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Evaluation Of Gastro-Duodenal Mucosa Of Non-IBS / Non-Endoscopic EGD Disorders In Diabetes Mellitus And Bronchial Asthma

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Abstract
Background: *Irritable bowel syndrome (IBS) affects a large portion of the world's population. Diabetes Mellitus (DM) and Bronchial Asthma (BA) induce a broad spectrum of clinical GIT manifestations.*
Objective: *Assessing the histopathologic changes of the Gastro-Duodenal mucosa of IBS compared to non-IBS patients in Diabetics and Asthmatics.*
Subjects and Methods: *Study populations (n = 351) underwent free gastroscopic screening and were divided into three groups: diabetics (n = 84), asthmatics (n = 70), and non-asthmatics non-diabetics (n=197); each of them was subdivided into IBS and non-IBS. Mucosal-lymphocytic infiltration (MLCI) was graded into average (< 10 cells/HPF), mild (10 to 30 cells/HPF), and moderate (> 30 cells/HPF). Mucosal bacterial invasion (MBI) was also graded into no microorganism (0/HPF), few microorganisms (<10/HPF), moderate number of microorganisms (≥10/HPF).*
Results: *The average (<10cells/HPF) MLCI was significant in the IBS category of no. DM/no.BA compared to that of diabetics (P=0.008) and asthmatics (P=0.021). Moderate (>30 cells/HPF) MLCI was more frequent in non-IBS patients with DM (P=0.044) and BA (P=0.086) compared to those no. DM/no.BA group. The IBS cases in no.DM/no. The BA subgroup had a significantly increased frequency of no bacterial invasion compared to diabetics (P = 0.003) and asthmatics (P = 0.02). The non-IBS cases with bronchial asthma showed a significantly increased frequency of MBI with a moderate number of microorganisms (≥10/HPF) compared to those without.DM/no.BA subgroup (P=0.0147).*
Conclusion: *Moderate (>30 cells/HPF) gastro-duodenal Mucosal-Lymphocytic-Infiltration is found in non-IBS patients who have Diabetes-Mellitus and Bronchial Asthma, while moderate Mucosal-Bacterial-Invasion (≥10/HPF) is seen only in Bronchial Asthma.*
Keywords: *Diabetes Mellitus, Bronchial Asthma, Gastro-duodenal mucosa*

1. INTRODUCTION

Irritable bowel syndrome (IBS) is a chronic and recurrent functional gastrointestinal disorder that affects 7% to 54% of the global population1. Rome IV Criteria are the current standard for diagnosing irritable bowel syndrome (IBS). ROME IV defines IBS as recurrent abdominal pain occurring at least once a week on average over the past three months. This pain is linked to two or more of the following: a. a relation to defecation, b. a change in the frequency of bowel movements, c. changes in stool consistency. These criteria must be met for the last three months, and symptoms should have started six months before the diagnosis 2.

Microscopic Gastroenteritis (MG) refers to a group of chronic inflammatory bowel disorders. These conditions are characterized by recurring or persistent watery diarrhea accompanied by abdominal pain. Importantly, these symptoms occur without any abnormalities found in radiological examinations. Endoscopic appearances are typically normal or nearly normal, but specific microscopic abnormalities are observed in gastric biopsies 3. Gastrointestinal manifestations in chronic diseases like Diabetes Mellitus (DM) are typically associated with other microvascular complications. With the rising number of diabetes cases, more people are developing diabetic neuropathy. The digestive symptoms linked to

diabetes are also getting more attention. Patients can present with GERD, delayed gastric emptying (Gastroparesis), nausea and vomiting, and even upper gastrointestinal hemorrhage4. The respiratory tract and gastrointestinal tract (GIT) share common embryologic origins; It has long been recognized by the medical community that asthma and gastrointestinal symptoms are connected. Many people with asthma experience digestive issues, especially gastroesophageal reflux disease. However, researchers have historically been unsure whether these two sets of symptoms come from the same underlying cause or if gastrointestinal processes themselves might lead to respiratory symptoms. 5. The study aims to assess the histopathologic changes of Gastro-Duodenal mucosa in the expected nonorganic lesion by endoscopy and non-IBS GIT disorders in patients with Diabetes Mellitus, Bronchial Asthma.

2. SUBJECTS AND METHODS:

Study Design and Population

This is a cross-sectional case-control study that was conducted at the Hepatology,
Gastroenterology & Infectious Diseases (HGID) Department of Al-Azhar University Hospitals and Theodor Bilharz Research Institute (TBRI). A sample size of 351 patients was calculated to detect a 50% difference between groups with 80% power (α = 0.05). Adult patients (>18 years) undergoing esophagogastroduodenoscopy (EGD) for gastroduodenal symptoms were enrolled over one year (September 2022–August 2023).

Study Groups: Patients were stratified into: peptic ulcer disease, erosive gastritis, pangastritis, congestive gastropathy, stomach cancer, or no evident pathology – each compared between diabetics/asthmatics and nondiabetics/nonasthmatics. A sub-analysis focused on patients with no macroscopic lesions, further classified by Histopathologic findings (with/without Rome IV IBS criteria) in addition to Diabetic/asthmatic status. The 351 cases recruited were classified into the following: group A included patients with Diabetes Mellitus (n=84), group B consisted of cases with Bronchial Asthma (n=70), and group C contained no. DM/no.BA (n=197). Each group was divided into IBS and non-IBS subgroups.

Inclusion Criteria: age >18 years, symptomatized patients with gastroduodenal manifestations; submitted to gastroscopy will be differentiated into naïve (Gastroscopy for the first time) or experienced (repeated Gastroscopy) with no apparent gastric lesion in previous screening; currently having DM and/or Bronchial asthma.

Exclusion Criteria: age <18 years old; follow-up of pre-diagnosed gastric diseases; short or long history of documented GIT diseases: a. co-infection with HIV, HBV b. Salmonellosis c. food poisoning, e.g., E. coli, Shigellosis, Staph aureus, Bacillus coeruleus, d. Pseudo-membrane colitis (CDF) e. Schistosomiasis; pregnant female; hepatocellular carcinoma except 6 months after cure or other extrahepatic malignancy except 2 years after free interval; total serum bilirubin more than 3mg/dl; unexplained rise in ALT and/or AST, and decrease in serum albumin to < 2.8 g/dl; INR > 1.7; Platelet count less than 50,000/mm; patients with recently diagnosed active untreated chronic hepatitis C virus (CHCV); patients with chronic debilitating diseases other than DM or bronchial asthma e. g. uremic patients, cases with congestive heart failure, patients with impaired consciousness.

Clinical Assessment was performed with emphasis on GIT symptoms and signs in association with Diabetes Mellitus and Bronchial Asthma. The related risk factors were also evaluated in all study population.

Laboratory Tests included routine tests (CBC, liver/kidney function, lipids, HbA1c) and sometimes specific tests for exclusion, such as H. pylori antigen, fecal calprotectin, and tumor markers.

Gastroduodenoscopy: Patient preparation and screening will be performed according to the invented protocol. Mucosal biopsies were taken from each of antrum and 2nd part of the duodenum

Histopathology of gastroduodenal biopsies: All biopsies were stained with H&E to address histologic abnormalities, mucosal cellular infiltrations and bacterial invasion.

Scaling of both histopathological and histochemical changes into average ,mild, and moderate categories was performed to correlate with diabetes mellitus and bronchial asthma. Microscopic examination of gastro-duodenal biopsies was blindly examined by an experienced gastrointestinal pathologist without any previous knowledge about case selection or presentation.

Preparation of slides

Begins with fixation of biopsies in 10% neutral buffered formalin. The biopsies were then processed in a Leica tissue processor overnight, through graded alcohols, cleared in xylene, and embedded in paraffin to create tissue blocks. Thin sections measuring 3-5 µm were cut with a microtome and placed on glass slides. For H&E staining, the sections were deparaffinized, hydrated, stained with hematoxylin, counterstained with eosin, dehydrated, and covered with a slip.

Statistics: Data were analyzed using SPSS v. 25. Normality was assessed via the Shapiro-Wilk test; homogeneity of variance via Levene's test. Quantitative data: Mean ± SD (independent t-test), Categorical data: Frequency (%) (chi-square test), Significance threshold: $p \leq 0.05$.

Ethics approval: This research was endorsed by the ethical committee at the Department of Hepatology, Gastroenterology, and Infectious Diseases and by the ethical committee at Al-Azhar Faculty of Medicine. Certificate Registration Number: Trop.Med._1Med.Research_Inf.GIT.Liv.Dis._00081. Written consent was endorsed by subjects.

Sample size calculation: A study of subjects in which we regressed the values of patients against controls was planned. Prior data indicated that the standard deviation of the control is 0.9, and the standard deviation of the regression errors was 1.94. If the true slope obtained by regressing patients against controls is 1.4, we would need to study 35 subjects at least for each group, to be able to reject the null hypothesis that this slope equals zero with probability (power) 90%. The Type I error probability associated with this test of the null hypothesis is 0.05. The formula for calculating a z-score is $z = (x-\mu)/\sigma$, where x is the raw score, μ is the population mean, and σ is the population standard deviation.

3. RESULTS

The demographic data for participants with irritable bowel syndrome (IBS) and non-IBS individuals across three study groups, DM, BA, and no DM/no BA, are illustrated in Table 1. There were no meaningful differences between the groups in terms of age, gender, and smoking rates.

Table 1, Demographic Data in IBS versus non-IBS in all study populations (n=351)

Study groups	Age		Gender		Smoking	
	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS
A. DM (n=84)	47.76 ±13.98	44.51 ±12.62	16 (35.6%) 29 (64.4%)	18 (56.2%) 21 (53.8%)	16 (40.0%) 24 (60.0%)	18 (46.2%): 21 (53.8%)
B. BA (n=70)	48.15 ±18.02	40.70 ±14.91	16 (40.0%) 24 (60.0%)	18 (46.2%) 21 (53.8%)	14 (35.0%) 26 (65.0%)	12 (40.0%) 18 (60.0%)
C. no DM/no BA (n=197)	43.66 ±15.33	39.69 ±13.34	44(35.7%) 82(64.3%)	30 (42.2%) 41(59.8%)	35(28.6%) 91(71.4%)	26(36.6%) 45(65.4%)
P value: A vs B	0.88	0.08	0.672	1.00	0.644	0.609
A vs C	0.145	0.175	0.94	0.693	0.144	0.328
B vs C	0.089	0.599	0.56	0.693	0.383	0.748

Continuous variables data are expressed as Mean ± standard deviation (SD)

Regarding GIT symptoms in IBS patients, in the DM group, the prevalence of gastro-esophageal symptoms was observed at 30.12%, epigastric symptoms at 44.0%, and colonic symptoms at 48.8%. In contrast, the non-IBS group exhibited much higher rates with 69.5%, 67%, and 73.6% respectively. Statistical analysis shows significant differences when comparing DM to the non-IBS group for all symptoms ($p < 0.0001$). Furthermore, the comparison between DM and the BA group (n=70) also yielded significant results for gastro-esophageal ($p < 0.0001$) and colonic symptoms ($p < 0.0001$).

Among non-IBS patients, the prevalence of gastro-esophageal symptoms was 55.95% In the DM group, while the BA group (n=70) reported a prevalence of 52.85%. In contrast, only 30.46% of the no DM/no BA group (n=197) exhibited these symptoms. Statistically significant differences were observed when comparing DM to BA ($p < 0.0001$) and DM to no DM/no BA ($p < 0.0001$), indicating that individuals with IBS symptoms in the DM group were notably more affected. Similar trends were noted for epigastric and colonic symptoms, with DM showing 41.7% and 44.0%, respectively, compared to lower percentages in the no DM/no BA group (33% and 26.40%). The statistical significance between DM and None was also strong for colonic symptoms ($p < 0.0001$) (Table 2).

Table 2. GIT symptoms in IBS versus non-IBS in all study populations (n=351)

Study groups	**Gastro-esophageal symptoms**		**Epigastric symptoms**		**Colonic symptoms**	
	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS
A. DM (n=84)	33(39.28)	47(55.95)	37(44.0%)	35(41.7)	41(48.8%)	37(44.0%)
B. BA (n=70)	34(48.57)	37(52.85)	32(45.7%)	29(41.4%)	26 (37.1%)	40(57.1%)
C. no DM/no BA (n=197)	137(69.5)	48(24.36%)	132(67%)	58(29.4%)	145(73.60%)	40(20.3%)
P value: A vs B **A vs C** **B vs C**	0.188 <0.0001 0.0016	0.58 <0.0001 <0.0001	0.83 0.003 0.0016	0.97 0.02 0.03	0.14 <0.0001 <0.0001	0.105 <0.0001 <0.0001

Categorical variables data are expressed in their absolute and relative frequencies (number and percentage)

Regarding risk factors associated with IBS, DM patients exhibited a 21.4% incidence of antirheumatic conditions and 40.5% with a disturbed lipid profile, significantly higher than the BA group, which showed only 21.4% and 17.1% respectively ($p < 0.0001$ for both comparisons). The presence of eczema and oral aphthous lesions did not demonstrate significant differences across groups, with p-values of 0.78 and 0.59, respectively. Notably, the comparison of DM to the non-IBS group showed significant results for disturbed lipid profiles ($p < 0.0001$) and oral aphthous lesions ($p = 0.048$).
Among non-IBS patients, 23.8% in the DM group reported using antirheumatic medications, a significant increase compared to 12.9% in the BA group and only 1.52% in the no DM/no BA group. This difference was statistically significant ($p < 0.0001$). Dyslipidemia was also prevalent in the DM group (41.7%) compared to 17.1% in BA and 2.53% in no DM/no BA, with a significant p-value of <0.0001. Other factors like eczema and oral aphthous lesions did not show significant differences, although there was a trend towards significance in the prevalence of eczema between DM and BA ($p = 0.0013$) (Table 3).

Table 3, Risk factors in IBS versus non-IBS in all study populations (n=351)

Study groups	**Antirheumatic**		**Dist. Lipid Profile**		**Eczema**		**Oral Aphthous**	
	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS
A. DM (n=84)	18 (21.4%)	20 (23.8%)	34 (40.5%)	35 (41.7%)	7 (8.3 %)	10 (11.9%)	8 (9.5%)	13 (15.5%)
B. BA (n=70)	15 (21.4%)	9 (12.9%)	12 (17.1%)	12 (17.1%)	5 (7.1 %)	12 (17.1%)	5 (7.1 %)	4 (5.7%)

C. no DM/no BA (n=197)	3 (1.52%)	3 (1.52%)	6 (3.04%)	5 (2.53%)	14 (7.10%)	5 (2.53%)	33 (16.75%)	20 (10.15%)
P value: A vs B	1.0	0.083	0.0016	0.0063	0.78	0.35	0.59	0.054
A vs C	<0.0001	<0.0001	<0.0001	<0.0001	0.72	0.0013	0.116	0.204
B vs C	<0.0001	<0.0001	<0.0001	<0.0001	0.99	<0.0001	0.048	0.26

Categorical variables data are expressed in their absolute and relative frequencies (number and percentage)

In IBS patients, DM patients exhibited significantly higher harmful lipid levels (182.24 ± 77.35) compared to the BA group (149.45 ± 62.86) with a p-value of 0.015. The beneficiary lipid levels were comparable across groups, with no significant differences (p = 0.4). Uric acid levels were higher in DM compared to the non-IBS group (5.50 ± 1.53 vs. 5.05 ± 1.8) but did not reach statistical significance (p = 0.15). The TSH levels displayed no significant difference between DM and BA groups (p = 0.18).
Among non-IBS patients, the DM group had an average harmful lipid level of 212.18 ± 77.08, significantly higher than both the BA group (165.20 ± 65.02, p = 0.001) and the no DM/no BA group (167.25 ± 73.80, p = 0.266). Beneficial lipid levels were comparable across groups, with a mean of 54.23 ± 11.58 in DM and 56.97 ± 11.14 in BA, lacking statistical significance (p = 0.178). Uric acid and TSH levels did not exhibit significant differences (Table 4).

Table 4. Routine serum laboratory results in IBS versus non-IBS in all study populations (n=351)

Study groups	**Cholesterol / Triglycerides**		**High-Density LP**		**Uric acid**		**TSH**	
	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS
A. DM (n=84)	-182.24 ± 77.35 -205.33 ± 55.22	-212.18 ±77.08 -241.72 ±55.52	56.84 ±9.71	54.23 ±11.58	5.50 ±1.53	5.36 ±1.55	1.80 ±0.84	3.04 ±1.28
B. BA (n=70)	-149.45 ± 62.86 -188.63 ± 61.40	-165.20 ± 65.02 -204.27 ±73.42	58.15 ±9.87	56.97 ±11.14	5.36 ±1.55	5.39 ±1.45	1.43 ±1.03	3.17 ±2.62
C. no DM/no BA (n=197)	-158.81 ±72.23 -191.34 ± 59.92	-167.25 ±73.80 -216.20 ± 68.15	58.67 ±11.44	56.47 ±13.23	5.05 ±1.8	5.26 ±1.4	1.62 ±1.1	2.73 ±2.24
P value:	0.005 / 0.08	0.008 / 0.005	0.4	0.15	0.57	0.9	0.015	0.68
A vs B	0.015 / 0.07	0.001 / 0.003	0.302	0.178	0.02	0.62	0.18	0.22
A vs C	0.337 / 0.74	0.266 / 0.207	0.87	0.89	0.15	0.64	0.208	0.17
B vs C								

Continuous variables data are expressed as Mean ± standard deviation (SD)

Table 5 shows that the average (<10 cells/HPF) mucosal lymphocytic infiltration MLCI) was significant in IBS patients with no. DM/no.BA compared to diabetics (P=0.008) and asthmatics (P=0.021). Moderate (> 31 cell/HPF) MLCI was more frequently seen in non-IBS patients with Diabetes Mellitus (P=0.044) and Bronchial Asthma (P=0.086) compared to no DM/no BA group.

Table 5. Gastro-duodenal mucosal Lymphocytic infiltration (MLCI) in IBS versus non-IBS in all study populations (n=351)

Study groups	**Average (<10 cells/HPF)**		**Mild (11 to 30 cells / HPF)**		**Moderate (> 31 cell/HPF)**	
	IBS	Non-IBS	IBS	Non–IBS	IBS	Non-IBS
A. DM (n=84)	42 (50%)	1 (1.2%)	7 (8.3%)	25 (29.8%)	1 (1.2%)	8 (9.5%)
B. BA (n=70)	38 (54.28%)	0 (0.0%)	4 (5.7%)	21 (30.0%)	1 (1.2%)	6 (8.6%)
C. no DM/no BA (n=197)	134 (68%)	1 (0.5%)	4 (2.0%)	49 (25.0%)	1 (0.5%)	8 (4.1%)
P value: **A vs B** **A vs C** **B vs C**	 0.414 0.008 0.021	1.00 1.00 1.00	1.00 0.43 0.65	0.97 0.45 0.452	1.00 1.00 1.00	0.85 0.044 0.086

Categorical variables data are expressed in their absolute and relative frequencies (number and percentage). Mid P exact 1-tailed P was used to analyze data. Abbreviations:

Table 6 shows that the IBS cases in no DM / no BA group had a significantly increased frequency of no bacterial invasion compared to diabetics (P=0.003) and asthmatics (P=0.02). The non-IBS cases with bronchial asthma had a significantly increased frequency of mucosal invasion with a moderate number of microorganisms (≥10 / HPF) on comparison with the no DM / no BA group (P=0.0147).

Table 6. Gastro-duodenal mucosal Bacterial invasion (MBI) in IBS versus non-IBS in all study populations (n=351)

Study groups	**No microorganism (0 / HPF)**		**Few microorganisms (<10 / HPF)**		**Moderate number of microorganisms (≥10 / HPF)**	
	IBS	Non-IBS	IBS	Non-IBS	IBS	Non-IBS
A. DM (n=84)	44 (52.4%)	13 (15.5%)	1 (1.2%)	23 (27.4%)	0 (0.0%)	3 (3.6%)
B. BA (n=70)	38 (54.29%)	14 (46.7%)	2 (5.0%)	11 (36.7%)	0 (0.0%)	5(7.14%)
C. No DM / No BA (n=197)	136 (69%)	22 (11.16%)	0 (0.0%)	37(18.78 %)	0 (0.0%)	2(1.01%)
P value: **A vs B** **A vs C B vs C**	 0.591 0.003 0.02	 0.46 0.316 0.06	 0.59 0.99 0.99	 0.08 0.107 0.56	 1.00 1.00 1.00	 0.46 0.159 0.0147

Categorical variables data are expressed in their absolute and relative frequencies (number and percentage)

4. DISCUSSION:

The findings of this study provide valuable insights into the histopathologic changes in the gastro-duodenal mucosa of patients with Diabetes Mellitus (DM), Bronchial Asthma (BA), particularly in those without macroscopic lesions on endoscopy. The results highlight significant associations between these chronic conditions and gastrointestinal tract (GIT) manifestations, as well as the role of microscopic inflammation and metabolic dysregulation in GI symptomatology.

The study found no significant differences in age, gender distribution, or smoking status between the non-IBS and IBS groups for both DM and BA. However, significant differences were observed in gastro-esophageal symptoms among DM patients, and epigastric symptoms, and colonic symptoms among BA patients. These findings align with existing literatures, which report that DM and BA are associated with distinct GI manifestations 6. This agrees with Kumar et al.,2024,7 who showed that Patients with diabetes mellitus (DM) are more likely to have gastroesophageal reflux disease (GERD), and there is a significant association between the two conditions. Also, Pervez et al. 2024,8 that the major clinical complaint in microscopic gastro-enteritis and/or colitis is chronic, watery, non-bloody diarrhea that might be accompanied by painful abdominal cramps. Rutkowski et al. 20249,declared that Additional symptoms may include abdominal discomfort, which occurs in up to 41% of patients. Abdominal pain is reported in 31 to 42% of cases. Weight loss also affects 31 to 42% of patients, along with fatigue, nausea, and vomiting.

Regarding risk factors associated with IBS and non-IBS, DM patients exhibited an increased incidence of antirheumatic conditions. This agrees with Peery et al.,202410, who demonstrated that Medications like nonsteroidal anti-inflammatories, proton pump inhibitors, and antidepressants have been seen as the primary risk factors for microscopic colitis (MC).

Significant differences in lipid profiles, especially harmful lipids (triglycerides, cholesterol), were observed between the non-IBS and IBS groups for both DM and BA. These findings suggest that metabolic dysregulation may exacerbate GI symptoms or contribute to mucosal changes. The elevated lipid levels in IBS patients could reflect underlying insulin resistance or chronic inflammation, which are hallmarks of both DM and BA 11; 12. Forss et al.,202313, agreed and reported that Metabolic comorbidities occurred more often in MC patients than in reference individuals. This included higher rates of diabetes mellitus (18.1% compared to 10.8%), hypertension (13.8% versus 7.6%), and dyslipidemia (3.0% compared to 1.6%). This also agrees with Abdissa, D.et al.,2022,14who recalled that the high rates of dyslipidemia among diabetic patients show that mixed dyslipidemia, involving high triglycerides and low HDL, is the most common pattern. In diabetic patients, hypertriglyceridemia occurs due to insulin resistance and high blood sugar levels. This situation can cause the liver to produce too many triglyceride lipoproteins and reduce their clearance. In some cases, the breakdown of lipoproteins after meals may also be affected. Others, Lim et al.,2023,15; Sago et al.,2024,16indicated that Elevated serum TC levels were linked to a higher risk of asthma.

The study identified significant histopathologic differences, including increased lymphocyte cellular infiltrate and mucosal bacterial infiltrate in the IBS group. These changes were consistent across both DM and BA patients, indicating a common pathway of mucosal inflammation. The presence of intraepithelial lymphocytes and bacterial infiltration aligns with previous reports of microscopic gastritis and its association with autoimmune and inflammatory conditions17.

Histopathologic findings revealed significant differences in mucosal lymphocytic infiltration (MLCI) and mucosal bacterial invasion (MBI). In the IBS group, no DM/no BA patients showed a higher proportion of average MLCI (68.0% with <10 cells/HPF) compared to DM and BA patients (52 and 54.0% with mild infiltration). Bacterial infiltration was prevalent in DM patients (48.6%) and in BA patients (46.0%). These findings indicate that average mucosal inflammation and bacterial colonization patterns don't differ between DM and BA, possibly reflecting the same underlying mechanisms, such as immune dysregulation in BA and metabolic toxicity in DM 18. This agrees with Wildt S, et al.,202119who showed that Microscopic colitis was linked to many autoimmune diseases, particularly those related to the gastrointestinal system. These include diabetes and bronchial asthma.

The above-mentioned finding lines up with Yip et al.,2020,20 who showed that Lymphocytic gastritis is

a rare reaction to gastric injury. It is marked by a build-up of lymphocytes within the surface foveolar epithelium and ongoing inflammation in the lamina propria. This condition usually occurs alongside gluten-sensitive enteropathy, Helicobacter pylori gastritis, non-steroidal anti-inflammatory drugs, and microscopic colitis. It is also in agreement with Robert M, et al., 2021 21 who showed that lymphocytic gastritis, defined by increased gastric intraepithelial lymphocytes (more than 25 per 100 epithelial cells), indicates that intraepithelial lymphocytosis is usually higher in the surface epithelium. You may also notice lymphoplasmacytic expansion of the lamina propria. Intraepithelial neutrophils can appear, particularly in cases of H. pylori infection or mucosal erosion. Contrarily, Sonnenberg A, Genta RM in 2019, 22 disagreed; they showed that the inverse association between Helicobacter Pylori gastritis and Microscopic Colitis shows that H. pylori positive chronic active gastritis was less common among patients with microscopic colitis than among those without it (odds ratio = 0.61; 95% confidence interval, 0.52-0.70). This study has some limitations. Its cross-sectional design prevents causal conclusions. The sample size is adequate, but it may not represent all subgroups effectively. Future longitudinal studies could look into the relationship between metabolic changes and GI pathology over time. Additionally, we need mechanistic studies to clarify the pathways linking diabetes mellitus, bile acids, and gastrointestinal mucosal changes.

IN CONCLUSION, this study demonstrates significant differences in metabolic profile and histopathology of the gastro-duodenal mucosa of patients with DM, BA. It also found that moderate (> 30 cells/HPF) colonic Mucosal-Lymphocytic-Infiltration in non-IBS patients who have Diabetes-Mellitus and Bronchial Asthma, while moderate Mucosal-Bacterial-Invasion (≥10/HPF) is seen only in Bronchial Asthma. The findings favor the importance of considering microscopic inflammation and metabolic dysregulation in the evaluation and management of GIT symptoms in IBS and non-IBS populations. Further research is warranted to explore targeted interventions that address these underlying mechanisms.

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