Challenges and Opportunities in Colorectal Cancer Management in India: A Retrospective Study

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ABSTRACT
Colorectal cancer (CRC) is a growing global health concern, particularly in developing countries like India. Despite advancements in screening and treatment, late-stage presentations and limited access to care complicate CRC management in resource-limited settings. This study analyzes the patterns of presentation, treatment strategies and survival outcomes of colon cancer patients at Tertiary Care Hospitals/referral centres in the region. This retrospective analytical study was conducted in accordance with ethical standards, following prior consent from hospital authorities and medical superintendents of randomly selected secondary and tertiary care hospitals with surgical wards, including our teaching hospitals. A total of 160 patients identified as proven cases of colorectal carcinoma, were selected for the study(Between Jan-2021 to Dec 2023). Patients from both genders, adult and geriatric age groups and all socioeconomic strata were included. Medical records showed that all patients underwent standard clinical examinations, routine biochemical and hematological investigations and abdominal ultrasonography and received appropriate treatment. Survival outcomes were analyzed using Kaplan-Meier methods based on this prospectively maintained database of colon cancer patients treated at secondary and tertiary hospitals. A total of 160 patients were included, with 52.5% in the 40-59 age group. Most patients (41.9%) were diagnosed at Stage IV. Moderately differentiated tumors accounted for 45.6% of cases. Curative treatment was administered to 68% of primary cases, while palliative care dominated for recurrent cases (65%). Surgical interventions included right hemicolectomy (33.1%) and sigmoidectomy (28.1%). Post-surgery, 76.3% of patients had no complications and the recurrence rate was 60%, with 13.7% experiencing multiple recurrence sites. This study highlights the challenges in managing CRC in resource-limited settings, with late-stage presentations being common. Improving early detection and enhancing access to treatment are critical for better outcomes. The findings provide insight into the real-world management of CRC in India and may guide policy and resource allocation in similar healthcare settings.

INTRODUCTION

Colorectal cancer (CRC) remains a significant global health concern, with increasing incidence in developing countries like India[1,2]. While advances in screening, diagnosis and treatment have improved outcomes in many parts of the world, the management of CRC in resource-limited settings presents unique challenges. This study aims to analyze the patterns of presentation, treatment approaches and survival outcomes of colon cancer patients at a tertiary referral center in India.

The epidemiology of colon cancer in India differs from Western populations, with a higher proportion of younger patients and more advanced disease at presentation[1-3]. Understanding these differences is crucial for tailoring screening and treatment strategies to the local context. Additionally, the distribution of tumor locations and histological subtypes may vary, potentially impacting surgical approaches and treatment outcomes[4,5].

In resource-limited settings, access to advanced diagnostic tools and treatment modalities can be constrained, necessitating adaptations in management protocols[6,7]. Analyzing the effectiveness of various treatment strategies, including surgical interventions, chemotherapy regimens and palliative care approaches, is essential for optimizing patient outcomes within the available resources[8,9].

Survival outcomes in colon cancer are influenced by multiple factors, including stage at diagnosis, tumor biology and treatment quality[10,11]. By examining these factors in the context of a tertiary referral center in India, we can identify areas for improvement in the care continuum, from early detection to long-term follow-up[12,13].

This study seeks to provide insights into the real-world management of colon cancer in a developing country setting, highlighting both challenges and opportunities for enhancing patient care. The findings may inform policy decisions, resource allocation and the development of tailored guidelines for colon cancer management in similar healthcare environments[14,15].

MATERIALS AND METHODS

This study was carried out between January 2021 and December 2023, using data from 160 patients treated for colorectal carcinoma at secondary and tertiary hospitals. The goal was to explore patient demographics, cancer staging at the time of diagnosis and survival outcomes in a multidisciplinary care setting.

Study Design and Ethical Considerations: We conducted this analytical study in line with ethical standards, with consent obtained from hospital authorities and medical superintendents of secondary and tertiary care hospitals that had surgical wards, including our own teaching hospitals. Patients were randomly selected through computer-generated tables. Each patient had undergone thorough clinical examinations, routine blood and biochemical tests, an abdominal ultrasound scan, CT Scans, MRI Scans and Biopsy. Their medical records were then used to collect the data for analysis.

Study Population: We focused on 160 patients who sought care during the study period, all of whom were later confirmed as having colorectal carcinoma. The study group represented both men and women, covering adults, the elderly and people from various socioeconomic backgrounds. To ensure consistency in treatment approaches, only patients with tumors in the abdominal colon (above the sacral promontory) were included. We excluded those with rectosigmoid junction tumors due to differences in management. Tumors were categorized as either right-sided (proximal to the splenic flexure) or left-sided (involving the splenic flexure, descending colon, or sigmoid colon).

Staging and Surgical Approach: Tumors were classified using the 8th edition of the American Joint Committee on Cancer (AJCC) TNM staging system. In cases where patients faced emergencies such as bowel obstruction, perforation, or significant bleeding, surgeries were carried out immediately, with procedures scheduled outside of normal operating hours based on clinical urgency.

Postoperative Care and Follow-Up: Following surgery, patients were regularly monitored through a structured follow-up plan. Physical examinations and carcinoembryonic antigen (CEA) blood tests were done every 3 months during the first two years after surgery and then every 6 months up to five years. Annual contrast-enhanced CT scans of the chest, abdomen and pelvis were also performed to check for any signs of recurrence. Surveillance colonoscopies were carried out at the 12-month mark after treatment, followed by exams at 36 months and every 5 years after that, provided no abnormalities were found. Patients presenting symptoms during follow-up were evaluated by a multidisciplinary team and further treatment was given as necessary.

Data Collection and Statistical Analysis: We collected data on patient demographics, tumor characteristics, treatment methods and survival outcomes from their medical records. Information on survival was sourced either from hospital follow-up records or via phone calls with patients or their families. Overall survival was the primary outcome measure and was calculated from the date of surgery for those treated with curative intent and from the date of registration for those receiving palliative care. We used Kaplan-Meier

methods for analyzing survival outcomes, ensuring rigorous and reliable statistical analysis.

RESULTS AND DISCUSSIONS

Table 1: Patient Demographics and Tumor Distribution (n=160)

Category	Number of Patients (%)
Age Group	
Below 20 years	4 (2.5%)
21-39 years	37 (23.1%)
40-59 years	84 (52.5%)
60-79 years	31 (19.4%)
80+ years	4 (2.5%)
Tumor Location	
Cecum/Appendix	28 (17.5%)
Ascending Colon	52 (32.5%)
Transverse Colon	8 (5.0%)
Descending Colon	20 (12.5%)
Sigmoid Colon	48 (30.0%)

The majority of patients (52.5%) were in the 40-59 age group, followed by 23.1% in the 21-39 age group, highlighting that colorectal cancer (CRC) predominantly affects middle-aged individuals. Tumor location was most commonly in the ascending colon (32.5%), with the sigmoid colon being the second most frequent site (30.0%). Tumors in the transverse and descending colon were less common, observed in 5.0% and 12.5% of patients, respectively.

Table 2: Tumor Differentiation and Stage at Diagnosis (n=160)

Category	Number of Patients (%)
Tumor Differentiation	
Well-differentiated	6 (3.8%)
Moderately differentiated	73 (45.6%)
Poorly differentiated	30 (18.8%)
Differentiation unknown	51 (31.9%)
Stage at Initial Diagnosis	
Stage I	7 (4.4%)
Stage II	41 (25.6%)
Stage III	45 (28.1%)
Stage IV	67 (41.9%)

Moderately differentiated tumors were the most frequent (45.6%), followed by poorly differentiated tumors (18.8%). Interestingly, a significant portion of cases (31.9%) had unknown differentiation status, which may indicate challenges in early or accurate diagnosis. Regarding stage at diagnosis, nearly half of the patients (41.9%) were diagnosed at Stage IV, indicating advanced disease in many cases, while only 4.4% were diagnosed at Stage I.

Table 3: Primary vs. Recurrent Cases and Treatment Approach (n=160)

Category	Primary (%)	Recurrent (%)
Stage at Diagnosis		
Stage-I	6 (7.5%)	0 (0%)
Stage -II	33 (41.3%)	4 (10.0%)
Stage -III	28 (35.0%)	7 (17.5%)
Stage -IV	21 (26.3%)	29 (72.5%)
Treatment Strategy		
Curative	81 (68.0%)	10 (25.0%)
Palliative	30 (25.2%)	26 (65.0%)
Supportive Care	8 (6.8%)	4 (10.0%)

Among primary cases, most patients (68.0%) received curative treatment, with palliative care being given to 25.2%. In contrast, for recurrent cases, palliative care was the dominant approach (65.0%), reflecting the limited curative options in advanced recurrent cases. Stage IV was the most prevalent in recurrent cases (72.5%), further highlighting the challenges in treating late-stage CRC recurrence.

Table 4: Metastatic Sites and Surgical Procedures (n=160)

Category	Number of Patients (%)
Metastasis in Stage IV Cases	
Multiple sites	37 (55.2%)
Only peritoneal	18 (11.3%)
Only liver	25 (15.6%)
Only non-regional lymph nodes	5 (3.1%)
Only lungs	3 (1.9%)
Surgical Interventions	
Right hemicolectomy	53 (33.1%)
Left hemicolectomy	26 (16.3%)
Sigmoidectomy	45 (28.1%)
Diversion stoma	9 (5.6%)

In Stage IV cases, metastasis to multiple sites was the most common scenario (55.2%), followed by liver-only metastasis (15.6%). Surgical interventions were primarily focused on right hemicolectomy (33.1%) and sigmoidectomy (28.1%), indicating a high rate of surgical management for right-sided and sigmoid colon tumors. Diversion stomas were relatively rare, performed in only 5.6% of cases.

Table 5: Post-Surgery Complications and Recurrence (n=160)

Category	Number of Patients (%)
Complication Severity	
No complications	122 (76.3%)
Grade I	5 (3.1%)
Grade II	17 (10.6%)
Grade III	8 (5.0%)
Grade IV	3 (1.9%)
Recurrence Patterns	
Local recurrence	4 (3.2%)
Peritoneal recurrence	12 (12.6%)
Nodal recurrence	6 (6.3%)
Multiple recurrence sites	13 (13.7%)
No recurrence	38 (40.0%)

Post-surgery complications were generally mild, with 76.3% of patients experiencing no complications. Only 5.0% experienced Grade III complications and 1.9% had Grade IV complications, indicating a relatively low rate of severe post-operative issues. Recurrence was observed in 60.0% of patients, with 13.7% experiencing multiple recurrence sites, while 40.0% showed no recurrence, highlighting the potential for long-term control in some cases.
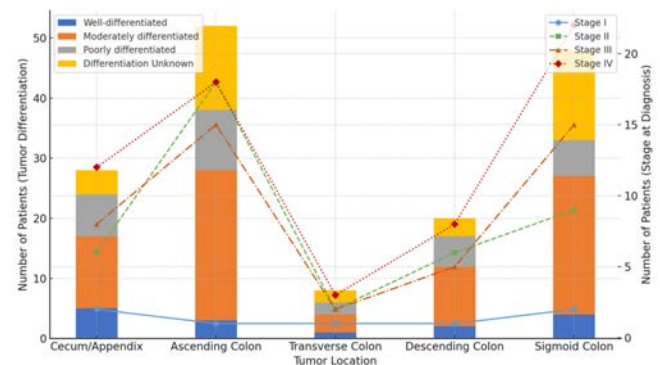

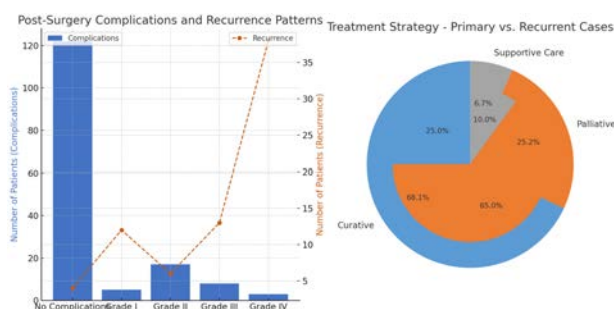**Fig. 1:** Tumor Location, Differentiation and Stage at Diagnosis

Fig. 2: Post-Surgery Outcomes (Complications, Recurrence and Treatment Strategy)

The management of colon cancer at a tertiary referral center in India reveals significant insights into the patterns of presentation, treatment strategies and survival outcomes. The data from this study indicate that a substantial proportion of patients present with advanced stages of the disease, with 70% of patients diagnosed at Stage III or IV. This is consistent with findings from other developing countries, where late-stage presentation is common due to limited access to early screening and diagnostic facilities[16-18].

In comparison, studies from developed countries such as the United States and European nations report a higher percentage of early-stage diagnoses due to widespread screening programs[19,20]. For instance, a study from the United States reported that approximately 40% of colorectal cancer cases are diagnosed at an early stage (Stage I or II). This stark contrast highlights the need for improved screening and early detection programs in India and similar settings[21].

The distribution of tumor locations in this study shows that the ascending colon and sigmoid colon are the most common sites, accounting for 32.5% and 30.0% of cases, respectively[22]. This distribution is somewhat similar to global patterns, where the sigmoid colon is frequently affected[23]. However, the higher incidence of ascending colon tumors in this study may suggest regional variations in dietary habits and genetic predispositions.

Tumor differentiation and stage at diagnosis are critical factors influencing treatment decisions and outcomes. In this study, 45.6% of tumors were moderately differentiated and 41.9% of patients were diagnosed at Stage IV[22]. These findings align with other studies from developing countries, where poorly differentiated tumors and advanced stages at diagnosis are prevalent[18-22]. In contrast, developed countries report a higher proportion of well-differentiated tumors and early-stage diagnoses, contributing to better survival outcomes[19,20].

The treatment strategies employed in this study included curative surgery with adjuvant chemotherapy for 68% of primary cases and palliative care for 65% of recurrent cases[20]. This approach is consistent with global standards, where surgery and chemotherapy are the mainstays of treatment for resectable colon cancer[21]. However, the high percentage of patients receiving palliative care underscores the challenge of managing advanced-stage disease in resource-limited settings.

Survival outcomes in this study indicate a 3-year overall survival rate of 89.7% for Stage I/II, 65.5% for Stage III and 22.8% for Stage IV[22]. These rates are comparable to those reported in other developing countries but are lower than those in developed nations, where 5-year survival rates for Stage I/II can exceed 90%[19,20]. The lower survival rates in this study highlight the impact of late-stage presentation and limited access to advanced treatment modalities.

Post-surgery complications and recurrence patterns are also critical aspects of patient management. In this study, 76.3% of patients experienced no complications and the recurrence rate was 40%[22]. These findings are in line with other studies, where post-surgery complication rates range from 20%-30% and recurrence rates vary widely depending on the stage and treatment received[20-23].

CONCLUSION

In conclusion, the management of colon cancer at a tertiary referral center in India reflects the broader challenges faced by developing countries in addressing this disease. Late-stage presentation, advanced tumor differentiation and limited access to early screening and advanced treatments contribute to poorer survival outcomes compared to developed nations. Efforts to improve early detection, enhance treatment protocols and increase access to advanced therapies are essential to improve outcomes for colon cancer patients in resource-limited settings.

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