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Original Research Article

Histopathological Study of Spectrum of Benign and Malignant Lesions of Intestine

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Abstract

Background: The small and large intestines account for the majority of gastrointestinal (GI) tract length and are common sites of primary and metastatic tumors. There is a large variation in the distribution of this neoplasm, all over the world. It is a leading cause of death in the developed world, emphasizing the importance of proper documentation of histopathologically diagnosed gastrointestinal neoplasm. The study aims to comprehensively investigate the spectrum of benign and malignant lesions across all age groups in the intestine, evaluate suspected patients through histopathology, examine the prevalence within our institution, and provide site-wise distribution information.

Methods: This prospective study was carried out over two years and includes 99 cases of surgically resected and biopsy specimens of the intestine having suspected benign and malignant lesions. Poorly fixed/unfixed specimens and inadequate biopsies were excluded. The diagnosis, typing, and staging of tumors were done following the latest guidelines.

Results: Of the total 99 intestinal neoplastic lesions large intestine was most commonly affected (82%) while Anal Canal was least commonly affected (2%). The majority of tumors were epithelial in origin (95%). Only 12% of cases showed metastasis to regional lymph nodes or a distant site.

Conclusion: Histopathological evaluation of resected intestine is important in determining the cause, extent of disease, further adjuvant therapy, and prognosis of disease, and thus improving patient survival.

Keywords: Histopathological evaluation, Resected intestine.

Introduction

From an anatomical perspective, the gastrointestinal tract extends from the mouth to the anal canal [1]. Its fundamental roles encompass the processes of food intake, breakdown, digestion, nutrient absorption, and the expulsion of waste products [2]. The upper part of the gastrointestinal tract originates from the foregut, while the lower section comprises components derived from both the midgut and hindgut [1]. Due to the intestines serving as the primary interface between the immune system and the myriad of antigens encountered in food and gut microorganisms, they frequently become targets for infectious and inflammatory disorders [3]. The small and large intestines constitute the majority of the gastrointestinal (GI) tract's length and are frequent locations for both primary and metastatic tumors. Intestinal neoplasms are pervasive in India and globally, representing a significant cause of mortality in developed nations. Thus, it underscores the necessity for meticulous documentation of histopathologically diagnosed gastrointestinal neoplasms [4]. Surprisingly, despite the small bowel accounting for over two-thirds of the digestive tract's length and more than 90% of its mucosal area, it is responsible for only a small fraction (1.5-2%) of total gastrointestinal neoplasms [5].

Malignant tumors of the small intestine are exceedingly rare worldwide, with a global estimated incidence of less than one in 100,000 people [6]. Annually, approximately 1.2 million new cases of colorectal adenocarcinoma are diagnosed, resulting in 600,000 deaths [3]. Colorectal cancer ranks as the third most prevalent cancer globally [7]. Obstructive lesions, such as

adhesions, volvulus, and intussusceptions, as well as ischemic bowel disease, infectious enterocolitis, inflammatory bowel disease, granulomatous inflammatory conditions (including tuberculosis), polyps, carcinomas, carcinoid tumors, and lymphomas, all can affect the small and large intestine [3]. Intestinal disorders often manifest with nonspecific symptoms such as vomiting, abdominal pain, distension, alterations in bowel habits, fever, melena (tarry stools), weight loss, and hematochezia (bloody stools). Many of these lesions share common clinical presentations, but their distinctive pathological characteristics facilitate diagnosis and determine the extent and severity of the ailment [8]. The incidence of various histological types of tumors at different intestinal locations varies, affecting prognosis as well [9]. However, demographic trends predict a twofold increase in colorectal carcinoma incidence by 2025 due to evolving dietary habits and lifestyles [10]. The pathological evaluation of resected specimens plays a pivotal role in assessing the disease's extent, guiding further adjuvant therapy decisions, and predicting prognosis. Thus, histopathology remains the definitive standard for diagnosing gastrointestinal tumors.

The study aimed to comprehensively explore both benign and malignant intestinal lesions across all age groups, investigating their distribution concerning age and gender. It sought to assess individuals suspected of harboring these lesions through histopathological examination, evaluating the prevalence of such conditions within the institute. Additionally, it aimed to provide a detailed breakdown of the location-specific distribution of these lesions, facilitating a thorough understanding of their occurrences and implications. Through histopathology, the study intended to examine and evaluate patients suspected of having benign and malignant lesions in the intestine, thereby contributing to a deeper understanding of these conditions and their prevalence across demographics and specific anatomical sites.

Materials & Methods

The prospective study was conducted in the histopathology section of the department of pathology over a two-year period, from October 2018 to September 2021, with the exclusion of the period from June 2020 to May 2021. The study involved data collection from 99 cases, comprising surgically resected and biopsy specimens of small and large intestine lesions. Inclusion criteria encompassed all patients who underwent surgical procedures due to suspected benign and malignant intestinal lesions. Exclusion criteria were applied to specimens that were poorly fixed or unfixed and to inadequate biopsies lacking mucosal glands, containing only fibro-collagenous tissue.

Gross examination included the documentation of the type of polyp for polypectomies, with serial sectioning and submission of multiple sections, including the base. Relevant clinical history and any pre-operative biopsy diagnosis were noted for surgically resected specimens, along with the nature of the surgical procedure. Surgical procedures were categorized based on the segment of the intestine resected, including right hemicolectomy, left hemicolectomy, transverse, descending, or sigmoid colectomy, anterior resection (categorized into high, low, and ultra-low), abdominoperineal resection, and total proctocolectomy for specific conditions.

The length of the specimen was measured, and the tumor was palpated externally to check for perforation. For rectosigmoid colectomy, anterior resections, and abdominoperineal resections, the tumor's location in relation to the anterior peritoneal reflection and its distance from the dentate line were recorded. The gross appearance of the tumor, including whether it was ulceroproliferative or infiltrative, and its measurements were determined post-fixation. Bowel involvement was documented in terms of circumferential or quadrants.

Sampling involved the first resection margin, with any gross involvement noted. The tumor was serially sectioned, with slices no more than 5 mm thick. The presence of tumor invasion in the bowel wall, color, consistency, areas of necrosis, and/or hemorrhage were observed. Multiple sections of the tumor were taken, focusing on the most invasive regions and relevant anatomical surfaces, including the serosa and/or circumferential resection margin.

Lymph nodes in the vicinity were dissected, and their gross appearance was recorded. Following current recommendations, a minimum of twelve lymph nodes were removed for analysis [11]. Microscopy and reporting were carried out in accordance with the World Health Organization (WHO) guidelines for diagnosis and tumor typing. Staging was determined using the College of American Pathologists (CAP) and Modified Astler-Coller staging classification [12].

Results

This study is a prospective investigation spanning two years from October 2018 to September 2021 conducted within the Department of Pathology. A total of 99 surgical specimens from both small and large intestines were included, encompassing resected segments and biopsy specimens. A comprehensive histopathological examination was conducted revealing a diverse range of lesion etiologies, meticulously documented and reported. The study showed the prevalence of benign cases

was at about 7% and a malignant lesion at 93% (Table1).

Neoplastic Distribution of Cases:

Table 1: Neoplastic Distribution of Cases

Neoplastic	No of Cases	Percentage
Benign	7	7%
Malignant	92	93%
Total	**99**	**100%**

Table 2: Types of Surgical Specimens Received for Lesions of Small and Large Intestine

Surgical Specimen	Specimen	Percentage
Resection	89	90%
Biopsy	10	10%
Total	**99**	**100%**

The specimens collected from patients who had undergone surgeries for intestinal lesions were categorized into two groups: resection and biopsy. The resected specimen was the most prevalent, constituting 90% of the total specimens. (Table 2)

Table 3: Age Wise Distribution of Benign and Malignant Tumors

Age in Years	Benign Tumor		Malignant Tumor	
	No of Cases	Percentage	No of Cases	Percentage
0-10	0	0%	0	0%
11-20	0	0%	2	2%
21-30	0	0%	4	4%
31-40	1	14%	10	11%
41-50	2	29%	24	26%
51-60	2	29%	21	23%
61-70	2	29%	25	12%
71-80	0	0%	6	7%
81-90	0	0%	0	0%
91-100	0	0%	0	0%
Total	**7**	**7%**	**92**	**93%**

Benign tumors were observed to occur in the 5th, 6th, and 7th decade of life, displaying a broad age distribution, ranging from the earliest presentation at 32 years to the highest age recorded at 68 years. In contrast, malignant tumors exhibited their peak incidence during the 7th decade of life, also displaying a wide range of age distribution, starting as early as 12 years and extending to the highest age of 76 years. (Table 3)

Table 4: Age and gender Distribution of Lesions of Small and Large Intestine

Age in Years	Benign Tumor				Malignant Tumor			
	Male		Female		Male		Female	
	No of Cases	Percentage	No of Cases	Percentage	No of Cases	Percentage	No of Cases	Percentage
0-10	0	0%	0	0%	0	0%	0	0%
11-20	0	0%	0	0%	1	2%	1	3%
21-30	0	0%	0	0%	4	8%	0	0%
31-40	0	0%	1	20%	5	10%	5	13%
41-50	0	0%	2	40%	14	12%	10	25%
51-60	1	50%	1	20%	12	23%	9	23%
61-70	1	50%	1	20%	12	23%	13	33%
71-80	0	0%	0	0%	4	8%	2	5%
81-90	0	0%	0	0%	0	0%	0	0%
91-100	0	0%	0	0%	0	0%	0	0%
	2	**100%**	**5**	**100%**	**52**	**100%**	**40**	**100%**

The age and gender-specific analysis showcased a predominance of benign lesions in females during their 5th decade, while malignant lesions were more common in males, also peaking during their 5th decade. The overall study depicted a male predominance with 55% of cases, establishing a male-to-female ratio of 1:0.8 (Table *4*).

Table 5: Symptoms of Lesions of Small and Large Intestine

Symptoms	No of Cases	Percentage
Pain in abdomen	95	96%
Vomiting	9	9%
Distension	3	3%
Obstipation/Constipation	11	11%
Mass per abdomen/Mass per rectum	30	30%
Bleeding per rectum	13	13%
Altered bowel habits	16	16%
Loss of weight/appetite	11	11%

Symptomatically, abdominal pain was prevalent in 96% of cases, followed by mass presence in 30%, altered bowel habits in 16%, and rectal bleeding in 13% (Table 5). Dietary habits of the patients showed a majority (82%) consuming mixed vegetarian and non-vegetarian diets (Table 6).

Table 6: Distribution of Cases According to Dietary Habits

Diet	No of Cases	Percentage
Veg	18	18%
Mixed	81	82%
Total	**99**	**100%**

Anatomically, the large intestine was most affected, comprising 83% of cases, while the Anal Canal had the lowest incidence at 2% (Table 7). Further, the Descending Colon was the most prevalent site, accounting for 21% of cases (Table 8). Tumor types were predominantly epithelial, making up 95% of cases, with adenocarcinoma as the most common tumor at 61% (Table 9).

Table 7: Distribution of Lesions in Small and Large Intestine

Site	No of Cases	Percentage
Small Intestine	15	15%
Large Intestine	82	83%
Anal Canal	2	2%
Total	**99**	**100%**

Table 8: Anatomical Distribution of Lesions in Small and Large Intestine

Anatomical Site-wise Distribution	No of Cases	Percentage
Small Intestine	**15**	**15%**
Duodenum	3	3%
Jejunum	5	5%
Ileum	7	7%
Large Intestine	**84**	**85%**
Caecum	6	6%
Ascending Colon	11	11%
Transverse Colon	4	4%
Descending Colon	21	21%
Rectum	16	16%
Rectosigmoid	9	9%
Sigmoid Colon	15	15%
Anal Canal	2	2%
Total	**99**	**100%**

Table 9: WHO Categories of Colorectal Tumors

WHO Category	No of Cases	Percentage
Epithelial	94	95%
Mesenchymal	2	2%
Lymphoma	3	3%
Total	**99**	**100%**

The most prevalent type of tumor in the study was adenocarcinoma, which accounted for 61% of cases. Following closely, mucinous adenocarcinoma represented 12% followed by Mucinous Adenocarcinoma with Signet Ring Histology accounting 7% of cases, followed by Signet Ring Cell Carcinoma accounting 4% of cases. Neuroendocrine tumors accounted for 3% of cases (Figure 1)..Malt Lymphoma constituted 2% of the cases (Figure 2).

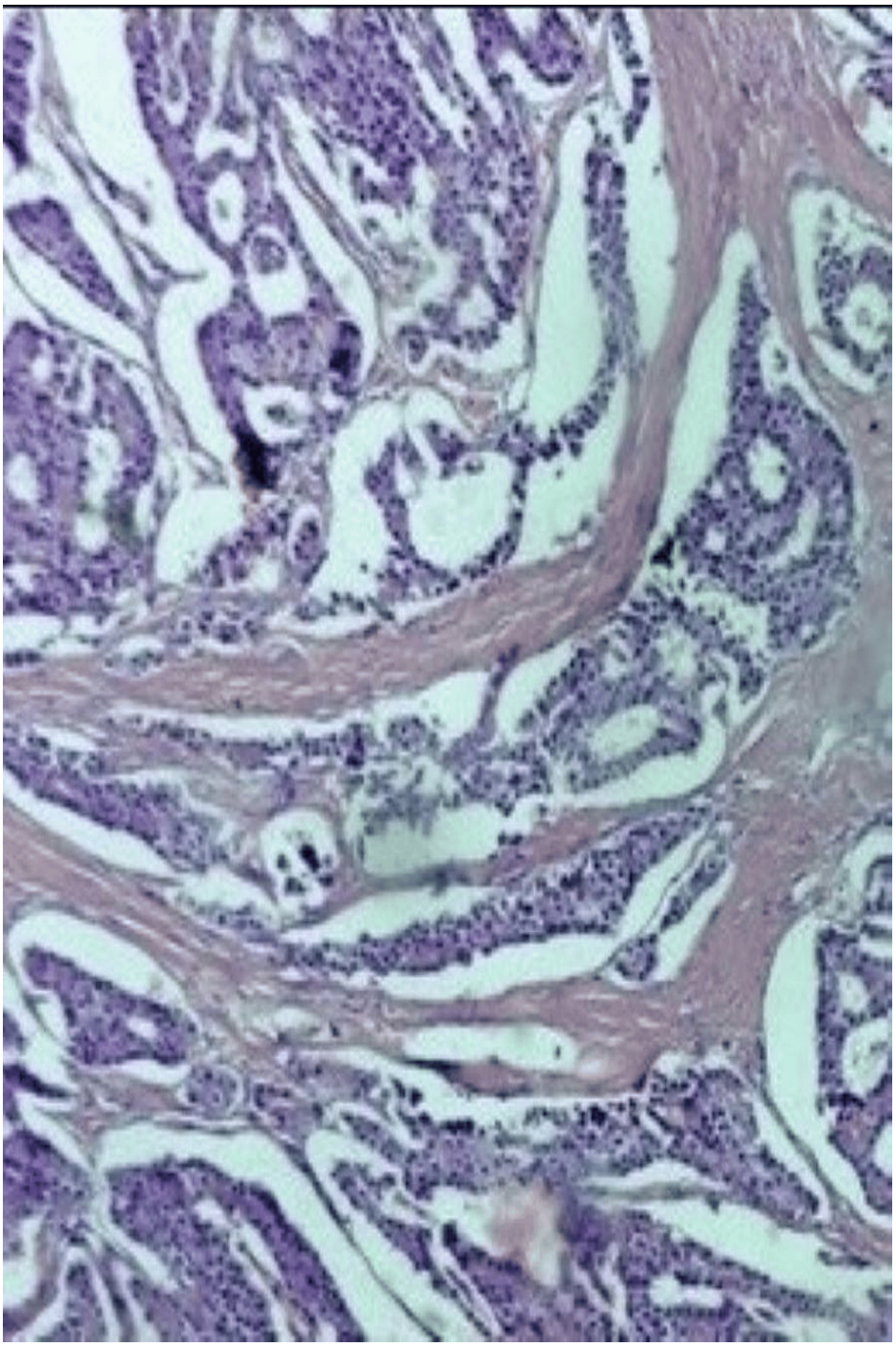

Figure 1: Neuroendocrine tumor of intestine shows organoid and nesting pattern. (H&Ex 10)

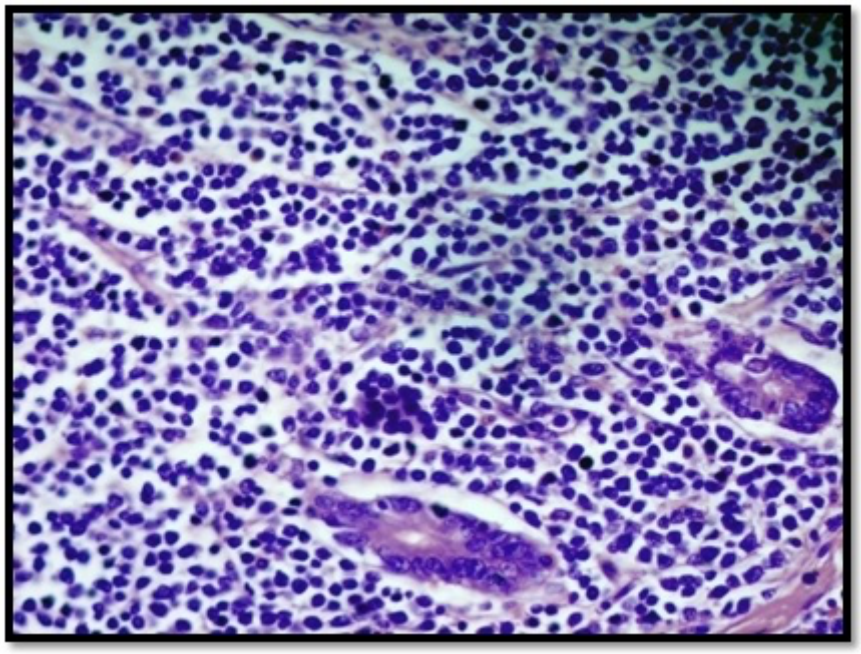

Figure 2: Maltoma showing small and medium sized lymphocytes with irregular nuclear contour. (H&E 40)

Among benign tumors, tubulo-villous adenomas accounted for 3% of cases, while villous adenomas represented 2% of cases. Subserosal lipoma and leiomyoma each had one case, making up 1% of cases each (Table 10).

Table 10: Incidence of Various Histopathological Types

Tumor	Number of Cases	Percentage
Adenocarcinoma	60	61%
Mucinous Adenocarcinoma	12	12%
Mucinous Adenocarcinoma With Signet Ring Histology	7	7%
Non-Hodgkin's Lymphoma	1	1%
Malt Lymphoma	2	2%
Neuroendocrine Tumor	3	3%
GIST	1	1%
Signet Ring Cell Carcinoma	4	4%
Squamous Cell Carcinoma	2	2%
Villous Adenoma	2	2%
Tubulo-Villous Adenoma	3	3%
SubserosalLipoma	1	1%
Leiomyoma	1	1%
Total	**99**	**100%**

The gross appearance revealed ulceroproliferative (57%) as the most common configuration (Table 11). Metastasis was observed in 12% of malignant cases (Table 12), and the majority of colorectal carcinomas were moderately differentiated (55%) (Table 13). The depth of invasion analysis showed that 49% of cases had invaded up to the serosa (Table 14).

Table 11: Gross Appearance of Tumors of Resected Specimen

Gross Appearance	Number of Cases	Percentage
Ulceroproliferative	51	57%
Ulceroinfilrative	25	28%
Polypoidal	1	1%
Nodular	2	2%
Stricture	6	7%
Fungating	4	4%
Total	**89**	**100%**

Table 12: Percentage of Tumors with Metastasis

Metastasis	Number of Cases	Percentage
Present	12	12%
Absent	72	73%
Total	**99**	100%

Table 13: Differentiation of Colorectal Carcinoma

Differentiation	Number of Cases	Percentage
Well	37	43%
Moderate	47	55%
Poor	2	2%
Total	**86**	**100%**

Table 14: Depth of Invasion by Tumors

Site	Small Intestine		Large Intestine		Total	
	No of Cases	Percentage	No of Cases	Percentage	No of Cases	Percentage
Submucosa	0	0%	4	6%	**4**	**6%**
Muscularis Propria	1	14%	11	17%	**12**	**17%**
Muscle Coat	2	29%	18	28%	**20**	**28%**
Serosa	4	57%	31	48%	**35**	**49%**
Total	**7**	**100%**	**64**	**100%**	**71**	**100%**

Discussion

In western countries, the incidence of gastrointestinal malignancies is on the decline. In contrast, India is experiencing an increase in gastrointestinal tract neoplasms due to shifts in dietary habits and lifestyle. Gastrointestinal neoplasms exhibit diverse histological patterns, clinical presentations, and a range of gross characteristics, leading to variability in prognosis. Furthermore, these neoplasms demonstrate significant geographic variations in the anatomical sites affected. To comprehensively investigate the multifaceted factors contributing to the pathogenesis of gastrointestinal tumors, we conducted an in-depth study focused on tumors of the gastrointestinal tract.

In this study, a total of 99 cases involving the intestines were examined. The age at presentation ranged from 12 to 76 years, with the highest incidence observed in the 61-70 years age group, accounting for 12% of cases. This contrasts with the findings of other studies conducted by Joshi HR et al. [4], which reported the highest number of cases in the 41-50 years age group, with incidences of 36%. Meanwhile, Assem O et al. [13], found a peak incidence in the 51-60 years age group, with 25.6%.

A male predominance was noted in our study, with 55% of cases being male and 45% female, resulting in a male-to-female ratio of 1:0.8. This aligns with the findings of Joshi HR et al. [4], who also observed a male predominance, with 64% male and 36% female cases and a male-to-female ratio of 1.78:1. Resected specimens were the most common type for intestinal lesions in our study, consistent with the findings of Uploankar et al. [14], and Sharma P et al. [15]. Our study also revealed that the large intestine was the most commonly affected site, accounting for 86% of cases, which is in agreement with Nanawati et al. [16], and Joshi HR et al. [4], who reported similar incidences of 86% and 82%, respectively.

Out of the total 99 cases, malignancies were more prevalent, comprising 93% of cases, compared to benign lesions, which accounted for only 7%. This is consistent with the study conducted by Joshi HR et al. [4], which reported malignancies in 96% of cases and benign lesions in 4%. Although Sharma et al. [15], reported a lower incidence of malignant lesions than our study; they still found malignant lesions to be more common than benign lesions, with incidences of 81% and 19%, respectively. The most common type of lesion in our study was ulceroproliferative growth (57%), followed by ulceroinfiltrative and stricture types. This is similar to the findings of Sharma P et al. [15], which showed ulceroproliferative as the most common type, followed by annular type. However, Rasool M et al. [17], found ulceroinfiltrative to be the most common type, followed by ulceroproliferative.

Our study indicated that the majority of cases had epithelial-origin tumors, followed by lymphoma and neuroendocrine tumors, while mesenchymal-origin tumors were the least common. This trend is comparable to the findings of Parmar et al. [18], and Nunna VK et al. [19], which both showed that tumors of epithelial origin were the most common, followed by mesenchymal tumors and lymphomas. It's worth noting that this variation could be attributed to the smaller sample size in our study (Table 15).

Table 15: Comparison of Histological Types of Intestinal Neoplasms

Histological type	Parmar A Et al [19] (2018)	Nunna VK et al [20] (2018)	Present Study (2021)
Epithelial	93.75%	91.10%	92%
Mesenchymal	4.17%	6.60%	2%
Lymphoma	2.08%	2.20%	3%
Neuroendocrine	0.00%	0.00%	3%
Metastatic adenocarcinoma	0.00%	0.00%	0%
Total	**100.00%**	**100.00%**	**100%**

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Total	**100.00%**	**100.00%**	**100%**

In our study, the descending colon was the most commonly affected site (21%), whereas the transverse colon was less frequently affected (4%). This differs from the findings of Laishram RS et al. [7], and Rasool M et al. [18], who reported the rectum as the most common site with incidences of 53.71% and 40.14%, respectively. The caecum was less commonly affected in our study, possibly due to the smaller sample size. Regarding histological types of colorectal carcinoma, adenocarcinoma was the most common type in our study, accounting for 64% of cases, which is consistent with the findings of Shah N et al. [20] (62.16%). However, Sharma P et al. [15], reported even higher incidences of adenocarcinoma, at 96.6%. Our study also identified ten cases of mucinous adenocarcinoma, representing 12% of cases, in line with the findings of Shah N et al. [20], and Sharma P et al. [15], did not report any cases of mucinous adenocarcinoma (Table 16).

Table 16: Comparison of Histological Types of Colorectal Carcinoma

Histological Type	Sharma P et al. 2015 [15]	Shah N et al. 2017 [20]	Joshi HR et al. 2015 [4]	Present Study (2021) No. (%)
Adenocarcinoma	86(96.6)	46(62.16)	80 (64.52%)	54(64)
Mucinous adenocarcinoma	0	9(12.16)	12 (9.68%)	10(12)
Squamous cell carcinoma	0	4(5.40)	0 (0%)	2(2)
Signet ring cell carcinoma	0	5(6.75)	12(9.68%)	4(5)
Adenosquamous carcinoma	0	0	0 (0%)	0
Undifferentiated carcinoma	0	4(5.4)	0 (0%)	0
Others	3(3.4)	6(8.1)	20 (16.13%)	9(11)
Total	**89(1000)**	**74(100)**	124 (100%)	**79(100)**

Moderately differentiated adenocarcinoma was the most common subtype in our study (55%), involving both the small and large intestines. This aligns with the findings of Laishram RS et al. [7]. In contrast, Sharma P et al. [15], found well-differentiated adenocarcinoma to be the most common type.

In our study, only two cases of malignancy in the anal canal were observed, both of which were squamous cell carcinomas and occurred in males aged 50 and 61, respectively. This corresponds to the findings of Saiprasad BV et al. [21], Sulegaon RV et al. [22], and Jyothi V et al. [23], which also reported cases of squamous cell carcinoma in the anal canal. Additionally, Saiprasad BV et al. [21], Sulegaon RV et al. [22], and Jyothi V et al. [23], each found cases of malignant melanoma in the anal canal, whereas our study did not report any cases of adenocarcinoma in the anal canal, which differs from Parmar A et al. [18], who reported four cases of adenocarcinoma. This disparity could be due to the smaller sample size of our study. Furthermore, our study revealed 12 cases with lymph node metastases, with three cases originating from the small intestine and 24 from the large intestine. This is comparable to the findings of Saiprasad BV et al. [21], who reported 10 cases with lymph node metastasis, including three cases from the small intestine and seven from the large intestine. Diet is known to play a role in the causation of colorectal tumors. In the present study, all cases had rice, wheat, bajra, and jawar as the staple diet. The majority of cases (81 cases or 82% cases) had mixed dietary habits and consumed non-vegetarian food occasionally too frequently. The rest of the patients (18 cases or 18%) were vegetarians. This is in accordance with the findings of Larsson et al. [24], and the study by Norat et al. [25], which support the consumption of non-vegetarian food as a causative factor of colorectal tumors. Limitation of present study is that the conclusion of study is based on findings from a single region, and it may not be representative of the entire population or reflect variations in clinical practice across different settings or regions.

Conclusion

The current study delves into the spectrum of neoplastic lesions affecting both the small and large intestines. These lesions exhibit a diverse range of morphological variations and can afflict individuals of all age groups. Consequently, histopathological examination becomes imperative for diagnosing, typing, and classifying these tumors. Given that clinical and radiological findings in various diseases lack specificity, histopathological studies serve as a crucial means of confirming the diagnosis. Histopathological assessment of resected intestine specimens assumes great significance in elucidating the underlying cause, determining disease extent, guiding adjuvant therapy decisions, and forecasting prognosis. Consequently, it contributes significantly to enhancing patient survival rates. In light of these findings, it is advisable to recommend routine endoscopic screening for bowel cancer in high-risk patients. This proactive approach enables early detection and a more favorable prognosis, thereby enhancing overall patient outcomes.

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