



**St. Paul Hospital Millennium Medical College Graduate
Study Program**

Lower Gastrointestinal Tract Endoscopic Biopsies:
Correlation between endoscopic and histopathologic
features and assessment of diagnostic accuracy of
endoscopy at
St. Paul's Hospital Millennium Medical College

By: Meron Berhanu (M.D)

Addis Ababa, Ethiopia
December, 2023



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Graduate Study Program**

**Lower Gastrointestinal Tract Endoscopic Biopsies:
Correlation between endoscopic and histopathologic features and
assessment of diagnostic accuracy of endoscopy:
A cross sectional study from 2018 to 2023, at
St. Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia**

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**A Research Proposal submitted to the Department of Pathology;
Presented in Partial fulfillment of the Requirements for the
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**Addis Ababa, Ethiopia
December, 2023**

Academic Research Proposal Submission

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Summary

Background: Lower gastrointestinal endoscopic biopsies are frequently used for the diagnosis and management of various gastrointestinal diseases. They provide a minimally invasive means of obtaining tissue for histopathologic assessment, which is the gold standard for the diagnosis of gastrointestinal pathologies. In Ethiopia, there are only a few studies done on correlation between endoscopic and histopathologic features of colonoscopic biopsies as well as their diagnostic concordance.

Objectives: To assess the correlation between endoscopic features and histopathologic results of Lower GI endoscopic biopsies and the diagnostic accuracy of endoscopy in the diagnosis of Lower GI diseases done at St. Paul's Hospital Millennium Medical College (SPHMMC), Addis Ababa, from August 2018 to August 2023 G.C

Method: Cross sectional study was conducted and all lower gastrointestinal endoscopic biopsy samples from August 2018 to August 2023 G.C were included. Data was collected from the anatomic pathology record file and endoscopy reports by using structured, self-prepared anonymous questionnaire. Data was entered and analysed using SPSS version 25. The sample size was calculated to be 384. Descriptive analysis was used for sociodemographic data and histologic spectrum. Correlation was analysed using Chi square Statistical test. Magnitude of association was calculated using Phi and Cramer V and graded as follows:- absolute values of r , 0–0.19 is regarded as very weak, 0.2–0.39 as weak, 0.40–0.59 as moderate, 0.6–0.79 as strong, and 0.8–1.0 as very strong correlation. Diagnostic concordance/accuracy was assessed using sensitivity, specificity, Negative predictive value and positive predictive value by taking histopathologic diagnosis as a gold standard diagnostic test.

Results: In this study the most common histopathological diagnosis was adenocarcinoma (23%). The correlation between non-specific colitis and erythema as well as non-specific colitis and ulceration was statistically significant ($p < 0.0001$). IBD showed statistically significant correlation with erythema, edema and ulceration ($p < 0.0001$). But the correlation between IBD and abnormal vascular pattern was not statistically significant. A significant correlation was also found between mass and adenocarcinoma ($p < 0.0001$). Endoscopy was found to have a high diagnostic yield with diagnostic accuracy of 84.6% for inflammatory lesions, 89.9% for malignant lesions and 86.4 % for polyps.

Conclusion: This study showed adenocarcinoma was the commonest diagnosis in lower GI endoscopic biopsies followed by non-specific chronic colitis, which was the most common non neoplastic lesion. Moreover, it highlighted the significant correlation between endoscopic features and histopathologic patterns. The study also showed endoscopy has a high diagnostic accuracy, sensitivity and specificity in diagnosing inflammatory, malignant and polypoid lesions.

Keywords: Colonoscopy, biopsy, Correlation, Sensitivity and Specificity, Ethiopia

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Acronyms and Abbreviations

GI	Gastrointestinal
GIT	Gastrointestinal Tract
IBD	Inflammatory Bowel Disease
CD	Crohn's Disease
UC	Ulcerative Colitis
SPHMMC	St. Paul's Hospital Millennium Medical
NPV	Negative predictive value
PPV	Positive predictive value

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1. Introduction

1.1. Background

Colonoscopy is a method of examining the mucosa of the large bowel and the terminal ileum using endoscopic direct visualization. It is an important diagnostic tool in the workup of a wide range of lower gastrointestinal diseases. Moreover, it has a crucial role in colo-rectal cancer screening programs.(1,2) Indications for lower GI endoscopy could be diagnostic or therapeutic. It can be used as a screening tool for colorectal carcinoma in normal risk individuals, as well as to investigate GI bleeding, suspected colorectal carcinoma, chronic abdominal pain or unexplained changes in bowel habit.(3)

During endoscopy, biopsies are often obtained from suspicious lesions or abnormal mucosal areas to further assess the underlying pathology. The endoscopic evaluation followed by histopathological examination of the biopsy sample is currently the gold standard for accurate objective assessment. It not only helps to diagnose neoplastic and non-neoplastic lesions but also for monitoring the course, extent of the disease, response to therapy and early detection of complications. In evidence-based medical practice, confirmation of a diagnosis is crucial to instituting the appropriate treatment protocol for the disease entity.(2,4)

The correlation between endoscopy and biopsy reflects significant advances in understanding the pathophysiology, course and prognosis of gastrointestinal diseases. In addition, it provides diagnostic information that aids in improving patient management.(5)

This proposed research seeks to delve into the diagnostic accuracy of endoscopy as well as the correlation between endoscopic and histopathologic features observed in lower GIT endoscopic biopsies received at SPHMMC Pathology department over a period of five years.

1.2. Statement of the Problem

The gastrointestinal tract is a common site for numerous pathologic processes including non-neoplastic, pre-neoplastic and neoplastic conditions. Gastrointestinal tumors constitute one of the major causes of morbidity and mortality worldwide.(6) GI cancers account for 26% of the global cancer incidence and 35% of all cancer-related deaths, of which colorectal cancers make up 10% and 9.4% of incidence and mortality respectively.(7) Despite the high burden of gastrointestinal pathologies, Data on lower Gastrointestinal (GI) disease patterns from developing countries, are sparse.(8)

Colonoscopy in combination with biopsy has become one of the gold standard investigation modalities for many colon and distal ileum pathologies.(6,9) In addition to diagnosis of neoplastic and non-neoplastic lesions, it is also used for monitoring the course, extent of the disease, response of the therapy and early detection of complications. In endoscopic biopsies, an accurate diagnosis can be reached by correlating endoscopic findings with histology of biopsy specimens. (10)

St. Paul Hospital Millennium Medical College is one of the largest public tertiary hospitals in Addis Ababa, Ethiopia. It is also one of the few public hospitals in the country that provide pathology and gastrointestinal endoscopy services.(11,12) Consequently, The pathology department at SPHMMC receives large number of endoscopic biopsy specimens each year. However, there are no studies on the diagnostic concordance and correlation between endoscopic and histopathologic features at SPHMMC. In addition, to the researcher's knowledge, there are only a few researches done exploring the diagnostic concordance and correlation between endoscopic and pathologic findings in Ethiopia.

Therefore, it is important to assess the histopathologic spectrum of endoscopic biopsies and their correlation with endoscopic features, as well as the diagnostic accuracy of endoscopy as screening and diagnostic tool to improve the diagnostic and therapeutic approaches for gastrointestinal pathologies.

1.3. Rationale of the Study

This research seeks to bridge the divide that separates histopathology and endoscopy within the context of lower gastrointestinal tract disorders. Establishing the correlation between histopathological findings and endoscopic features can offer profound insights into understanding gastrointestinal disorders.

Pathologists can use the findings of this study to improve the accuracy of their diagnoses. This study can be used as a stepping stone to develop a standard for pathology reports of endoscopic biopsies. Furthermore, it can help to increase the role of histopathologic examinations in assessment of disease activity and treatment response in patients with established diagnosis, who are on follow up.

Identifying consistent patterns and associations between microscopic and macroscopic observations will empower clinicians to make informed decisions on patient management and prognostic assessment.

Assessment of the diagnostic accuracy of endoscopy allows gastroenterologists to effectively categorize patients that need follow up versus those requiring biopsy and use the appropriate tissue sampling protocol based on their endoscopic findings. These, in turn, improve the quality of specimens sent to the pathology laboratory and consequently result in satisfactory and complete pathology reports. This study will also help patients get the ultimate care and reduce the need for unnecessary and invasive procedures, saving the patient's time and resources.

This study can help health care systems, particularly in resource limited settings, in their efforts to improve overall patient care and optimize resources. It can also serve as a guide for future researches on the topic.

2. Literature Review

2.1. Histomorphologic patterns

A cross sectional study done in turkey in 2014 found that the most common finding on lower GIT endoscopic biopsies was colitis, accounting for 85 of 135 (62.96%) cases. Tubular adenoma was the second most common finding in 22 (16.30%) of cases, followed by tubulovillous adenoma in 15 (11.11%) cases, and 9 (6.67%) patients were diagnosed with cancer.(13)

In contrast, a retrospective studies done in India showed malignant tumors were the most common finding in lower GI endoscopic biopsies, accounting for 37.95%, of which 88.46% were adenocarcinomas. The second most common finding was non-specific colitis, followed by benign neoplastic lesions and polyps.(14)

Another retrospective study done in Nigeria in 2023, colorectal cancer was the most common histopathological finding accounting for 32.1%, followed by chronic nonspecific colitis (9.9%), polyps (8.6%), adenomas (6.2%), acute on chronic colitis (6.2%) and normal histologic findings (27.2%).(2)

Meanwhile, cross sectional study in Egypt found that out of 710 patients who underwent colonoscopic biopsy, the most commonly found pathology was nonspecific chronic colitis (NSCC) in 59.7% of patients, followed by malignancy in 19.3%, inflammatory bowel disease (IBD) in 15.6% and hyperplastic inflammatory polyp in 3.7% of cases.(15)

In Ethiopia, a retrospective cohort study done at Ayder referral hospital, Mekelle University, found that the most common histopathologic findings for colon biopsy were chronic nonspecific colitis in 30 (30.6 %), colorectal adenocarcinoma in 27(27.6%), unremarkable in 14 (14.3%), dysplasia in 6 (6.1%) and Schistosoma colitis in 5(5.1%). There was 1(1%) case of malignant melanoma and schistosomiasis-leishmaniasis co-infection each.(16)

2.2. Assessment of diagnostic accuracy of endoscopy and correlation of Endoscopic features with histopathology

Few studies have investigated the relationship between histopathological findings and endoscopic features in the lower gastrointestinal tract.

A retrospective study done at a medical college in India in 2022 found that the diagnostic value of endoscopic findings to differentiate between benign and malignant lesions had a sensitivity of 96.25%, specificity of 68.67%, PPV of 74.76%, NPV of 95% and overall diagnostic accuracy of 82.21%, p value being <0.001.(5)

A cross sectional study done in a teaching hospital in Nepal in 2022 found a statistically significant correlation of colonoscopic diagnosis with histopathological diagnosis with P value of <0.001. All 41 cases diagnosed as benign on endoscopy, were also diagnosed as benign on histopathology, On the other hand, out of 54 cases diagnosed as malignant on endoscopy, 10 were found to be benign on histopathologic evaluation and the remaining 44 were found to be malignant .(17)

The aforementioned study at Ayder Hospital, Mekelle, Ethiopia, found that, the most common endoscopic finding was erythema of colonic mucosa, found in 78(15.9%) cases, followed by colorectal cancer in 114 (23.2%), internal hemorrhoids in 37(7.5%) and unremarkable in 237(48.2%) cases. Regarding diagnostic accuracy, for colon cancer, sensitivity of endoscopy was 87.8%, specificity was 88.1%, PPV was 63.2%, and NPV was 96.9%. For colitis, sensitivity of endoscopy was 75%, specificity was 79.6%, PPV was 36.4%, and NPV was 95.3%. Endoscopic diagnosis showed significant correlation (73%-100%) with histological diagnosis.(16)

The assessment of diagnostic accuracy and correlation with endoscopic features of lower gastrointestinal tract endoscopic biopsies with histopathology is a significant area of research especially for resource limited settings where surgical biopsy services are scarce and patient management could rely on endoscopic diagnosis.

3. Objectives

3.1. General Objective:

To comprehensively explore the correlation between lower gastrointestinal endoscopic features and corresponding histopathologic findings, as well as assessment of diagnostic accuracy/concordance of endoscopy, at St. Paul's Hospital Millennium Medical College from August 2018 - August 2023 G.C.

3.2. Specific objectives

1. To assess the histopathologic spectrum of lower gastrointestinal endoscopic biopsies.
2. To assess the Correlation between endoscopic findings and histopathologic results.
3. To assess the diagnostic concordance/accuracy of Lower GI endoscopic findings using histopathology as the gold standard.

4. Methods and materials

4.1. Study Setting:

The study will be conducted at St Paul's Hospital Millennium Medical College (SPHMMC) located in Addis Ababa, Ethiopia. SPHMMC is a tertiary and teaching hospital established in 2007 after a medical college was opened in a Hospital built in 1968.(18)

According to the database of the pathology department, the pathology service at SPHMMC provides more than 7,000 patients biopsy services annually since its establishment as medical specialty in the college in 2014.

4.2. Study Period:

This study will be conducted from June 2022 to February 2024.

4.3. Study Design:

The study design of this study will be cross sectional study and data will be collected retrospectively from all patients who underwent lower GI endoscopies with subsequent biopsies from August 2018 to August 2023.

4.4. Study Population:

The source population will be all patients who underwent lower GI endoscopic biopsy at SPHMMC. The study population will be patients who had undergone lower gastrointestinal endoscopic biopsy including neonates, young adults, adults and whose samples are sent to SPHMMC, Anatomic Pathology department during the data collection period that fulfil the eligibility criteria.

4.5. Sample Size:

The sample size was calculated using single population proportion formula. The value of P was taken as 50 percent since the proportion of patients in the study population fulfilling the eligibility criteria is not known. Desired confidence level of 95% and margin of error of 5% was used. A sample size of 384 patients was obtained.

$$n = \frac{Z_{\alpha/2}^2 p(1-p)}{d^2}$$

Where; $Z_{\alpha/2}$ = critical value of standard normal deviation at 95% confidence interval (1.96).

d = precision (the marginal error) 5%.

P = Proportion of patients in the study population fulfilling the eligibility criteria (taken as 50%).

4.6. Sampling Procedures:

The study will involve all patients who meet the inclusion criteria.

4.6.1 Inclusion criteria

- Patients of all ages, who underwent lower gastrointestinal endoscopic biopsies within the data collection period where the biopsy samples were sent to Anatomic pathology at SPHMMC during the study period will be included.

4.6.2 Exclusion criteria

- Patients who underwent endoscopic biopsy beyond the specified data collection period.
- Patients with unavailable or incomplete endoscopic and pathologic reports.
- Endoscopic biopsies that were signed out as Suboptimal/ See description.

4.7. Measurement

4.7.1 Study Variables:

Dependent variable

- ✓ Type of pathology (morphologic pattern) and endoscopic findings

Independent variable

- ✓ Socio demographic characteristics- Age, Sex,

- ✓ Clinical symptoms and signs,
- ✓ Clinical indication
- ✓ Site of lesion

4.8. Data Collection and Procedures:

Data was collected from anatomic pathology record file, Histopathology request forms and endoscopy reports using structured, self-prepared and anonymous questionnaire designed to include the following variables.

4.9. Operational Definitions:

- Histopathologic Spectrum: The range of histological findings observed in lower gastrointestinal tract biopsies, including inflammatory changes, benign and malignant neoplasms, and other relevant histologic patterns.
- Endoscopic Features: Macroscopic appearances observed during endoscopy, such as ulceration, polyps, erosions, abnormal vascular patterns and mucosal changes.
- Correlation: The relationship between endoscopic features and their corresponding histopathologic findings.
- Diagnostic accuracy/concordance: The ability of endoscopy to correctly identify Lower GIT pathologies as measured by sensitivity, specificity, PPV and NPV, using Histopathologic diagnosis as the gold standard diagnostic test.

4.10. Data Quality Control and Management:

Data was collected by the trained data collectors. The data collectors were trained about the contents of the interview and to collect the data in an accurate manner. Immediately after administration of the questionnaires, each paper was checked for completeness by the principal investigator. One general practitioner and one pathology resident were selected for data collection. A pre-test was conducted on randomly selected patients with lower GI endoscopic biopsy on 10% of the sample size. Further modifications and clarifications of the questionnaire were undertaken after the pre-test.

4.11. Data Analysis

After data was collected, data was coded, entered to statistical package for the social sciences version 26. Descriptive statistical tests was used to describe the findings using gross numbers, percentages and means. The results of the study were expressed in tables, graphs/charts and narratives.

Correlation analysis: Chi-square Statistical test and was employed to assess the correlation and Phi and Cramer V was used to analyse the strength and direction of associations between endoscopic features and histopathologic spectrum. A p-value <0.05 was considered significant.

Assessment of diagnostic accuracy of lower GI endoscopy was done using sensitivity, specificity, Negative predictive value and positive predictive value by taking histopathologic diagnosis as a gold standard diagnostic test.

4.12. Ethical Consideration:

Before conducting the research permission was obtained from SPHMMC research office and research ethics committee. To ensure confidentiality, the name of clients was not recorded on the data collection format. Permission to collect data was obtained from the department of Pathology and department of Internal medicine, Gastroenterology unit at SPHMMC.

4.13. Dissemination of Results:

At the end of the research the findings will first be presented at relevant conferences in the field of Pathology, Gastroenterology and Internal medicine. In addition, the study will be distributed to the health care providers, hospital quality control bodies, administrators, policy makers directly affected by the results by publishing the results in a reputable journal.

5. Results

5.1. Sociodemographic data

A total of 692 lower GI endoscopic biopsies were received at SPHMMC Department of Pathology from August 2018 to August 2023, of which 245 cases did not fulfil the inclusion criteria and were excluded from the study. Out of the remaining 447 cases, 192 (43%) were females and 255 (57%) were males. The youngest age was 5, oldest was 91 with mean age $\pm$ standard deviation of 46.8 ± 17.3 , and 126 (28.2%) patients belonging to the 60 and above year age group (Figure 1).

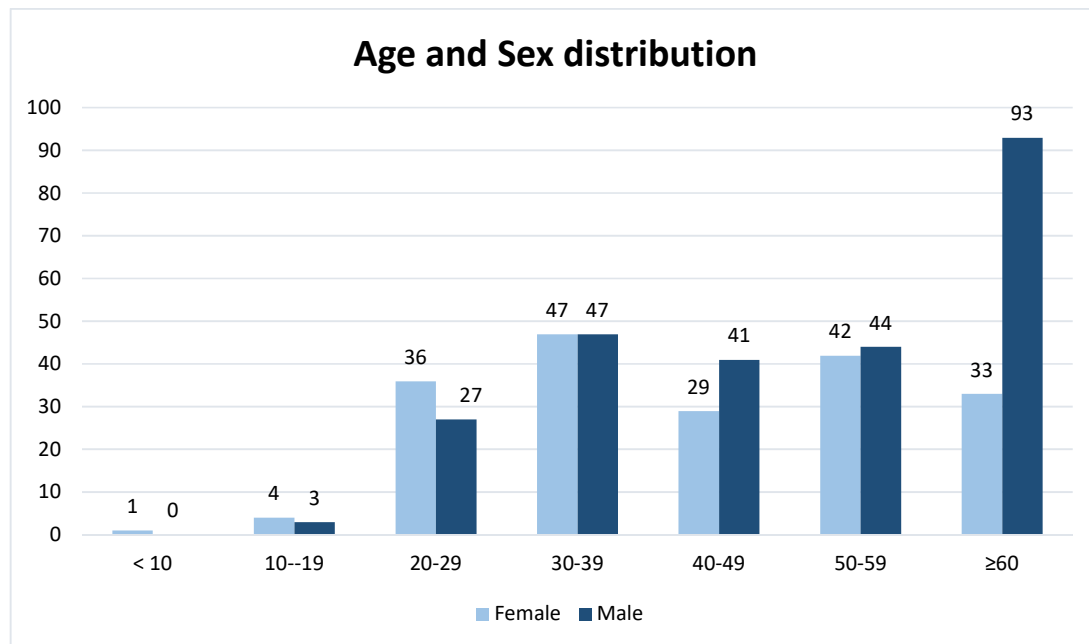


Fig 1: Socio demographic characteristics of patients who underwent colonoscopic biopsies at SPHMMC from August 2018 to August 2023

5.2. Histopathologic spectrum

Colon was the most commonly biopsied site making up 273 (61.1%) of the total biopsies. Biopsies taken from the rectum were 128 (28.6%), 41 (9.2%) were from ileum and 5 (1.1%) were from the anal canal.

The most common diagnostic category was inflammatory with 35.6% of the total biopsies followed by polyp at 30.6% and Malignant at 24.8%. (Table 1)

Table 1: Distribution of histopathologic diagnoses of colonoscopic biopsies at SPHMMC from August 2018 to August 2023, (n=447)

		Histopathologic diagnosis n,(%)				Total
		Unremarkable	Inflammatory	Malignant	Polyp	
Site	Ileum	8(1.8)	33(7.4)	0(0)	0(0)	41(9.2)
	Colon	27(6.1)	101(22.6)	56(12.5)	89(19.9)	273(61.1)
	Rectum	4(0.9)	25(5.6)	51(11.4)	48(10.7)	128(28.6)
	Anal canal	1(0.2)	0(0)	4(0.9)	0(0)	5(1.1)
Total		40(9)	159(35.6)	111(24.8)	137(30.6)	447(100)

Under the inflammatory category 94(59.1%) cases were diagnosed as Non-specific inflammation, 20 (12.6%) were IBD, 15(9.4%) were Crohn's disease and 10 (6.3%) were ulcerative colitis. (Table 2)

Table 2: Distribution of inflammatory lesions by site

		Inflammatory n(%)							Total
		Non specific inflammation	Granulomatous inflammation	IBD	Crohn's disease	Ulcerative colitis	Infectious	Other	
Site	Ileum	16 (10.1)	1(0.6)	8(5.0)	7(4.4)	0(0.0)	1(0.6)	0(0.0)	33(20.8)
	Colon	63(39.6)	1(0.6)	9(5.7)	8(5.0)	6(3.8)	6(3.8)	8(5.0)	101(63.5)
	Rectum	15(9.4)	1(0.6)	3(1.9)	0(0.0)	4(2.5)	2(1.3)	0(0.0)	25(15.7)
	Anal canal	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Total		94(59.1)	3(1.9)	20(12.6)	15(9.4)	10(6.3)	9(5.7)	8(5.0)	159(100)

In the malignant category, out of the 111 cases, 103(92.8%) were diagnosed as Adenocarcinoma, of which 47.8% and 43.2% were found in colon and rectum respectively. Undifferentiated malignancy and squamous cell carcinoma accounted for 3 (2.7%) cases each, whereas Lymphoma and secondary carcinoma accounted for 1(0.9%) case each. (Table 3)

Table 3: Distribution of malignant lesions by site

		Malignant, n(%)					Total
		Adenocarcinoma	Lymphoma	Undifferentiated malignancy	Squamous cell carcinoma	Secondary carcinoma	
Site	Ileum	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
	Colon	53(47.8)	1(0.9)	2(1.8)	0(0.0)	0(0.0)	56(50.5)
	Rectum	48(43.2)	0(0.0)	1(0.9)	1(0.9)	1(0.9)	51(46.0)
	Anal canal	2(1.8)	0(0.0)	0(0.0)	2(1.8)	0(0.0)	4(3.6)
Total		103(92.8)	1(0.9)	3(2.7)	3(2.7)	1(0.9)	111(100)

Of the 137 cases diagnosed as polyps, all were found in the colon and rectum. There were 75 (54.7%) cases of tubular adenomas, tubulovillous adenomas and inflammatory polyps accounted for 20 (14.5%) cases each, 11 (8%) cases were hyperplastic polyps, 3(2%) cases each were villous adenoma, Traditional serrated adenoma and juvenile polyp, and the remaining 2 cases were sessile serrated polyp and hamartomatous polyp. (Fig 2)

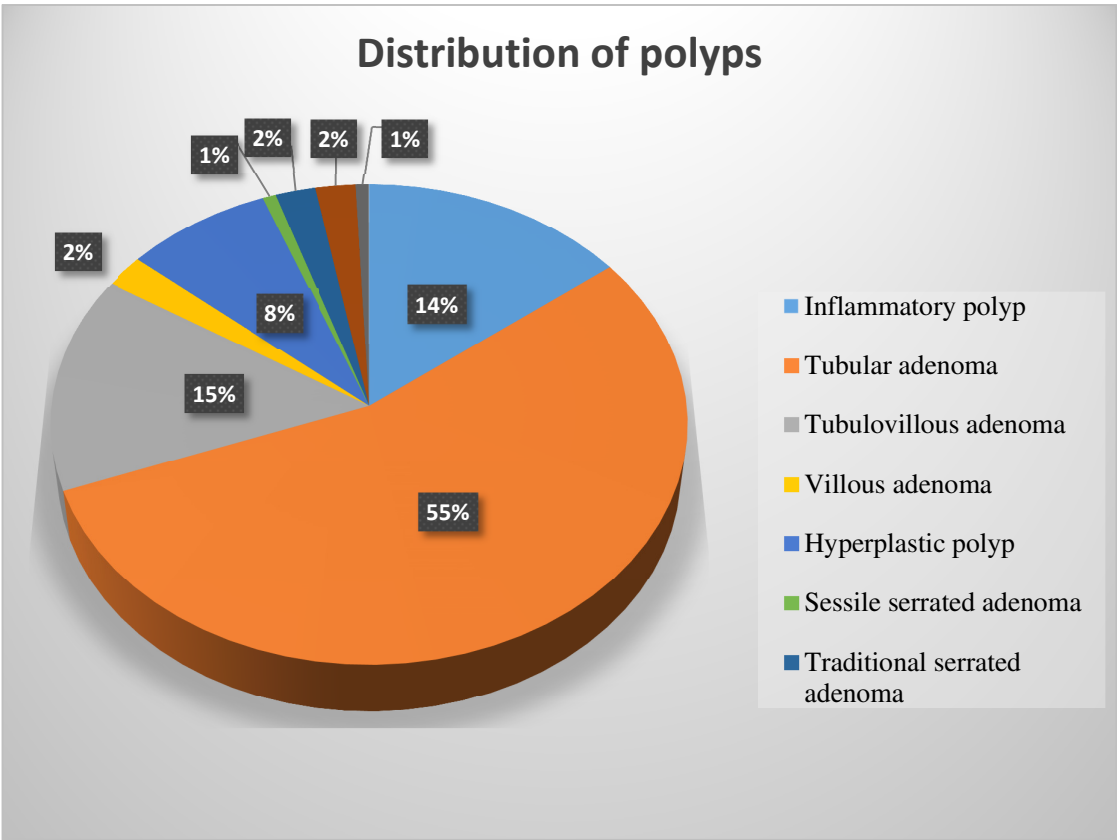


Fig 2: Distribution of polyps

Overall, the most common diagnosis was adenocarcinoma making up 23% of all cases, followed by non-specific colitis (21%), tubular adenoma (16.8%) and IBD (10.1%).

5.3. Endoscopic features and diagnoses

The commonest indications for endoscopy were suspected malignancy (34.5%), followed by bowel habit changes (23%), lower GI bleeding (15.2%) and screening for malignancy (9.2%).

The most frequently encountered endoscopic features were polypoid growth (30%), mass (27%), ulceration (16%) and erythema (15%). (Fig 3)

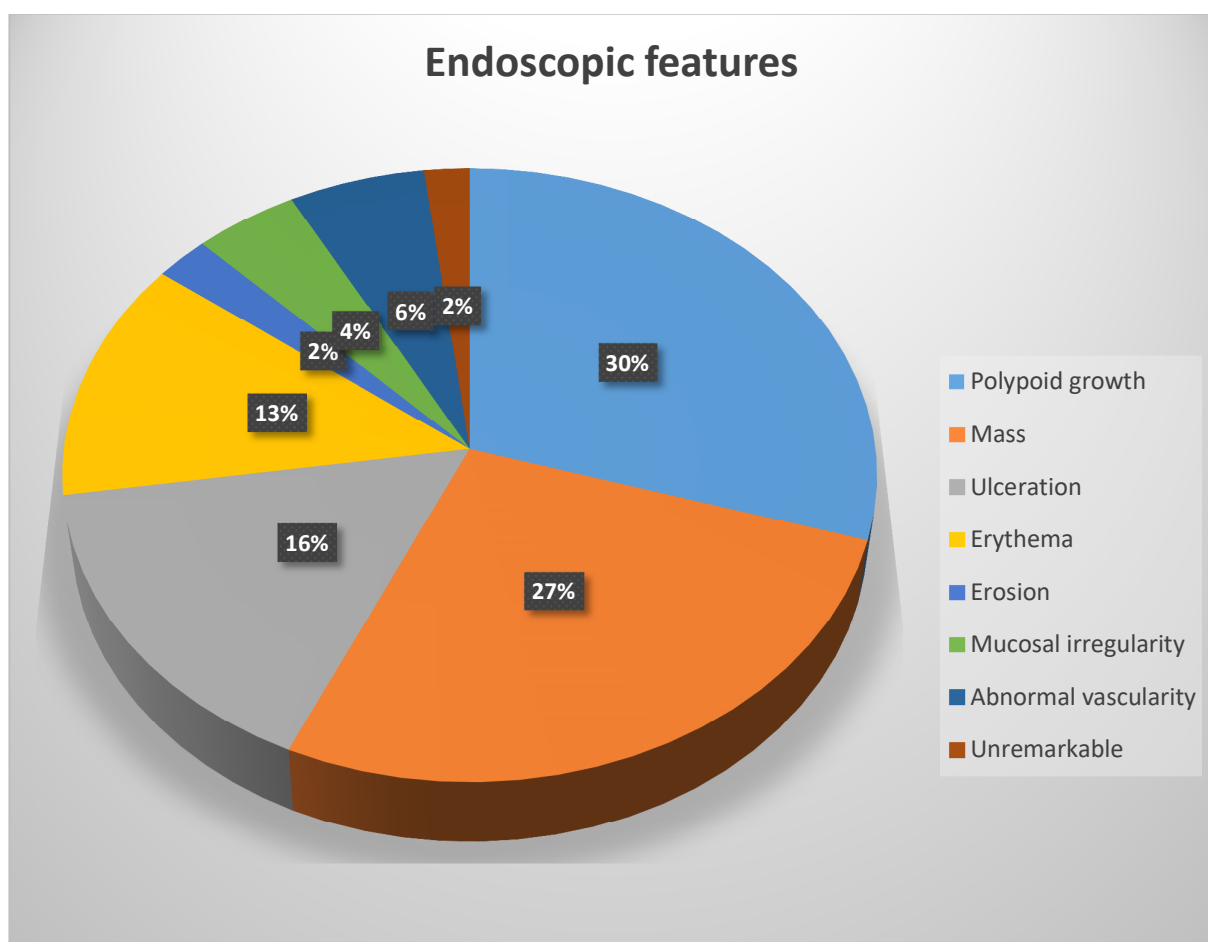


Fig 3: Distribution of endoscopic features

Out of the 447 cases 144(32.2%) were diagnoses as polyp, 142(31.8%) were malignant lesions, 136(30.4%) were inflammatory, 20(4.5%) were unremarkable/ normal endoscopy and 5(1.1%) were not given a diagnosis on endoscopy. (Fig 4)

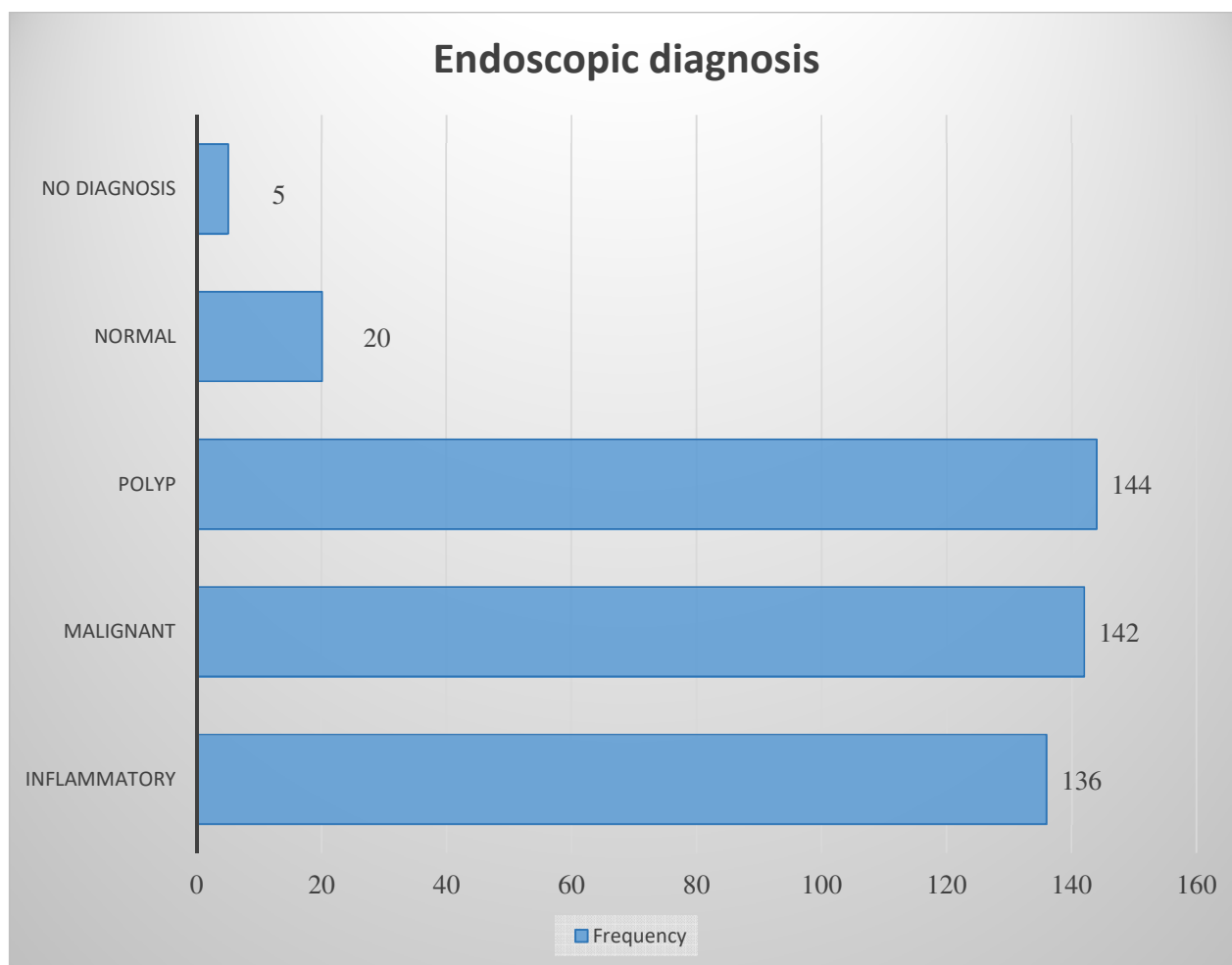


Fig 4: Distribution of endoscopic diagnoses by site

5.4. Correlation between endoscopic features and histopathologic diagnosis

Correlation was done for the most frequently encountered endoscopic features which were polypoid growth, mass, ulceration and erythema. Out of the 111 malignant cases, 105 (94.6%) showed a mass on endoscopy. Among the inflammatory lesions, 23 (51.1%) IBD cases (including Crohn's disease and ulcerative colitis) and 34 (36.2%) non-specific colitis cases showed ulceration on endoscopy. In addition 35.5% of IBD and 33% of colitis cases showed erythema on endoscopy. Meanwhile, IBD and non-specific colitis cases that featured erosion on endoscopy was 8.9% and 4.3% respectively. (Table 4)

Table 4: Distribution of endoscopic features per histopathologic diagnosis

Histopathologic diagnosis	Endoscopic features n, (%)							
	Unremarkable	Mucosal irregularity	Erythema	Erosion	Ulceration	Polypoid growth	Abnormal vascular pattern	Mass
inflammatory								
Non specific	8(0.8)	13(56.5)	31(47.8)	4(33.3)	34(42)	16(10.5)	11(36.7)	9(6.5)
Granulomatous	0(0)	0(0)	1(1.5)	0(0)	2(2.5)	0(0)	0(0)	0(0)
IBD	1(0.1)	3(13)	4(6.2)	1(8.3)	10(12.4)	6(4)	2(6.7)	3(2.2)
CD	0(0)	1(4.4)	6(9.2)	2(16.7)	9(11.1)	1(0.7)	0(0)	0(0)
UC	0(0)	1(4.4)	6(9.2)	3(25)	4(4.9)	3(1.9)	5(16.6)	2(1.5)
Infectious	1(0.1)	1(4.4)	4(6.2)	0(0)	5(6.2)	2(1.3)	2(6.7)	0(0)
Inflammatory-Other	0(0)	0(0)	6(9.2)	0(0)	3(3.7)	0(0)	2(6.7)	1(0.7)
Malignant								
Adenocarcinoma	0(0)	0(0)	1(1.5)	0(0)	3(3.7)	9(5.9)	2(6.7)	98(71)
Lymphoma	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	1(0.7)
Undifferentiated malignancy	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	3(2.2)
SCC	0(0)	0(0)	0(0)	0(0)	1(1.2)	0(0)	0(0)	2(1.5)
Secondary carcinoma	0(0)	0(0)	0(0)	0(0)	1(1.2)	0(0)	1(3.3)	1(0.7)
Polyp	0(0)	4(17.3)	6(9.2)	2(16.7)	9(11.1)	115(75.7)	5(16.6)	18(13)
	10(100)	23(100)	65(100)	12(100)	81(100)	152(100)	30(100)	138(100)

In the investigation of the correlation between common endoscopic features and histopathologic diagnoses among 447 cases, significant insights were found.

Comprehensive statistical analysis, using the Pearson chi-square test, revealed statistically significant correlation between Non-specific colitis and ulceration ($\chi^2 = 22.7$, $p < 0.0001$). The Phi coefficient (Phi) and Cramer's V both indicated a weak relationship between ulceration and Non-specific colitis, with values of 0.23. The correlation between Non-specific colitis and erythema was also found to be statistically significant, ($\chi^2 = 25.1$, $p < 0.0001$) with Phi coefficient (Phi) and Cramer's V value of 0.24 indicating a weak relationship. The relationship of Non-specific colitis with abnormal vascularity and erosion was not statistically significant.

For cases of IBD, cases diagnosed as IBD, crohn's disease and ulcerative colitis were added and analysed together. IBD showed statistically significant correlation with ulceration ($\chi^2 = 33.5$, $p < 0.0001$), erosion ($\chi^2 = 19.3$, $p < 0.0001$) and erythema ($\chi^2 = 14.0$, $p < 0.0001$). The Phi coefficient (Phi) and Cramer's V for ulceration, erosion and erythema was 0.27, 0.21 and 0.18 indicating a weak relationship between all three endoscopic features and IBD. In addition the correlation between abnormal vascular pattern and IBD was statistically insignificant.

The correlation between adenocarcinoma and mass was statistically significant ($\chi^2 = 245.4$, $p < 0.0001$) with Phi coefficient (Phi) and Cramer's V both showing a strong relationship with values of 0.74. (Table 5)

Table 5: Correlation between common histopathologic patterns and endoscopic features

		Non-specific Colitis	IBD	Adenocarcinoma
Ulceration	χ^2	22.7	33.5	22.5
	Phi	0.23	0.27	-0.23
	Cramer's V	0.23	0.27	0.23
	p-value	<0.0001	<0.0001	<0.0001
Erythema	χ^2	25.1	14.0	22.7
	Phi	0.24	0.18	-0.23
	Cramer's V	0.24	0.18	0.23
	p-value	<0.0001	<0.0001	<0.0001
Erosion	χ^2	0.77	19.3	4.0
	Phi	0.41	0.21	-0.95
	Cramer's V	0.41	0.21	0.95
	p-value	0.38	<0.0001	0.45
Mass	χ^2	27.5	10.0	245.4
	Phi	-0.29	-0.15	0.74
	Cramer's V	0.29	0.15	0.74
	p-value	<0.001	0.002	<0.0001
Abnormal vascularity	χ^2	3.19	4.8	12.8
	Phi	0.08	0.10	0.17
	Cramer's V	0.08	0.10	0.17
	p-value	0.203	0.89	0.002

5.5. Diagnostic accuracy/concordance of endoscopy with histopathology

136 cases were diagnosed as inflammatory on endoscopy, of which 113 cases has similar diagnosis on histology, 14 were diagnosed as unremarkable, 8 were diagnosed as polyp and 1 case was diagnosed as malignant. Out of 142 cases diagnosed as malignant on endoscopy, 104 had a similar diagnosis on histology, 19 were diagnosed as polyp, 14 were diagnosed as inflammatory lesions and 5 cases were diagnosed as unremarkable. On endoscopic evaluation 144 cases were diagnosed as polyp, 110 of them had a similar diagnosis on histology, 18 cases were diagnosed as inflammatory lesions, 13 cases were unremarkable and the remaining 3 were found to be malignant. (Table 6)

Table 6: Correlation between endoscopic and histopathologic diagnoses

		Endoscopic diagnosis					
		Inflammatory	Malignant	Polyp	Normal	No diagnosis	Total
Histopathologic diagnosis	Unremarkable	14	5	13	8	0	40
	Inflammatory	113	14	18	11	3	159
	Malignant	1	104	3	1	2	111
	Polyp	8	19	110	0	0	137
Total		136	142	144	20	5	447

On analysis of diagnostic accuracy of endoscopy, for identifying inflammatory lesions endoscopic evaluation had a sensitivity of 71.1%, specificity of 92%, PPV and NPV of 83.1% and 85.2% respectively. For malignant lesions, endoscopy had sensitivity of 93.1%, specificity of 88.7%, PPV of 73.2% and NPV of 97.7%. For polypoid lesions the sensitivity of endoscopic evaluation was 80.2%, specificity was 89%, PPV was 76.4 and NPV was 91.1%. The diagnostic accuracy of endoscopy in differentiating between inflammatory, malignant and polypoid lesions ranges from 84.6% to 89.9%. (Table 7)

Table 7: Diagnostic value of endoscopy in differentiating between inflammatory, malignant and polypoid lesions

	Inflammatory	Malignant	Polyp
Diagnostic value (%)	Sensitivity	71.1	93.7
	Specificity	92	88.7
	PPV	83.1	73.2
	NPV	85.2	97.7
	Diagnostic accuracy	84.6	89.9

6. Discussion

The aim of this study was to assess the histopathologic spectrum of lower GI tract endoscopic biopsies, analyze the correlation between endoscopic features and histopathologic patterns, and determine the diagnostic accuracy of endoscopy in differentiating between the various lower GI tract lesions among endoscopic biopsies received in the department of Pathology at SPHMMC. After exclusion criteria was applied, 447 out of 692 cases were analyzed.

In this study the predominant histopathologic diagnosis was adenocarcinoma (23%), followed by Non-specific colitis (21%), tubular adenoma (16.8%) and IBD (10.1%). Similar patterns were seen in a 2018 study in India where 37.9% of the lower GI endoscopic biopsies were malignant, predominantly adenocarcinomas, and the second most common diagnosis was non-specific colitis (19.7%). (14) Another study from Nigeria done in 2023 showed comparable results with Adenocarcinoma (32.1%) as most common diagnosis, followed by non-specific colitis (9.9%) and polyps (8.6%).(2) A 2021 study in Sudan also showed the predominance of malignancies (10.1%) over proctocolitis (3.7%) in lower GI endoscopic biopsies. (8)

In contrast, a 2017 study at Ayder referral hospital, Mekelle, Ethiopia, found that the most common histologic diagnoses was non-specific colitis (30.6%), followed by adenocarcinoma (27.6%). (16) A 2020 study in Egypt also found non-specific colitis to be most common diagnosis in lower GI endoscopic biopsies making up 59.7% of the cases followed by adenocarcinoma at 16%. (15)

These discrepancies could be explained by the difference in prevalence of colorectal carcinoma across different countries and regions. In addition sociodemographic characteristics of the participants could also explain the difference in histopathologic spectrum. Age is an established risk factor for colonic carcinoma. (19) In our study, mean age of participants was 46.8 ± 17.3 with 23% being above the age of 60, which was higher compared to mean ages of the participants in Egypt (mean age= 42.5 ± 13.9) and Mekelle, Ethiopia (mean age= 40). The higher proportion of older participants in our study can contribute to the predominance of malignancy over the other diagnoses.

Another reason for the differences in histopathologic spectrum can be the prevalence of adenomatous polyps. In our study adenomatous polyps, which include tubular adenoma, tubulovillous adenoma and villous adenoma, accounted for 22% of the endoscopic biopsies. This is a significantly higher proportion compared to the studies in Egypt and Mekelle, Ethiopia where adenomatous polyps accounted for 2.7% and 2% respectively. Adenomatous polyps are precancerous neoplastic lesions with potential to progress to carcinoma and increased prevalence of adenomatous polyp contributes to the higher prevalence of colon cancer.(19)

Lastly the setting for this study was SPHMMC, a referral hospital which receives more advanced cases such as malignancies in higher proportion compared to other health facilities.

In this study, the most frequently identified endoscopic features were mass, ulceration and erythema. Significant insights were revealed after conducting a thorough analysis of the relationship between endoscopic features and histopathologic diagnoses. Statistical analysis showed significant correlation between non-specific colitis and ulceration as well as, non-specific colitis and erythema. IBD cases also showed statistically significant correlation with ulceration, erosion and erythema. A higher proportion of IBD cases showed ulceration, erythema and erosion on endoscopy compared to non-specific colitis. These findings are similar to a 2019 study done in Egypt which found that patients with IBD have significantly higher rates of ulceration and mucosal irregularity ($P < 0.0001$) compared to patients with non-specific colitis. (20) Another study from India also showed significant correlation between histologic diagnoses and erythema as well as edema. However, the correlation between histology and ulceration/erosion was not statistically significant.(21) The insignificance of correlation in ulceration/erosion in contrast to our study could be due to a difference in analysis, where cases with ulceration and erosion were analysed together, whereas in our study these two endoscopic features were analysed separately.

Our study also found that the correlation between abnormal vascular pattern and IBD was not statistically significant. This finding is in contrast to studies done in Korea that mention abnormal or decreased vascular pattern as a typical feature of IBD, specifically ulcerative colitis.(22,23) The different result in our study could be a result of the correlation analysis method in which our study analysed all IBD cases (diagnosed as IBD, ulcerative colitis and Crohn's disease) together due to the very small number of ulcerative colitis cases. In addition, ulcerative colitis cases with low index of severity or in remission could show a normal vascular pattern on endoscopy.(24) This can result in the statistically insignificant correlation between abnormal vascular pattern and IBD seen in our study. A statistically significant correlation was also found between mass and adenocarcinoma. Similar findings were also seen in studies done in India in 2017 and Nigeria in 2023. (2,25)

Another objective of the study was to assess the diagnostic value or accuracy of endoscopy in differentiating between inflammatory, malignant and polypoid lesions. Our study found that

endoscopy has a diagnostic accuracy 84.6% for inflammatory lesions, 89.9% for malignant lesions and 86.4 % for polyps. This finding has been supported in numerous other studies. The study done in Mekelle, Ethiopia showed Endoscopy has a high diagnostic value with sensitivity of 75%, specificity of 79.6%, PPV of 36.4%, and NPV was 95.3% in diagnosing inflammatory lesions (colitis). For colonic cancer, the sensitivity of endoscopy was 87.8%, specificity was 88.1%, PPV was 63.2%, and NPV was 96.9%.(16) The 2022 study in India also showed diagnostic value of endoscopic findings to differentiate between benign and malignant lesions had a sensitivity of 96.25%, specificity of 68.67%, PPV of 74.76%, NPV of 95% and overall diagnostic accuracy of 82.21%.(5) In addition the 2023 study in Nigeria found endoscopy has a high a diagnostic yield for colon cancer with a 100% sensitivity, 81.8% specificity, 72.7% PPV and 100% NPV.(2)

The findings from the above studies show that the endoscopy can be used as a reliable tool to differentiate between inflammatory, malignant and polyp lesions.

7. Strengths and limitations of the study

7.1. Strengths

- To the researches knowledge the correlation of endoscopic and histologic features is a novel research topic in Ethiopia and there no similar studies done on this subject particularly at SPHMMC.
- This study included large number of participants over a period of 5 years in an attempt to conduct an extensive and thorough assessment of lower GI endoscopic biopsies.
- The study used both descriptive analysis and correlation analysis
- This study can serve as a tool for improving the quality of healthcare and an important starting point for further research on endoscopic biopsies.

7.2. Limitations

- Due to missing and incomplete endoscopic and pathologic reports it was not possible to conduct analysis on all lower GI endoscopic biopsies received at the department of Pathology during the study period.
- Certain endoscopic features, such as polyp size and pit pattern were not analysed because they were not mentioned in majority of the reports.
- This is a single center study and did not include cases from other health care centers.

8. Conclusion and recommendations

8.1. Conclusion

This study showed adenocarcinoma was the commonest diagnosis in lower GI endoscopic biopsies followed by non-specific chronic colitis, which was the most common inflammatory lesion. Moreover, this study highlighted that there is a statistically significant correlation between endoscopic features and histopathologic patterns, where a more reliable association seen between malignant lesions and presence of mass on endoscopy. Lastly the study also showed endoscopy has a high diagnostic accuracy, sensitivity and specificity in diagnosing inflammatory, malignant and polypoid lesions.

8.2. Recommendations

For Pathologists:

- To practice the habit of reviewing endoscopic reports and correlate with histopathologic findings to reach the accurate diagnosis
- To standardize pathologic reports of endoscopic biopsies

For gastroenterologists:

- To ensure completeness of endoscopic reports by commenting on all relevant features

For hospital administrators and MOH:

- To implement policies that increase surveillance and screening for colorectal cancer
- To adopt computerized data storage system for all patients at the hospital for medical record purpose.

For researchers:

- To conduct more extensive and possibly prospective studies to further analyse endoscopic biopsies and the wide spectrum of intestinal pathologies.

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Annex

Questionnaire

Diagnostic concordance and correlation between Histopathologic and endoscopic features of lower GIT endoscopic biopsies in patients who underwent endoscopic biopsy at SPHMMC, 2018-2023

	Variable	Response categories	Remark
Socio demographic characteristics	Questionnaire code		
	MRN		
	Biopsy number		
	Age		
	Sex	1. Female	
		2. Male	
Endoscopy data	Indication	1. Abdominal pain	
		2. Rectal bleeding	
		3. Constipation	
		4. Other	
	Site of lesion	1. Ileum	
		2. Colon	
		3. Rectum	
		4. Anal canal	
	Macroscopic findings	1. Normal	
		2. Mucosal irregularities	
		3. Mucosal Erythema	
		4. Erosion	
		5. Ulceration	
		6. Polypoid growth	

		6.1. Polyp size	
		6.2. Polyp pit pattern	
		7. Abnormal vascularity	
		8. Mass	
	Endoscopic diagnosis	1. Normal	
		2. Non neoplastic	
		3. Neoplastic	
Histopathology data	Diagnosis	1. unremarkable	
		2. Non neoplastic	
		2.1 Non-specific colitis	
		2.2 Granulomatous colitis	
		2.3 IBD	
		2.4 CD	
		2.5 UC	
		2.6 Other	
		3. Benign neoplastic	
		4. Premalignant	
		4.1 Low grade dysplasia	
		4.2 High grade dysplasia	
		5. Malignant Neoplastic	
		5.1 Adenocarcinoma	
		5.2 Lymphoma	
		5.3 Undifferentiated malignancy	
		5.4 Squamous cell carcinoma	
		5.5 Other	

		6. Polyp	
		6.1 Inflammatory polyp	
		6.2 Hyperplastic polyp	
		6.3 Adenomatous polyp	