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Understanding ulcerative colitis: Insights from locus of control, expressed emotion, and quality of life

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Abstract

Patients suffering from ulcerative colitis (UC) experience periods of remission and relapse that could affect their mental health. The study aimed to use logistic regression analysis in a novel way by incorporating locus of control (LOC), expressed emotion (EE), and quality of life (QOL) as predictors of UC. This study involved 100 individuals with UC and 100 healthy controls, focusing on LOC groups (internal, chance, powerful others), EE, and QOL. This model also helped to better understand how these psychological variables interact to predict the likelihood of a UC diagnosis. The results revealed all significant predictors. EE corelates positively with UC probability (Estimate: 0.191, $p < 0.001$), whereas QOL corelates inversely (Estimate: −0.150, $p < 0.001$). The model had a classification accuracy of 82.5%. While trends in LOC groups warrant further exploration, the model contributes to understanding psychological risk factors in UC. This research suggests the potential use of these factors as predictive markers. It adds to the existing literature on how psychological factors influence health results, offering practical implications for clinical care and guiding future investigations to improve the management and comprehension of UC.

Keywords: Expressed emotions; Locus of control; Psychological variables; Quality of life; Regression analysis; Ulcerative colitis

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1. Introduction

Ulcerative colitis (UC) is a form of inflammatory bowel disease (IBD) with an unclear etiology. It is a chronic, recurrent, remitting, and potentially progressive disease characterized by inflammation that is limited to the mucosa of the colon and rectum.[1,2] There is diffusion of the friability and superficial erosions on the colon

wall, often accompanied by bleeding.[3,4] Endoscopically, mild-to-moderate UC is defined as mucosal erythema, decreased or absent vascularization, friability, and erosions.[5] In the United States of America, more than a quarter-million people suffer from this condition.[6] Although the specific cause of IBD is not known, scientists suggest that genetics, family history, and independent risk factors play a major role. Clinical and demographic elements are crucial in assessing disease progression and patient management.[7] The goal of treatment is to achieve disease remission, prevent disease-related complications such as infection, surgery, and neoplasia, as well as preserve patients' quality of life (QOL).[8] In addition, the aim of treatment is to achieve endoscopic and histological remission.[9]

Studies indicate that patients with UC often experience psychological issues, which can significantly impact their recovery and response to treatment.[10] These issues may stem from dietary changes, medication effects, healthcare experiences, depression, and anxiety due to improper functioning of the body. Thus, it becomes critical to understand the behavioral underpinnings of patient's health, leading to poor QOL and to what extent patients feel they have control over their disease. The concept of locus of control (LOC) refers to the degree to which an individual believes their actions influence life events. Those who believe they have control over outcomes exhibit an internal LOC, whereas those who attribute control to external factors have an external LOC.[11] UC has phases of relapse and remission.[12] According to Goddard,[13] relapse rates are high for many forms of psychopathology, placing significant emotional tolls on both patients and their families. Thus, it is important to identify high-risk patients for relapse after remission. A greater understanding of the risk factors helps in the development of more effective interventions. One important psychological factor influencing relapse is expressed emotion (EE). Research indicates that psychological variables not only affect the structure and function of the brain but also influence the timing of gene expression.[14,15] Empirical data show that EE is one of the important psychological stressors that show a direct association with the recurrence of the illness.[16] Studies show that LOC and EE are significantly associated, particularly with an internal LOC. Individuals with a high internal LOC believe that they are accountable for the results of their actions and, as a result, perceive greater control over reinforcements.[17]

Literature related to QOL, LOC, and EE have been explored in many different psychological issues but not related to UC. Most research on LOC and EE has focused on mental illnesses, such as schizophrenia.[18-21] It would be beneficial to understand how these constructs affect individuals with UC. UC patients often report fatigue, sleep disturbances, unable to perform daily activities, and feelings of inadequacy in completing their daily chores, or taking part in leisure activities.[22] Many patients worry about surgery and the potential risk of developing cancer. Several studies collectively support the idea that heightened stress perception increases the risk for symptom relapse.[23-26] Even during remission, overall well-being remains affected, as individuals with UC experience poor general health, indicating a major burden of disease and persistent negative symptoms.[17] Thus, not only physical health but also psychological, emotional, and social aspects of daily life are affected.[27] Few studies were found on QOL during severe exacerbations and following surgery.[28-30] Many studies focused on stress, anxiety, and depression.[24-26] Studies have shown that stress triggers the release of cytokines, which activate the immune system and lead to inflammation.[31] The brain-gut axis interaction has also been studied extensively. The brain-gut axis is a complicated, bidirectional system that includes numerous connections between the gastrointestinal tract, autonomic nervous system, and neuroendocrine pathways. Research shows that brain-gut interactions affect psychological well-being and symptom reporting in functional gastrointestinal disorders. Anxiety or depression has been associated with the development of new-onset gastrointestinal symptoms, while the presence of gastrointestinal symptoms has been associated with the *de novo* development of psychological disorders.[32] There are insufficient data to determine whether psychological disorders are caused by disease activity or factors that contribute to the occurrence of IBD. Furthermore, the precise mechanisms by which depression, anxiety, and cognitive dysfunction may manifest in these patients remain unclear. Commonly, both UC and Chron's disease follow a pattern of exacerbations and remissions. Studies suggest that between 25% and 50% of patients experience a relapse within 1 year.[33] Hence, the study of QOL, LOC, and EE in individuals with UC may provide an insight for developing psychotherapeutic treatment modalities aimed at reducing disease symptoms and restoring mental health.

2. Materials and methods

2.1. Materials

The Multidimensional Health LOC scales were used to assess individuals' perceptions of control over their health outcomes. The widely utilized Forms A and B were initially introduced by Wallston, Wallston, and DeVellis in 1978, while Form C is designed for condition-specific assessments. The scale shows strong internal consistency and stability over time. In addition, the validity of the

scales has been confirmed through extensive research and application in various healthcare contexts.

The Family Emotional Involvement and Criticism Scale (FEICS)-II was also used. Developed by Cleveland G. Shields, this self-report tool assesses emotional involvement and criticism within familial relationships, making it crucial for evaluating EE in family dynamics. FEICS-II demonstrates high reliability (Cronbach's alpha > 0.80) and robust concurrent validity ($p < 0.001$). The questionnaire contains 14 belief statements related to family experiences, with responses given on a five-point scale ranging from "Almost Never" to "Almost Always." The emphasis on the absence of right or wrong answers fosters an open and supportive research environment.

QOL Scale designed by Sarika Sharma and Dr. Nakhat Nasreen was employed in this study. This scale has 42 statements (34 positive and 8 negative), scored on a three-point scale. Every question has three responses – "Always," "Seldom," "Never." The scale has a reliability coefficient of 0.80.

2.2. Participant selection and study criteria

The study encompassed a cohort of 200 Indian participants, selected using a purposive sampling technique. The sample included 100 UC patients (mild-to-moderate) and 100 healthy individuals with no major disease – specifically, non-UC, non-diabetic, and no other major disease related to heart, kidney, gastrointestinal system, brain, or psychiatric issues. Patients who had undergone surgery for UC or had severe UC were excluded. In addition, individuals with major health or psychiatric issues were excluded. Mild-to-moderate UC was defined as patients with <4 – 6 bowel movements per day, mild or moderate rectal bleeding, and a low overall inflammatory burden.[34] Each group had an equal number of 50% male and 50% female participants, aged 30 – 50 years. While UC can affect individuals at any age, it has peak onset periods between 15 – 30 years and 50 – 70 years.[6] Therefore, patients with mild-to-moderate symptoms were selected for this age group. After 50 years, factors, such as the aging process and hormonal changes in women could potentially interfere with the study outcomes.

The patients of mild-to-moderate UC were recruited from three hospitals in the Nagpur region, with diagnoses confirmed through colonoscopy and tissue biopsy. Disease staging was determined by a gastroenterologist based on signs of inflammation in the colon and other symptoms. All UC patients in this study adhered to a non-spicy, non-oily, home-prepared diet due to their condition. They were also prescribed Mesalazine 1200 (Vegaz OD 1.2 g) and took it on a regular basis. The participants represented diverse socioeconomic status, from both urban and rural residential areas, thus providing a comprehensive representation across different living conditions.

2.3. Data collection procedure

A pencil-paper questionnaire was given to the participants. The study, focusing on LOC, EE, and QOL, was explained to the participants. They were informed that the purpose of the questionnaire was to collect particular data regarding their perceived ability to control influencing factors in their lives and how these factors affect their overall life. Before the questionnaire, participants signed an informed consent form, indicating their voluntary participation. They were given a maximum of 45 min to complete the entire questionnaire and were assured that all data and answers gathered would remain confidential. In addition, they were made fully aware of their unrestricted right to refuse participation or withdraw from the study at any time, without providing a reason. Only individuals diagnosed with UC through colonoscopy and histological standards were included.

The questionnaire was distributed to 236 participants in total, and 208 forms were returned, yielding an 88% response rate. However, some responses were incomplete and, as a result, excluded in this study. Ultimately, 200 participants' responses were included in the study, providing comprehensive and useful data.

2.3.1. Demographic details of UC and non-UC individuals

Figure 1 shows the demographic features of UC patients. The age group of 40 – 44 years accounted for the largest proportion (39%), followed by 45 – 49 years (28%), 35 – 39 years (21%), and 30 – 34 years (12%). There was an equal distribution of males and females. Regarding socioeconomic status, 22% of participants were from the low-income group, 43% from the middle-income group, and 35% from the high-income group. Urban residents accounted for 81%, while 19% lived in rural areas. In terms of education, 56% were graduates, 35% were post-graduates, and 9% were undergraduates. Of these patients, 76% were married, 15% were single, and 9% were widowed. In addition, 86% of the participants were employed, while 14% were unemployed.

Figure 2 shows the demographic characteristics of non-UC individuals. The majority (36%) were in the 35 – 39 age groups, followed by 45 – 49 years (31%), 30 – 34 years (30%), and 40 – 44 years (3%). There was an equal distribution of males and females. Regarding socioeconomic status, 72% of participants were from the middle-income group, 12% from the high-income group, and 16% from the low-income group. Most participants (85%) were from urban areas, while few (15%) were from

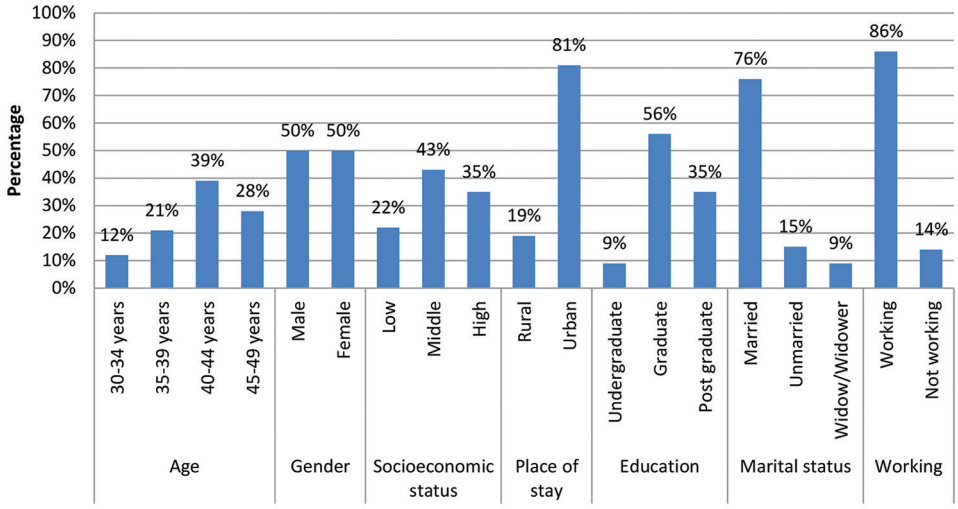


Figure 1. Demographic details of UC patients
Abbreviation: UC: Ulcerative colitis.

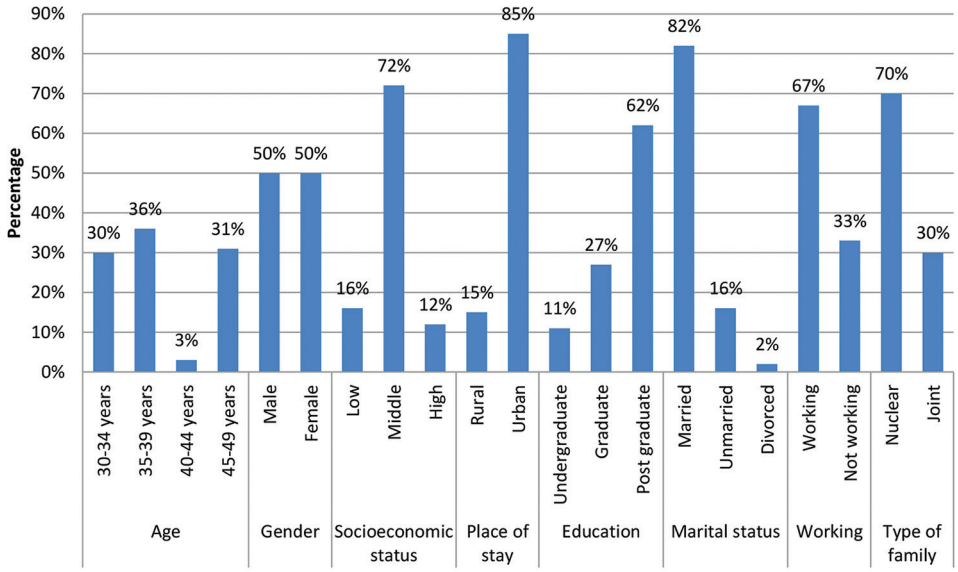


Figure 2. Demographic details of non-UC individuals
Abbreviation: UC: Ulcerative colitis.

rural areas. In terms of education, 27% were graduates, 62% were post-graduates, and 11% were undergraduates. Marital status distribution was 82% married, 16% unmarried, and 2% widowed. In addition, 67% were employed, while 33% were unemployed.

3. Results

3.1. Differences in EE, LOC, and QOL between UC and non-UC individuals

Figure 3 shows the EEs in UC and non-UC individuals (100 UC patients and 100 non-UC individuals). In the control group, 9 individuals exhibited a low level of EE, 85 individuals demonstrated a moderate level, and 6 individuals displayed a high level. In contrast, none of the UC patients demonstrated a low level; 73 individuals exhibited a moderate level, while 27 individuals displayed a high level of EE.

The Chi-square test yielded a statistically significant difference, $\chi^2(2) = 23.3$, $p < 0.001$ (Table 1). This result suggests a substantial difference in the distribution of EE levels between the two groups, indicating that UC patients are more likely to exhibit higher levels of EE compared to the control group.

Figure 4 shows the LOC in UC patients and non-UC individuals. In the control group, 69% reported an internal LOC, 7% attributed outcomes to chance, and 24% believed in powerful others' influence. Conversely, among UC patients, only 31% endorsed an internal LOC, while 40% attributed outcomes to chance, and 29% believed in powerful others' influence.

The Chi-square test indicated a significant association between LOC and UC, $\chi^2(2) = 38.1$, $p < 0.001$ (Table 2). These findings suggest that individuals with UC are more likely to attribute outcomes to external factors, such as chance or powerful others, rather than their own actions.

Figure 5 shows the QOL in UC and non-UC individuals. None of the individuals in either group fell into low or extremely low QOL categories. In the non-UC (control) group, 64 individuals exhibited an extremely high QOL, 20 individuals had a high QOL, 9 individuals demonstrated an above-average QOL, and 7 individuals displayed a below-average QOL. In contrast, among UC patients, only 14 demonstrated an extremely high QOL; 20 individuals exhibited an above-average QOL, and 66 displayed an average QOL.

The Chi-square test yielded a statistically significant result, $\chi^2(4) = 129$, $p < 0.001$ (Table 3). This result suggests a substantial difference in the distribution of QOL between the two groups, indicating that UC patients are more likely to have an average QOL, whereas the control group predominantly reported an extremely high QOL.

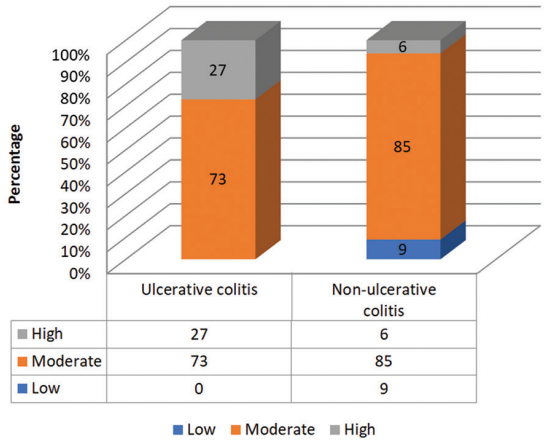


Figure 3. Expressed emotions in UC patients and non-UC individuals
Abbreviation: UC: Ulcerative colitis.

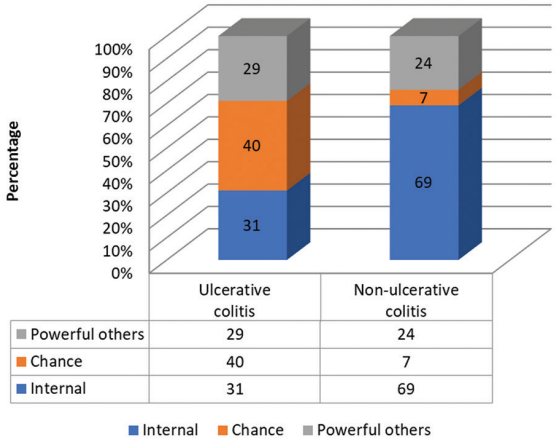


Figure 4. Locus of control in individuals with UC patients and non-UC individuals
Abbreviation: UC: Ulcerative colitis.

3.2. Predictive modeling of UC and the influence of EE, LOC, and QOL

Table 4 shows the results of binomial logistic regression, examining the factors influencing UC, focusing on LOC groups (internal, chance, powerful others), EE, and QOL. The logistic regression model aimed to elucidate the relationships among these psychological variables and their predictive value for UC.

The analysis revealed significant findings regarding predictors of UC. McFadden's pseudo $R^2 = 0.485$ indicates that approximately 48.5% of the variability in

Table 1. Chi-square test of expressed emotion distribution in UC and non-UC groups

	χ^2 tests		*p*-value
	Value	df	
χ^2	23.3	2	<0.001
n	200		

Abbreviation: df: Degrees of freedom.

Table 2. Chi-square test of locus of control distribution in UC and non-UC groups

	χ^2 tests		*p*-value
	Value	df	
χ^2	38.1	2	<0.001
n	200		

Abbreviation: df: Degrees of freedom.

Table 3. Chi-square test of quality of life distribution in UC and non-UC groups

	χ^2 tests		*p*-value
	Value	df	
χ^2	129	4	<0.001
n	200		

Abbreviation: df: Degrees of freedom.

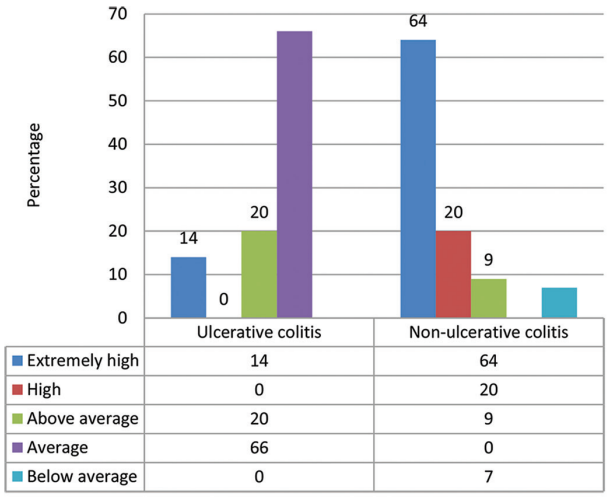


Figure 5. Quality of life in individuals with UC patients and non-UC individuals
Abbreviation: UC: Ulcerative colitis.

Table 4 . Binomial logistic regression

Model	Deviance			R^2_{MCF}
1	143			0.485
Predictor	**Estimate**	**SE**	**Z**	***p*-value**
Intercept	8.589	2.06	4.150	<0.001
EE	0.191	0.04	4.283	<0.001
QOL	−0.150	0.02	−6.417	<0.001
LOC				
Internal-powerful others	0.793	0.48	1.647	0.100
Internal chance	0.362	0.67	0.534	0.594
Prediction				
Observed	**Predicted**			**% Correct**
	Normal	**UC**		
Normal	81	19		81.0
UC	16	84		84.0
Predictive measures				
Accuracy	**Specificity**			**Sensitivity**
0.825	0.810			0.840

Abbreviations: R^2_{MCF}: McFadden's pseudo R^2, EE: Expressed emotion; QOL: Quality of life; LOC: Locus of control; SE: Standard error; Z: Z-score, UC: Ulcerative colitis.

UC diagnosis is accounted for the combined influence of LOC, EE, and QOL. The intercept, representing the log-odds of the control group (normal individuals) when all predictors are zero, was statistically significant (Estimate: 8.589, Standard error [SE]: 2.0697, Z: 4.150, $p < 0.001$). EE showed a positive association with UC (Estimate: 0.191, SE: 0.0447, Z: 4.283, $p < 0.001$), indicating that higher EE is linked to increased odds of UC. Conversely, QOL exhibited a negative association (Estimate: −0.150, SE: 0.0234, Z: −6.417, $p < 0.001$), suggesting that higher QOL is associated with reduced odds of UC. LOC groups "powerful others" – internal and chance – Internal showed intriguing trends. While "powerful others" – internal had a positive coefficient, it did not reach statistical significance at the 0.05 level (Estimate: 0.793, SE: 0.4815, Z: 1.647, $p = 0.100$). Similarly, chance – internal was not a significant predictor of UC odds (Estimate: 0.362, SE: 0.6787, Z: 0.534, $p = 0.594$).

The classification table, using a cut-off value of 0.5, demonstrated an overall accuracy of 82.5%, with high sensitivity (84.0%) and specificity (81.0%). These results highlight the model's efficacy in accurately classifying individuals with and without UC (Table 1). In summary, this analysis not only emphasizes the statistical significance of individual predictors, such as EE and QOL but also provides insights into their associations with UC. While further exploration is needed to understand trends within LOC groups, these findings contribute valuable insights into potential risk factors for UC by showcasing the intricate interplay between psychological variables and health outcomes.

4. Discussion

The purpose of this study was to introduce a novel approach by examining three variables – LOC, EE, and QOL – as an innovative methodology involving logistic regression analysis aimed to predict the likelihood of UC. While previous research has typically assessed these factors in isolation, this study was designed to reveal their combined impact on UC. The results of this investigation, involving 100 UC patients and 100 healthy individuals, reveal a significant relationship between psychological factors and the likelihood of UC diagnosis. Logistic regression was chosen as the most suitable method for identifying these associations, as it effectively highlights the statistical significance of predictors such as EE and QOL, while also providing interpretable insights into their associations with UC. While trends in LOC groups warrant further exploration, the model contributes to understanding psychological risk factors in UC. Intriguingly, the logistic regression model yielded a McFadden's pseudo R^2 value of 0.485, implying that around half the variability in UC can be explained by combined effects of LOC, EE, and QOL. Moreover, these findings suggest that these psychological variables may serve as potential negative prognostic indicators for the disease.

The association between UC and LOC has been a subject of many studies. For instance, Boye *et al.*[35] utilized various psychometric instruments to analyze the QOL related

to specific diseases in UC patients experiencing distress. Their findings revealed a notable relationship between personality traits and specific quality-of-life dimensions in UC patients. Notably, those with higher emotional function scores exhibited lower neuroticism levels, while those with higher social function scores demonstrated lower levels of social conformity.[36] Similarly, Bahmani and Mujemnari[37] revealed that children and adolescents with IBD (including UC) demonstrated a greater external LOC compared to their diabetic and healthy peers. This suggests a potential link between external LOC, the severity of physical illness, and the co-occurrence of psychiatric disorders among UC patients. These results highlight the importance of considering personality traits and perceived control when analyzing the psychosocial variables influencing coping mechanisms and QOL in UC patients.

Findings from UC studies demonstrate that self-conscious emotions, such as embarrassment and shame, play a significant role in the psychosocial impact of the disease. These emotions may lead to delays in seeking help and worsen health outcomes.[38] Qualitative methodologies, such as semi-structured interviews, have unveiled certain themes among UC patients – notably their lack of control and understanding. These findings underscore the importance of addressing self-conscious emotions during therapy and advocating for greater public awareness on invisible disabilities, such as IBD.[36] Furthermore, psychological and social factors influence pain perception in UC, with studies identifying the relationship between pain experience, QOL, psychological distress, coping styles, and familial reactions to pain communications.[39] In addition, individuals with UC exhibit changes in how they perceive physical sensations linked to emotions, showing variations in intensity during emotional events compared to healthy individuals. This suggests a modified emotional response linked to increased anxiety and depression levels in UC patients, even when in remission.[40] Studies on the QOL in UC have provided important insights into how the disease affects patients' overall well-being. Systematic reviews and meta-analyses have consistently shown that individuals with UC experienced a lower QOL than healthy individuals, in both adults and children.[41-43] Moreover, younger patients with IBD are much more likely to develop new mental health issues. Mental health remains one of the most neglected aspects of managing IBD.[44]

Moreover, among UC patients, QOL are typically lower when the disease is active compared to periods of remission.[39] In spite of these challenges, promising evidence indicates that QOL may improve over time, offering hope to individuals dealing with this chronic condition.[41] In addition, research has highlighted the impact of psychological factors, such as anxiety and depression, on QOL in patients with UC, stressing the significance of comprehensive approaches to patient care.[43] These results emphasize the complex characteristics of QOL in UC and highlight the importance of holistic treatments targeting both physical and psychological aspects to enhance patient well-being.

This research offers important insights into how LOC, EE, and QOL interact in cases of UC. It reveals their collective impact on UC diagnosis, with EE positively related to UC likelihood and QOL negatively associated. The nuanced trends observed in LOC groups suggest their relevance in understanding UC risk. While the findings support the significance of these psychosocial variables, they also offer novel insights into their combined effects on UC, emphasizing the need for holistic approaches in both clinical practice and research.

The study's cross-sectional design is a major drawback, as it cannot establish a causal relationship between psychological variables and UC, highlighting the need for longitudinal studies. The sample size may not be sufficient to capture the full diversity of the UC population, thus compromising generalizability. Relying on self-report measures introduces potential biases; future research could greatly benefit from incorporating more objective assessments. In addition, self-report measures are susceptible to response style effects, such as the respondent's propensity to choose extreme value on a rating scale, which is a well-established limitation. Delving into additional psychosocial and biological factors could further enhance the understanding of the etiology and prognosis of UC. While significant, these limitations point directly to specific areas for improvement, offering opportunities for better management and understanding of UC in future research initiatives.

5. Conclusion

This study contributes to the knowledge on UC by examining the collective impact of LOC, EE, and QOL on diagnosis. While previous studies have explored these factors individually, the findings underscore the need to consider their combined influence. Logistic regression analysis has revealed that the relationships between specific psychological factors and the likelihood of developing UC, implying their potential role to serve as predictive markers. However, some limitations exist, this study is cross-sectional, has a small sample size, and based on self-reported data. Despite these constraints, the results provide important insights on a novel perspective on UC pathogenesis. Future studies should use longitudinal approaches that integrate both psychological and biological

elements. Nevertheless, this study adds to the existing literature on how psychological factors influence health results, offering practical implications for clinical care and guiding future investigations to improve the management and comprehension of UC. This study does not claim direct causation but highlights trends that warrant future experimental and longitudinal studies. Despite its cross-sectional design, the associations found remain relevant for identifying potential psychological risk factors for UC. Interventions such as cognitive behavioral therapy, rational emotive behavior therapy, stress management, and mindfulness meditation may help mitigate stress, regulate negative emotions, and improve the overall QOL in UC patients.

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Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author contributions

Conceptualization: Shaini Suraj and Anand Prakash
Formal analysis: Shaini Suraj, Anand Prakash, and Pradeep Patil
Investigation: Shaini Suraj and Deepa Sangolkar
Methodology: Shaini Suraj, Anand Prakash, and Pradeep Patil
Writing – original draft: Shaini Suraj and Deepa Sangolkar
Writing – review & editing: Shaini Suraj, Anand Prakash, and Pradeep Patil

Ethics approval and consent to participate

The Institutional Ethical Committee (IEC DMMC) has confirmed that no ethical approval is required due to the nature of the study. Permission was taken from concerned authorities of the hospitals where the study was conducted. Full confidentiality was maintained by assigning a code to each participating patient's document. Data were stored with a security code. Informed consent has been taken on the consent form for participation in research and also consent to publication.

Consent for publication

An informed consent form was signed by all participants giving consent for publication.

Availability of data

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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