

Exploring the Impact of Trauma and Psychosocial Processes on the Quality of Life in Individuals Living with Inflammatory Bowel Disease

Heidi Glynn¹, Pragalathan Apputhurai², Gregory T. Moore^{3,4}, Simon R. Knowles^{1,5,6}

1) Department of Psychological Sciences, Faculty of Health, Arts and Design, Swinburne University of Technology, Melbourne;
2) Department of Health Sciences and Biostatistics, Swinburne University of Technology, Melbourne;
3) Monash Health, Melbourne;
4) School of Clinical Sciences, Monash University, Melbourne;
5) St Vincent's Hospital, Melbourne;
6) Gastroenterology Department, Royal Melbourne Hospital, Melbourne, Australia

ABSTRACT

Background & Aims: Post traumatic stress disorder (PTSD) is common in individuals with inflammatory bowel diseases (IBD). Living with a medical condition has been linked to the development of PTSD and to adversely impact patient outcomes. The aim of this study is to extend the common sense model (CSM) and evaluate trauma as an additional psychosocial process in the relationship between IBD symptoms and quality of life (QoL).

Method: A cross-sectional online study exploring trauma and IBD was performed.

Results: 68 (32.2%) of the sample met the criteria for PTSD. Of this trauma group, 37 (54.4%) reported IBD related trauma, 21 (30.9%) reported non-IBD related trauma and 10 (14.7%) did not identify the trauma type. A structural equation model (SEM) based upon the CSM was found to have an excellent fit ($\chi^2(3)=1.10$, $p=0.35$, RMSEA=0.02, SRMR=0.02, CFI=1.00, GFI=0.99). Results showed that trauma symptoms partially mediated the relationship between illness perceptions and QoL and fully mediated the relationship between maladaptive coping and QoL.

Conclusion: This study extended the CSM and found that trauma symptoms functioned as a mediator between IBD activity and QoL. These results highlight the need for a holistic approach including psychological assessment and intervention in IBD.

Key words: post-traumatic stress disorder – trauma – inflammatory bowel disease – common sense model.

Abbreviations: COPE: coping orientation to problems experienced; CSM: common sense model; GUTS: Gastrointestinal Unhelpful Thinking Scale; HTMT: Heterotrait-Monotrait; IBD: inflammatory bowel disease; IPQ: Illness Perception Questionnaire; PCA: principal component analysis; PCL-5: post-traumatic stress disorder checklist for DSM-5; PTS: post-traumatic stress; PTSD: post-traumatic stress disorder; QoL: quality of life; SEM: structural equation model.

Address for correspondence:

Simon R. Knowles

John Street, Hawthorn, Vic,
3122, Melbourne, Australia
sknowles@swin.edu.au

INTRODUCTION

Inflammatory bowel disease (IBD), of which Crohn's disease and ulcerative colitis are subtypes, are chronic relapsing inflammatory conditions impacting approximately 396 cases per 100,000 persons annually [1]. Symptoms of IBD include cramps, abdominal pain, severe bloody diarrhoea, tenesmus and fever, among other symptoms [2, 3]. Due to the unpredictability, severity and related complications (e.g., surgery and medication side effects), compared to healthy

controls, individuals with IBD report poorer quality of life (QoL) [4, 5] and increased psychological distress [6].

Reflecting the bi-directional nature of the brain-gut axis, stress, including post-traumatic stress (PTS) have been identified as a key process influencing digestive processes [7-9]. Further, living with a medical condition (such as IBD) is linked to the development of PTS [10-13], and subsequently, post-traumatic stress disorder (PTSD). In a recent systematic review, Glynn et al. [14] identified that the prevalence of PTSD across gastrointestinal cohorts was high, with 31% of individuals with inflammatory conditions (e.g., ulcerative colitis, Crohn's disease, gastro-oesophageal reflux disease, peptic disease) having PTSD. Recent qualitative studies highlight multiple sources of trauma in IBD cohorts, including not only the physical and psychological impact of IBD, but also diagnostic and surgical processes, lack of perceived support from medical professionals, along with medication effectiveness and associated side effects [10, 12]. Given that stress, including

Received: 15.04.2022

Accepted: 19.07.2022

psychological distress and PTS have been found to adversely impact IBD course [15-19], further research relating to PTS, potential psychosocial mediators of illness adjustment, and the impact on illness outcomes in IBD cohorts is needed.

One well-established psychosocial model of illness adjustment is the common sense model (CSM) [20]. Studies across multiple chronic illness conditions [21] including gastrointestinal cohorts [22-26] have provided evidence for the CSM, indicating that an individual's adaptation to illness (such as QoL) is mediated by their cognitive representation of their illness (e.g., illness perceptions and coping strategies). One of the reasons for the widespread application of the CSM is the ability for researchers to apply and extend the CSM. This flexible approach allows researchers to explore other potential psychosocial processes which may be relevant to illness adjustment.

In relation to the current study, as noted by Hayes et al. [25], two psychosocial factors that may also be relevant to illness adjustment in IBD cohorts are gastrointestinal-specific visceral anxiety and pain catastrophising. Studies involving gastrointestinal cohorts have found that visceral sensitivity was associated with increased gastrointestinal symptoms [27-30], greater psychological distress [23, 28-30], and poorer QoL [23, 27, 28]. Similarly, pain catastrophising has been found to predict visceral sensitivity and acceptance in gastrointestinal cohorts [27] and has also been found to be associated with poorer QoL [31].

To date, the CSM is a widely applied model of illness adaptation, including its application within IBD cohorts [25]. Despite this, no study has utilised the CSM to explore the potential impact of trauma on illness adjustment. Given this, the aim of the current study was to evaluate the mediating roles of psychosocial processes (illness perceptions, coping, gastrointestinal specific anxiety, pain catastrophising, trauma) on the relationship between IBD symptoms and QoL. It was hypothesised that trauma symptoms, illness perceptions, coping, gastrointestinal specific visceral anxiety, pain catastrophising and psychological distress will mediate the relationship between IBD symptoms and QoL.

METHODS

Patients were recruited via an advertisement in the Crohn's & Colitis Association newsletter. Inclusion criteria to participate were: (1) IBD diagnosis confirmed by a medical professional and (2) aged 18 years or above.

Disease Activity Assessment

For Crohn's disease, severity was assessed using the 3-item scale (PRO3-CD) [32]. The score range was 0-3, with higher scores indicating greater disease activity. Remission was defined as a score being ≤ 1 . For ulcerative colitis, disease severity was assessed using the 2-item disease severity scale (PRO2-UC) [33]. The score range was 0-3, with higher scores indicating greater disease activity. Remission was defined as rectal bleeding = 0 and absolute stool frequency is ≤ 2 . Based on the scales above, a standardised disease activity score (mean divided by standard deviation) was calculated. Ten patients were categorised in the indeterminate colitis category and

the PRO2-UC measurements were used to calculate disease activity.

Brief Illness Perception Questionnaire

Brief Illness Perception Questionnaire (Brief IPQ) [34] is an eight-item questionnaire exploring the emotional and cognitive representations of illness. Each item is assessed on an 11 point rating scale: 0 (not at all) – 10 (severely affects my life). Consistent with previous research [22, 35, 36], a principal component analysis (PCA) was conducted resulting in a 6 item scale: 'How much does your illness affect your life?', 'How much do you feel you have control over your illness?', 'How much do you think treatment can help your illness?', 'How much do you experience symptoms from your illness?', 'How concerned are you about your illness?' and 'How much does your illness affect you emotionally?'. Items were reverse coded as appropriate, then averaged, with higher scores indicating poorer illness perceptions. The six scale items had a strong internal consistency ($\alpha=0.81$) after removal of the following two items; 'How long do you think your illness will continue?' and 'How well do you feel you understand your illness?'.

Coping styles. Brief COPE

The Brief coping orientation to problems experienced (COPE) [37] is a 28-item questionnaire exploring the ways in which individuals tend to cope with a stressor. Traditionally, the brief COPE has 14 subscales, each scored using two sub-items, scored on a four-point rating scale: 0 (I haven't been doing this at all) – 3 (I've been doing this a lot). Consistent with the recommendations of Carver [37] a PCA was conducted resulting in two components which represented 42% of the variance and had strong component weights with item-if-deleted analyses.

The first component comprised 14 items and was identified as 'adaptive coping' and had a good fit and internal consistency ($\alpha=0.88$). Examples of items included: 'I've been concentrating my efforts on doing something about the situation I am in', 'I've been getting emotional support from others', 'I've been taking action to try to make the situation better'. Items were then averaged, with higher scores indicating greater levels of adaptive coping. The second component was identified as 'maladaptive coping' and comprised 9 items and had a good fit and internal consistency ($\alpha=0.81$), including: 'I've been saying to myself "this isn't real"', 'I've been saying things to let my unpleasant feelings escape', 'I've been giving up the attempt to cope'. Items on both subscales were then averaged, with higher scores indicating increased levels of maladaptive coping.

Trauma. PTSD Checklist for DSM-5 (PCL-5)

The PTSD Checklist for DSM-5 (PCL-5) [38] is a 20 item self-report measure that assesses the 20 DSM-5 symptoms of PTSD. Respondents are asked to rate how bothered they have been on each item in the past month (e.g., repeating, disturbing and unwanted memories of a stressful experience). Each item is scored on a five-point rating scale: 0 (not at all) – 4 (extremely). The total PCL-5 category ranges from 0-80 and was calculated by summing the items, with higher scores reflective of increased trauma experiences. A cut-point score of 31-33 can be used to determine a provisional PTSD diagnosis

and a score equal to or greater than 31 was categorised as likely to meet a probable PTSD diagnosis in the current study. The PCL-5 internal consistency was: $\alpha=0.95$.

Pain Catastrophising and Visceral Sensitivity. Gastrointestinal Unhelpful Thinking Scale

The 15-item Gastrointestinal Unhelpful Thinking Scale (GUTS) [39] is designed to assess cognitive processes associated with bowel discomfort with two subscales (9 items assessing pain catastrophising and 6 items assessing visceral sensitivity). Each item is scored on a six point rating scale: 0 (strongly agree) – 5 (strongly disagree). The two subscales are created by averaging the relevant items. The total GUTS score was calculated by taking the average of the two subscale averages. Higher scores indicated greater engagement in the respective thinking pattern. Internal consistency for the pain catastrophising, visceral sensitivity and total GUTS were $\alpha=0.94$, $\alpha=0.88$ and $\alpha=0.94$ respectively.

Psychological Distress. Depression Anxiety and Stress Scale

The 21-item Depression Anxiety Stress Scale (DASS) [40] is designed to assess stress, anxiety and depression with each subscale comprising seven items. Each item is scored on a four-point rating scale: 0 (Did not apply to me at all) – 3 (Applied to me very much, or most of the time). Scores on each sub-scale are calculated by adding up the scores on each item and multiplying by 2 (0-42). Total DASS-21 distress category was calculated by summing the 21 items and multiplying by 2 (range 0-126), with higher scores reflective of increased psychological distress. The total DASS-21 internal consistency was $\alpha=0.95$.

Quality of Life. World Health Brief-8 Item Quality of Life Scale

The World Health Organisation QoL Questionnaire [41] is an eight-item questionnaire exploring QoL across four domains: psychological, physiological, social and environmental. Each item is assessed on a 5 point rating scale evaluating the respondent's QoL over the past two weeks: 1 (very poor) – 5 (very good). The overall QoL score is calculated by summing the scores on each of the eight items (range 8-40), with higher scores reflecting better QoL. The QoL internal consistency was: $\alpha=0.87$.

Statistical Analyses

Analyses were conducted using SPSS v27 and AMOS v27. Preliminary descriptive statistical analyses were conducted prior to subsequent analysis. All study variables were entered into a measurement model to confirm divergent and convergent validity of the scales using Heterotrait-Monotrait (HTMT) criterion [42]. Based on the HTMT criterion threshold suggested by Markus [43] of 0.85, it was concluded that there was a lack of discriminant validity (0.87) between the trauma symptoms (as measured by PCL-5) and psychological distress (as measured by the total DASS-21 score). All scales (with the exclusion of psychological distress) identified as meeting HTMT criterion were then used in the subsequent structural equation model (SEM). Model development was guided by an iterative process (adding and removing of variables and

paths), with the fit being based on established guidelines: $\chi^2 p > .05$; $\chi^2/N = 1-3$, RMSEA < 0.07 , SRMR < 0.10 , CFI > 0.95 , GFI > 0.95 [44].

RESULTS

Two hundred and twenty-eight participants completed the online questionnaire. Of the 228 participants, 16 participants indicated that they had a stoma and one further participant had a diagnosis of collagenous colitis and were removed from further analysis. Of the 211 remaining participants, 184 (87.2%) were female, and the average age was 38.68 years (SD = 13.69). The majority (64%, $n=135$) of participants reported a diagnosis of Crohn's disease with an average diagnosis duration of 12.28 years (SD=10.34). Based on the Manitoba Index (disease activity in past 6 months), 154 participants (73%) reported symptoms consistent with active disease activity status (Table I).

Table I. Participant characteristics

Participant Characteristics	n	%
Gender		
Female	184	87.2
Male	26	12.3
Gender non specific	1	0.5
Diagnosis		
Crohn's disease	135	64.0
Ulcerative colitis	66	31.3
Indeterminate colitis	10	4.7
Current disease activity in past 6 months (Manitoba IBD index)		
Active disease	154	73.0
Inactive disease	57	27.0
Self reported current mental health issue		
Yes	106	50.2
No	105	49.8
Highest education		
Primary school	1	0.5
Secondary school	36	17.1
Certificate	32	15.2
Diploma	23	10.9
Undergraduate degree	63	29.9
Postgraduate degree	51	24.2
Other	5	2.4
Marital status		
Single	64	30.3
De facto	50	23.7
Divorced	12	5.7
Married	80	37.9
Widowed	1	0.5
Separated	4	1.9
Dependents		
None	126	59.7
One	24	11.4

Table I (continued)

Two	39	18.5
Three or more	22	10.4
Type of accommodation living in		
Private rental	59	28.0
Own house	131	62.1
Public housing	3	1.4
Board: friends/family	14	6.6
Other	4	1.9
Living setting		
Metropolitan	118	55.9
Regional	69	32.7
Rural	23	10.9
Remote	1	0.5
Employment status		
Full time	92	43.6
Part time	43	20.4
Casually	14	6.6
Self employed	10	4.7
Unemployed	4	1.9
Retired	14	6.6
Pensioner	10	4.7
Home duties	7	3.3
Student	13	6.2
Other	4	1.9

Overall, 32.2% of participants met a probable diagnosis for PTSD. Of these 68 participants, 37 (54.4%) reported IBD related trauma and 21 (30.9%) reported non IBD related trauma. Ten participants (14.7%) in this trauma group did not identify the type of the trauma experienced. Over 75% of participants in the IBD related trauma group with probable PTSD also reported non disease related trauma (28 of 37 participants).

A much higher number of participants in the total sample (147, 69.7%) reported having experienced a traumatic event. Of those 147 participants, 86 (58.5%) reported IBD related trauma and 62 (42.2%) reported no IBD related trauma. Over 70% of participants in the IBD related trauma group who reported having experienced trauma also reported non disease related trauma (62 of 86 participants) (Table II).

A correlational analysis (Table III) of the study variables indicated that QoL had a significant negative relationship with disease activity, illness perceptions, maladaptive coping, trauma symptoms, visceral sensitivity, pain catastrophising, and psychological distress. Poorer illness perceptions were associated with increased disease activity, maladaptive coping, trauma, psychological distress, gastrointestinal visceral sensitivity, and pain catastrophising. Trauma symptoms also had significant positive association with all study variables with the exception of adaptive coping and QoL. Adaptive coping was the only study variable that did not correlate significantly with any of the study variables.

Prior to the SEM model being developed, preliminary descriptive analyses were conducted to assess the influence of

Table II. Trauma sample characteristics

Trauma Characteristics	n	%
PTSD diagnosis (self-reported)		
Yes	28	13.3
No	183	86.7
Probable PTSD Diagnosis (PCL-5 score $\geq$ 31) ¹		
Yes	68	32.2 ³
No	143	67.8 ³
IBD related trauma total	37	54.4 ¹
IBD related trauma and other trauma*	28	41.1 ¹
IBD trauma only*	9	13.2 ¹
Non IBD related trauma	21	30.9 ¹
Did not identify trauma type	10	14.7 ¹
Participants identifying with having experienced a traumatic event ²		
Yes	147	69.7 ³
No	64	30.3 ³
IBD related trauma total	86	58.52
IBD related trauma and other trauma *	62	42.2 ²
IBD trauma only*	24	16.3 ²
Non IBD related trauma	61	41.5 ²
Nature of traumatic events identified ³		
Relating to IBD diagnosis	45	21.3 ³
Relating to your IBD treatment and/or related symptoms	71	33.6 ³
Serious, life threatening illness (heart attack, etc)	30	14.2 ³
Physical assault (rape, attempted rape, forced sexual act with a weapon etc)	19	9.0 ³
Sexual assault (rape, attempted rape, forced sexual act with a weapon etc)	34	16.1 ³
Military combat or lived in a war zone	2	0.9 ³
Child abuse (severe beating, sexual acts with someone 5 years older than you etc)	33	15.6 ³
Accident (serious injury or death from a car, at work, a house fire etc)	29	13.7 ³
Natural disaster (severe hurricane, food, earthquake, etc)	9	4.3 ³
Other trauma (e.g., adoption, bullying, death of a loved parent)	51	24.2 ³

¹ of PTSD group; ² of those participants identifying trauma; ³ of total sample; multiple responses permitted for type of traumatic events identified; *sub-category of applicable total scores.

participant demographics (e.g., age, gender) on the dependent variables. Correlational and Multiple Analysis of Variance (MANOVA) analysis indicated that all demographic variables had a non-significant influence on QoL, except for income. When income was added to the model it did not significantly improve the model fit and was therefore not included in subsequent analyses. A SEM of study variables was then undertaken using an iterative process where the refinement of pathways (adding and removing variables and paths) was based upon past research, CSM theory, and modification indices. This process led to the removal of several variables, including visceral sensitivity, pain catastrophising, and adaptive coping.

Table III. Descriptive statistics and Pearson's correlation between study variables

	DA	IPs	AC	MC	TR	VS	PC	GutsT	PD	Mean (SD)	Min-Max
Disease activity (DA)										0 (1.00)	-1.35-4.54
Illness perceptions (IPs)	0.44**									5.66 (1.79)	0.50-10
Adaptive coping (AC)	-0.06	-0.02								1.32 (0.61)	0-2.79
Maladaptive coping (MC)	0.13	0.35**	0.02							0.58 (0.53)	0-2.67
Trauma (TR)	0.23**	0.44**	0.10	0.54**						22.16 (17.51)	0-80
Visceral sensitivity (VS)	0.26**	0.57**	0.09	0.25**	0.35**					2.91 (1.22)	0-5
Pain catastrophising (PC)	0.31**	0.59**	0.09	0.40**	0.43**	0.67**				2.55 (1.35)	0-5
GUTS Total (GutsT)	0.31**	0.64**	0.10	0.36**	0.43**	0.90**	0.92**			2.73 (1.17)	0-5
Psychological distress (PD)	0.27**	0.46**	0.03	0.59**	0.82**	0.41**	0.49**	0.49**		31.82 (26.45)	0-120
Quality of life (QoL)	-0.43**	-0.64**	0.12	-0.40**	-0.55**	-0.42**	-0.48**	-0.49**	-0.54**	26.55 (6.67)	8-40

Min: participant minimum score; Max: Participant Maximum score; **: $p < 0.01$.

The final model (Fig. 1) had an excellent fit: $\chi^2(3)=1.10$, $p=0.35$, RMSEA=0.02, SRMR=0.02, CFI=1.00, GFI=0.99, and accounted for 52% of the variation in QoL. A comparison model where trauma symptoms were replaced by with psychological distress produced a comparable high fitting model: $\chi^2(3)=1.74$, $p=0.16$, RMSEA=0.06, SRMR=0.02, CFI=0.99, GFI=0.99. The final model provided partial support for the hypothesis that trauma symptoms, illness perceptions and coping strategies mediated the relationship between IBD disease activity and QoL. Illness perceptions had a significant direct influence on QoL ($\beta=-0.43$, $p<0.001$). Disease activity had a significant direct influence on QoL ($\beta=-0.16$, $p<0.003$) and was also partially mediated by illness perceptions. Illness perceptions had a significant direct influence on maladaptive coping and trauma symptoms ($\beta=0.35$, $p<0.001$, $\beta=0.28$, $p<0.001$ respectively). The relationship between illness perceptions and QoL was partially mediated by trauma symptoms. Maladaptive coping and QoL was fully mediated by trauma symptoms. Trauma symptoms had a significant direct influence on QoL ($\beta=-0.33$, $p<0.001$).

Post Hoc Trauma versus no Trauma

Due to small sample size comparison across groups in the model was not achievable. Therefore, a post hoc analysis comparing groups via Multiple Analysis of Variance (MANOVA) was performed; independent variable (trauma as defined by probable PTSD/no trauma), DV (standardised disease activity, illness perceptions, maladaptive coping, adaptive coping, pain catastrophising, visceral sensitivity, psychological distress and QoL). There was a statistically significant difference on the combined dependent variables, $F(8,202)=28.98$, $p<0.001$, Wilks' Lambda=0.47, partial eta squared=0.53.

Trauma category had a statistically significant effect on standardised disease activity $F(1,209)=10.95$; $p=0.001$; partial $\eta^2=0.05$, illness perceptions $F(1,209)=23.19$; $p<0.001$; partial $\eta^2=0.10$, maladaptive coping $F(1,209)=47.99$; $p<0.001$; partial $\eta^2=0.19$, pain catastrophising $F(1,209)=26.49$; $p<0.001$; partial $\eta^2=0.11$, visceral sensitivity $F(1,209)=14.06$; $p<0.001$; partial $\eta^2=0.06$, psychological distress $F(1,209)=209.94$; $p<0.001$; partial $\eta^2=0.50$, quality of life $F(1,209)=68.31$; $p<0.001$;

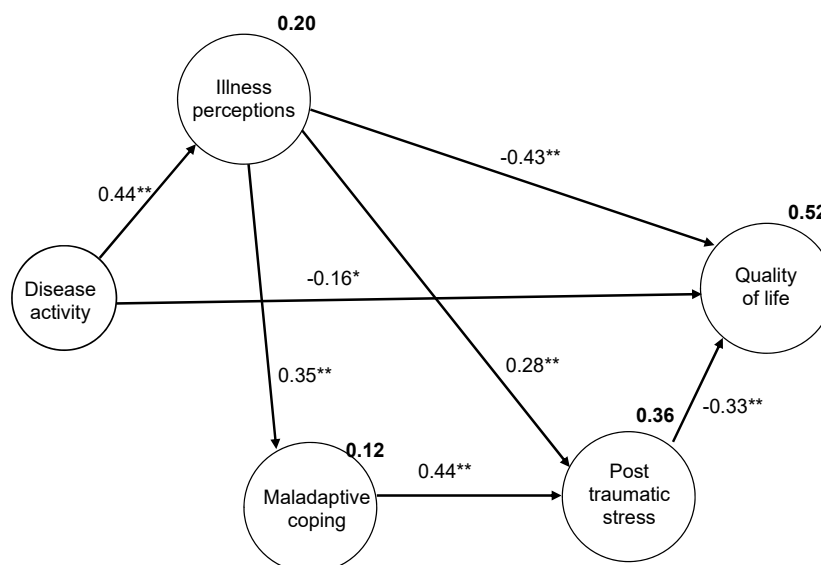


Fig. 1. Final SEM model (**: $p < 0.001$; *: $p < 0.003$).

partial $\eta^2=0.25$. As shown in Table IV participants classified as probable PTSD showed higher mean scores for the study variables.

Table IV. Differences in mean and standard deviation scores by trauma category.

Study variables	No trauma	Trauma
	Mean (SD)	Mean (SD)
Illness perceptions	5.27 (1.65)	6.48 (1.82)
Maladaptive coping	0.42 (0.45)	0.91 (0.52)
Adaptive coping	1.29 (0.62)	1.37 (0.58)
Visceral sensitivity	2.70 (1.17)	3.36 (1.20)
Pain catastrophising	2.24 (1.25)	3.20 (1.31)
Psychological distress	18.94 (15.45)	58.91 (24.26)
Quality of life	28.83 (5.24)	21.76 (6.84)

DISCUSSION

Overall, the current study found that 32.2% of participants met a probable diagnosis for PTSD. This finding is consistent with the overall gastrointestinal inflammatory condition pooled prevalence rate of 31% reported in the systematic review by Glynn et al. [14]. The current study found that 54.4% of individuals who met the criteria for a probable PTSD diagnosis reported IBD related trauma and 21 (30.9%) reported non IBD related trauma. Ten participants (14.7%) within this probable PTSD group did not identify the type of trauma experienced. Over 75% of participants in the IBD related trauma group with probable PTSD also reported non disease related trauma (28 of 37 participants). These findings support previous research showing the interplay between pre-existing trauma and IBD related trauma [12].

The present study extended previous research by providing evidence that trauma symptoms function as a potential mediating pathway as proposed by the CSM. Consistent with the CSM, disease activity directly influenced illness perceptions [22, 23, 26, 45] and illness perceptions directly influenced QoL and maladaptive coping [26, 36]. Poorer illness perceptions mediated the relationship between disease activity and QoL [25,26,45]. The comparison model identified in this study is consistent with previous research which reported that maladaptive coping mediates the relationship between illness perceptions and psychological distress [26]. The current findings indicate that trauma directly influenced QoL as well as acting as a partial mediator between illness perceptions and QoL. Trauma symptoms also mediated the relationship between maladaptive coping and QoL. These findings are consistent with previous research which found that maladaptive coping was associated with the development of PTSD symptoms [46] and the mediation effect of PTSD in broader health research [47]. These results provide further evidence for the pervasive impact of trauma on patient outcomes.

These findings have clinical implications for the consideration of trauma prevalence and the subsequent impact on QoL. Previous research provided evidence for an increased risk of physical health issues in individuals with PTSD [48, 49]. These findings highlight the need for comprehensive

screening of PTSD by trauma type and identification of factors that contribute specifically to the development of IBD related trauma (e.g., diagnostic procedures, perceived support from treatment team). Recommendations for managing this screening process are outlined in the brief guide developed by Glynn et al. [14]. Adopting an integrative approach is consistent with the national guidelines recommended by Crohn's & Colitis Australia that psychological screening should be conducted [50]. Psychological care has been shown to optimise patient outcomes when integrated within a holistic and routine framework [51]. Clinicians are then better equipped to support patients regarding these potentially modifiable psychological mediators of illness adjustment.

A strength of this research is that it is the first study to explore the potential influence of trauma using the CSM, a well-established framework to evaluate illness adaptation. This study extends the current literature in relation to medical and non-medical trauma in IBD cohorts. Despite this, there are certain methodological limitations which should be noted. Over 87% of the sample were female, thus potentially limiting the generalisability of results. In relation to this sample bias, participants were able to self-select to participate in the study and as such those individuals with trauma experiences may have been more inclined to participate. All responses were self-reported, and we were therefore unable to confirm diagnostic status (e.g., PTSD) or biochemical assessment for disease activity. Further, we did not identify the timeline for traumatic events (i.e., if the non IBD trauma occurred prior to IBD diagnosis) and this would be important to explore in future research. Future research should also seek to attain prospectively recruited participants, with biomarkers and stratifying based upon disease severity, hospitalisation, surgery, corticosteroids, and biologics. Outcome measures for the assessment of trauma in IBD cohorts should also consider the measurement of future oriented intrusions and arousal related to internal triggers [12, 52]. Due to the relatively small sample size in the trauma group ($n=68$), a trauma informed SEM model comparison could not be undertaken (i.e., exploring potential differences between disease related and non IBD related trauma). Future research should undertake this model comparison and expand the CSM by exploring for the role of post-traumatic growth and other key factors (e.g., self-esteem, recency of trauma, emotional regulation) identified in the systematic review evaluating PTSD treatment outcomes [53]. Given the possibility that pre-existing trauma may play a role in the aetiology of gastrointestinal conditions [54], future research should also be based on a longitudinal design to assess bi-directional mechanisms.

CONCLUSIONS

Our findings indicate that 32.2% of the sample met the criteria for PTSD. 54.4% of individuals who met the criteria for a probable PTSD diagnosis reported IBD related trauma. Over 75% of individuals in this probable PTSD group, reported experiencing both IBD and non IBD related trauma. This study also extended the CSM and found that trauma symptoms partially mediated the relationship between illness perceptions and QoL and fully mediated the relationship

between maladaptive coping and QoL. These findings support the relevance related to the application and extension of the CSM to illness adjustment and identifies potential modifiable psychosocial factors which can be targeted to improve illness adjustment associated with living with IBD. The current research highlights the need for and importance of promoting a more integrative approach, which includes trauma assessment and psychological interventions.

Conflicts of interest: None to declare.

Authors' contribution: H.G., S.K. and G.M. conceived and designed the study. H.G. and S.K. collected data. H.G., S.K. and P.A. performed the statistical analyses. H.G. and S.K. analysed the data and drafted the manuscript. All authors critically revised the manuscript, approved the final version to be published, and agree to be accountable for all aspects of the work.

Acknowledgements: This research was conducted through the support of the Australian Government Research Training Program Scholarship. We thank the participants for their valuable time and contribution to the research.

REFERENCES

- Masoodi I, Alsayari K, Albishri J. Inflammatory bowel disease register: Steps towards Crohn's & colitis foundation of Saudi Arabia (CCFSA). *Int J Health Sci (Qassim)* 2012;6:232-236. doi:10.12816/0006002
- Steed H. Ulcerative colitis. *Medicine* 2019;47:371-376. doi:10.1016/j.mpmed.2019.03.001
- Keightley P, Pavli P, Platten J, Looi JC. Gut feelings 2. Mind, mood and gut in inflammatory bowel disease: approaches to psychiatric care. *Australas Psychiatry* 2015;23:407-410. doi:10.1177/1039856215590034
- Knowles SR, Graff LA, Wilding H, Hewitt C, Keefer L, Mikocka-Walus A. Quality of Life in Inflammatory Bowel Disease: A Systematic Review and Meta-analyses - Part I. *Inflamm Bowel Dis* 2018;24:742-751. doi:10.1093/ibd/izx100
- Knowles SR, Keefer L, Wilding H, Hewitt C, Graff LA, Mikocka-Walus A. Quality of Life in Inflammatory Bowel Disease: A Systematic Review and Meta-analyses-Part II. *Inflamm Bowel Dis* 2018;24:966-976. doi:10.1093/ibd/izy015
- Mikocka-Walus A, Knowles SR, Keefer L, Graff L. Controversies Revisited : A Systematic Review of the Comorbidity of Depression and Anxiety with Inflammatory Bowel Diseases. *Inflamm Bowel Dis* 2016;22:752-762. doi:10.1097/MIB.0000000000000620
- Makris AP, Karianaki M, Tsamis KI, Paschou SA. The role of the gut-brain axis in depression: endocrine, neural, and immune pathways. *Hormones (Athens)* 2021;20:1-12. doi:10.1007/s42000-020-00236-4
- Tait C, Sayuk GS. The Brain-Gut-Microbiota Axis: A framework for understanding functional GI illness and their therapeutic interventions. *Eur J Intern Med* 2021;84:1-9. doi:10.1016/j.ejim.2020.12.023
- Labanski A, Langhorst J, Engler H, Elsenbruch S. Stress and the brain-gut axis in functional and chronic-inflammatory gastrointestinal diseases: A transdisciplinary challenge. *Psychoneuroendocrinology* 2020;111:104501. doi:10.1016/j.psyneuen.2019.104501
- Pothemont K, Quinton S, Jayoushe M, et al. Patient Perspectives on Medical Trauma Related to Inflammatory Bowel Disease. *J Clin Psychol Med Settings* 2021 Jul 22. doi:10.1007/s10880-021-09805-0
- Taft TH, Quinton S, Jedel S, Simons M, Mutlu EA, Hanauer SB. Posttraumatic Stress in Patients With Inflammatory Bowel Disease: Prevalence and Relationships to Patient-Reported Outcomes. *Inflamm Bowel Dis* 2022;28:710-719. doi:10.1093/ibd/izab152
- Glynn H, Knowles SR. A Phenomenological Investigation of Trauma in 18 Adults Living With Inflammatory Bowel Disease. *Clin Nurs Res* 2022 Feb 12. doi:10.1177/10547738221075649
- Tedstone JE, Tarrier N. Posttraumatic stress disorder following medical illness and treatment. *Clin Psychol Rev* 2003;23:409-448. doi:10.1016/s0272-7358(03)00031-x
- Glynn H, Möller SP, Wilding H, Apputhurai P, Moore G, Knowles SR. Prevalence and Impact of Post-traumatic Stress Disorder in Gastrointestinal Conditions: A Systematic Review. *Dig Dis Sci* 2021;66:4109-4119. doi:10.1007/s10620-020-06798-y
- Sun Y, Li L, Xie R, Wang B, Jiang K, Cao H. Stress Triggers Flare of Inflammatory Bowel Disease in Children and Adults. *Front Pediatr* 2019;7:432. doi:10.3389/fped.2019.00432
- Sinagra E, Utzeri E, Morreale GC, Fabbri C, Pace F, Anderloni A. Microbiota-gut-brain axis and its affect inflammatory bowel disease: Pathophysiological concepts and insights for clinicians. *World J Clin Cases* 2020;8:1013-1025. doi:10.12998/wjcc.v8.i6.1013
- Dubinsky MC, Dotan I, Rubin DT, et al. Burden of comorbid anxiety and depression in patients with inflammatory bowel disease: a systematic literature review. *Expert Rev Gastroenterol Hepatol* 2021;15:985-997. doi:10.1080/17474124.2021.1911644
- Mikocka-Walus A, Pittet V, Rossel JB, von Känel R; Swiss IBD Cohort Study Group. Symptoms of Depression and Anxiety Are Independently Associated With Clinical Recurrence of Inflammatory Bowel Disease. *Clin Gastroenterol Hepatol* 2016;14:829-835.e1. doi:10.1016/j.cgh.2015.12.045
- Cámara RJ, Gander ML, Bégre S, von Känel R; Swiss Inflammatory Bowel Disease Cohort Study Group. Post-traumatic stress in Crohn's disease and its association with disease activity. *Frontline Gastroenterol* 2011;2:2-9. doi:10.1136/fg.2010.002733
- Leventhal H, Phillips LA, Burns E. The Common-Sense Model of Self-Regulation (CSM): a dynamic framework for understanding illness self-management. *J Behav Med* 2016;39:935-946. doi:10.1007/s10865-016-9782-2
- Hagger MS, Orbell S. A Meta-Analytic Review of the Common-Sense Model of Illness Representations. *Psychol Health* 2003;18:141-184. doi:10.1080/088704403100081321
- Knowles SR, Wilson JL, Connell WR, Kamm MA. Preliminary examination of the relations between disease activity, illness perceptions, coping strategies, and psychological morbidity in Crohn's disease guided by the common sense model of illness. *Inflamm Bowel Dis* 2011;17:2551-2557. doi:10.1002/ibd.21650
- Knowles SR, Austin DW, Sivanesan S, et al. Relations between symptom severity, illness perceptions, visceral sensitivity, coping strategies and well-being in irritable bowel syndrome guided by the common sense model of illness. *Psychol Health Med* 2017;22:524-534. doi:10.1080/13548506.2016.1168932
- Knowles SR, Cook SI, Tribbick D. Relationship between health status, illness perceptions, coping strategies and psychological morbidity: A preliminary study with IBD stoma patients. *J Crohns Colitis* 2013;7:e471-e478. doi:10.1016/j.crohns.2013.02.022
- Hayes B, Moller S, Wilding H, Burgell R, Apputhurai P, Knowles SR. Application of the common sense model in inflammatory bowel disease: A systematic review. *J Psychosom Res* 2020;139:110283. doi:10.1016/j.jpsychores.2020.110283

26. Woodhouse S, Hebbard G, Knowles SR. Exploring Symptom Severity, Illness Perceptions, Coping Styles, and Well-Being in Gastroparesis Patients Using the Common Sense Model. *Dig Dis Sci* 2018;63:958-965. doi:10.1007/s10620-018-4975-x
27. Cassar GE, Knowles S, Youssef GJ, et al. Examining the mediational role of psychological flexibility, pain catastrophizing, and visceral sensitivity in the relationship between psychological distress, irritable bowel symptom frequency, and quality of life. *Psychol Health Med* 2018;23:1168-1181. doi:10.1080/13548506.2018.1476722
28. Jerndal P, Ringström G, Agerforz P, et al. Gastrointestinal-specific anxiety: an important factor for severity of GI symptoms and quality of life in IBS. *Neurogastroenterol Motil* 2010;22:646-e179. doi:10.1111/j.1365-2982.2010.01493.x
29. Labus JS, Bolus R, Chang L, et al. The Visceral Sensitivity Index: development and validation of a gastrointestinal symptom-specific anxiety scale. *Aliment Pharmacol Ther* 2004;20:89-97. doi:10.1111/j.1365-2036.2004.02007.x
30. Labus JS, Mayer EA, Chang L, Bolus R, Naliboff BD. The central role of gastrointestinal-specific anxiety in irritable bowel syndrome: further validation of the visceral sensitivity index. *Psychosom Med* 2007;69:89-98. doi:10.1097/PSY.0b013e31802e2f24
31. Sherwin LB, Leary E, Henderson WA. The association of catastrophizing with quality-of-life outcomes in patients with irritable bowel syndrome. *Qual Life Res* 2017;26:2161-2170. doi:10.1007/s11136-017-1554-0
32. Khanna R, Zou G, D'Haens G, et al. A retrospective analysis: the development of patient reported outcome measures for the assessment of Crohn's disease activity. *Aliment Pharmacol Ther* 2015;41:77-86. doi:10.1111/apt.13001
33. Jairath V, Khanna R, Zou GY, et al. Development of interim patient-reported outcome measures for the assessment of ulcerative colitis disease activity in clinical trials. *Aliment Pharmacol Ther* 2015;42:1200-1210. doi:10.1111/apt.13408
34. Broadbent E, Petrie KJ, Main J, Weinman J. The Brief Illness Perception Questionnaire. *J Psychosom Res* 2006;60:631-637. doi:10.1016/j.jpsychores.2005.10.020
35. Knowles S, Swan L, Salzberg M, Castle D, Langham R. Exploring the relationships between health status, illness perceptions, coping strategies and psychological morbidity in a chronic kidney disease cohort. *Am J Med Sci* 2014;348:271-276. doi:10.1097/MAJ.0000000000000242
36. Knowles SR, Apputhurai P, O'Brien CL, Ski CF, Thompson DR, Castle DJ. Exploring the relationships between illness perceptions, self-efficacy, coping strategies, psychological distress and quality of life in a cohort of adults with diabetes mellitus. *Psychol Health Med* 2020;25:214-228. doi:10.1080/13548506.2019.1695865
37. Carver CS. You want to measure coping but your protocol's too long: consider the brief COPE. *Int J Behav Med* 1997;4:92-100. doi:10.1207/s15327558ijbm0401_6
38. Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr PP. The PTSD checklist for DSM-5 (PCL-5) - Standard [Measurement instrument]. 2013. Available from: <https://www.ptsd.va.gov/professional/assessment/adult-sr/ptsd-checklist.asp>
39. Knowles SR, Apputhurai P, Burgell RE, Keefer L. Development and validation of the Gastrointestinal Unhelpful Thinking Scale (GUTs): A brief self-report measure for clinical and research settings. *Gastroenterol Nurs* 2022;45:E1-E12. doi:10.1097/SGA.0000000000000644
40. Lovibond SH, Lovibond PF. Manual for the depression anxiety stress scales. 2nd Edition, Psychology Foundation, Sydney, 1995.
41. Schmidt S, Mühlan H, Power M. The EUROHIS-QOL 8-item index: psychometric results of a cross-cultural field study. *Eur J Public Health* 2006;16:420-428. doi:10.1093/eurpub/cki155
42. Henseler J, Ringle CM, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J Acad Mark Sci* 2015;43:115-135. doi:10.1007/s11747-014-0403-8
43. Markus KA. Principles and Practice of Structural Equation Modeling by Rex B. Kline. *Struct Equ Modeling* 2012;19:509-512. doi:10.1080/10705511.2012.687667
44. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct Equ Modeling* 1999;6:1-55. doi:10.1080/10705519909540118
45. Möller SP, Apputhurai P, Tye-Din JA, Knowles SR. Quality of life in coeliac disease: relationship between psychosocial processes and quality of life in a sample of 1697 adults living with coeliac disease. *J Psychosom Res* 2021;151:110652. doi:10.1016/j.jpsychores.2021.110652
46. Choi KW, Sikkema KJ, Velloza J, et al. Maladaptive coping mediates the influence of childhood trauma on depression and PTSD among pregnant women in South Africa. *Arch Womens Ment Health* 2015;18:731-738. doi:10.1007/s00737-015-0501-8
47. Kim YJ. Posttraumatic Stress Disorder as a Mediator Between Trauma Exposure and Comorbid Mental Health Conditions in North Korean Refugee Youth Resettled in South Korea. *J Interpers Violence* 2016;31:425-443. doi:10.1177/0886260514555864
48. Boscarino JA. Posttraumatic Stress Disorder and Physical Illness: Results from Clinical and Epidemiologic Studies. *Ann N Y Acad Sci* 2004;1032:141-153. doi:10.1196/annals.1314.011
49. Spitzer C, Barnow S, Völzke H, John U, Freyberger HJ, Grabe HJ. Trauma, posttraumatic stress disorder, and physical illness: findings from the general population. *Psychosom Med* 2009;71:1012-1017. doi:10.1097/PSY.0b013e3181bc76b5
50. Crohn's and Colitis Australia. 2018; Available from: <https://www.crohnsandcolitis.com.au/>
51. Lores T, Goess C, Mikocka-Walus A, et al. Integrated Psychological Care is Needed, Welcomed and Effective in Ambulatory Inflammatory Bowel Disease Management: Evaluation of a New Initiative. *J Crohns Colitis* 2019;13:819-827. doi:10.1093/ecco-jcc/jjz026
52. Edmondson D. An Enduring Somatic Threat Model of Posttraumatic Stress Disorder Due to Acute Life-Threatening Medical Events. *Soc Personal Psychol Compass* 2014;8:118-134. doi:10.1111/spc3.12089
53. Barawi KS, Lewis C, Simon N, Bisson JI. A systematic review of factors associated with outcome of psychological treatments for post-traumatic stress disorder. *Eur J Psychotraumatol* 2020;11:1774240. doi:10.1080/2008198.2020.1774240
54. Husarewycz MN, El-Gabalawy R, Logsetty S, Sareen J. The association between number and type of traumatic life experiences and physical conditions in a nationally representative sample. *Gen Hosp Psychiatry* 2014;36:26-32. doi:10.1016/j.genhosppsych.2013.06.003