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Research Article

Colorectal Cancer in India: A Comprehensive Analysis from a Tertiary Care Center.

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Abstract:

Background*: Colorectal cancer (CRC) is prevalent worldwide, with most cases occurring in developed countries, while India has a relatively low prevalence in comparison to the western world. . Limited cancer registry coverage in India suggests possible under-reporting, but CRC incidence is rising due to rapid socio-economic development. The purpose of this study is to investigate and evaluate various treatment modalities employed and explore recent advancements in the management of colorectal carcinoma.*

Methods: *This was an observational single-center study combined both prospective and retrospective analyses involving 82 patients diagnosed with colorectal cancer conducted in the Department of Surgery at Gandhi Medical College and Hamidia Hospital, Bhopal, a tertiary referral center in Madhya Pradesh. Following institutional ethics committee approval, a three-year descriptive study was performed, consisting of a one-year retrospective analysis of case files from September 2021 to September 2022, and a two-year prospective analysis of patients from October 2022 to June 2024.*

Results:*The study reviewed 82 CRC patients, with a male-to-female ratio of 1.05:1 and reveals that 8 (10%) of the patient were strict vegetarians, suggesting a possible protective effect. Tobacco use was prevalent, correlating with CRC risk factors. Most cancerous lesions were located on the left side of the colon, primarily in the rectum 40 (48%) and ascending colon 25 (31%). Our analysis revealed that most tumors were moderately differentiated adenocarcinoma and the most patients presented with the Stage II disease. Notably, the median age of diagnosis was 46.87 years, with 29 (35.36%) of cases occurring before age 40.*

Conclusion: *This study highlights distinct demographic and histological features of CRC in India, including younger age at diagnosis, a higher rate of signet ring cell tumors, left-sided tumor predominance, advanced stages at presentation, and widespread malnutrition among patients. The younger age structure likely contributes to the higher incidence in younger patients, emphasizing the need for thorough family histories and nutritional interventions. Limited access to advanced treatment adds to the healthcare burden, underscoring the need for research on emerging risk factors like dietary shifts that may influence CRC patterns in India. Survival data will further illuminate the evolving landscape of CRC.*

Categories: *Oncology, General Surgery, Pathology/Radiology*

Keywords: *Colorectal cancer, Neoadjuvant Chemoradiotherapy, TNM staging, Hemicolectomy, Low Anterior Resection, Abdominoperineal Resection.*

Introduction

Globally, colorectal cancer ranks as the third most common cancer and the third leading cause of cancer-related deaths in both men and women, accounting for 10% of all cancers [1-2]. The highest incidence rates are observed in Australia, New Zealand, Europe, and North America, while the lowest rates are seen in Africa and Asia [3-4]. Overall, 60% of cases are reported in developed countries. In India, colorectal cancer is the 10th most common cancer and is responsible for 4% of cancer-related deaths, as recorded by cancer registries in Mumbai, Chennai, and Karnataka [5-7]. According to the 2013 report, the highest annual incidence rates (AAR) of colorectal cancer in men were observed in Thiruvananthapuram (4.1), followed by Bangalore (3.9) and Mumbai (3.7). For women, Nagaland recorded the highest AAR (5.2), with Aizwal coming in second (4.5) [8].

In Western populations, sporadic cancer rates increase significantly after the age of 50 [7]. Age-standardized incidence rates are generally lower in women than men across most countries [9]. In India, around 90% of colorectal cancer (CRC) cases are diagnosed in individuals aged 50 and above. At diagnosis, approximately 40% of patients present with localized disease, 37% have regional spread, and 20% show distant metastasis. The overall survival (OS) rates for CRC are strongly influenced by the stage at diagnosis, with 5-year survival rates of roughly 90% for localized disease, 70% for regional disease, and 12% for metastatic disease.

In a country like India, which has a population exceeding one billion, the absolute number of colorectal cancer (CRC) cases is significant. The five-year survival rate for CRC in India is among the lowest in the world, at less than 40%. Notably, the CONCORD-2 study reveals a declining five-year survival rate for rectal cancer in certain Indian cancer registries, indicating potential deficiencies in the diagnostic and treatment pathways for CRC. This situation necessitates an urgent investigation into the underlying factors contributing to this poor survival rate. Conducting a baseline study to assess the demographic and clinical profiles of CRC patients is essential for formulating an effective strategy to combat this disease in India. Therefore, this study aims to take an initial step toward addressing these critical issues.

The incidence of colorectal cancer (CRC) is projected to increase by 60% over the next 15 years, positioning it among the cancers with a rising incidence. It is now well-established that tumors of the colon and rectum can be considered together, as they exhibit similar patterns of genomic alterations. A set of 24 genes has been identified as recurrently mutated in a significant proportion of CRC cases. Notable genes involved include APC, ARID1A, TP53, KRAS, PIK3CA, SOX9, FAM123B/WTX, ERBB2, and IGF [8]. Over the past 25 years, the treatment landscape for CRC has undergone substantial advancements. What was once considered an incurable condition is now effectively managed through multimodal therapies, leading to a remarkable reduction in mortality rates for locally advanced rectal cancer from 100% to under 4% [10].

Colorectal surgery has long been the cornerstone of CRC treatment. Surgical techniques for rectal cancer have

evolved significantly, progressing from Miles' abdominoperineal resection to Hartmann's procedure, anterior rectal resection, and Heald's total mesorectal excision (TME), with TME now regarded as the gold standard for rectal cancer treatment [11-12]. Increasing emphasis has been placed on aggressive surgical approaches aimed at complete eradication of malignancy to enhance disease-free survival. Several topics related to improving post-surgical recurrence-free survival remain subjects of ongoing discussion, including complete mesocolic excision (CME), management strategies for metastatic disease, the role of hyperthermic intraperitoneal chemotherapy (HIPEC), and surgical techniques for treating recurrence [13].

Geographic variations in incidence of colorectal cancer (CRC) are linked to differences in diet, including the consumption of red and processed meats, fiber, alcohol, body weight, and physical activity [14-15]. In the U.S., a declining trend is noted due to regular screening and early detection, whereas rising rates are seen in Asian countries due to dietary shifts toward Western patterns [16-18]. However, it remains unclear whether there are differences in the anatomical distribution and stage of presentation between developed and developing countries [19]. As India undergoes an epidemiological transition driven by similar risk factors, it is anticipated that the burden of CRC will increase, particularly given the high mortality and morbidity associated with the disease. To better understand the natural history and therapeutic outlook for CRC, further research on epidemiological patterns, symptomatology, etiology, and treatment modalities is urgently needed. The purpose of this study is to investigate the epidemiological and demographic profile (age, sex, incidence) of colorectal cancer patients; examine the etiological factors associated with colorectal carcinoma; analyse the clinical signs and symptoms in relation to the stage of the disease; assess the clinicopathological correlation of colorectal cancer; evaluate various treatment modalities employed in its management; and explore recent advancements in the management of colorectal carcinoma at Gandhi Medical College, Hamidia Hospital, Bhopal to prevent, treat and rehabilitate the patients suffering from it.

Materials and Methods

The study was conducted in the Department of Surgery at Gandhi Medical College and Hamidia Hospital, Bhopal, a tertiary referral center in Madhya Pradesh. This observational, single-center study combined both prospective and retrospective analyses involving 82 patients diagnosed with colorectal cancer. Following institutional ethics committee approval, a three-year descriptive study was performed, consisting of a one-year retrospective analysis of case files from September 2021 to September 2022, and a two-year prospective analysis of patients from October 2022 to June 2024.

Various clinicopathological parameters were systematically collected from case records and institutional medical records. Data included detailed demographic information, socioeconomic status, family and past medical history, chief complaints and their duration, routine investigations, radiological characteristics, and

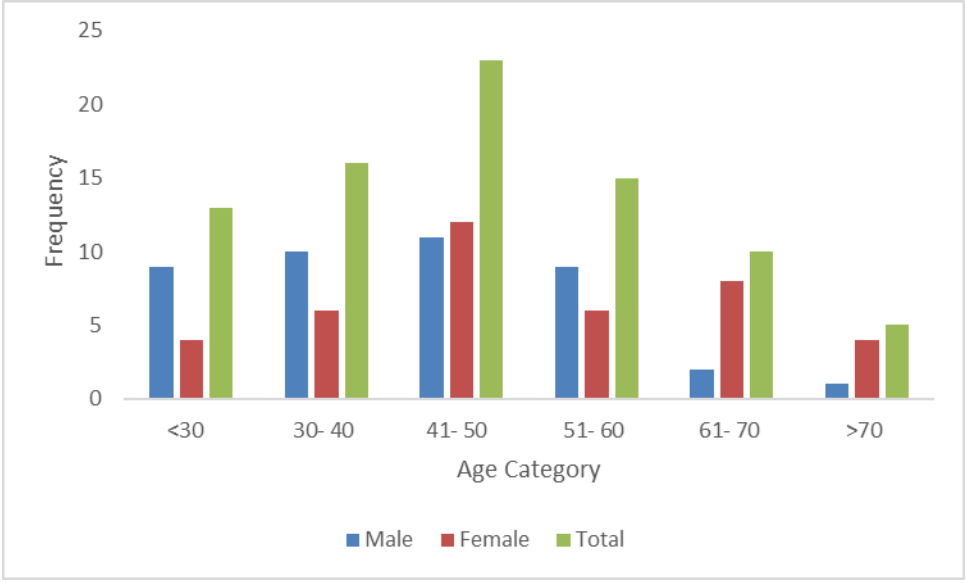
carcinoembryonic antigen (CEA) levels.

Statistical analysis was performed using Epi Info™. Graphical data representation was achieved with MS Excel. Demographic characteristics were summarized using descriptive statistics. Categorical data was analysed with z-test and t-test, and quantitative comparisons between groups utilized the Mann-Whitney U test. Mean and standard deviation were calculated for quantitative parameters. Statistical significance was determined at a level of 0.05, with a p-value < 0.05 considered statistically significant.

Results

The study population consisted of 82 patients with histopathologically confirmed colorectal cancers, including 40 cases of rectal cancer and 42 cases of colon cancer. The male-to-female ratio for rectal cancers was 1.3:1. The distribution of age and sex among study subjects is shown in Figure 1.

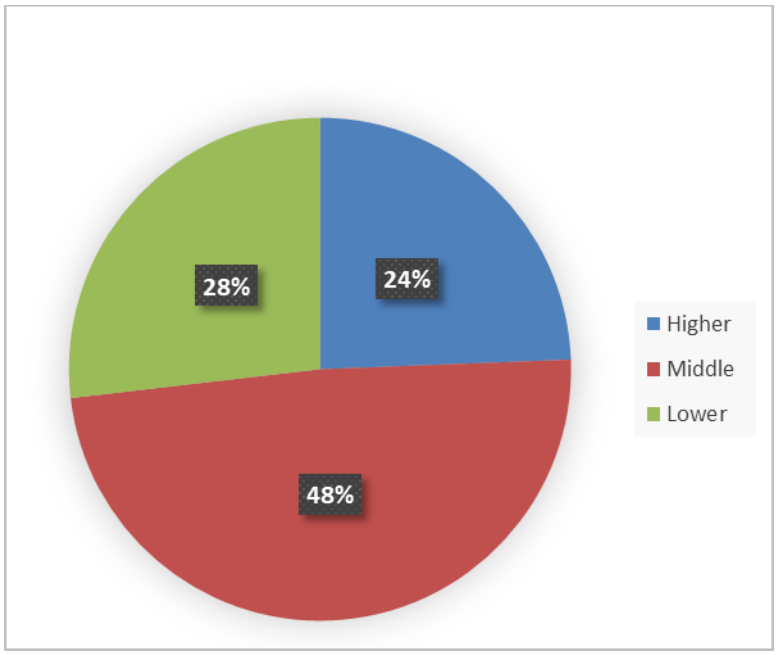
Figure 1: Age and Sex Distribution of Study Subjects



Regarding dietary history, eight patients reported being strict vegetarians. Due to limited literacy, many participants were unable to specify their dietary composition in detail, but the reported data suggested adequate fat and fiber intake in most cases. Tobacco use was reported in over 42 (50%) of the patients. Among males, all but one was regular smokers of beedis and/or cigarettes, while 10 of the 40 female patients reported using tobacco or pan masala.

The majority of patients 40 (48%) were from a middle socioeconomic background, with 20 (24%) from a higher socioeconomic background and 22 (28%) from a lower socioeconomic background, as outlined in Figure 2.

Figure 2: Socioeconomic status of study subjects



Clinical Presentation, Anatomical Distribution, Histopathological Patterns, and Tumor Staging

"The duration of symptoms at presentation ranged from 2 weeks to 15 months, with a mean duration of 6 months. Among rectal cancer cases, rectal bleeding was the primary symptom reported by patients, followed by altered bowel habits and difficulty with stool passage. In the colon cancer group, abdominal pain and mass were the predominant presenting symptoms, with 12 (14%) of cases presenting as acute intestinal obstruction in the emergency department. Diagnosis was often facilitated by the specific presentations of later-stage right-sided lesions as masses, left-sided growths as masses or obstructions, and rectal growths typically being palpable during a digital rectal examination.

For colon cancer cases, the right colon was involved in 25 cases, while the left colon was affected in 17 cases (Table 1).

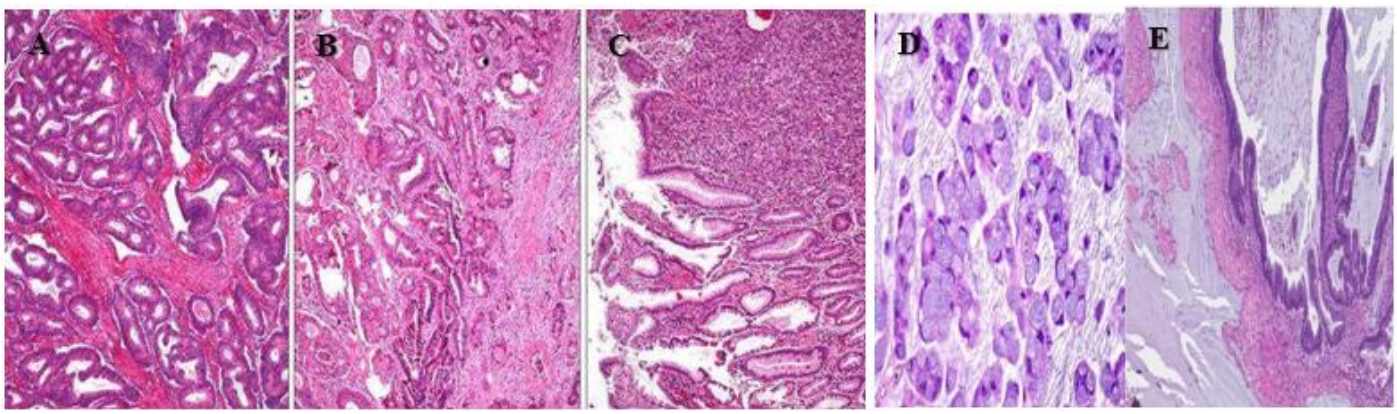
TABLE 1: Distribution of Primary Tumor Sites

Site	Frequency	Percentage
Rectum	40	48%
COLON	**42**	**(52%)**
- **RIGHT COLON**	25	31%
- **LEFT COLON**	17	21%

Figure 3 defines the pathological analysis of tumors in the study revealed a range of histological differentiation among colorectal cancer cases. Approximately 15 (18%) of tumors were classified as well-differentiated, indicating a lower grade of malignancy and suggesting a relatively better prognosis. Moderately differentiated tumors constituted the largest proportion, with 29 (35%) of cases displaying characteristics that imply intermediate malignancy and potential for metastasis. A significant 19 (23%) of tumors were poorly differentiated, indicating a more aggressive cancer type with a higher likelihood of rapid progression.

Notably, 9 (11%) of the tumors were identified as signet ring cell carcinoma, a rare and typically more aggressive subtype associated with poor outcomes. Additionally, mucinous adenocarcinomas were observed in 10 (13%) of cases, marked by the presence of mucus-secreting cells, which often portend a distinct clinical behaviour and response to treatment.

Figure 3: Tumor characteristics on pathology



A-Well differentiated; B-Moderately differentiated; C-Poorly differentiated; D-Signet ring cell tumor; E-Mucinous tumor

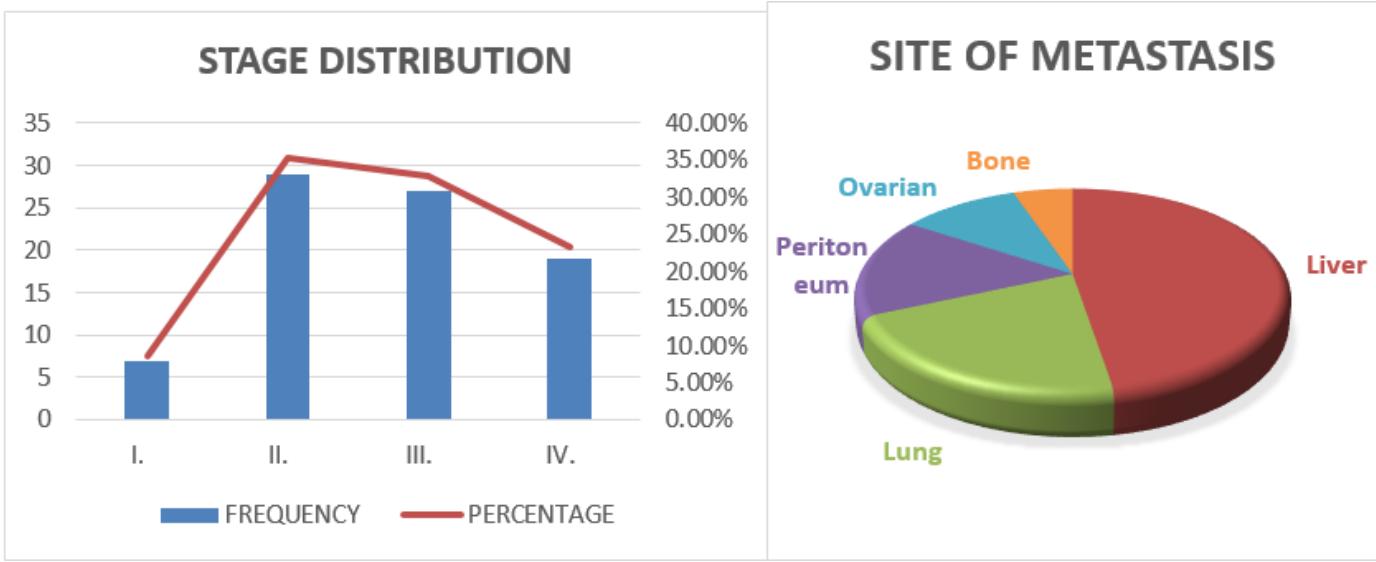
The treatment plan for each patient was tailored based on the clinical stage at presentation, as determined through both clinical examination and radiological findings. Surgical operability and the specific type of surgery were evaluated by the operating surgeon, which included examination under anaesthesia. Adherence to standard protocols guided the administration of neoadjuvant and adjuvant chemotherapy, as well as radiotherapy. Of the total cohort, 77 patients underwent surgery, while 5 patients were deemed locally advanced and therefore inoperable.

Carcinoembryonic antigen (CEA) levels were available for all 82 patients, with a mean value of 175.36 ng/mL, ranging from 0.96 ng/mL to 2000 ng/mL. Among the patients, 8 had CEA levels within the normal range (0–3 ng/mL), 26 had levels between 100.01 ng/mL and 1000 ng/mL, and 8 had CEA levels exceeding 1000

ng/mL. A higher baseline CEA level correlated with an increased probability of presenting with stage IV disease; notably, 4 patients with normal CEA levels had stage IV disease, compared to 8 patients in the group with CEA levels above 1000 ng/mL.

The mean serum albumin level in the study population was 3.8 g/dL, and the mean haemoglobin level was 9 g/dL, with a range of 4.4–14.3 g/dL. These laboratory parameters provided additional insights into the overall health and nutritional status of the patients at the time of diagnosis.

Figure 4: Stage Distribution and Site of Metastasis



The majority of patients, 29(35.36%) individuals were diagnosed with stage II colorectal cancer, while 19 (23.1%) patients presented with stage IV metastatic disease (Figure 4). Approximately 7 (8.53%)patients had early-stage disease (stage I).

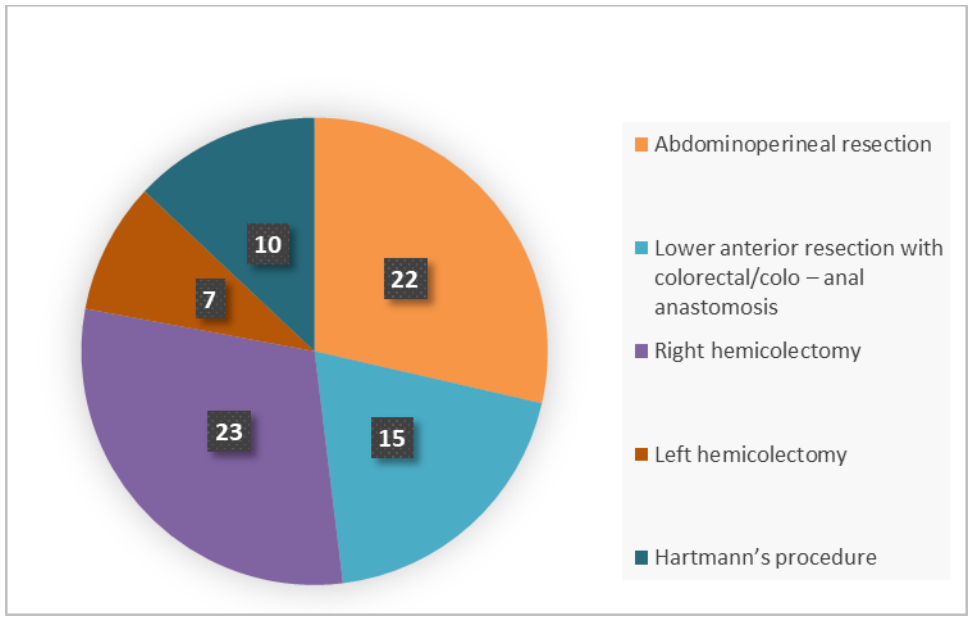
Liver metastases were the most common, observed in 9 (48%) patients, of whom 6 had metastases confined exclusively to the liver. Similarly, lung metastases were noted in 4 patients, with 1 patient exhibiting metastasis limited to the lungs. Peritoneal disease was identified in 3 patients, with 2 cases showing peritoneal metastases as the only site. Ovarian metastases occurred in 2 female patients, with one case involving metastasis restricted to the ovary. Bone metastases were rare, observed in only 1 patient.

Right-sided primary tumors demonstrated a significantly higher incidence of peritoneal and ovarian metastases compared to left-sided tumors. Additionally, colonic primary tumors were more frequently associated with peritoneal metastases than rectal primary tumors.

In this cohort, 4 patients had a notable family history and clinical indications suggestive of a familial cancer syndrome, such as familial adenomatous polyposis (FAP) or hereditary non-polyposis colorectal cancer

(HNPCC).

Figure 5: Types of Surgical Procedures Performed



Surgical resection was attempted in all patients with goals of cure, palliation, or palliative bypass/colostomy, as outlined in Figure5. One emergency case resulted in mortality, and two patients did not return for follow-up. The majority of cases were recommended to undergo adjuvant chemotherapy with 5-fluorouracil and calcium folinate, receiving a minimum of six cycles, with an additional four cycles administered to patients who demonstrated only a partial response.

Neoadjuvant chemoradiotherapy was administered to 15 rectal cancer patients prior to curative resection. Two patients experienced recurrence; one involved the abdominal wound site and led to mortality, while the other involved an anastomotic site, necessitating a subtotal colectomy. Local recurrence occurred in three patients following abdominoperineal resection (APR). Twenty-five patients maintained regular follow-up, which included normal findings on repeat ultrasonography, colonoscopy, and routine investigations.

Figure 6: Low anterior resection done with the help of circular staplers

Figure 7: Specimen retrieved after right hemicolectomy with the help of linear cutter staplers

Figure 8: Specimen retrieved after abdominoperineal resection

TABLE 2: Demographic and Tumor Profile in Left-Vs Right- Sided Primary Tumor Right- Sided Primary Tumor

	Left sided (splenic flexure and distal colon)	**Right sided (transverse colon and proximal colon)**	**t-value**	**z-value**	**P value**
Age, mean	46.5 years	50.1 years	2.823	-	0.006
Male gender	11 (65%)	15 (61.4%)	-	0.237	0.343
Mean, CEA (ng/ml)	296	106	1.07	-	0.29
HISTOLOGY					
SIGNET RING	2(12.3%)	4(17.7%)	-	1.79	0.073
MUCINOUS	3(15.7%)	5(20.25%)	-	1.37	0.172

Table 2 compares the key demographic and tumor characteristics between patients with left-sided primary

tumors (located at the splenic flexure and distal colon) and right-sided primary tumors (located at the transverse colon and proximal colon) by using t-test and z-test with statistical significance determined at a level of 0.05. The mean age of patients with left-sided tumors is 46.5 years, significantly younger than the mean age of 50.1 years for those with right-sided tumors, with a P value of 0.006 indicating statistical significance. Gender distribution shows that 11 (65%) of left-sided patients are male compared to 15 (61.4%) of right-sided patients. but this difference is not statistically significant (P = 0.343). The mean carcinoembryonic antigen (CEA) level is notably higher in left-sided tumors at 296 ng/ml compared to 106 ng/ml in right-sided tumors. In terms of histological types, signet ring cell carcinoma is observed in 2 (12.3%) of left-sided tumors versus 4 (17.7%) of right-sided tumors (P = 0.073), while mucinous carcinoma is found in 3 (15.7%) of left-sided tumors and 5 (20.25%) of right-sided tumors (P = 0.172), both showing no statistically significant differences. Overall, this table highlights significant age differences between the two groups, while demonstrating similar gender distribution and histological characteristics.

TABLE 3: Demographic and Tumor Profile in Rectal vs Colonic Primary Tumors

	Rectal tumors (upto 15 cm from the anal verge) N=40	**Colonic tumors (proximal to 15 cm from anal verge) N=42**	**t-value**	**z-value**	**P value**
Age, mean	45.7 years	49.1 years	3.416	-	0.001
Male gender	27(67.5%)	25(59.6%)	-	2.69	0.007
Mean, CEA (ng/ml)	164	105	1.09	-	0.28
HISTOLOGY					
SIGNET RING	5(12.5%)	5(12%)	-	0.978	0.328
MUCINOUS	6(15%)	7(17%)	-	0.473	0.636

Table 3 presents a comparative analysis of rectal tumors, defined as those located up to 15 cm from the anal verge (N=40), and colonic tumors, located more than 15 cm from the anal verge (N=42)by using t-test and z-test with statistical significance determined at a level of 0.05. The mean age of patients with rectal tumors was 45.7 years, while those with colonic tumors had a mean age of 49.1 years, indicating a statistically significant difference (p=0.001). Additionally, a higher proportion of males were diagnosed with rectal tumors 27 (68.8%) compared to colonic tumors 25 (59.6%), which was also statistically significant (p=0.007). The mean carcinoembryonic antigen (CEA) levels were 164 ng/mL for rectal tumors and 105 ng/mL for colonic tumors

but this difference did not reach statistical significance (p=0.28). The prevalence of signet ring and mucinous histologies was similar between the two groups, with no significant differences noted (p=0.328 and p=0.636, respectively).

TABLE 4: Comparison of Symptoms with respect to Tumor Location

Symptom	**Left colon *n* = 17**	**Right colon *n* = 25**	***z-value***	***P* value**
Pain	9 (52.5)	12 (49.5)	0.385	0.7
Diarrhoea	15 (8.6)	4 (14.4)	1.28	0.2
Constipation	6 (33.8)	3(22.7)	1.75	0.08
Vomiting	2 (11.5)	3 (11.3)	0	1
Weight loss	6 (34.5)	7 (29.9)	0.71	0.48
Rectal bleeding	4 (26.6)	2 (10.3)	3.09	0.002
Melena	5 (3.6)	1 (2.1)	0.39	0.7
Change in Bowel Habits	8(48.9)	8(30.9)	2.75	0.006

Table 4 compares the symptoms associated with tumors located in the left colon (n=17) and the right colon (n=25). The prevalence of pain was reported by 9 (52.5%) of patients with left-sided tumors and 12 (49.5%) with right-sided tumors by using z-test with statistical significance determined at a level of 0.05, resulting in a p-value of 0.7, indicating no significant difference between the two groups. Diarrhoea was more frequently observed in left colon patients 15 (88.6%) compared to right colon patients 4 (14.4%), but this difference did not reach statistical significance (p=0.2). Constipation was noted in 6 (33.8%) of patients with left-sided tumors versus 3(22.7%) with right-sided tumors, yielding a p-value 0.08, again reflecting no significant difference. The rates of vomiting were similar between the groups, with 2 (11.5%) of left colon and 3 (11.3%) of right colon patients reporting this symptom (p=1). In terms of weight loss, 6 (34.5%) of left colon patients and 7 (29.9%) of right colon patients reported this symptom, resulting in a p-value of 0.48, indicating no significant difference. Notably, rectal bleeding was significantly more prevalent in the left colon group 4 (26.6%) compared to the right colon group 2 (10.3%), with a p-value of 0.002. Additionally, changes in bowel habits were observed in 8 (48.9%) of left colon patients versus 8 (30.9%) of right colon patients, with a significant p-value of 0.006. These findings suggest that while many symptoms are comparable between left and right colon tumors, rectal bleeding and changes in bowel habits are significantly more common among patients with left-sided tumors.

Discussion

Colorectal cancer (CRC) is prevalent worldwide, with most cases occurring in developed countries, while India has a relatively low prevalence of 87 per 100,000 population over five years.

Colorectal cancer (CRC) is a prevalent malignancy globally, with a significant concentration of cases in developed countries. In India, the annual incidence rates (AARs) for colon cancer and rectal cancer in men are 4.4 and 4.1 per 100,000 populations respectively, which is relatively low. This reduced incidence is often attributed to differences in dietary patterns, lifestyle factors, and the lower prevalence of obesity—a known risk factor for CRC—in developing nations. Additionally, the younger demographic profile in India, where CRC is more commonly diagnosed in older adults, may contribute to the observed lower incidence. However, it is noteworthy that only 7.45% of India's population is covered by cancer registries, compared to 21% globally, which may result in underreporting of cases [20].

With the ongoing socio-economic development in India, there is a concerning trend of increasing CRC incidence. Nonetheless, there remains a relative scarcity of comprehensive epidemiological and clinical data pertaining to CRC in Indian patients. Our study evaluated a sample population of over 82 patients diagnosed with CRC, providing critical insights into the disease within our local context. The male-to-female ratio in our study was approximately 1.05:1, consistent with findings from other studies conducted by Peedikayil et.al [21], Goh K-L et al. [22] and Javid G, Zargar SA et.al.[23]. In contrast to the Surveillance, Epidemiology, and End Results (SEER) statistics that report a median diagnosis age of 71 years, our study's median age was notably younger at 46.87 years, with 29(35.36%) of cases presenting in individuals under 40. This observation aligns with reports fromPal et al. [24], Gupta et al. [25], and Nath et al.[26], but contrasts with data from Population-Based Cancer Registries (PBCR) in larger Indian cities.

The predominant age group among our patients was between 40 and 60 years, indicating that CRC occurs at a younger age compared to findings from studies reporting mean diagnosis ages above 60. Our study also revealed that 8 (10%) of patients were strict vegetarians, suggesting a potential protective effect of vegetarian diets against CRC, as supported by the work of Orlich et al. [27]. Additionally, tobacco use was prevalent, particularly among male patients, highlighting its association with CRC as evidenced in prior studies, including those by Kuper et al. [28], who identified a significant correlation between smoking and colorectal cancer risk.

The majority of lesions in our cohort were located on the left side, aligning with findings from Goh et al. [22] and Mik et al. [29]. The most common sites of tumor occurrence were the rectum 40 (48%) and ascending colon 25 (31%). The higher proportion of rectal cancer cases compared to previous studies, which reported figures between 25% and 40%, may reflect local demographic and lifestyle factors. The finding was however

consistent with Peedikayil et al. [21] The anatomical location of tumors is of clinical significance, given the differing embryological origins and the implications for screening methods; flexible sigmoidoscopy and faecal occult blood testing may be more cost-effective compared with screening colonoscopy.

Common presenting symptoms included altered bowel habits, palpable abdominal masses, abnormal findings on digital rectal examinations, anaemia, and intestinal obstruction. These findings align with extant research although our study noted a relatively higher incidence of patients presenting with acute abdominal obstruction. Metastatic disease was observed in 19 (23%) of cases, consistent with Sinha et al.[30]. Similar to previous studies, the majority of cases presented at stage II or III.

One limitation of our study is that patients in advanced stages are often referred to our center, and rectal cancer cases are referred more frequently than colon cancer cases. Consequently, our study may not fully represent the overall prevalence and distribution of colorectal cancer within the regional population. However, as a major oncological center in the area, our findings likely reflect important trends and underscore the importance of early diagnosis through timely evaluation and management. This study, involving 82 patients from a single center, highlights the need for larger, multicentric studies to comprehensively explore the etiological, demographic, and clinicopathological aspects of CRC. Such research would enable the development of more effective prevention strategies, as well as improved diagnostic and therapeutic approaches, ultimately benefiting patients through more targeted care.

Conclusion

The implications of the study's findings on colorectal cancer (CRC) in India are multifaceted, spanning clinical practice, healthcare policy, and research priorities. Given the younger age at diagnosis and high incidence of advanced-stage presentations, it is essential to develop early screening programs tailored to India's unique demographic profile. These programs could help identify CRC at earlier, more treatable stages, especially among younger patients.The higher prevalence of signet ring cell tumors and left-sided CRC in India suggests a need for specialized clinical management and research into treatment protocols that address these unique histological characteristics. Signet ring cell tumors, for example, may require different approaches due to their aggressive behaviour.

With malnutrition prevalent among CRC patients in India, nutritional assessment and intervention should become standard practice in CRC care. Integrating dieticians into oncology teams could help improve patient outcomes and address malnutrition's impact on treatment efficacy and recovery. Clinicians are encouraged to obtain comprehensive family histories, particularly due to the substantial proportion of younger CRC patients. This practice could improve early identification of high-risk individuals and allow for preventive

interventions, potentially mitigating CRC incidence. The limited availability of advanced treatment options in India may strain healthcare resources, particularly as CRC incidence is projected to increase. Policymakers may need to prioritize investments in CRC-specific healthcare infrastructure and expand access to affordable treatments.

With a potential rise in CRC incidence, public health campaigns could focus on increasing awareness of CRC symptoms, risk factors, and the importance of timely screenings, especially among younger and underserved populations.

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Conflicts of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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