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ORIGINAL RESEARCH

Bowel Urgency in Ulcerative Colitis is Independently Associated with Histologic Inflammation and Stool Form Despite Endoscopic Remission

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Background: Bowel urgency (BU) is a distressing symptom in patients with ulcerative colitis (UC), yet its associations with disease activity and patient-reported outcomes remain unclear. This study aimed to provide the first comprehensive evaluation of these relationships.

Materials and Methods: Between September 2024 and March 2025, we enrolled 100 patients with UC. Patients were stratified into two groups based on the Urgency Numeric Rating Scale (NRS): bowel urgency–active (BU-A; NRS > 1) and bowel urgency–remission (BU-R; NRS ≤ 1). Clinical parameters including the partial Mayo score, Mayo endoscopic subscore (MES), Nancy Index (NI), Bristol Stool Form Scale (BSFS), and IBD Disk score were evaluated. Logistic regression analyses were performed to identify independent predictors of active BU.

Results: 50 patients were in BU-A, and 50 in BU-R. Endoscopic remission (MES=0) occurred in 14% of BU-A and 34% of BU-R; Histological remission (NI = 0) in 10% and 36%, respectively. Stool consistency was predominantly normal (Bristol types 3–5) in both groups (60% of BU-A, 72% of BU-R); however, type 6–7 stools were significantly more frequent in the BU-A group (36% vs 6%, $P < 0.001$). The BU-A group also had significantly higher partial Mayo scores, MES, NI, and total IBD Disk scores (25.3 ± 20.0 vs 12.0 ± 14.9, $P < 0.001$). In multivariate analysis, higher NI (OR: 1.874; 95% CI: 1.277–2.750; $P < 0.001$) and BSFS score (OR: 1.499; 95% CI: 1.052–2.137; $P = 0.025$) were independently associated with active BU.

Conclusion: Histological inflammation and loose stool form were identified as independent predictors of BU. BU may persist despite endoscopic or histological remission and normal stool form, warranting targeted evaluation beyond traditional marker of disease activity.

Plain Language Summary: Summarize the established knowledge on this subject

- Bowel urgency (BU) is a frequent, distressing symptom of ulcerative colitis (UC) that markedly impairs quality of life.
- The precise links between BU, objective disease activity, and patient-reported outcomes remain unclear.

What are the significant and/or new findings of this study?

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- Active histological inflammation and loose stool form are independent predictors of BU.
- BU can persist despite simultaneous endoscopic and histological remission and normal stool consistency, revealing a symptom burden not captured by conventional indices.
- Recognising BU as an independent treatment target supports more personalised, patient-centred management strategies and may translate into measurable gains in quality of life.

Keywords: ulcerative colitis, bowel urgency, patient-reported outcomes

Introduction

Ulcerative colitis (UC) is a chronic, relapsing inflammatory disorder of the gastrointestinal tract that frequently manifests with symptoms such as rectal bleeding, increased stool frequency, and bowel urgency (BU).[1] BU, also referred to as fecal urgency, is defined as a sudden or immediate need to defecate.[2] Among the various symptoms of UC, BU is considered one of the most distressing, with profound impacts on patients' quality of life and psychosocial well-being.[3–6]

The majority of patients with UC, including those undergoing treatment, report experiencing BU.[7] Previous cross-sectional and observational studies have shown that over 80% of UC patients experience BU.[2,7–10] Moreover, BU is a major contributor to treatment dissatisfaction and is among the symptoms patients most wish to see improved.[4,8,11] Despite its substantial clinical burden, BU is frequently underreported by patients, often due to embarrassment, and may be insufficiently addressed by clinicians because of limited familiarity with validated assessment instruments or an underestimation of its clinical significance.[4,8,11,12]

Although several studies have suggested associations between BU and disease activity, quality of life, psychological burden, clinical outcomes, and inflammatory biomarkers in UC,[3,13–15] the methods used to assess BU have been inconsistent and largely unvalidated. The recent development of the Urgency Numeric Rating Scale (NRS) has introduced a standardized and reliable tool to quantify BU severity in UC patients.[16] Nonetheless, comprehensive evaluations of BU in relation to a broad spectrum of clinical and patient-reported outcomes (PRO) remain scarce.

To address this gap, the present study aimed to investigate the associations between BU and multiple clinical parameters in patients with UC, including disease activity indices, endoscopic and histological findings, stool patterns, and health-related quality of life assessed by the validated IBD Disk. In addition, we examined the correlations between Urgency NRS and the Bristol Stool Form Scale (BSFS), clinical disease activity, and IBD Disk scores.

Materials and Methods

Study Design and Participants

We conducted a questionnaire-based study in adult patients with a confirmed diagnosis of UC. Participants were recruited from the Chang Gung Inflammatory Bowel Disease Center between September 2024 and March 2025. Eligible patients were those receiving regular follow-up care at the center. Regular follow-up was defined as outpatient visits scheduled according to disease activity and the treating physician's clinical assessment, typically every 1–2 months for patients with active UC and every 2–6 months for those in remission, with shorter intervals when warranted by symptom changes or treatment modifications. Patients with incomplete questionnaires or a history of colorectal cancer surgery were excluded. Trained IBD nurse coordinators provided personalized instructions to patients in the outpatient department to facilitate questionnaire completion. The average time required to complete the questionnaire was 15–20 minutes, yielding a completion and return rate of over 90%.

Data Collection

Demographic and clinical data, including age, sex, body mass index (BMI), and disease extent (classified according to the Montreal classification), were collected. Disease activity was evaluated using the partial Mayo score, the Mayo endoscopic subscore (MES), and the Nancy Index (NI). Sigmoidoscopy or colonoscopy was performed to determine the MES of the rectosigmoid colon. The questionnaire was completed within one month of the endoscopic examination, which served as the index date for clinical correlation.

Histological activity was assessed from rectal biopsy specimens. When endoscopic inflammation was evident, targeted biopsies were obtained from the most severely inflamed rectal areas; if no visible inflammation was present, random biopsies were taken from the rectum. Endoscopic activity (MES) and histological activity (NI) were evaluated solely on rectal findings, irrespective of proximal colonic involvement.

Clinical remission was defined as a partial Mayo score ≤ 1, with no individual subscore > 1. Endoscopic remission was defined as a MES of 0, indicating normal or inactive mucosa. Histological remission was defined as a NI of 0, reflecting the absence of both acute and chronic inflammatory infiltrates. Laboratory data, including serum albumin and C-reactive protein (CRP) levels, were collected.

Current medication use was documented, including 5-aminosalicylic acid (5-ASA), immunosuppressants, corticosteroids, biologics, topical therapies, and treatments for irritable bowel syndrome (IBS). Duration of clinical follow-up was recorded. Immunosuppressant therapy consisted of azathioprine. Biologic therapies included anti–tumor necrosis factor agents (infliximab, adalimumab), an anti-integrin agent (vedolizumab), and an anti–interleukin-12/23 agent (ustekinumab). Topical treatments comprised 5-aminosalicylate enemas and hydrocortisone enemas. For patients with IBS, pharmacologic management included antispasmodics (eg, mebeverine) for abdominal pain and bloating, and osmotic (eg, polyethylene glycol) or bulk-forming laxatives for constipation-predominant symptoms, when clinically indicated.

Stool consistency was assessed using the BSFS, which categorizes stool into seven types.[17] BU severity was quantified using the validated NRS, an 11-point scale ranging from 0 (no urgency) to 10 (worst possible urgency).[16] Quality of life (QoL) and functional status were evaluated using the IBD Disk, a validated PRO instrument,[18] which encompasses 10 domains: abdominal pain, regulation of defecation, interpersonal interactions, education and work, sleep, energy, emotions, body image, sexual function, and joint pain.

Statistical Analysis

Continuous variables were reported as means ± standard deviation (SD) and compared using Student's *t*-test. Categorical variables were presented as counts and percentages, with comparisons made using the chi-square test or Fisher's exact test, as appropriate. Logistic regression analysis was performed to identify independent predictors of BU. Variables with a P value < 0.05 in univariate analysis were included in a multivariate model. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. A P value < 0.05 was considered statistically significant. All analyses were conducted using SPSS software, version 26 (IBM Corp., Armonk, NY).

Results

Baseline Characteristics

Our study enrolled 100 UC patients at Chang Gung Memorial Hospital, Linkou, between September 2024 and March 2025. The mean age of participants was 44.8 years, and 66% were male. The mean duration since UC diagnosis was 77 months, and nearly half of the patients (47%) had pancolitis (Montreal E3). None of the enrolled patients had undergone colorectal surgery. Participants were categorized into two groups based on their Urgency NRS scores: an active BU group (BU-A; NRS > 1, n = 50) and a BU remission group (BU-R; NRS ≤ 1, n = 50).[16,19] The mean Urgency NRS was significantly higher in BU-A than in BU-R (4.2 ± 2.0 vs 0.2 ± 0.4, P < 0.001). Disease activity indicators, including the partial Mayo score, MES, and NI, were significantly higher in BU-A compared to BU-R. Overall, 24 patients achieved endoscopic remission (MES = 0), comprising 7 patients (14%) in the BU-A group and 17 (34%) in the BU-R group. Similarly, histological remission (NI = 0) was observed in 23 patients, including 5 patients (10%) in BU-A and 18 (36%) in BU-R. Stool consistency also differed significantly between the two groups: the mean BSFS was 4.7 ± 1.5 in BU-A versus 3.6 ± 1.3 in BU-R (P < 0.001). Both groups predominantly had normal stool form (Bristol types 3–5), accounting for 60% of BU-A and 72% of BU-R. However, the BU-A group had a higher proportion of type 6–7 stools, indicating a greater tendency toward diarrhea. Baseline characteristics of the two groups are summarized in Table 1, and the stool pattern distribution is illustrated in Figure 1.

Table 1 Baseline Characteristics of UC Patients with BU Remission (BU-R) Versus BU Active (BU-A)

	Overall	BU-R (NRS≤1)	BU-A (NRS>1)	P-value
Number	100	50	50	
Age (years)	44.8 ± 12.7	44.2 ± 14.1	45.4 ± 11.2	0.645
Gender (male)	66 (66%)	35 (70%)	31 (62%)	0.398
BMI	23.4 ± 3.6	23.5 ± 3.7	23.4 ± 3.8	0.988
Montreal classification				0.426
E1	32 (32%)	19 (38%)	13 (26%)	
E2	21 (21%)	10 (20%)	11 (22%)	
E3	47 (47%)	21 (42%)	26 (52%)	
Partial mayo score	1.4 ± 2.0	0.7 ± 1.0	2.0 ± 2.4	<0.001*
Mayo endoscopic subscore	1.6 ± 1.1	1.2 ± 1.0	2.0 ± 1.0	<0.001*
Nancy index	1.9 ± 1.3	1.3 ± 1.2	2.5 ± 1.2	<0.001*
Lab data				
Albumin	4.5 ± 0.9	4.5 ± 0.3	4.6 ± 1.2	0.617
CRP	3.4 ± 10.2	2.5 ± 4.7	4.2 ± 13.5	0.45
Medication				
5-ASA	53 (53%)	25 (50%)	28 (56%)	0.548
Immunosuppressants	4 (4%)	3 (6%)	1 (2%)	0.617
Prednisolone	18 (18%)	6 (12%)	12 (24%)	0.118
Biologics	59 (59%)	30 (60%)	29 (58%)	0.839
IBS treatment	34 (34%)	14 (28%)	20 (40%)	0.205
Topical therapy	3 (3%)	2 (4%)	1 (2%)	1
Follow up duration	72.7 ± 68.8	63.6 ± 56.1	81.9 ± 79.3	0.195
BSFS	4.2 ± 1.5	3.6 ± 1.3	4.7 ± 1.5	<0.001*
Urgency NRS	2.2 ± 2.4	0.2 ± 0.4	4.2 ±2.0	<0.001*
Total IBD Disk scores	18.6 ± 18.8	12.0 ± 14.9	25.3 ± 20.0	<0.001*
Abdominal pain	2.0 ± 2.5	1.4 ± 2.2	2.6 ± 2.6	0.013*
Regulating defecation	1.4 ± 2.3	0.5 ± 1.4	2.2 ± 2.7	<0.001*
Interpersonal interaction	0.9 ± 2.0	0.2 ± 0.7	1.6 ± 2.5	<0.001*
Education and work	1.2 ± 2.3	0.5 ±1.6	1.9 ± 2.7	0.002*
Sleep	3.2 ± 3.1	2.5 ± 3.1	3.8 ± 3.0	0.049*
Energy	3.1 ± 2.7	2.4 ± 2.6	3.7 ±2.6	0.016*
Emotion	2.5 ± 2.7	1.8 ± 2.7	3.1 ± 2.6	0.021*
Body image	1.5 ± 2.4	0.9 ± 2.0	2.1 ± 2.6	0.008*
Sexual function	1.1 ± 2.2	0.5 ± 1.7	1.7 ± 2.5	0.01*
Joint pain	2.0 ± 2.8	1.2 ± 2.2	2.8 ± 3.0	0.003*

Abbreviations: 5-ASA, amino salicylic acid; BMI, body mass index; BSFS, Bristol Stool Form Scale; CRP, C-reactive protein; IBD, inflammatory bowel disease; IBS, irritable bowel syndrome; NRS, numeric rating scale; UC, ulcerative colitis. *P < 0.05.

IBD Disk Scores

Patients in the BU-A group had significantly higher total IBD Disk scores than those in the BU-R group (25.3 ± 20.0 vs 12.0 ± 14.9, P < 0.001), reflecting greater impairment in quality of life. The distribution of total IBD Disk scores for both groups is shown in Figure 2. Analysis of IBD Disk components revealed marked differences between the groups: the BU-A group scored higher in abdominal pain (2.6 ± 2.6 vs 1.4 ± 2.2, P = 0.013) and in the regulating defecation domain (2.2 ± 2.7 vs 0.5 ± 1.4, P < 0.001). Similar trends were observed in other domains, including interpersonal interactions, sleep, energy, emotion, body image, sexual function, and joint pain, where BU-A patients consistently had worse outcomes (P < 0.05 for all). These findings underscore the association between BU and impairments across multiple quality-of-life domains.

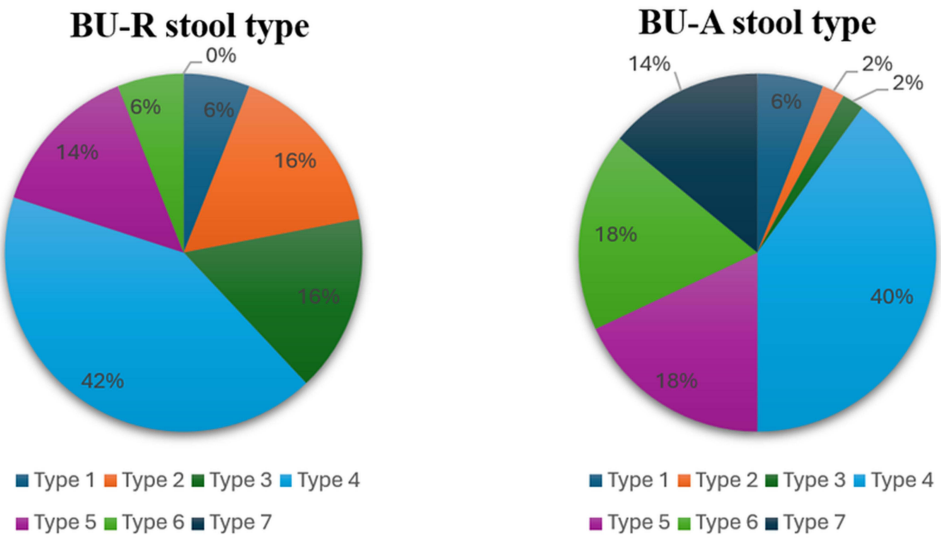

Figure 1 Stool Pattern Distribution in BU-R and BU-A Groups, Categorized by Bristol Stool Form Scale. Pie charts show the percentage distribution of Bristol Stool Form Scale types among patients in the BU-R and BU-A groups.

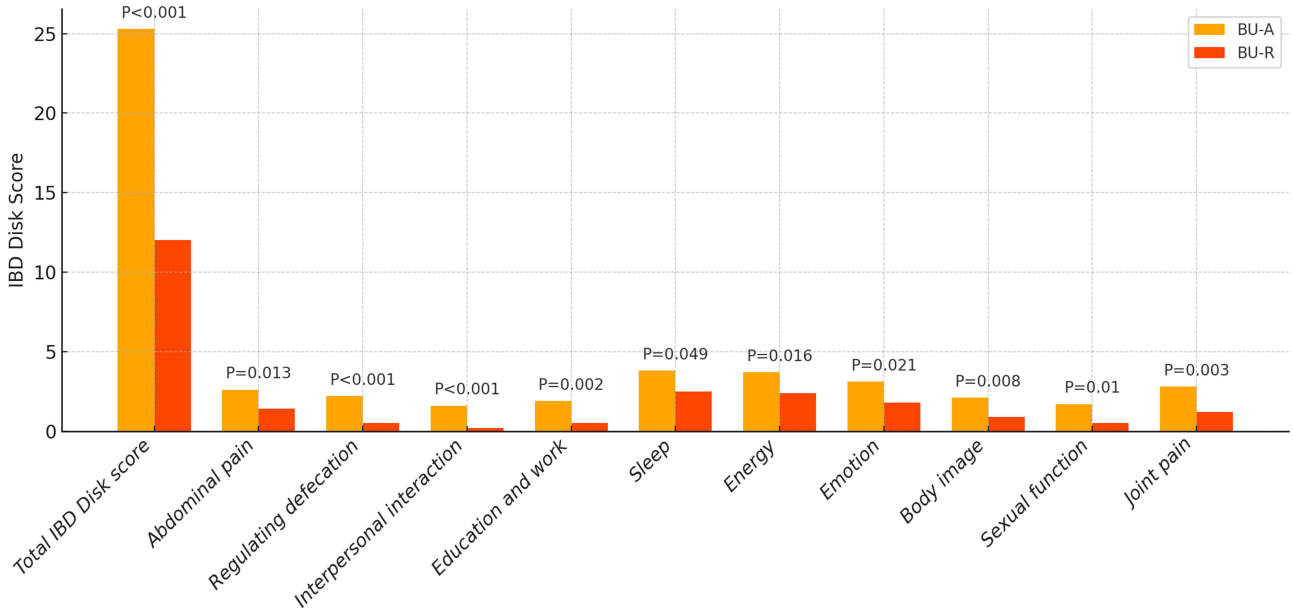

Figure 2 Comparison of Total IBD Disk Scores and Component Domain Scores Between BU-R and BU-A Groups. The bar graph demonstrates that the BU-A group exhibited significantly higher total IBD Disk scores, as well as elevated scores across multiple individual domains, compared with the BU-R group ($P < 0.001$).

Independent Factor of BU

To identify independent factors associated with BU, variables with $P < 0.05$ in the univariate analysis were entered into a multivariate logistic regression. This analysis identified the NI (OR = 1.91, 95% CI: 1.319–2.764, $P < 0.001$) and stool pattern (OR = 1.499, 95% CI: 1.052–2.137, $P = 0.025$) as independent predictors of BU. Detailed results of the univariate and multivariate analyses are presented in Table 2.

Discussion

BU is defined as a sudden or immediate need for a bowel movement[2] and is one of the most distressing symptoms for patients with UC, significantly affecting their quality of life and psychosocial well-being.[3–6] BU and urgency-related fecal incontinence have also been associated with a higher risk of colectomy, increased corticosteroid use, and a greater

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Table 2 Independent Factors of Bowel Urgency in UC Patients

	Univariate Analysis			Multivariate Analysis		
	OR	**95% CI**	**P-value**	**OR**	**95% CI**	**P-value**
Age (years)	1.007	0.977–1.039	0.641			
Gender (male)	0.699	0.304–1.607	0.399			
BMI	0.999	0.889–1.122	0.988			
Montreal classification						
E1	-	-	-			
E2	1.608	0.530–4.876	0.402			
E3	1.81	0.728–4.496	0.202			
Partial mayo score	1.573	1.174–2.108	0.002*	1.106	0.757–1.616	0.601
Mayo endoscopic subscore	2.244	1.470–3.426	<0.001*	1.166	0.604–2.250	0.647
Nancy index	2.11	1.475–3.018	<0.001*	1.874	1.277–2.750	0.001*
Lab data						
Albumin	1.167	0.630–2.159	0.624			
CRP	1.021	0.963–1.082	0.485			
Medication						
5-ASA	1.273	0.579–2.795	0.548			
Immunosuppressant	0.32	0.032–3.184	0.331			
Prednisolone	2.316	0.793–6.764	0.125			
Biologics	0.921	0.415–2.043	0.839			
IBS treatment	1.714	0.742–3.961	0.207			
Topical therapy	0.49	0.043–5.582	0.565			
Follow up duration	1.004	0.998–1.010	0.197			
BSFS	1.795	1.289–2.498	<0.001*	1.499	1.052–2.137	0.025*
Total IBD Disk scores	1.05	1.109–1.082	0.001*	1.028	0.995–1.063	0.095

Abbreviations: 5-ASA, amino salicylic acid; BMI, body mass index; BSFS, Bristol Stool Form Scale; CRP, C-reactive protein; IBD, inflammatory bowel disease; IBS, irritable bowel syndrome; UC, ulcerative colitis. *P < 0.05.

likelihood of hospitalization.[3] Nevertheless, the assessment of BU has not been formally recommended as an endpoint in UC clinical trials or real-world studies, and it remains frequently overlooked during drug approval and registration processes.[6] Furthermore, BU is not included in most UC disease activity indices, despite being a symptom with considerable impact on patients' daily lives.[20,21]

A principal finding of our study was the strong association between histological inflammation and BU. Histologic remission was achieved in 34% of patients in the BU-R group but in only 10% of those in the BU-A group. Furthermore, histological activity, rather than endoscopic or clinical indices, emerged as an independent predictor of BU in our multivariate analysis. These findings are consistent with prior evidence underscoring a close link between intestinal inflammation and the presence of urgency.[16] Active inflammation leads to rectal hypersensitivity, which accelerates transit through the sigmoid colon and disrupts normal rectal motility. In addition, impaired rectal wall function and reduced distensibility lower rectal capacity. As a result, even small volumes of stool can raise intrarectal pressure and trigger the sensation of urgency.[22,23] Chronic inflammation may cause thickening of the muscularis mucosae and increased submucosal fibrosis, which can impair rectal wall compliance and contribute to the development of BU.[24] Although previous studies have suggested that achieving BU remission may be associated with endoscopic remission,[25] our findings indicate that histologic remission may better reflect true resolution of inflammation at the tissue level and thus serve as a more reliable marker for symptom control. Although current treatment guidelines, such as STRIDE-II, define endoscopic remission as the primary therapeutic target,[26] emerging evidence suggests that histological remission is associated not only with improved clinical outcomes in UC[27] but also with a reduction in BU, thereby enhancing patients' quality of life. As such, histological remission may represent a meaningful future therapeutic target.

Stool form also played an important role in the expression of BU. Patients in the BU-A group had significantly looser stools than those in the BU-R group (mean BSFS 4.7 ± 1.5 vs 3.6 ± 1.3, $P < 0.001$), paralleling a higher inflammatory burden (mean NI 2.5 ± 1.2 vs 1.3 ± 1.2, $P < 0.001$). In active inflammation, stool consistency becomes looser and stool weight increases, likely due to exudation from the inflamed epithelium, increased mucus secretion, and reduced fluid and electrolyte absorption.[28] Looser stool forms often reflect shorter colonic transit times and higher water content, which can overwhelm rectal capacity, especially in inflamed or hypersensitive mucosa, thereby triggering urgency.[8,17,28,29] Monitoring stool type may therefore be a valuable tool in assessing the presence and severity of BU.

Importantly, our data revealed that BU can persist despite histological remission and normal stool patterns. Notably, 60% of patients in the BU-A group had normal stools (Bristol types 3–5),[30] and a small subset even met histologic remission criteria. This disconnect suggests that the pathogenesis of BU involves factors beyond inflammation and stool form. Potential contributors include residual low-grade inflammation, altered rectal compliance, anorectal hypersensitivity, and psychosocial influences, which may account for the persistence of BU despite formed stools.

The potential contribution of topical therapy in these patients also warrants further investigation. A prospective study found that both active and quiescent UC patients have reduced rectal compliance compared to healthy controls.[31] This finding implies that UC may be a progressive condition and that decreased rectal compliance might not fully normalize even after inflammation is controlled, although effective disease management could potentially improve compliance. Another possible explanation is that anal sphincter fatigability and altered brain-gut signaling may persist after inflammatory control is achieved.[32–34] These observations challenge the paradigm that resolution of inflammation alone is sufficient to alleviate all UC symptoms and underscore the need for a broader evaluation of persistent symptoms like BU.

The persistence of BU despite remission further highlights the importance of psychosocial and functional factors. Negative emotions such as anxiety and stress may exacerbate BU by heightening visceral sensitivity through the brain-gut axis—a complex, bidirectional system involving interactions between neuroendocrine pathways, the autonomic nervous system, and the gastrointestinal tract.[32,34] Prior studies have shown that BU causes significant embarrassment, fear of incontinence, and avoidance of social activities, compounding the psychosocial burden of UC.[34] Recently, the IBD Disk has been shown to correlate with depression and anxiety and to identify patients at risk of adverse outcomes at IBD diagnosis.[35] In our cohort, patients in the BU-A group had significantly higher IBD Disk scores across nearly all dimensions, including abdominal pain, defecation control, sleep, energy, emotion, body image, and interpersonal relationships. A decline in quality of life may contribute to anxiety or depression, which in turn can indirectly worsen BU via the brain-gut axis. The IBD Disk appears to capture much of this impact and may serve as a surrogate marker of urgency-related disability. This raises the possibility that the Urgency NRS could be integrated into future versions of the IBD Disk or other PRO instruments.

This study has several strengths and limitations. To our knowledge, this is the first study to comprehensively investigate the associations between BU and multiple clinical parameters in patients with UC, including clinical disease activity, endoscopic and histologic findings, stool patterns, and health-related quality of life assessed using the validated IBD Disk. The integration of endoscopic and histologic assessments, combined with validated instruments such as the Urgency NRS, IBD Disk, and BSFS, strengthens the validity and reliability of our findings. Moreover, the balanced distribution of BU-A and BU-R groups, together with the application of standardized evaluation methods, further enhance the robustness of the results.

Several limitations should also be acknowledged. First, rectal compliance and anorectal function were not objectively assessed (eg, via manometry or defecography), which may limit our understanding of functional contributors to urgency. Second, although the IBD Disk provided valuable patient-centered data, urgency-specific patient-reported outcome measures (such as deferral time, leakage anxiety, or urgency frequency) were not included; incorporating such tools in future studies may yield additional insights. Third, fecal calprotectin data were not routinely available, as the test is not covered by national health insurance and requires self-payment, which reduced sample availability and may have limited our ability to evaluate correlations between fecal calprotectin and BU. Finally, this was a single-center study with a relatively small sample size, which may restrict the generalizability of our findings to the broader UC population and real-world clinical settings.

Recently, BU has been increasingly recognized as a key symptom in UC and is being recommended as a core outcome measure in clinical trials,[20,36] including incorporation into PRO assessments.[37] Clinical trials of mirikizumab have also included BU as an important endpoint for evaluating patient outcomes in UC.[38] Emerging evidence suggests that intestinal ultrasound may aid in detecting subtle, chronic alterations in rectal wall morphology—such as increased thickness or vascularity—providing a non-invasive method to assess transmural involvement that could contribute to persistent symptoms.[39]

In this study, histological inflammation and loose stool form were identified as independent predictors of BU. Notably, a substantial proportion of patients continued to experience BU despite achieving histological remission or having normal stool form, indicating a multifactorial origin beyond inflammation alone. These findings underscore the need of recognizing BU as a key PRO in UC and incorporating its assessment into routine clinical practice to optimize patient care.

Ethics Approval and Informed Consent

This study was approved by the Institutional Review Board (IRB) of the Chang Gung Medical Foundation (approval number: 202400030B0). All study procedures involving human participants complied with the ethical standards of the institutional or national research committee and the principles of the Declaration of Helsinki.

Consent for Publication

Written informed consent was obtained from all participants for inclusion in the study. No identifiable personal data, images, or recordings are included in this manuscript.

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Author Contributions

All authors made substantial contributions to the work reported, including, but not limited to, the conception and design of the study, execution, data acquisition, analysis, and interpretation. All authors participated in drafting, revising, or critically reviewing the manuscript; approved the final version for publication; agreed on the target journal for submission; and accepted responsibility for the integrity and accuracy of all aspects of the work.

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Disclosure

The authors declare no financial disclosures or conflicts of interest in this work.

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