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Prevalence and Influencing Factors of Fatigue in Patients with Inflammatory Bowel Disease: A Cross-Sectional Study

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Abstract: *Objective*: To investigate the prevalence of fatigue and identify its associated influencing factors in patients with inflammatory bowel disease (IBD), thereby providing an evidence base for targeted clinical interventions. *Methods*: A cross-sectional survey design was adopted. A total of 204 patients with confirmed IBD diagnoses were consecutively enrolled from the gastroenterology outpatient clinics and inpatient wards of a tertiary-level hospital in Shiyan, Hubei Province, China, between June 2023 and June 2024. Fatigue was assessed using the IBD-Fatigue (IBD-F) scale. Sociodemographic characteristics, disease-related parameters, inflammatory biomarkers, and psychological status were simultaneously collected. Univariable analyses and multivariable logistic regression were performed to identify independent determinants of fatigue. *Results*: Among the 204 enrolled IBD patients, 142 (69.61%) had fatigue (IBD-F ≥ 13). Univariable analyses revealed that sex, disease activity status, anemia, C-reactive protein (CRP) level, serum albumin level, sleep quality, anxiety, and depression were significantly associated with fatigue occurrence (all $p < 0.05$). Multivariable logistic regression identified active disease phase (OR = 3.12, 95% CI: 1.54–6.31, $p = 0.002$), comorbid anemia (OR = 2.87, 95% CI: 1.42–5.80, $p = 0.004$), elevated CRP (OR = 2.43, 95% CI: 1.21–4.88, $p = 0.013$), poor sleep quality (OR = 2.19, 95% CI: 1.10–4.36, $p = 0.026$), and comorbid depression (OR = 3.56, 95% CI: 1.76–7.19, $p = 0.001$) as independent risk factors for fatigue; serum albumin ≥ 35 g/L was identified as a protective factor (OR = 0.48, 95% CI: 0.24–0.96, $p = 0.037$). Fatigue was significantly and negatively correlated with health-related quality of life ($r = -0.61$, $p < 0.001$). *Conclusion*: The prevalence of fatigue in IBD patients is as high as 69.61%, and it is independently associated with disease activity, elevated inflammatory markers, anemia, sleep disturbance, and depression, significantly impairing patients' quality of life. Routine fatigue screening and comprehensive multidimensional management strategies should be integrated into standard IBD care.

Keywords: Inflammatory bowel disease; Fatigue; Influencing factors; Cross-sectional study

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1. Introduction

Inflammatory bowel disease (IBD), encompassing Crohn's disease (CD) and ulcerative colitis (UC), is a chronic, systemic inflammatory disorder of the gastrointestinal tract characterized by relapsing and remitting intestinal inflammation. In recent decades, the global incidence and prevalence of IBD have risen substantially, posing a considerable burden on patients, healthcare systems, and society [1]. Fatigue is among the most commonly reported symptoms in IBD patients, with a reported prevalence of 47–72% [2]. Notably, 40–50% of patients in clinical remission continue to experience clinically significant fatigue, severely impairing their capacity for work, education, and daily functioning [2].

Despite its high burden, fatigue has historically received insufficient clinical attention in the context of IBD, often being dismissed as a secondary manifestation of disease activity. However, fatigue in IBD patients should be regarded as an independent symptom that may persist even during clinical remission, with a multifactorial and complex pathophysiology spanning multiple organ systems [3]. International research has demonstrated that the association between fatigue and disease activity is not absolute; rather, lifestyle factors, psychological status, sleep quality, and numerous other variables may all contribute to fatigue [4]. Epidemiological data on IBD-related fatigue in China remain sparse, and systematic investigations are insufficient.

The IBD-Fatigue (IBD-F) scale, developed by Czuber-Dochan et al., demonstrates high reliability and validity and has been validated and applied across multiple countries [5–9]. However, its application in Chinese IBD populations has been limited. Therefore, this study employed the IBD-F scale to systematically investigate the prevalence and influencing factors of fatigue in IBD patients, with the aim of providing an evidence base for clinically targeted interventions.

2. Methods

2.1. Study design and participants

A convenience sampling approach was used to enroll IBD patients attending the gastroenterology inpatient ward and outpatient clinic of a tertiary-level hospital in Shiyan City, Hubei Province, China, from June 2023 to June 2024.

2.1.1. Inclusion criteria

(1) Diagnosis of IBD in accordance with the 2018 Chinese Society of Gastroenterology consensus guidelines [1];
(2) Age ≥ 18 years;
(3) Confirmed diagnosis for ≥ 3 months;
(4) Intact consciousness with normal reading and comprehension ability; and
(5) Provision of written informed consent and voluntary participation.

2.1.2. Exclusion criteria

(1) Concurrent gastrointestinal malignancy or other malignant tumors;
(2) Coexistence of other major diseases known to cause fatigue (e.g., hypothyroidism, chronic renal failure, congestive heart failure);
(3) Currently undergoing chemotherapy or radiotherapy;

(4) Pregnancy or lactation;
(5) History of blood transfusion within the preceding month; and
(6) Incomplete questionnaire completion.

2.2. Instruments

(1) General information questionnaire

A researcher-designed questionnaire collected sociodemographic data, including sex, age, marital status, education level, occupational status, monthly household income, and type of health insurance.

(2) Disease-related data

Information collected included IBD subtype (CD/UC), disease duration, disease activity status, medication use (corticosteroids, immunosuppressants, and biologics), surgical history, and laboratory parameters (hemoglobin, serum albumin, CRP). Disease activity was assessed using the Harvey-Bradshaw Index (HBI) for CD and the Mayo Score for UC; scores ≥ 5 (CD) or ≥ 3 (UC) were classified as active disease.

(3) IBD-fatigue (IBD-F) scale

The IBD-F was developed in the United Kingdom by Czuber-Dochan et al. [5] in 2014, based on semi-structured interviews with IBD patients, and is specifically designed to assess fatigue in this population. The validated Chinese version, translated by Wang Qian et al., comprises three parts: Part 1 (5 items) and Part 2 (30 items) are scored on a 0–4 Likert scale, with higher scores indicating greater fatigue and greater impact on daily activities; Part 3 consists of 5 open-ended questions and is not included in scoring. A Part 1 total score ≥ 13 was used to define the presence of fatigue; scores of 13–19, 20–29, and ≥ 30 were classified as mild, moderate, and severe fatigue, respectively. The Chinese version demonstrates excellent psychometric properties, with a Cronbach's α of 0.966 and a test-retest reliability coefficient of 0.850 [10].

(4) Pittsburgh sleep quality index (PSQI)

The PSQI comprises 19 self-reported items with a total score range of 0–21; a score > 7 indicates poor sleep quality. The scale has been widely validated in Chinese populations and demonstrates good reliability and validity [11].

(5) Patient health questionnaire-9 (PHQ-9)

The PHQ-9 consists of 9 items with a total score range of 0–27; a score ≥ 10 indicates clinically significant depression. The PHQ-9 has been validated in IBD populations with favorable psychometric properties [12].

(6) Generalized anxiety disorder-7 (GAD-7)

The GAD-7 consists of 7 items with a total score range of 0–21; a score ≥ 10 indicates clinically significant anxiety. It demonstrates good reliability and validity in IBD patients [12].

2.3. Data collection

Data were collected by trained researchers using a combination of face-to-face interviews and self-administered questionnaires. Hospitalized patients were surveyed at least 48 hours after admission; outpatients were surveyed at the time of their clinic visit. Questionnaires were distributed and retrieved on-site. Where necessary, researchers provided item-by-item clarification without guiding responses. A total of 220 questionnaires were distributed, and 204 valid questionnaires were returned, yielding an effective

response rate of 92.73%. Laboratory parameters, including CRP, ESR, hemoglobin, albumin, and fecal calprotectin, were extracted from patients' medical records.

2.4. Statistical analysis

All data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables conforming to normal distribution were expressed as mean ± standard deviation (SD) and compared between groups using independent-samples *t*-tests. Categorical variables were expressed as frequencies and percentages (%) and compared using chi-squared (χ^2) tests or Fisher's exact test as appropriate. Variables with $p < 0.05$ in univariable analyses were entered into multivariable logistic regression using a stepwise backward elimination method. The presence or absence of fatigue served as the dependent variable (fatigue = 1, no fatigue = 0); odds ratios (ORs) and their 95% confidence intervals (CIs) were calculated. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Participant characteristics

A total of 204 IBD patients were enrolled. The sample comprised 98 males (48.04%) and 106 females (51.96%), with ages ranging from 18 to 72 years (mean ± SD: 38.42 ± 12.16 years). CD was diagnosed in 123 patients (60.29%) and UC in 81 patients (39.71%). Disease duration ranged from 1 to 22 years (mean ± SD: 5.84 ± 4.37 years). Sixty-four patients (31.37%) had active disease, and 140 (68.63%) were in remission. Seventy-nine patients (38.73%) had concurrent anemia; 71 (34.80%) had elevated CRP (> 8 mg/L); 58 (28.43%) had serum albumin < 35 g/L; 96 (47.06%) had poor sleep quality (PSQI > 7); 81 (39.71%) had comorbid depression (PHQ-9 ≥ 10); and 74 (36.27%) had comorbid anxiety (GAD-7 ≥ 10).

3.2. Prevalence and severity of fatigue

The mean IBD-F total score for all 204 patients was 18.37 ± 8.24. One hundred and forty-two patients (69.61%) had IBD-F scores ≥ 13 and were classified as fatigued. Among the 142 fatigued patients, 68 (47.89%) had mild fatigue (IBD-F 13–19), 51 (35.92%) had moderate fatigue (IBD-F 20–29), and 23 (16.20%) had severe fatigue (IBD-F ≥ 30). Thus, moderate-to-severe fatigue (IBD-F ≥ 20) was present in 74 patients, representing 52.11% of the fatigued cohort.

The mean IBD-F score in the fatigue group was 23.81 ± 7.43, compared with 8.16 ± 3.29 in the non-fatigue group ($t = 14.27$, $p < 0.001$). Fatigue prevalence was 72.36% (89/123) in CD patients and 65.43% (53/81) in UC patients; the difference between subtypes was not statistically significant ($\chi^2 = 1.24$, $p = 0.265$). Fatigue was significantly and negatively correlated with health-related quality of life ($r = -0.61$, $p < 0.001$).

3.3. Univariable analysis of factors associated with fatigue

Univariable analyses were performed with fatigue status (IBD-F ≥ 13) as the dependent variable. Results are presented in **Table 1**. Sex ($\chi^2 = 4.38$, $p = 0.036$), disease activity ($\chi^2 = 18.76$, $p < 0.001$), anemia ($\chi^2 = 16.43$, $p < 0.001$), elevated CRP ($\chi^2 = 12.87$, $p < 0.001$), serum albumin level ($\chi^2 = 9.54$, $p = 0.002$), poor sleep quality ($\chi^2 = 21.34$, $p < 0.001$), depression ($\chi^2 = 26.82$, $p < 0.001$), and anxiety ($\chi^2 = 14.56$, $p < 0.001$) were all significantly associated with fatigue (all $p < 0.05$). Age, IBD subtype, disease duration, corticosteroid use, biologic agent use, education level, and surgical history showed no statistically significant association with

fatigue (all $p > 0.05$).

Table 1. Univariable analysis of factors associated with fatigue in IBD patients (n = 204)

Variable	Fatigue group (n = 142), n (%)	Non-fatigue group (n = 62), n (%)	t/χ^2	*p*
Sex			4.38	0.036
Female (n = 106)	82 (77.36)	24 (22.64)		
Male (n = 98)	60 (61.22)	38 (38.78)		
Age (years, mean ± SD)	39.14 ± 12.53	36.89 ± 11.24	1.12	0.264
Education level			1.87	0.393
Middle school or below (n = 48)	35 (72.92)	13 (27.08)		
High school/vocational (n = 71)	51 (71.83)	20 (28.17)		
College or above (n = 85)	56 (65.88)	29 (34.12)		
IBD subtype: CD (n = 123)	89 (72.36)	34 (27.64)	1.24	0.265
Disease duration (years, mean ± SD)	6.12 ± 4.51	5.23 ± 4.05	1.24	0.218
Active disease phase (n = 64)	57 (89.06)	7 (10.94)	18.76	< 0.001
Surgical history (n = 37)	30 (81.08)	7 (18.92)	2.06	0.151
Anemia (n = 79)	67 (84.81)	12 (15.19)	16.43	< 0.001
Elevated CRP (n = 71)	60 (84.51)	11 (15.49)	12.87	< 0.001
Serum albumin < 35 g/L (n = 58)	49 (84.48)	9 (15.52)	9.54	0.002
Corticosteroid use (n = 52)	40 (76.92)	12 (23.08)	2.18	0.140
Biologic agent use (n = 46)	30 (65.22)	16 (34.78)	1.03	0.310
Poor sleep quality (PSQI > 7, n = 96)	82 (85.42)	14 (14.58)	21.34	< 0.001
Depression (PHQ-9 ≥ 10, n = 81)	70 (86.42)	11 (13.58)	26.82	< 0.001
Anxiety (GAD-7 ≥ 10, n = 74)	62 (83.78)	12 (16.22)	14.56	< 0.001

3.4. Multivariable logistic regression analysis of factors associated with fatigue

Fatigue status served as the dependent variable (fatigue = 1, no fatigue = 0). The eight variables achieving $p < 0.05$ in univariable analysis, including sex, disease activity, anemia, elevated CRP, serum albumin level, poor sleep quality, depression, and anxiety, were entered as independent variables into multivariable logistic regression using a stepwise backward elimination method. Variable coding is presented in **Table 2**, and regression results are shown in **Table 3**.

Table 2. Variable coding for multivariable logistic regression analysis

Variable	Coding
Fatigue (dependent variable)	Present = 1, Absent = 0
Sex	Female = 1, Male = 0
Disease activity	Active phase = 1, Remission = 0
Anemia	Present = 1, Absent = 0
Elevated CRP (> 8 mg/L)	Yes = 1, No = 0
Serum albumin	< 35 g/L = 1, ≥ 35 g/L = 0
Sleep quality	Poor (PSQI > 7) = 1, Good (PSQI ≤ 7) = 0
Depression	Present (PHQ-9 ≥ 10) = 1, Absent = 0
Anxiety	Present (GAD-7 ≥ 10) = 1, Absent = 0

Table 3. Multivariable logistic regression analysis of factors associated with fatigue in IBD patients

Variable	β	SE	Wald χ^2	*p*	OR	95% CI
Active disease phase	1.14	0.36	10.03	0.002	3.12	1.54–6.31
Anemia	1.05	0.36	8.51	0.004	2.87	1.42–5.80
Elevated CRP	0.89	0.36	6.12	0.013	2.43	1.21–4.88
Poor sleep quality	0.78	0.35	4.96	0.026	2.19	1.10–4.36
Depression	1.27	0.36	12.43	0.001	3.56	1.76–7.19
Serum albumin ≥ 35 g/L	-0.73	0.35	4.35	0.037	0.48	0.24–0.96
Constant	-1.32	0.42	9.88	0.002	—	—

Multivariable logistic regression identified active disease phase (OR = 3.12, 95% CI: 1.54–6.31, $p = 0.002$), comorbid anemia (OR = 2.87, 95% CI: 1.42–5.80, $p = 0.004$), elevated CRP (OR = 2.43, 95% CI: 1.21–4.88, $p = 0.013$), poor sleep quality (OR = 2.19, 95% CI: 1.10–4.36, $p = 0.026$), and comorbid depression (OR = 3.56, 95% CI: 1.76–7.19, $p = 0.001$) as independent risk factors for fatigue in IBD patients. Serum albumin ≥ 35 g/L was identified as a protective factor against fatigue (OR = 0.48, 95% CI: 0.24–0.96, $p = 0.037$).

4. Discussion

4.1. High prevalence of fatigue in IBD patients

The present study found a fatigue prevalence of 69.61% among 204 IBD patients, which exceeds the overall fatigue rates of 26.4%–54% reported in the systematic review by Radford et al. [4]. This discrepancy may be attributed to the higher proportion of patients with active disease in our sample (31.37%) and the fact that patients were recruited exclusively from tertiary-level medical centers, where disease severity tends to be greater. In comparison with domestic literature, our findings are slightly lower than the 89.6% fatigue rate in Chinese IBD patients reported by Wang et al. [13]. Notably, moderate-to-severe fatigue (IBD-F ≥ 20) was present in 74 patients (52.11% of the fatigued cohort), indicating that a substantial proportion of IBD patients bear a significant fatigue burden, consistent with the assertion by Czuber-Dochan et al. that fatigue is among the most distressing symptoms experienced by IBD patients [5].

4.2. Disease activity as the primary determinant of fatigue

In the present study, the fatigue prevalence among patients with active disease was 89.06% (57/64), significantly higher than the 60.71% (85/140) observed in patients in remission; active disease was confirmed as an independent risk factor for fatigue (OR = 3.12). During active disease, intestinal inflammation drives the excessive release of pro-inflammatory cytokines (including TNF-α, IL-6, and IL-1β), which traverse the blood-brain barrier to act on the central nervous system, inducing “sickness behavior” manifested as fatigue, somnolence, and cognitive impairment [14]. Remarkably, 60.71% of patients in clinical remission still experienced fatigue, higher than the 41–48% remission-phase fatigue rate reported by Czuber-Dochan et al. [15]. This suggests that IBD-related fatigue operates through mechanisms independent of disease activity, potentially involving intestinal dysbiosis and gut-brain axis dysfunction [14], warranting further investigation.

4.3. Anemia and inflammatory biomarkers as key biological determinants

Both comorbid anemia (OR = 2.87) and elevated CRP (OR = 2.43) were identified as independent risk factors for fatigue, consistent with international research findings [16]. The prevalence of anemia in our IBD

cohort was 38.73%, attributable primarily to impaired iron absorption, hepcidin elevation driven by chronic inflammation, and gastrointestinal blood loss, resulting in insufficient oxygen delivery to tissues and a direct contribution to fatigue [14]. As a systemic inflammatory marker, elevated CRP reflects a state of persistent inflammation that affects the central nervous system through cytokine-mediated pathways. Conversely, serum albumin ≥ 35 g/L was identified as a protective factor (OR = 0.48), suggesting that adequate nutritional status contributes to reduced fatigue burden, a finding consistent with the conclusions of Tasson et al. [17].

4.4. Depression as the strongest psychological determinant

Multivariable analysis identified depression as the single most potent independent risk factor for fatigue in IBD patients (OR = 3.56), surpassing all other variables in magnitude. This is highly concordant with the findings of Emerson et al. in a cohort of 834 IBD patients, in which 59.8% of patients had comorbid depression closely associated with fatigue [18]. The relationship between fatigue and depression is bidirectional: depression exacerbates fatigue by disrupting sleep, reducing motivation for physical activity, and promoting neuroinflammation; conversely, persistent fatigue may precipitate or intensify depressive symptoms [19]. Notably, anxiety was statistically significant in univariable analysis ($\chi^2 = 14.56$, $p < 0.001$) but was eliminated in the multivariable model, suggesting that the effect of anxiety on fatigue may be partially mediated through depression.

4.5. Independent effect of sleep quality on fatigue

The prevalence of poor sleep quality (PSQI > 7) in this study was 47.06% (96/204), substantially higher than that observed in the general population, and poor sleep quality was confirmed as an independent risk factor for fatigue (OR = 2.19). Sleep disturbance in IBD patients typically arises from a combination of abdominal pain, nocturnal defecation, corticosteroid therapy, and comorbid anxiety and depression, with poor sleep quality further exacerbating fatigue in a vicious cycle. These findings suggest that sleep-targeted interventions, including sleep hygiene education and cognitive behavioral therapy for insomnia (CBT-I), should be incorporated into comprehensive fatigue management programs for IBD patients.

4.6. Limitations

This study has several limitations. First, convenience sampling from a single tertiary-level center may introduce selection bias and limit the generalizability of findings to the broader IBD population. Second, the cross-sectional design precludes causal inference; in particular, the temporal and bidirectional relationship between fatigue and depression requires confirmation through longitudinal studies. Third, certain nutritional parameters potentially relevant to fatigue, such as vitamin D levels and serum ferritin, were not collected.

5. Conclusion

The prevalence of fatigue in IBD patients is as high as 69.61%, with moderate-to-severe fatigue accounting for more than half of affected individuals; fatigue is significantly and negatively associated with health-related quality of life. Active disease phase, anemia, elevated CRP, poor sleep quality, and depression are independent risk factors for fatigue, while normal serum albumin (≥ 35 g/L) serves as a protective factor. Clinicians and nursing staff should incorporate routine fatigue screening into standard IBD management, with particular attention to patients in the active disease phase and those with comorbid anemia or psychological

disorders. Multidimensional, integrated intervention strategies focusing on inflammation control, anemia correction, sleep improvement, and psychological support should be implemented to alleviate the fatigue burden and improve quality of life in this patient population.

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Disclosure statement

The authors declare no conflict of interest.

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