiary care institution serving urban and semi-urban populations of the Greater Dhaka region. All patients admitted to the Department of Surgery who were histologically diagnosed with primary colorectal cancer during the study period were included. A purposive sampling technique was applied and a total sample size of 276 patients was obtained.

Selection Criteria

Inclusion Criteria

- All patients with histologically confirmed primary colorectal adenocarcinoma.
- Patients with complete medical records, including histopathological reports, operative notes and follow-up data.
- All age groups and both sexes.
- Patients who underwent surgical management at the study institution.
- Patient who underwent any surgical procedure (curative or palliative).

Exclusion Criteria

- Patients presenting with recurrent colorectal cancer.
- Cases with incomplete or missing clinical and pathological records.
- Patients who were unwilling to participate or whose consent could not be obtained.
- Secondary colorectal malignancies (metastatic tumors from other primary sites).
- Patients after being diagnosed, referred to the oncology clinic for new adjuvant therapy were excluded from the study.

Data Collection Procedure

Data were collected retrospectively from the medical records maintained by the Department of Surgery, Enam Medical College & Hospital. The principal investigator reviewed all case files, operative notes, histopathological reports and discharge summaries using a pre-designed structured data collection form. The form captured information on demographic characteristics (age, sex, body mass index and family history of CRC), clinical presentation (chief complaints, duration of symptoms and mode of presentation), anatomical tumor location, macroscopic gross morphology, histopathological type and grade of tumor, TNM staging according to the American Joint Committee on Cancer (AJCC) 8th edition criteria, surgical procedures performed, resection margins (R0/R1/R2), lymphovascular invasion, perineural invasion and postoperative outcomes (complications and in-hospital mortality). Tumor location was defined as right-sided if located from the cecum to the splenic flexure and left-sided if located from the splenic flexure to the upper rectum (>15 cm from the anal margin). Tumors at the splenic flexure were categorized as left-sided. All data were entered into a standardized electronic spreadsheet to ensure accuracy and consistency. Patient confidentiality was strictly maintained throughout the study by anonymizing all data during entry and analysis. Ethical clearance was obtained from the Institutional Review Board of Enam Medical College & Hospital prior to data collection.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 25.0. Categorical variables were expressed as frequencies and percentages. The Chi-square test was used to assess associations between categorical variables such as tumor stage and tumor differentiation, lymph node involvement, tumor location and metastasis. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table I presents the age distribution of the study population. The age of patients ranged from 22 to 85 years, with a mean age of 56.8 ± 13.4 years. The most frequently affected age group was 51–60 years (28.6%), followed by 61–70 years (24.3%). Notably, 14.1% of patients were below 40 years of age, reflecting an appreciable burden of early-onset colorectal cancer. There was a significant male predominance, with 168 males (60.9%) and 108 females (39.1%), yielding a male-to-female ratio of approximately 1.55:1.

Table I
Demographic Characteristics of the Study Population (*n* = 276).

Demographic Characteristics		Frequency (n)	Percentage (%)
Age Group (years)	< 40	39	14.1
	41–50	41	14.9
	51–60	79	28.6
	61–70	67	24.3
	> 70	50	18.1
	Mean± SD	56.8 ± 13.4	
Gender	Male	168	60.9
	Female	108	39.1

Clinical Presentation

Figure 1 illustrates the distribution of presenting symptoms among patients. The most common presenting symptom was altered bowel habits (65.9%), followed by rectal bleeding (56.5%), abdominal pain (50.0%), weight loss (43.8%) and anemia-related symptoms such as fatigue and pallor (35.5%). Intestinal obstruction was observed in 23.2% of patients. A smaller proportion of patients presented with a palpable abdominal mass (12.3%) and perforation (3.6%).

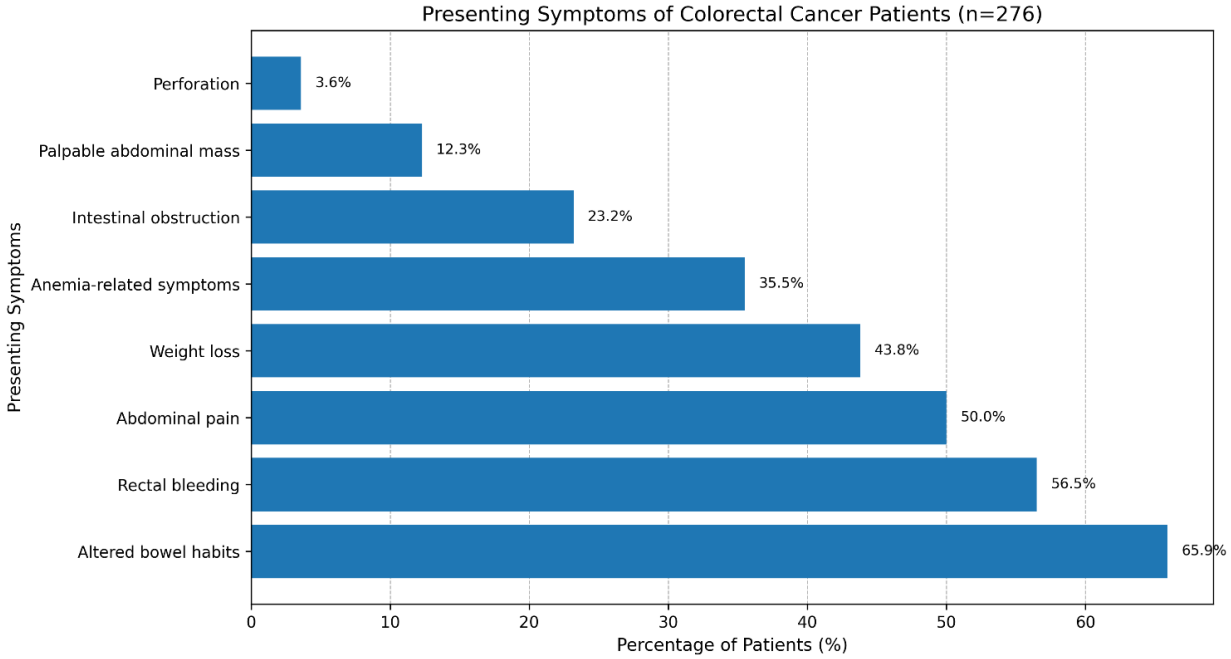

Figure 1: Distribution of Presenting Symptoms in Colorectal Cancer Patients (*n* = 276).

Table II presents the distribution of tumor location. The rectum was the most common site of involvement, accounting for 132 cases (47.8%), followed by the sigmoid colon (19.6%), ascending colon (14.1%), descending colon (7.6%), transverse colon (6.5%) and cecum (4.3%). Overall, left-sided lesions (including the rectum, sigmoid colon and descending colon) constituted approximately 75% of cases, while right-sided lesions (ascending colon, transverse colon and cecum) accounted for approximately 25%.

Table II

Distribution of Tumor Location (*n* = 276).

Sl. No.	Tumor Location	Number of Cases (n)	Percentage (%)
1	Rectum	132	47.8
2	Sigmoid Colon	54	19.6
3	Descending Colon	21	7.6
4	Transverse Colon	18	6.5
5	Ascending Colon	39	14.1
6	Caecum	12	4.3
	Total	276	100

Gross Morphology

Figure 2 illustrates the gross morphological types of tumors based on operative and pathological findings. The most common morphological pattern was ulceroproliferative growth, identified in 118 cases (42.8%), followed by annular constricting lesions (82 cases; 29.7%), polypoid growth (51 cases; 18.5%) and infiltrative type (25 cases; 9.1%).

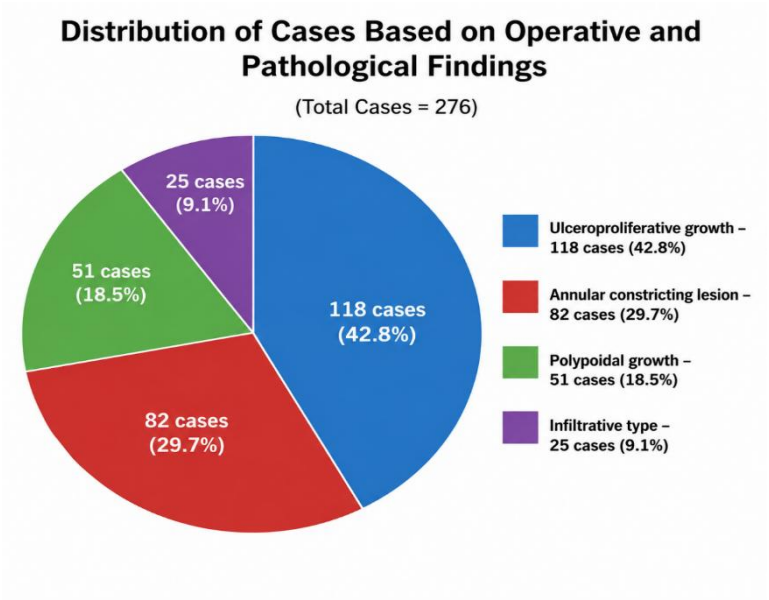

Figure 2: Distribution of Cases Based on Gross Morphological Findings (*n* = 276).

Histopathological Profile

Figure 3 presents the histopathological types and tumor differentiation. The overwhelming majority of tumors were conventional adenocarcinoma (236 cases; 85.5%), followed by mucinous adenocarcinoma (28 cases; 10.1%) and signet ring cell carcinoma (12 cases; 4.3%). Regarding tumor differentiation, moderately differentiated tumors were most common (162 cases; 58.7%), followed by well-differentiated (62 cases; 22.5%) and poorly differentiated tumors (52 cases; 18.8%).

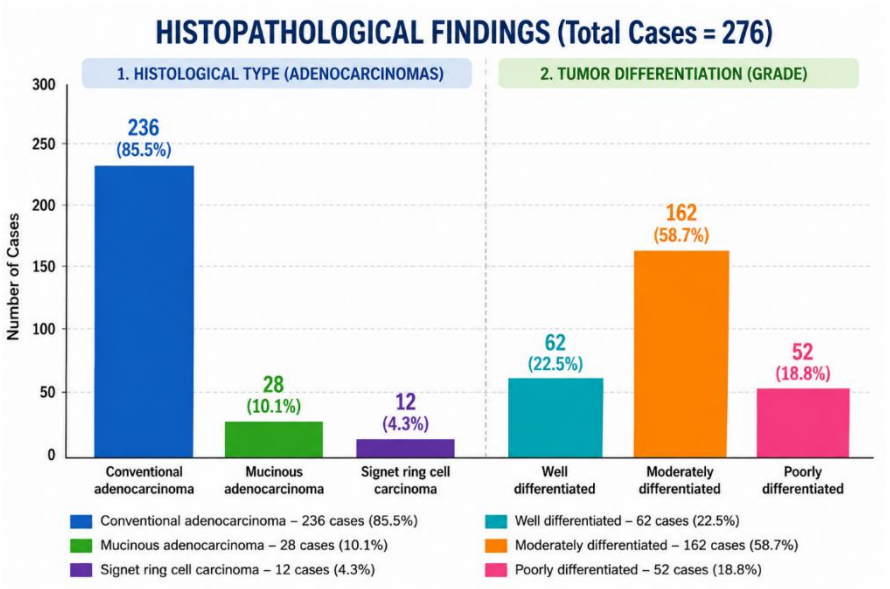

Figure 3: Distribution of Histopathological Types and Tumor Differentiation in Colorectal Cancer Patients (n = 276).

TNM Staging and Lymphovascular/Perineural Invasion

Figure 4 presents the TNM staging profile. A majority of patients presented with advanced disease: Stage III accounted for 96 cases (34.8%), followed by Stage II (86 cases; 31.2%), Stage IV (62 cases; 22.5%) and Stage I (32 cases; 11.6%). Advanced stage disease (Stage III + IV) was present in 57.3% of patients. T4 tumors were identified in 72 cases (26.1%). Lymph node involvement showed N2 disease (≥4 positive nodes) in 64 cases (23.2%) and M1 (distant metastasis) in 62 cases (22.5%). Lymphovascular invasion was present in 104 cases (37.7%) and perineural invasion in 68 cases (24.6%), both significantly associated with higher tumor stage.

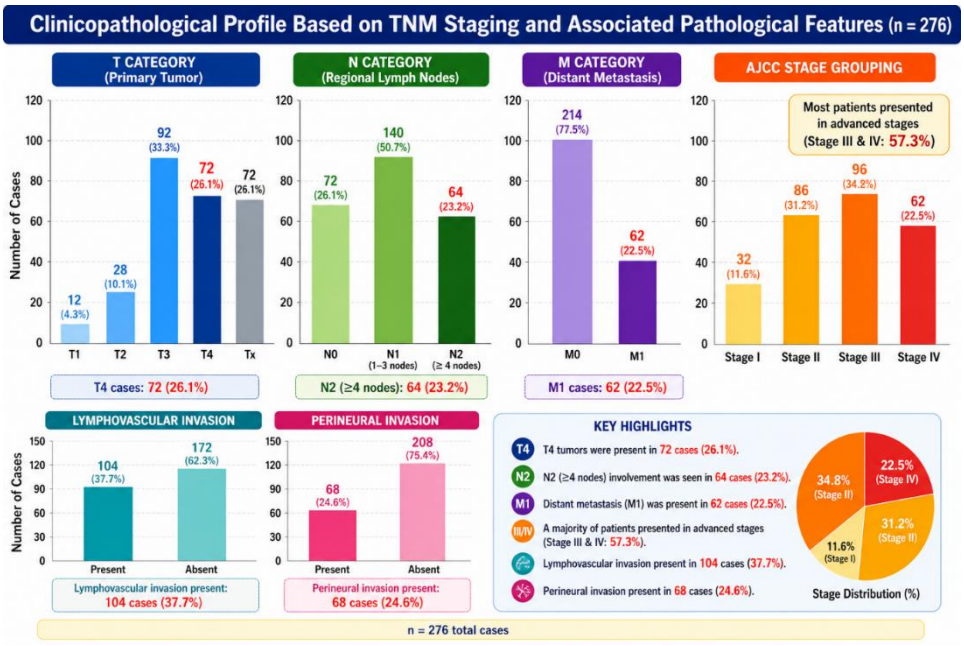

Figure 4: Clinico-pathological Profile Based on TNM Staging (*n* = 276).

Table III presents the surgical procedures performed. Anterior resection was the most commonly performed operation (102 cases; 37.0%), followed by abdominoperineal resection (APR) (78 cases; 28.3%), right hemicolectomy (42 cases; 15.2%), left hemicolectomy (28 cases; 10.1%), Hartmann's procedure (16 cases; 5.8%) and palliative procedures (10 cases; 3.6%). Among all procedures, ten were performed laparoscopically (6 anterior resections and 4 right hemicolectomies).

Table III
Surgical Procedures Performed (*n* = 276).

Sl. No.	Procedure Performed	Number (n)	Percentage (%)
1	Anterior Resection	102	37.0
2	Abdominoperineal Resection (APR)	78	28.3
3	Right Hemicolectomy	42	15.2
4	Left Hemicolectomy	28	10.1
5	Hartmann's Procedure	16	5.8
6	Palliative Procedure	10	3.6
	Total	276	100.0

Postoperative Outcomes

Figure 5 illustrates the postoperative outcomes. Postoperative complications occurred in 62 patients (22.5%). The most common complication was wound infection (28 cases), followed by ileus (14 cases), anastomotic leak (12 cases) and other complications (8 cases). In-hospital mortality was 8 cases (2.9%). One patient sustained an intraoperative left ureteric injury during laparoscopic anterior resection, which was detected postoperatively and managed with a staged procedure.

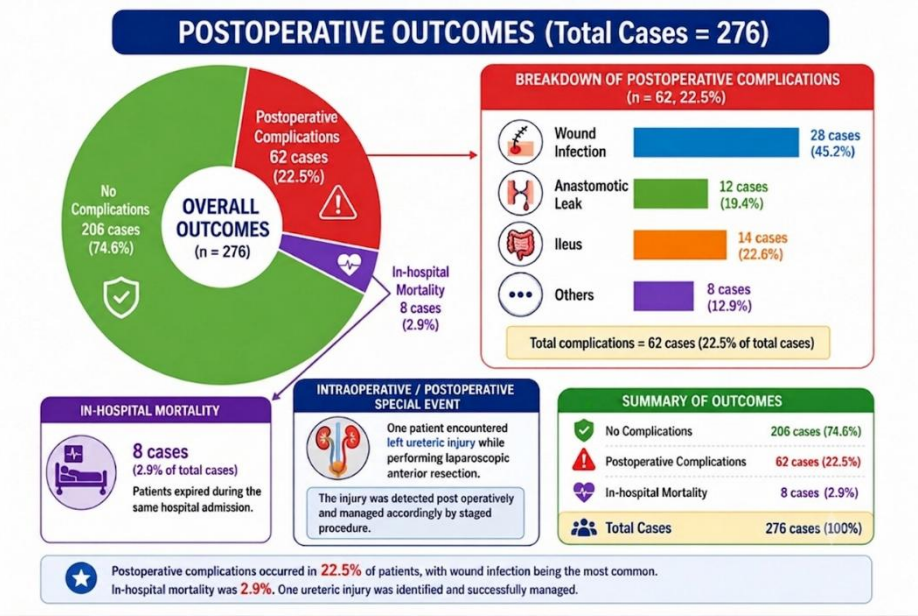

Figure 5: Post-operative Outcomes of the Cases (*n* = 276).

Table IV presents the association between tumor stage and tumor differentiation. A statistically significant association was observed (p = 0.0004), with poorly differentiated tumors more prevalent in advanced stages (Stage III and IV).

Table IV
Association Between Tumor Stage and Tumor Differentiation.

Stage	Well Differentiated	Moderately Differentiated	Poorly Differentiated	Total	P-value
I	18	12	2	32	0.0004
II	26	48	12	86	
III	12	66	18	96	
IV	6	36	20	62	
Total	62	162	52	276	

Table V presents the association between tumor location and stage. No statistically significant association was found between tumor site and stage (p = 0.18), although rectal cancers showed a higher tendency to present in advanced stages.

Table V
Association Between Tumor Location and Stage.

Site	Stage I	Stage II	Stage III	Stage IV	Total	P-value
Rectum	12	38	50	32	132	0.18
Sigmoid	8	20	18	8	54	
Right Colon*	12	28	28	22	90	
Total	32	86	96	62	276	

Table VI presents the association between nodal status and tumor stage. A highly significant association was observed between nodal involvement and stage (p < 0.0001), confirming progressive lymphatic spread with advancing disease.

Table VI
Association Between Lymph Node Status and Tumor Stage.

Stage	N0	N1	N2	Total	P-value
I	30	2	0	32	<0.001
II	60	20	6	86	
III	20	48	28	96	
IV	8	24	30	62	
Total	118	94	64	276	

Table VII presents the association between distant metastasis and tumor stage. A perfectly significant association was observed between metastasis and stage (p < 0.0001), as Stage IV disease is by definition characterized by distant metastasis.

Table VII
Association Between Metastasis and Tumor Stage.

Stage	M0	M1	Total	P-value
I	32	0	32	
II	86	0	86	
III	96	0	96	<0.001
IV	0	62	62	
Total	214	62	276	

DISCUSSION

Colorectal cancer remains a leading contributor to cancer-related morbidity and mortality globally, with a rising incidence particularly in developing nations transitioning toward urbanized lifestyles. The present retrospective study evaluated the clinico-pathological profile, surgical management and perioperative outcomes of 276 colorectal cancer patients over a five-year period at a tertiary care hospital in Dhaka, Bangladesh. The findings offer valuable insight into the burden and characteristics of CRC in this setting and align with several regional and international observations.

In the present study, the mean age at presentation was 56.8 ± 13.4 years, with the 51–60 years age group most frequently affected. This is consistent with findings from Patra et al. who reported a mean age of 55.4 years in a tertiary cancer center in Eastern India, with rectal predominance and similar age distribution [10]. Deo et al., in a large Indian cohort of 970 patients, reported a mean age of 47.7 years, slightly lower than in the present study, reflecting possible differences in genetic susceptibility and dietary habits across South Asian subpopulations [9]. In Western countries, the mean age of CRC diagnosis is typically above 60 years, consistent with older, more extensively screened populations. Notably, 14.1% of patients in the present study were below 40 years of age, in keeping with the globally recognized phenomenon of early-onset CRC. Sung et al. demonstrated rising EOCRC incidence rates in 27 of 50 countries analyzed, including Asian nations, linked to growing obesity rates, dietary shifts and declining physical activity levels [6].

A male predominance was observed, with a male-to-female ratio of 1.55:1. This aligns with numerous published series. Bray et al. from GLOBOCAN 2022 confirmed higher CRC incidence in males across virtually all world regions, attributed to a greater prevalence of lifestyle risk factors including smoking, alcohol use, visceral adiposity and physical inactivity [1]. Similarly, Rawla et al. noted that male sex is an independent risk factor for CRC, with endogenous estrogen and oral contraceptive use conferring some degree of biological protection in females [4]. A North India prospective observational study by Himjournals et al. similarly reported 64% male patients, with the highest incidence in the 51–60-year age group [15].

Altered bowel habits and rectal bleeding were the most common presenting symptoms in the present study. These symptoms are characteristic of left-sided tumors, particularly rectal and recto-sigmoid lesions, which constituted the majority of cases. Intestinal obstruction in 23.2% of patients and perforation in 3.6% indicate advanced and emergency presentations. Similar symptom patterns have been reported in studies from South Asia and Sub-Saharan Africa, where delayed healthcare-seeking behavior, limited diagnostic facilities and low public awareness contribute to late presentation [12]. The lack of organized CRC screening programs in Bangladesh further compounds this challenge.

Regarding tumor location, the rectum was the most common site (47.8%), followed by the sigmoid colon. Approximately 75% of lesions were left-sided. This distribution mirrors findings from South Asian studies. Patra et al. reported rectal predominance at 46.2% in their Indian cohort [10]. Similarly, De et al. noted that 58.7% of cases were rectal cancer and 55.6% of colonic tumors showed right-sided predominance [9]. In contrast, Western cohorts have shown a gradual epidemiological shift toward right-sided tumors, largely attributable to widespread colonoscopic screening programs and demographic changes. The left-sided predominance observed in our study may explain the higher prevalence of rectal bleeding and altered bowel habits as presenting symptoms.

Histopathologically, conventional adenocarcinoma was the predominant tumor type (85.5%), consistent with global literature. Mucinous adenocarcinoma (10.1%) and signet ring cell carcinoma (4.3%) accounted for smaller proportions. These aggressive variants are frequently associated with younger patient populations and advanced stage at presentation, as well as poorer survival outcomes. Moderately differentiated tumors were the most common grade (58.7%), which is consistent with published literature on CRC differentiation patterns worldwide. The statistically significant association between tumor stage and differentiation ($p = 0.0004$) found in the present study confirms that poorly differentiated tumors cluster in advanced stages, reflecting aggressive tumor biology.

A substantial proportion of patients in the current study presented with advanced-stage disease; Stages III and IV together accounted for 57.3% of all cases. This pattern of late presentation is well documented in resource-limited settings. Morgan et al. projected that CRC burden will continue rising predominantly in LMIC nations, where screening is largely absent and late diagnosis is the norm [2]. Hossain et al. similarly highlighted that CRC in developing nations is frequently diagnosed at Stage III or IV, leading to poorer treatment outcomes and increased mortality [12].

Lymphovascular invasion (LVI) was identified in 37.7% and perineural invasion (PNI) in 24.6% of cases. Both features showed significant associations with higher tumor stage in the present study. These findings are congruent with published literature. Huh et al. established that LVI and PNI are independently associated with advanced stage, nodal metastasis, distant recurrence and reduced survival in patients with locally advanced colorectal cancer [11]. Zhang et al. similarly confirmed that LVI is a superior prognostic factor in Stage III colon cancer patients, predicting both recurrence and survival outcomes [16]. These pathological markers are increasingly being used to risk-stratify patients for adjuvant chemotherapy.

Anterior resection was the most commonly performed procedure (37.0%), reflecting the predominance of rectal and recto-sigmoid lesions. Abdominoperineal resection was performed in 28.3% of patients. The small proportion of laparoscopic procedures (10 cases) demonstrates limited adoption of minimally invasive colorectal surgery in this setting. Laparoscopic colorectal surgery has been shown to offer equivalent oncological outcomes to open surgery with reduced postoperative pain, shorter hospital stays and faster recovery. Postoperative complications were observed in 22.5% of patients. Wound infection was the most common complication, followed by ileus and anastomotic leak. The anastomotic leak rate of 4.3% (12 of 276) is within ranges reported in published literature, which typically ranges from 3% to 20% depending on the level of anastomosis and patient risk factors. Sciuto et al. identified technical, patient and disease-related factors as

determinants of anastomotic leak after laparoscopic colorectal surgery [17]. The in-hospital mortality rate of 2.9% is within acceptable ranges reported in major CRC surgical series globally.

The statistically significant associations observed between tumor stage and nodal involvement ($p < 0.0001$) and between tumor stage and distant metastasis ($p < 0.0001$) confirm the validity and internal consistency of the dataset. The absence of a significant association between tumor site and stage ($p = 0.18$) has been reported in several other studies, suggesting that anatomical location may not independently determine stage, although rectal cancers in the present study tended toward more advanced presentations. Collectively, the clinico-pathological findings of this study underscore the critical need for systematic CRC screening programs, enhanced public health awareness initiatives and expansion of endoscopic and histopathological diagnostic services in Bangladesh to facilitate earlier detection and improve outcomes.

LIMITATIONS

This retrospective single-center study is limited by selection bias, incomplete long-term follow-up and absence of molecular profiling or survival analysis. Future prospective multi-center studies incorporating molecular biomarkers, survival outcomes and systematic screening implementation are recommended to advance the understanding of CRC in Bangladesh.

CONCLUSION

This study demonstrates that colorectal cancer in a Bangladeshi tertiary care setting predominantly affects middle-aged males with rectal tumor predominance and late-stage presentation. Conventional adenocarcinoma with moderate differentiation is the most common histopathological type. Advanced disease at diagnosis, frequent lymphovascular invasion and limited laparoscopic uptake highlight the need for early detection programs and strengthened surgical training.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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