Section: Pathology

Original Research Article

HISTOPATHOLOGICAL STUDY OF COLONOSCOPIC BIOPSIES OVER A PERIOD OF TWO YEARS AT A TERTIARY MEDICAL CENTRE

S. Lakshmi Soundarya[1], V. Ramya Swathi[2], Shaila[3], G Baleswari[4], T Dhanamjaya Rao[5]

[1]*Assistant Professor, Department of Pathology, Viswabharathi Medical College, Penchikalapadu, Kurnool, Andhra Pradesh, India.*
[2]*Assistant Professor, Department of Pathology, Government Medical College, Nandyala, Andhra Pradesh, India.*
[3]*Associate Professor, Department of Pathology, Kurnool Medical College, Kurnool, Andhra Pradesh, India.*
[4]*Professor, Department of Pathology, Kurnool Medical College, Kurnool, Andhra Pradesh, India.*
[5]*(Rtd) Professor, Department of Pathology, Kurnool Medical College, Kurnool, Andhra Pradesh, India.*

Received *: 05/05/2025*
Received in revised form *: 25/06/2025*
Accepted *: 14/07/2025*

Corresponding Author:
Dr. Shaila,
Associate Professor, Department of Pathology, Kurnool Medical College, Kurnool, Andhra Pradesh, India.
Email: kamath_shaila@yahoo.com

DOI: 10.70034/ijmedph.2025.3.309

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 1682-1688

ABSTRACT

Background: Fibreoptic colonoscopy has an increasingly significant role in the examination of patients with colon disorders. Since the invention of fibreoptic colonoscopies, it is now possible to directly see the whole length of the colon, determine the location and type of colon disease with a colonoscopy and to take a biopsy.

Materials and Methods: The present study was a 2-year retrospective study conducted from January 2021 to December 2022 at Department of Pathology, in collaboration with the Department of Gastroenterology of our institution.

Results: This study was done in 200 colonoscopic biopsies which were received in the department of pathology. Out of 200 cases, 142 (71%) were non-neoplastic, 54 (27%) were neoplastic, and 4 (2%) were unsatisfactory. Among 142 non-neoplastic lesions, Chronic colitis was the most common lesion (58) (40.8%) and IBD secondary to vasculitis (2) (1.4%) was the least common lesion. Neoplastic lesions included 18 benign and 36 malignant lesions. Tubular adenoma(8cases) (44.44%) was the most common and submucosal lipoma (1case) (5.56%) was the rare benign neoplastic lesion. In malignant neoplastic category adenocarcinoma was the common lesion whereas rare cases like lymphoma, neuroendocrine carcinoma, were included in our study.

Conclusion: Endoscopic evaluation of the large bowel has been enormously expanded by the availability of colonoscopy. It is a relatively simple, invasive, safe procedure and has got very high diagnostic yield. In routine clinical practice, histopathology is the “gold standard” for definitive diagnosis.

Keywords: Colonoscopy, Biopsy, Colitis, Tubular adenoma, Crohn’s disease, Adenocarcinoma.

INTRODUCTION

Recent years have seen a vast growth in our understanding of the pathophysiology and progression of diseases that affect the gastrointestinal system due to the widespread use of flexible endoscopes. All parts of the large intestine and rectal mucosal biopsies are now examined at a significantly higher rate because of the development of flexible endoscopes. Fibreoptic colonoscopy is assuming an increasingly significant role in the examination of patients with colon disorders. Since the invention of fibreoptic colonoscopies, it is now possible to directly see and biopsy the whole length of the colon. It is possible to determine the location and type of colon disease with a colonoscopy and a biopsy. In order to diagnose and treat alleged colonic disorders, a colonoscopy is essential. For individuals with diarrhoea lasting from weeks to months or with any type of bloody diarrhoea, colonoscope examination is the preferred diagnostic method.[1] With the development of flexible endoscopes, there is an increase not only in the direct visualisation of the lesions but also in mucosal biopsy evaluation for histopathological diagnosis.[2]

Aim and Objectives

Aim

1. To prove colonoscopic biopsy as early diagnostic tool in all the symptomatic cases of lower gastrointestinal lesions and hence to provide proper treatment and to avoid complications.

Objectives

1. To examine the histopathological characteristics of samples from colonoscopic biopsy specimens.
2. To perform histopathological examination for diagnosing colonic lesions and to comment on their size, activity, and severity wherever possible.
3. Whenever possible, correlating the histopathology of the biopsies from the colonoscopy with that of histopathology of colectomy specimens.

MATERIALS AND METHODS

The present study was a 2-year retrospective study conducted from January 2021 to December 2022 at Department of Pathology, in collaboration with the Department of Gastroenterology of our institution. This study was done in 200 colonoscopic biopsies which were received in the department of pathology.

Inclusion Criteria: The study was on all colonoscopic biopsies that were received for histopathological examination at department of pathology from the terminal ileum to the pectinate line of the rectum irrespective of age and gender.

Exclusion Criteria: Poorly fixed/unfixed specimens and Anal lesions were excluded.

Clinical details along with a detailed description of the colonoscopic findings were obtained.

All colonoscopic biopsy specimens were collected in 10% neutral buffered formalin processed and embedded with the mucosal surface being uppermost. 4µ thick serial sections were prepared and stained with H&E. Detailed study of the sections was done under light microscope and diagnosis rendered accordingly.

This study was approved and permitted by the Institutional Ethics Committee.

RESULTS

During the study period, two hundred colonoscopic biopsy specimens were examined histologically with assessment of clinical data

Table 1: Age distribution of all cases

Age	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	total	Mean ± SD
Cases	01	09	21	50	33	37	30	19	200	48.72 ± 15.88
Percentage	0.5	4.5	10.5	25	16.5	18.5	15	9.5	100	

In our study, we performed colonoscopies with biopsies on individuals who ranged in age from 0 to 80 years. There was highest number of cases occurring in the age ranging from 31 to 40 years (25%) and from 51 to 60 years (18.5%) with 50 cases and 37 cases, respectively. (Table 1). There were 116 male patients in this study (58%) and 84 female cases (42%). (Table 2).

Table 2: Gender distribution

Gender	Male	Female	Total
Cases	116	84	200
Percentage	58	42	100

In the present study, the most common clinical feature with which the patients presented was found to be diarrhoea ,66 cases (33%), followed closely by pain abdomen in 56 cases (28%). Bleeding per rectum, constipation, weakness were other common clinical features. (Table 3)

In the present study, out of 200 cases, 139 (69.5%) were non-neoplastic, 54 (27%) were neoplastic, and 4 (2.5%) were unsatisfactory, as indicated in (Table no. 4.)

Table 3: Distribution of clinical features in all cases

Clinical features	Diarrhoea	Pain Abdomen	Constipation	Bleeding	Fatigue
Frequency	66	56	15	50	48

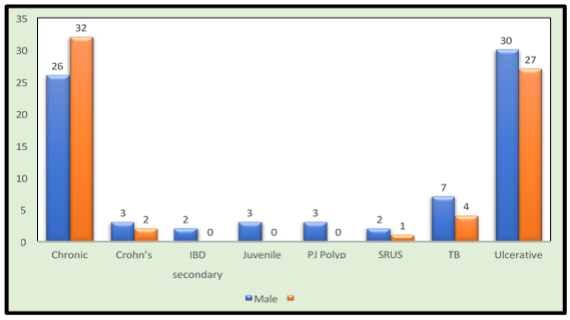
Table 4: Distribution of all lesions

Type of lesions		Frequency (Cases)	Percentage
Non neoplastic		142	71
Neoplastic	Benign	18	09
	Malignant	36	18
Unsatisfactory		04	02
Total		200	100

Table 5: Distribution of Non Neoplastic lesions

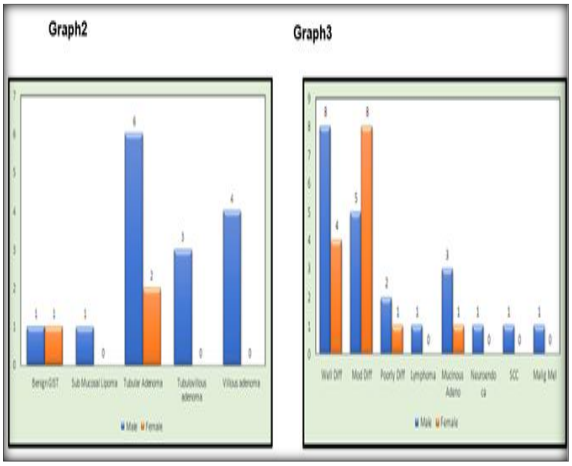
Sl No	Non neoplastic lesions	Total no of cases	percentage
1	Chronic colitis	58	40.8%
2	Crohn's Colitis	05	3.5%
3	IBD secondary to Vasculitis	02	1.4%
4	Juvenile polyp	03	2.1%
5	Peutz Jeghers polyp	03	2.1%
6	Solitary Rectal ulcer syndrome (SRUS)	03	2.1%
7	Tuberculosis	11	7.7%
8	Ulcerative colitis	57	40.1%
	Total	142	100 %

In the present study, out of 200 cases, 142 (71%) were non-neoplastic, 54 (27%) were neoplastic, and 4 (2 %) were unsatisfactory, as indicated in table no. 4.
Out of 200 cases in the current study, 142 were determined to be non-neoplastic, including 58 cases of chronic colitis, 57 cases of ulcerative colitis, 11 cases of tuberculosis, 5 cases of crohn's colitis, 3 cases of juvenile polyp, Peutz-Jeghers polyp, SRUS, and 2 cases of IBD secondary to vasculitis. (Table 5)
Among Non-neoplastic lesions our study discovered 76 males (53.52%) and 66 females (46.47%) patients and Chronic nonspecific colitis was the only nonneoplastic lesion found more in females than males .(Graph 1)



Graph 1: Gender distribution in Non-neoplastic lesions

Majority of benign neoplastic lesions in this study's participants were males (15 cases), with the remaining participants being female (3 cases) (Graph 2). Similarly malignant neoplastic lesions were more encountered in males (22cases) and remaining in females (14 cases). (Graph 3).



Gender distribution in benign (graph 2) and malignant neoplastic lesions (graph 3)

Table 7: Distribution of Malignant neoplastic lesions

Sl no	Malignant lesions	Frequency	Percentage
1	Adenocarcinoma moderate differentiated	13	36.01%
2	Adenocarcinoma well differentiated	12	33.33%
3	Mucinous adenocarcinoma	4	11.1%
4	Adenocarcinoma poorly Differentiated	3	8.3%
5	Lymphoma of colon	1	2.8%
6	Neuroendocrine carcinoma	1	2.8%
7	SCC extending from anus to rectum	1	2.8%
8	Malignant melanoma extending from anus to rectum	1	2.8%
	Total	36	100%

DISCUSSION

Infections, polyps, IBD, motility disorders and colorectal tumors are important colonic lesions which frequently require colonic biopsy for their conclusive diagnosis.[3] Colonoscopic evaluation is established as the diagnostic procedure of choice in the setting of diarrhea and lower GI bleed. A study population of 200 were considered for colonoscopic biopsies from patients presenting with chronic diarrhoea/bleeding per rectum as either a chief complaint or associated symptom were studied. Out of these 116 were males and 84 were females
In our study clustering of cases between 31 to 70 years with maximum cases seen in 31-40 [25%], 51-60 [18.5%] years of age groups having 50 cases and 37 cases respectively which is consistent with Geeta et al,[4] study, where clustering of cases seen between 21-70 years with maximum cases seen in 51-60 [24.5%], 61-70 [18.9%] having 48 and 37 cases respectively. But the present study is not similar to Karim et al,[5] study.

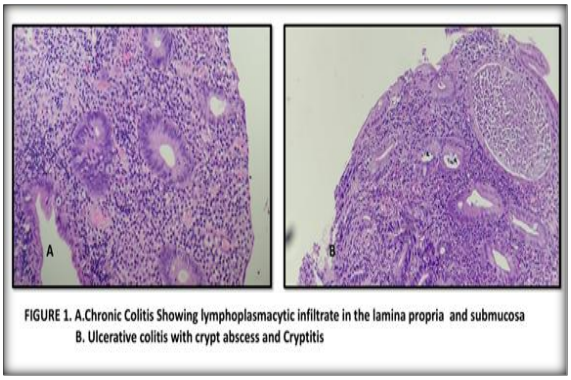


FIGURE 1. A.Chronic Colitis Showing lymphoplasmacytic infiltrate in the lamina propria and submucosa
B. Ulcerative colitis with crypt abscess and Cryptitis

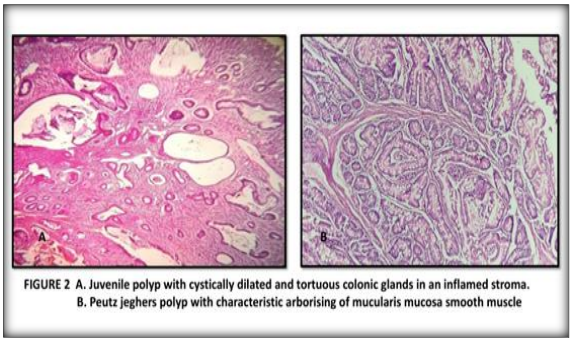


FIGURE 2 A. Juvenile polyp with cystically dilated and tortuous colonic glands in an inflamed stroma.
B. Peutz jeghers polyp with characteristic arborising of mucularis mucosa smooth muscle

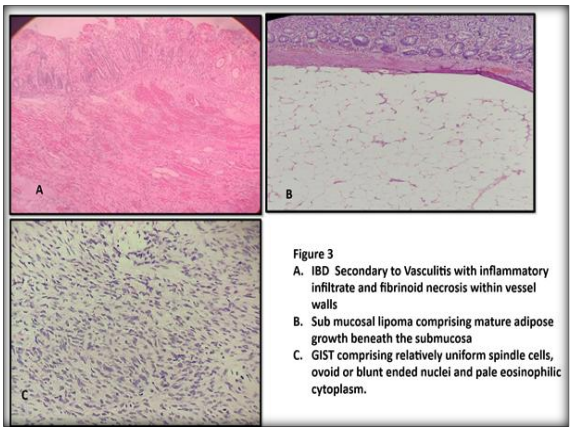


Figure 3
A. IBD Secondary to Vasculitis with inflammatory infiltrate and fibrinoid necrosis within vessel walls
B. Sub mucosal lipoma comprising mature adipose growth beneath the submucosa
C. GIST comprising relatively uniform spindle cells, ovoid or blunt ended nuclei and pale eosinophilic cytoplasm.

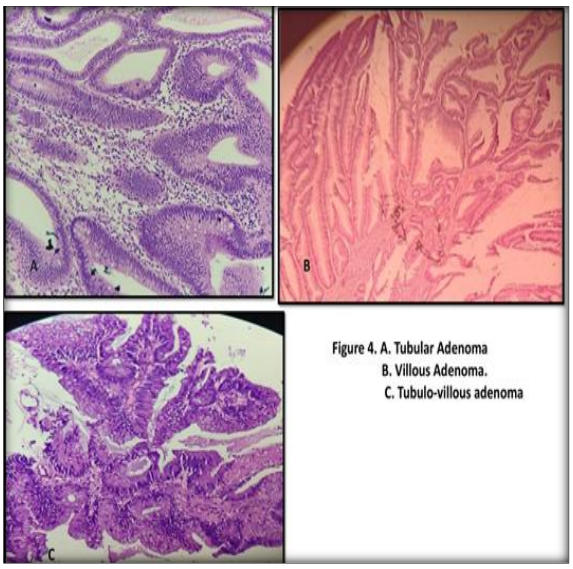


Figure 4. A. Tubular Adenoma
B. Villous Adenoma.
C. Tubulo-villous adenoma

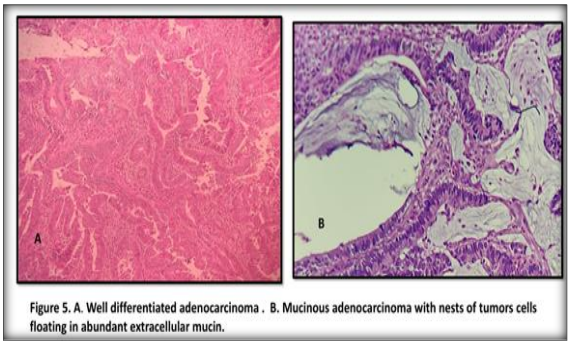


Figure 5. A. Well differentiated adenocarcinoma . B. Mucinous adenocarcinoma with nests of tumors cells floating in abundant extracellular mucin.

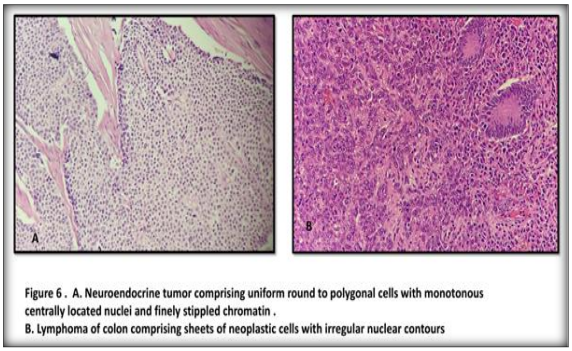


Figure 6 . A. Neuroendocrine tumor comprising uniform round to polygonal cells with monotonous centrally located nuclei and finely stippled chromatin .
B. Lymphoma of colon comprising sheets of neoplastic cells with irregular nuclear contours

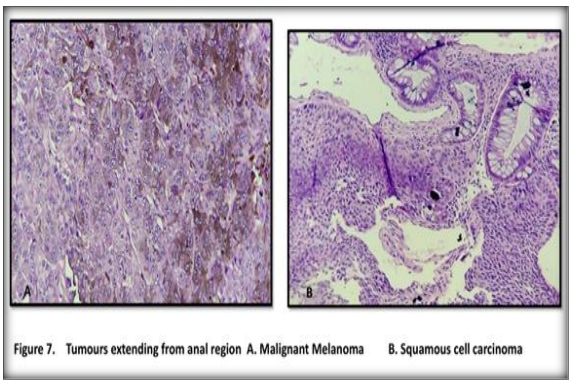


Figure 7. Tumours extending from anal region A. Malignant Melanoma B. Squamous cell carcinoma

out of 200 cases, 139(69.5%) cases were non neoplastic, 54 (27%) cases were neoplastic and 4(2.5%) cases were unsatisfactory. This finding is similar with the study series of Geeta et al,[4] whereas in studies of Sidney J et al6, Azar et al,[7] have shown maximum cases of non -neoplastic lesions followed by malignant neoplastic lesions which is followed by benign neoplastic lesions.

Non neoplastic lesions

In the present study, of the 142 cases diagnosed as non neoplastic lesions, 58(40.8%) cases comprised chronic colitis, 57(40.1%) ulcerative colitis cases and 5(3.5%) cases of Crohn's colitis. Similar findings were encountered with the study series of R.J. Dickinson et al,[9] where chronic colitis were maximum cases. But the present study is not similar to Geetha et al,[4] and Azhar et al,[7] study.

Chronic colitis RJ Dickinson et al9 described 20 cases (27%) of chronic colitis in their study of 74 cases. The present study showed 58 cases (40.8%) of chronic colitis. All these cases predominantly showed basal lymphoplasmacytic infiltrates in the lamina propria with well preserved mucosal glands and normal plasma cells.

Ulcerative colitis: Dickinson et al,[9] in their study of 74 cases described 11(14.9%) cases of IBD either UC or CD. Azar et al,[7] described 122 (25.5%) cases of ulcerative colitis. In the present study there were 57(41%)of ulcerative colitis.

Crohn's Colitis: There were 5 cases [3.5%] of Crohn's colitis in the present study which is consistent with Geetha et al,[4] study, Karim et al5 study and histologically they were characterized by presence of small, multiple granulomas, foreign body type of giant cells and lymphocytic infiltrate the mucosa and submucosa. But the present study is not similar to Tandon and Prakash et al8 study.

Tuberculosis

There were 11 cases of TB in the present study and were characterized by confluent granuloma, aggregation of epithelioid cells, Langhans giant cells and caseating necrosis in the mucosa. Tandon and Prakash et al,[8] in their study of 212 cases described 159 [75%] cases of TB whereas Geetha et al,[4] study showed 7 [06.6%] cases of TB out of 198 cases. The present study is consistent with Geetha et al,[4] study but not consistent to Tandon et al,[8] study.

Table 8: Showing comparison of Crohn's colitis with other studies

Study	No of cases of Crohn's disease
Geetha et al [2018]4	5 [4.8%]
Tandon et al[8]	10 [8.2%]
Karim et al 5	14[4.2%]
Present study	5 [3.5%]

Polyps (Non Neoplastic)

In the present study 6 [4.2%] cases of Juvenile/Inflammatory/Hamartomatous polyps were encountered out of 142 non neoplastic lesions which is similar to the study of Geetha et al,[4] where 4 [3.7%] cases of Juvenile/Inflammatory/Hamartomatous polyps out of 102 non neoplastic lesions were encountered.

Solitary rectal ulcer syndrome (SRUS): In the present study there were 3 [2.1%] cases of Solitary rectal ulcer syndrome out of 142 non-neoplastic cases which is consistent with Geetha et al study,[4] [0.9%] and Karim et al,[5] study [1.5%]

IBD Secondary to Vasculitis

In the present study there were 3 cases of IBD Secondary to Vasculitis encountered. Vasculitis comprises a group of rare but potentially life threatening diseases typically classified by the size of the vessels predominantly affected.[10] Primary large-vessel vasculitides (LVV) affect the aorta and its branches and include Takayasu arteritis (TAK) and giant cell arteritis (GCA). Medium vessel vasculitides affect the main visceral arteries and their branches and include polyarteritis nodosa (PAN) and Kawasaki disease. Small-vessel vasculitides affect arterioles and/or capillaries and include antineutrophil cytoplasmic antibody (ANCA)-associated vasculitides [AAV, including granulomatosis with polyangiitis (GPA), eosinophilic granulomatosis with polyangiitis (EGPA) and microscopic polyangiitis (MPA)] and immune-complex-mediated vasculitides.[10] Gastrointestinal tract manifestations can occur in these vasculitides,[11,12] due to involvement of the mesenteric arteries or smaller vessels, potentially leading to bowel ischemia. Granulomatous inflammation of the bowel mucosa can develop in GPA and EGPA and occasionally mimics inflammatory bowel diseases [IBD; Crohn's disease (CD) or ulcerative colitis (UC)

Neoplastic lesions

In the present study, 54 cases were diagnosed as neoplastic, of which 18 cases were benign, and 36 cases were malignant.

Benign lesions

Of the 18 benign lesions, 8 cases were tubular adenoma,[4] cases were villous adenoma, 3 cases were tubulovillous adenoma, 2 cases were of GIST and 1 case of Sub mucosal lipoma of colon.

Table 9: Comparison of Adenomatous polyps with other study

Study	tubular	villous	tubulovillous	Total
Geetha et al 4	**2**	**4**	**20**	**26(28.2%)**
Karim et al 5	70	**10**	**16**	**86 (29.03%)**
Present Study	**8**	**4**	**3**	**15 (27.7%)**

There were 15 [27.7%] cases of adenomatous polyps out of 54 neoplastic cases, of which 2 were tubular adenoma, 4 were villous adenoma, 20 were tubule villous adenoma and all of them were benign. This study is consistent with percentage to Geetha et al study,[4] [28.2%] and Karim et al study,[5] [29.03%]

Gastro Intestinal Stromal Tumor (GIST)

In the present study there were 2 cases of Benign GIST encountered. GISTs are rare, accounting for 1% to 2% of gastrointestinal neoplasms.[13] The median age was 65 (range, 10–100) with a 1:1 male to female ratio. The highest incidence rates (19–22 per million per year) were noted in Hong Kong, Shanghai, Taiwan, and Norway. The lowest incidence was noted in the Shanxi province of China with 4.3 per million per year. Eighteen percent (range, 5–40%) of GISTs were discovered incidentally. GISTs were found in the stomach (56%), small bowel (32%), colon and rectum (6%), esophagus (0.7%), and other locations (5.5%).[14]

Sub mucosal lipoma of colon

Lipomas are common, nonepithelial, benign, fatty tumors that can be found throughout the gastrointestinal tract, although they are most frequently seen in the colon. Approximately 90% of colonic lipomas are located in the submucosa; the remainder of these tumors are subserosal or intramucosal in origin. The reported incidence of colonic lipomas ranges from 0.2% to 4.4%.[15]

The present study includes one case of Submucosal Lipoma comprising [5.56%] of benign neoplastic lesions

Malignant lesions

The commonest malignant tumor of the colon and rectum is adenocarcinoma. It becomes highly frequent with increasing age and in the present study the average age at time of diagnosis being 65 years. It is more common in males (61.1%). These findings were in accordance with studies done by Thomas F I et al,[16] Geetha et al,[4] studies

Adenocarcinoma

The present study, of the 32 cases of adenocarcinomas, 12(33.3%) were well differentiated, 13(36.1%) were moderately differentiated, 3(8.3%) were poorly differentiated and 4(11.1%) were mucin secreting adenocarcinomas, but the number of cases based on cellular differentiation of malignant lesions varied in the studies of Geetha et al,[4], Janasson L et al,[17]

Lymphoma of colon

In this study there was 1 case of lymphoma is encountered in colorectal region. Only 1% of all colorectal malignancies are colorectal lymphomas, which are uncommon and make up 10–20% of all gastrointestinal lymphomas. In close proximity to the hepatic flexure, colonic lymphomas frequently occur. Diffuse large B-cell lymphoma (60%) is the most frequent subtype found in the colon, followed by Mucosa Associated Lymphoid Tissue [MALT] (15%) and Burkitt (15%).18In this study there was 1 case of lymphoma is encountered in the region of colon

Neuroendocrine tumor of rectum

The present study includes 1 [0.5%] case of Carcinoid tumour which is consistent with percentage to Karim et al,[5] study [1.5%]. In our present study 1 case of Neuroendocrine tumour out of 200 cases were encountered whereas in Karim et al5 study there were 5 cases of Neuroendocrine tumour out of 330 cases encountered.

Lesions extending from adjacent structures [From Anus]

Squamous cell carcinoma of Rectum

The present study includes a single case [2.8%] of Squamous cell carcinoma in biopsy specimen in a male patient with history of squamous cell carcinoma of anus. Primary Squamous-cell carcinomas of the colon and rectum are an extremely rare clinical entity. The first case of a pure squamous-cell carcinoma of the colon was reported in the German literature by Schmidtmann in1919.[19]

The incidence of squamous-cell carcinomas of the colon and rectum has been reported to be 0.25 to 0.1 per 1,000 colorectal neoplasms.[20]

Malignant melanoma of rectum

In the present study 1 [2.8%] case of malignant melanoma was seen in rectum which was a incidental finding during colonoscopy. On retrospective evaluation, there was a black discoloration of anal skin of the patient, which on biopsy proved to be a case of anal malignant melanoma.

Malignant melanoma of the rectum is an extremely rare and very aggressive disease.[21] This entity constitutes only 0.5-4% of all anorectal malignancies and less than 1% of all melanomas.[12]

CONCLUSION

Endoscopic evaluation of the large bowel has been enormously expanded by the availability of colonoscopy. It is a relatively simple invasive, safe procedure and has got very high diagnostic yield. In routine clinical practice, histopathology is the “gold standard” for definitive diagnosis. A variety of both Non-neoplastic and Neoplastic lesions were reported in the present study across a wide age distribution and the findings correlated well with that of similar studies.

Diagnostic interpretation limitations are encountered at times due to tiny biopsy material, handling and processing artefacts. Greater awareness of the disease and understanding of pathogenesis on the part of the pathologist is necessary for a better improved diagnosis since the specimens are smaller in size. Hence, colonoscopic biopsy has improved the role of pathologists in the early diagnosis and management of large bowel diseases..

REFERENCES

1. Carpenter HA, Talley NJ. The importance of clinicopathological correlation in the diagnosis of inflammatory conditions of the colon: histological patterns with clinical implications. The American journal of gastroenterology. 2000 Apr1;95(4):878-96.
2. Rangaswamy R, Sahadev R, Suguna BV, et al. Clinicocolonoscopic and histomorphological spectrum of colonic diseases in an academic tertiary care centre. Journal of Evolution of Medical and Dental Sciences 2014;3(1):1-9
3. Williams GT, Blackshaw AJ, Morson BC. Squamous carcinoma of the cotorectum and its genesis. J Pathol 1979;129:139-47
4. Geetha C, Pavani M, Prabhala S, Deshpande AK. Histomorphological spectrum of colonic biopsies: A two year study. Indian Journal of Pathology and Oncology. 2018 Apr;5(2):242-8.
5. Karim MI, Nachev R, Fuklev N, Wahab MA. Histomorphological Evaluation of Colonoscopic Mucosal Biopsy with Chronic Gastrointestinal Disorders. J. Armed Forces Med. Coll. 2019 May 13 ;13(2):54-8.
6. Sidney J.Winawer,Sheldon D Leidner et al.,Colonoscopic Biopsy and Cytology in the diagnosis of colon cancer.Cancer 1973 ;42:28492853.
7. Azhar Qayyum, Ali S. Sawan. Profile of colonic biopsies in King Abdul Aziz University Hospital, Jeddah. J Pak Med Assoc.2009; 59:608
8. Tandon HD, Prakash A. Pathology of intestinal tuberculosis and its distinction from crohn's disease. Gut 1972;13:260.

Dickinson RJ, Gilmour HM, McClelland DB. Rectal biopsy in patients presenting to an infectious disease unit with diarrhoeal disease. Gut. 1979 Feb 1;20(2):141-8.
9. Jennette JC, Falk RJ, Bacon PA, Basu N, Cid MC, Ferrario F, et al. 2012 Revised International Chapel Hill Consensus Conference Nomenclature of Vasculitides. Arthritis Rheum 2013;65:1–11.
10. Camilleri M, Pusey CD, Chadwick VS, Rees AJ. Gastrointestinal manifestations of systemic vasculitis. QJM 1983;52:
11. Pagnoux C, Mahr A, Cohen P, Guillevin L. Presentation and outcome of gastrointestinal involvement in systemic necrotizing vasculitides: analysis of 62 patients with polyarteritis nodosa, microscopic polyangiitis, Wegener granulomatosis, Churg–Strauss syndrome, or rheumatoid arthritis-associated vasculitis. Medicine 2005;84:115–28.
12. Beltran MA, Cruces KS. Primary tumors of jejunum and ileum as a cause of intestinal obstruction: a case control study. International Journal of Surgery. 2007 Jun 1;5(3):183-91.
13. Vecchio R, Ferrara M, Mosca F, Ignoto A, Latteri F. Lipomas of the large bowel.The European journal of surgery. 1996;162(11):915-9.
14. Williams AR, Balasooriya BA, Day DW. Polyps and cancer of the large bowel: a necropsy study in Liverpool. Gut 1982;23:835-42
15. Thomas FI et al. Results of screening colonoscopy among persons 45-49 years of age. N Engl J Med, June 6, 2002Vol. 346, No. 23.
16. Jonasson L, Hallgrimsson J, Theodors A, Jonsson T, Magnusson J, Jonasson JG. Carcinoma of the colon in Iceland 1955-1989. A study on pathology. Laeknabladid. 2001 Feb 1;87(2):111-7
17. Melissa Times. Colorectal Lymphoma. Clin Colon Rectal Surg 2011;24:135– 141
18. Schmidtmann M. Zur Kenntnis Settener Krebsformen. Virch Arch Pathol 1919;226:100-18
19. Williams GT, Blackshaw AJ, Morson BC. Squamous carcinoma of the cotorectum and its genesis. J Pathol 1979;129:139-47.
20. Van Schaik PM, Ernst MF, Meijer HA, Bosscha K. Melanoma of the rectum: a rare entity. World journal of gastroenterology: WJG. 2008 Mar 3;14(10):1633.
21. Singer M, Mutch MG. Anal melanoma. Clinics in colon and Rectal Surgery. 2006 May;19(02).