Section: Pathology

Original Research Article

COLORECTAL POLYPS: GROSS AND HISTOMORPHOLOGICAL FEATURES- A CROSS SECTIONAL STUDY FROM MAHARASHTRA

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ABSTRACT

Background: Colorectal polyps comprise a heterogeneous group of lesions ranging from benign non-neoplastic growths to premalignant adenomas and malignant tumors. Histopathological evaluation remains the gold standard for their diagnosis, classification, and assessment of malignant potential. Understanding their clinicopathological profile is essential for appropriate management and prevention of colorectal carcinoma. This study was undertaken to evaluate the gross and histomorphological characteristics of colorectal polyps in a tertiary care center.
Methods: This analytical cross-sectional study included 185 histopathologically confirmed colorectal polyp specimens collected over a five-year period, comprising both retrospective and prospective cases. Demographic and clinical details, anatomical site, gross morphology, and histopathological findings were recorded. Polyps were classified according to microscopic features, and adenomatous polyps were further stratified into low- and high-risk categories. Statistical analysis was performed using SPSS version 26.0, with $p<0.05$ considered statistically significant.
Results: Among 185 cases, males predominated (67.6%), with a male-to-female ratio of 2.08:1. The highest frequency of polyps was observed in the 0–10-year age group (31.9%), followed by the 51–60-year age group (15.7%), demonstrating a bimodal age distribution. The rectum was the commonest site (63.2%), and overall, left-sided lesions accounted for 79.4% of all polyps. Histopathologically, hamartomatous polyps were the predominant subtype (38.4%), mainly juvenile polyps (36.8%), followed by adenomatous polyps (28.6%), pseudopolyps (14.6%), mesenchymal polyps (9.2%), hyperplastic polyps (5.9%), and malignant polypoid lesions (5.4%). Among 53 adenomatous polyps, 60.4% were classified as low risk and 39.6% as high risk. Adenoma size ≥1 cm and villous or tubulovillous architecture showed a highly significant association with high-risk adenomas ($p<0.0000001$), whereas gender and anatomical site were not significantly associated with adenoma risk. **Conclusion:** Colorectal polyps exhibit considerable histomorphological diversity with distinct age- and site-specific distributions. Juvenile hamartomatous polyps predominated in this study, reflecting the substantial paediatric population, while adenomatous polyps represented the major premalignant lesions. Histopathological examination is indispensable for accurate diagnosis, risk stratification, and detection of dysplasia or malignancy. Early detection, complete excision, and appropriate surveillance are essential to reduce the risk of progression to colorectal carcinoma and improve patient outcomes.
Keywords: Colorectal polyps; Histopathology; Hamartomatous polyps; Juvenile polyp; Adenomatous polyp; Tubular adenoma; Villous adenoma; Colorectal neoplasia; Dysplasia; Colonoscopy; Rectal polyps; Colorectal carcinoma

INTRODUCTION

Polyps are not very uncommonly encountered lesions in histopathology laboratory sent from surgeons as well as gastroenterologists. There are several histological types of polyps which differ in their clinical presentation and particularly in their ability for malignant transformation; therefore, management

in every patient with polyp depends on an accurate histological diagnosis. There are variety of polyps with gross morphological features located in gastrointestinal tract from esophagus, stomach, small intestine and colon & rectum, which is the most common site. Polyps are mucosal elevations consisting of either benign or malignant epithelial proliferation, lamina propria inflammation, submucosal mesenchymal proliferation or tumours. They are broadly classified as neoplastic and non-neoplastic polyps. Non-neoplastic polyps include hyperplastic, juvenile (hamartomatous), inflammatory polyps depending on the basic etiology leading to the mucosal protrusion in the intestinal lumen.[1] The three most important colorectal polyps are inflammatory, hyperplastic or adenomatous. Adenomatous polyps can be either tubular, tubule-villous or villous of which tubular adenoma is the most common. Adenoma is benign glandular neoplasm that precedes colonic carcinoma development. They have two basic features of neoplasia composed of dysregulated proliferation of epithelium failure to fully differentiate. The transformation of adenomatous polyps to carcinoma is an extensively researched process and popularly known as adenoma-carcinoma sequence.[2-5] However, not all adenomas become malignant. Various features such as size, number of adenomas, site of distribution, histological type and grade of dysplasia are the markers to predict malignant potential.[6-8]

Optimal screening for colorectal adenomas is essential and most importantly in an asymptomatic individual. Once adenomas are detected, especially villous type, an increased risk for colorectal carcinoma is anticipated and adequate surveillance is necessary even after polypectomy. For surveillance to be useful and cost effective, it is important to have good follow-up programme. Therefore, once adenomas are detected, they must be promptly removed to decrease the development and incidence of colorectal cancer (CRC).[3,9-13]

Basic modality and gold standard for diagnosis of colorectal polyp is flexible colonoscopy. Polyp, once detected, can be removed. Complete polypectomy is possible with the help of colonoscope. USA National Polyp Study have shown very low incidence of CRC in patients undergoing colonoscopic surveillance as compared to reference population.[14] To achieve uniform risk stratification, two groups have now been identified as: low risk adenomas defined as 1-2 tubular adenomas of <10 mm and high-risk adenomas defined as adenomas with villous histology, high grade dysplasia, size >10 mm or >3 adenomas. The follow-up regimen is more rigorous for high-risk group. In Western population due to high prevalence of CRC, identification of adenomatous polyp which is considered as premalignant condition is the basic step towards cancer prevention however, in India, prevalence of CRC is much less. Also, there is limited data on colorectal polyps. This study aims to study the frequency, pattern, clinical presentation and to know exact microscopic nature and risk of malignant transformation. Study can guide gastroenterologists and surgeons for further management and prognosis.

Objectives:

- To study gross features of colorectal polyps
- To study histopathological features of colorectal polyps

MATERIALS AND METHODS

Study Design: The study was conducted as an analytical cross-sectional study.

Place of Study: The study was conducted in the Department of Pathology of a tertiary care teaching hospital in Mumbai.

All colorectal polyp specimens received in the histopathology laboratory during the study period were included for analysis.

Duration of Study

- The study was conducted over a period of 5 years, comprising:
  - A retrospective component of 3 years.
  - A prospective component of 2 years.
- Histopathology records, archived slides, and paraffin blocks from the retrospective period were reviewed, while newly received specimens during the prospective period were evaluated prospectively.

Sample Size: A total of approximately 185 cases of colorectal polyps diagnosed on histopathological examination were included in the study.

Study Population: The study population consisted of patients of all age groups and both sexes who were diagnosed with colorectal polyps on histopathological examination.

Inclusion Criteria

- All endoscopic biopsy, polypectomy, and surgical resection specimens diagnosed as colorectal polyps were included.
- Cases with adequate histopathological material and relevant clinical information were included.
- Both retrospective and prospective cases fulfilling the study criteria were considered.

Exclusion Criteria

- Inadequate tissue samples that precluded definitive histopathological diagnosis were excluded.
- Poorly preserved or autolyzed specimens were excluded.
- Cases with incomplete clinical or histopathological records were excluded.
- Malignant colorectal lesions without an associated polypoid component were excluded.

Data Collection

- Demographic and clinical data, including age, sex, presenting complaints, colonoscopic findings, and anatomical location of the polyps, were collected from medical records, pathology requisition forms, and endoscopy reports.

- Gross examination findings such as size, number, site, shape (sessile or pedunculated), and external appearance of the polyps were recorded.

Histopathological Evaluation

- All specimens were fixed in 10% neutral buffered formalin, processed routinely, embedded in paraffin, sectioned, and stained with Hematoxylin and Eosin (H&E).
- Histopathological slides were reviewed, and the polyps were classified according to their microscopic features.
- Histopathological parameters including type of polyp, architectural pattern, dysplastic changes, inflammatory features, and associated pathological findings were evaluated.

Study Variables

- Gross parameters assessed included size, number, location, and morphology of the polyps.
- Histopathological parameters assessed included the type of polyp, presence and grade of dysplasia, and associated microscopic findings.

Statistical Analysis

- Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 26.0 or an equivalent statistical package.
- Categorical variables were expressed as frequencies and percentages.
- Continuous variables were expressed as mean ± standard deviation or median with interquartile range, as appropriate.
- Associations between clinicopathological variables were assessed using the Chi-square test or Fisher's exact test.
- A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

- Approval was obtained from the Institutional Ethics Committee prior to commencement of the study.
- Patient confidentiality was maintained throughout the study.
- Personal identifiers were omitted from the database, and all data were analyzed anonymously.

RESULTS

Table 1: Distribution according to age group

Age Group (Years)	Male	Female	No. of Cases	Percentage
0–10	43	16	59	31.90%
11–20	7	6	13	7.00%
21–30	8	8	16	8.60%
31–40	17	9	26	14.10%
41–50	9	4	13	7.00%
51–60	20	9	29	15.70%
61–70	14	3	17	9.20%
71–80	5	3	8	4.30%
81–90	2	2	4	2.20%
Total	125	60	185	100.00%

The study included 185 cases of colorectal polyps. Males constituted 125 (67.6%) cases, while females accounted for 60 (32.4%) cases, resulting in a male-to-female ratio of 2.08:1. The highest number of cases was observed in the 0–10 years age group, with 59 cases (31.9%), followed by the 51–60 years age group with 29 cases (15.7%) and the 31–40 years age group with 26 cases (14.1%). The 61–70 years age group contributed 17 cases (9.2%), while 16 cases (8.6%) were observed in the 21–30 years age group. The 11–20 years and 41–50 years age groups each accounted for 13 cases (7.0%). The least number of cases was seen in the 81–90 years age group, comprising only 4 cases (2.2%), followed by the 71–80 years age group with 8 cases (4.3%).

Male predominance was observed across most age groups. The highest number of male cases was noted in the 0–10 years age group (43 cases), whereas the highest number of female cases was also observed in the same age group (16 cases). An equal distribution of males and females was seen in the 21–30 years age group (8 cases each) and the 81–90 years age group (2 cases each).

Overall, colorectal polyps were more common in males and showed a bimodal age distribution, with the highest frequency occurring in the first decade of life and a second peak observed in the sixth decade of life.

Table 2: Distribution of Colorectal Polyps According to Anatomical Site (n = 185)

Site	Number of Cases	Percentage
Right Colon		
Caecum	6	3.20%
Ascending Colon	14	7.60%
Hepatic Flexure	1	0.50%
Transverse Colon	12	6.50%
Total Right Colon	33	17.80%
Left Colon		

Splenic Flexure	0	0.00%
Descending Colon	8	4.30%
Sigmoid Colon	22	11.90%
Rectum	117	63.20%
Total Left Colon	147	79.40%
Other Sites		
Anal Canal	4	2.20%
Both Right and Left Colon (Multifocal)	1	0.50%
Grand Total	185	100.00%

The distribution of colorectal polyps according to anatomical site is shown in the table. Of the 185 cases studied, the majority of polyps were located in the left colon, accounting for 147 cases (79.4%), whereas only 33 cases (17.8%) were located in the right colon. Four cases (2.2%) involved the anal canal, and one case (0.5%) showed multifocal involvement of both the right and left colon.

Among the right-sided lesions, the ascending colon was the most common site, with 14 cases (7.6%), followed by the transverse colon with 12 cases (6.5%) and the caecum with 6 cases (3.2%). The hepatic flexure was the least common right-sided site, accounting for only 1 case (0.5%).

Among the left-sided lesions, the rectum was by far the most frequently involved site, comprising 117 cases (63.2%) of all colorectal polyps. This was followed by the sigmoid colon with 22 cases (11.9%) and the descending colon with 8 cases (4.3%). No polyp was identified at the splenic flexure.

Overall, colorectal polyps showed a marked predilection for the left side of the large intestine, particularly the rectum, which constituted nearly two-thirds of all cases. Right-sided polyps were comparatively less common, with the ascending colon being the most frequent site within the right colon. These findings indicate a predominantly distal distribution of colorectal polyps in the study population.

Table 3: Distribution of Polyps Based on Histological Type (n = 185)

Histological Type	Number of Cases	Percentage
Hyperplastic Polyp	11	5.90%
Hamartomatous Polyps	71	38.40%
• Peutz–Jeghers Polyp	2	1.10%
• Juvenile Polyp	68	36.80%
• Retention Polyp	1	0.50%
Adenomatous Polyps	53	28.60%
• Familial Adenomatous Polyposis (FAP)	1	0.50%
Mesenchymal Polyps	17	9.20%
• Fibroepithelial Polyp	17	9.20%
Pseudopolyps	27	14.60%
• Inflammatory Polyp	9	4.90%
• Ulcerative Colitis-associated Pseudopolyp	18	9.70%
Malignancies	10	5.40%
• Adenocarcinoma	8	4.30%
• Non-Hodgkin's Lymphoma	1	0.50%
• Neuroendocrine Carcinoma	1	0.50%
Others	3	1.60%
Total	185	100.00%

The histopathological distribution of colorectal polyps among the 185 cases is shown in the table. Hamartomatous polyps constituted the most common histological category, accounting for 71 cases (38.4%). Among these, juvenile polyps were the predominant subtype, comprising 68 cases (36.8%), while Peutz–Jeghers polyps and retention polyps accounted for 2 cases (1.1%) and 1 case (0.5%), respectively.

Adenomatous polyps were the second most common histological type, with 53 cases (28.6%). One case (0.5%) was associated with familial adenomatous polyposis (FAP). These lesions are of particular clinical importance because of their recognized premalignant potential.

Pseudo polyps accounted for 27 cases (14.6%). Of these, 18 cases (9.7%) were associated with ulcerative colitis, while 9 cases (4.9%) were inflammatory pseudo polyps. Mesenchymal polyps were identified in 17 cases (9.2%), all of which were fibroepithelial polyps.

Hyperplastic polyps constituted 11 cases (5.9%) of the study population. Malignant lesions presenting as polypoid growths were identified in 10 cases (5.4%), including 8 cases (4.3%) of adenocarcinoma, 1 case (0.5%) of non-Hodgkin's lymphoma, and 1 case (0.5%) of neuroendocrine carcinoma. In addition, 3 cases (1.6%) were classified under other miscellaneous histological types.

Overall, Hamartomatous polyps, particularly juvenile polyps, were the most frequently encountered colorectal polyps in the study, followed by adenomatous polyps. Hyperplastic polyps and malignant polypoid lesions constituted a relatively smaller proportion of cases. These findings indicate that non-neoplastic polyps predominated in the study population, although a substantial proportion of

adenomatous and malignant lesions was also observed.

Table 4: Classification of adenomatous polyps into low risk and high-risk categories (n=53)

Type of adenomatous polyp (n)	Low risk n(%)	High risk n(%)
Tubular (34)	32 (60.4%)	2 (3.8%)
Tubulo-villous (7)	0	7 (13.2%)
Villous (12)	0	12 (22.6%)
Total (53)	32 (60.4%)	21 (39.6%)

When we analysed risk stratification of adenomatous polyps as low risk and high risk, we found that 32(60.4%) adenomas fell under low-risk category while 21(39.6%) were under high-risk category. Of 34 tubular adenomas, majority 32(60.4%) were low risk and 2(3.8%) were high risk. Of 7 tubulo-villous, and 12 villous adenomas, all were high risk.

Table 5: Risk category of adenomas and various characteristics of colorectal adenomatous polyp

Variables	Low risk adenomas	High risk adenomas	Total	Chi square value	p value
Gender					
Males (n)	11	23	34	3.137	0.07
Females (n)	2	17	19		
Total (n)	13	40	53		
Site					
Right colon	5	11	16	0.969	0.32
Left colon	7	30	37		
Entire colon	0	0	0		
Total	12	41	53		
Size					
<1 cm	12	2	14	43.21	<0.0000001
≥1 cm	0	39	39		
Total	12	41	53		
Histology					
Tubular	32	2	34	45.13	<0.0000001
Tubulo-villous	0	7	7		
Villous	0	12	12		
Total	32	21	53		

The association between clinicopathological variables and risk category of adenomas was evaluated among 53 adenomatous polyps. Male patients constituted the majority of both low-risk (11 cases) and high-risk adenomas (23 cases), while females accounted for 2 low-risk and 17 high-risk adenomas. However, the association between gender and adenoma risk category was not statistically significant (χ^2=3.137, p=0.07).

With respect to the site of the lesion, the left colon was the most common location for both low-risk (7 cases) and high-risk adenomas (30 cases), followed by the right colon. No adenomas were observed involving the entire colon. The association between site and adenoma risk category was not statistically significant (χ^2=0.969, p=0.32).

A significant association was observed between adenoma size and risk category (χ^2=43.21, p<0.0000001). Most low-risk adenomas measured less than 1 cm (12 cases), whereas all adenomas measuring ≥1 cm were classified as high-risk (39 cases), indicating that larger adenomas were strongly associated with a higher risk category.

Histological type also showed a highly significant association with adenoma risk (χ^2=45.13, p<0.0000001). Tubular adenomas constituted the majority of low-risk lesions (32 cases), whereas tubule-villous (7 cases) and villous adenomas (12 cases) were exclusively observed in the high-risk group. This finding suggests that the presence of villous architecture is strongly associated with increased adenoma risk.

DISCUSSION

In the present study, the highest proportion of colorectal polyps was observed in the 0–10 years age group (31.9%), followed by the 51–60 years age group (15.7%) and 31–40 years age group (14.1%). The predominance of paediatric cases can be attributed to the high frequency of juvenile (hamartomatous) polyps in the study population. A male predominance was also noted, with males constituting 67.6% of cases. Abdulqader GMR et al[15] reported that colorectal polyps were predominantly encountered in middle-aged and older adults, with the majority of patients belonging to the fifth and sixth decades of life. Their findings differ from the present study, where a substantial proportion of cases occurred in the paediatric age group, likely reflecting differences in the histological spectrum and referral patterns. Similarly, Jasuja A et al,[16] observed that most colorectal polyps occurred in individuals aged above 40 years, with peak incidence in the fifth and sixth decades. The higher proportion of younger patients in the present study may be explained by the inclusion of a larger number of juvenile polyps, which are commonly diagnosed during childhood.

Wu Y et al,[17] while evaluating serrated colorectal lesions, reported that the majority of patients were older adults, generally above 50 years of age. This age distribution is consistent with the established association of serrated lesions and adenomatous polyps with advancing age. In contrast, the present study demonstrated a bimodal distribution, with a prominent paediatric peak and a second peak in the sixth decade. Likewise, Wang JD et al,[18] noted that serrated and neoplastic colorectal lesions were predominantly detected in middle-aged and elderly individuals. The higher frequency of paediatric cases in the present study differs from their observations and may be attributed to the inclusion of hamartomatous polyps, which are characteristically more common in children. Overall, while previous studies,[15-18] have consistently reported a predominance of colorectal polyps in middle-aged and elderly populations, the present study demonstrated a higher occurrence in the 0–10 years age group, followed by patients in the fifth and sixth decades, reflecting the significant contribution of juvenile polyps to the overall histopathological spectrum.

In the present study, the rectum was the most common site of colorectal polyps, accounting for 117 cases (63.2%), followed by the sigmoid colon (11.9%), ascending colon (7.6%), and transverse colon (6.5%). Overall, left-sided lesions constituted 79.4% of all polyps, whereas right-sided lesions accounted for 17.8%, indicating a marked predominance of distal colorectal polyps. Abdulqader GMR et al,[15] similarly reported that the rectum and rectosigmoid region were the most frequently involved sites for colorectal polyps. Their findings support the present study, which also demonstrated a clear predominance of distal colorectal lesions, particularly within the rectum. Jasuja A et al,[16] observed that the majority of colorectal polyps were located in the rectum and sigmoid colon, with fewer lesions occurring in the proximal colon. This distribution closely parallels the findings of the present study, where nearly three-fourths of all polyps were located in the rectosigmoid region. Wu Y et al,[17] in their study of serrated colorectal lesions, found a relatively higher prevalence of lesions in the proximal colon compared with conventional adenomas. Although right-sided lesions were identified in the present study, they constituted only 17.8% of cases, indicating that distal colorectal polyps remained considerably more common in the study population. Similarly, Wang JD et al,[18] reported that serrated lesions frequently involved the proximal colon, whereas conventional adenomatous polyps showed a greater tendency toward distal colonic involvement. The predominance of rectal and sigmoid lesions observed in the present study may therefore be attributed to the higher proportion of conventional adenomatous and juvenile polyps. Overall, the findings of the present study are in agreement with previous studies,[15,16] which reported that the rectum and sigmoid colon are the most common sites of colorectal polyps. However, studies focusing on serrated lesions,[17,18] have highlighted a greater tendency for proximal colonic involvement. Despite these variations, the rectum remained the single most common location for colorectal polyps in the present study.

In the present study, hamartomatous polyps were the most common histological subtype, accounting for 71 cases (38.4%), of which juvenile polyps constituted 68 cases (36.8%). This was followed by adenomatous polyps (28.6%), pseudopolyps (14.6%), mesenchymal polyps (9.2%), and hyperplastic polyps (5.9%). Malignant lesions were identified in 5.4% of cases. Abdulqader GMR et al,[15] reported that adenomatous polyps were the predominant histological type, followed by hyperplastic and inflammatory polyps. In contrast, hamartomatous polyps constituted the largest group in the present study. This difference is likely attributable to the higher proportion of paediatric patients and juvenile polyps included in the present series. Similarly, Jasuja A et al,[16] found adenomatous polyps to be the most common colorectal polyps, with tubular adenomas representing the major subtype. Hyperplastic and serrated lesions were less frequent. While adenomatous polyps formed a significant proportion of cases in the present study (28.6%), they were surpassed by hamartomatous polyps, reflecting differences in study population characteristics. Wu Y et al,[17] focused primarily on serrated colorectal lesions and demonstrated the growing recognition of serrated polyps as important precursors of colorectal carcinoma. Compared with their findings, hyperplastic polyps constituted only 5.9% of cases in the present study, and serrated lesions were relatively uncommon. The predominance of juvenile and adenomatous polyps in the present study may explain this variation. Likewise, Wang JD et al,[18] reported that adenomatous and serrated lesions represented the major categories of colorectal polyps in adults and highlighted their neoplastic potential. In contrast, the present study demonstrated a larger proportion of non-neoplastic hamartomatous polyps, particularly juvenile polyps, which contributed substantially to the overall histopathological spectrum.

The findings of the present study also revealed that malignant lesions accounted for 5.4% of all colorectal polyps, including adenocarcinoma, non-Hodgkin's lymphoma, and neuroendocrine carcinoma. This observation emphasizes the importance of histopathological evaluation of all excised polyps for the detection of premalignant and malignant changes. Overall, unlike previous studies,[15-18] where adenomatous polyps were the predominant histological subtype, the present study found hamartomatous (juvenile) polyps to be the most common lesion, followed by adenomatous polyps. This variation is likely related to the younger age distribution and increased representation of pediatric patients in the study population.

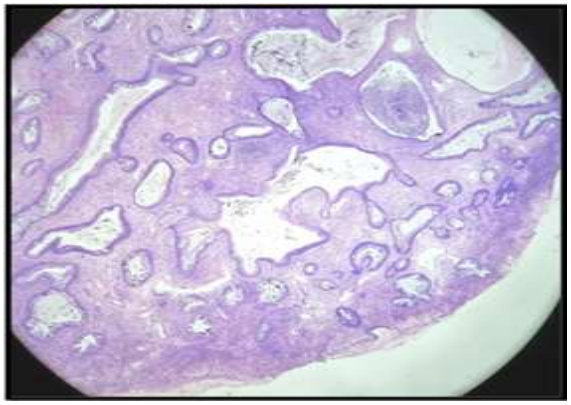

Figure 1: Juvenile polyp: shows cystically dilated and mucus filled glands, Lamina propria showing inflammation.

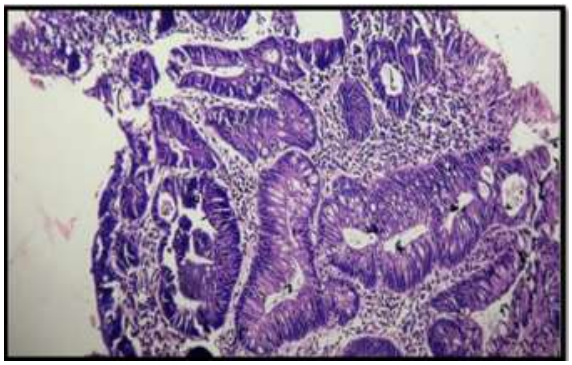

Figure 2: Tubular adenoma with high grade dysplasia.

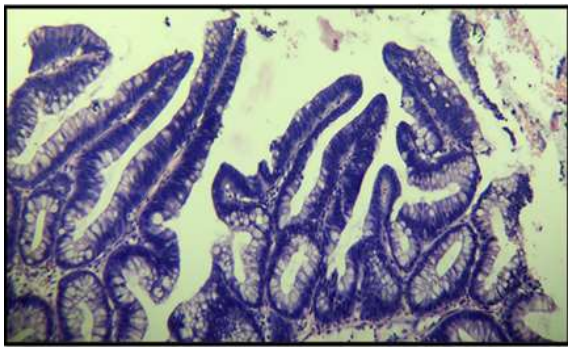

Figure 3: Villous adenoma.

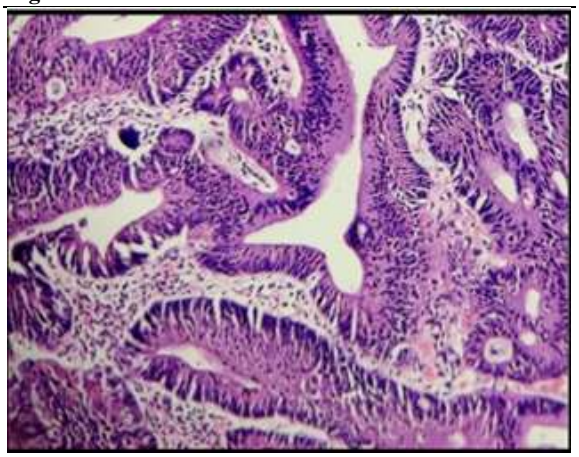

Figure 4: Villous adenoma with high grade dysplasia & features of adenocarcinoma.

CONCLUSION

The present study highlights the diverse gross and histomorphological spectrum of colorectal polyps. A total of 185 colorectal polypoid lesions were evaluated, with a marked male predominance and the highest incidence observed in the 0–10 years age group. The rectum was the most common site of involvement, followed by the sigmoid colon, indicating a predominance of left-sided colorectal lesions.

Histopathologically, hamartomatous polyps, particularly juvenile polyps, constituted the largest category, followed by adenomatous polyps. Hyperplastic polyps, pseudopolyps, mesenchymal polyps, and malignant lesions accounted for smaller proportions of cases. Among adenomatous polyps, tubular adenoma was the most frequent subtype. Multiple polyps were most commonly associated with adenomatous histology.

The study demonstrates that colorectal polyps encompass a wide range of non-neoplastic, premalignant, and malignant lesions with distinct age and site distributions. Histopathological examination remains the gold standard for definitive diagnosis, classification, and identification of dysplastic or malignant transformation. Early detection, complete excision, and meticulous pathological evaluation of colorectal polyps are essential for appropriate patient management and for reducing the risk of progression to colorectal carcinoma. The findings of this study contribute to a better understanding of the clinicopathological profile of colorectal polyps in the study population and emphasize the importance of routine colonoscopic surveillance and histopathological assessment of all excised polyps.

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