The Manitoba IBD Cohort Study: A population-based study of the prevalence of lifetime and twelve-month anxiety and mood disorders

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ABSTRACT

Background & Aims: Given the impact of anxiety and mood disorders on health, it is important to consider these disorders in persons with IBD. We assessed the prevalence of anxiety and mood disorders in a population-based IBD cohort.

Methods: A structured diagnostic interview was administered to participants in the Cohort (N=351), and rates were compared to age, gender and region matched controls drawn from a national survey (n=779).

Results: A comparison of lifetime prevalence suggests higher rates of panic, generalized anxiety, and obsessive-compulsive disorders and major depression and lower rates of social anxiety and bipolar disorders in the IBD sample than in national samples in the US and New Zealand. Direct comparisons with matched controls (with data available for three anxiety disorders) found lifetime prevalence (IBD vs. controls) as follows: panic disorder significantly higher in IBD (8.0% vs. 4.7%, Odds Ratio (OR) 1.77, 95%CI 1.06-2.95), social anxiety disorder lower (6% vs. 11%, OR 0.51, 95%CI 0.31-0.85), agoraphobia without panic not significantly different (1.1% vs. 0.6%, OR 1.78, 95%CI 0.47-6.65), and major depression higher (27.2% vs. 12.3%, OR 2.68, 95%CI 1.95-3.68). Comparing IBD respondents with and without lifetime anxiety or mood disorder, those with a disorder reported earlier onset of IBD symptoms and there was a trend

Conclusions: Clinicians should be aware of the increased prevalence of depression and panic disorder and possibly other anxiety disorders in persons with IBD as these disorders may influence response to treatment and quality of life.

INTRODUCTION

Psychiatric disorders are very common in the community with young people being especially at risk[1]. A recent population-based study in the United States[2] found one-year prevalence rates of 18% for anxiety disorders (10% moderate/severe cases), 9% for mood disorders (8% moderate/severe cases), 4% for substance use disorders (2% moderate/severe cases), and 26% for any disorder (15% moderate/severe cases). The presence of a chronic medical condition has been found to be associated with higher rates of anxiety, mood, and substance use disorders[3,4] compared to the general population. Consequently, the rates of psychiatric disorder seen in clinical settings are typically higher than those in community settings. A great deal of disability and functional impairment that occurs in chronic health problems is associated with comorbidity with psychiatric disorders. In a population survey of chronic medical conditions (hypertension, arthritis, asthma, and ulcers), impairment in work functioning as assessed by number of sick days and reduced work days was almost entirely confined to cases with comorbid psychiatric disorders[5]. Depression and anxiety in particular are thought to exacerbate chronic health conditions through a number of mechanisms, including decreased adherence to treatment recommendations, suppressed immune system functioning, and increased autonomic nervous system or hypothalamic-pituitary-adrenal axis activity[6].

Given the prevalence of psychiatric disorders in the community and their potential impact, it is important to consider the comorbidity of these disorders in persons with inflammatory bowel disease (IBD). Some studies have reported higher rates of psychiatric disorders for those with IBD compared to other chronic illnesses or healthy controls[7-9]. However, the findings are limited by problems of inadequate comparison groups, biased samples (i.e., treatment seeking) and lack of appropriate diagnostic criteria[10-12]. The symptom screening

measures most commonly used in previous studies can be helpful clinically, but they do not allow for the application of accepted international diagnostic criteria. Consequently it is difficult to compare findings across studies. To date, only one study, published in 1995[13], used the gold standard of a structured psychiatric interview to determine psychiatric diagnoses. This study evaluated only 40 patients and used an interview that has been replaced in recent research by the more accurate Comprehensive International Diagnostic Interview (CIDI)[14].

The purpose of the current study was to accurately assess the prevalence of anxiety and mood disorders in a population-based cohort of respondents with clearly established IBD who were not recruited from a clinical setting. Prevalence was compared to rates reported in recent population studies in the US and New Zealand. Rates for several common disorders were directly compared to a matched non-IBD comparison sample drawn from a Canadian survey of health and psychiatric disorders. It was hypothesized that there would be higher rates of anxiety and mood disorders in persons with IBD than in the population in general.

MATERIALS AND METHODS

Participants

The Manitoba IBD Cohort Study was initiated in 2002, drawing on participants from the University of Manitoba IBD Research Registry. Participating individuals were required to be at least 18 years of age and diagnosed within the previous 7 years. The population-based Registry was established in 1995[15] and updated in 2000. Residents of the province of Manitoba, Canada (population approximately 1 150 000) identified as having IBD through the database of Manitoba Health (the agency that provides universal health coverage), were eligible for inclusion in the Registry. Of those eligible, that is all those with IBD in the province, just over half

participated in the Registry[16]. The Cohort Study was approved by the University of Manitoba Health Research Ethics Board and participants provided written informed consent.

At the time of study recruitment, there were 3192 participants in the Research Registry, and 606 were eligible for this study, given the age and recent disease onset criteria. Approximately 12% could not be located, 5% moved out of province, were deceased, or were found to be too young, 14% directly declined to take part and 418 agreed to enroll in the study. Complete data were obtained in the first contact from 388 of those enrolled, and they have subsequently served as the Cohort, described in detail by Graff and colleagues[17]. Over the first two years of the longitudinal cohort study, there was a modest level of attrition and by the time of the 24 month contact, at which point the structured psychiatric interview was obtained, 353 respondents continued to participate. Data for the structured psychiatric interview was obtained for 351 of those participating in the Cohort at this point and data from two respondents was lost due to a computer problem.

Comparison Sample

In assessing psychiatric disorders in a sample with a specific health condition, it is often difficult to establish an appropriate comparison. Fortunately, a large national study, the Canadian Community Health Survey, Cycle 1.2: Mental Health and Well-Being (CCHS 1.2) was conducted in our region starting in May 2002[18] and it included a structured psychiatric interview, the CIDI. A representative sample of the residents of Manitoba was contacted for the study by Statistics Canada and there was a 77% response rate of identified households with 85% of the interviews conducted in person and the remainder conducted by telephone. In order to develop a matched comparison group, we randomly sampled Manitoba respondents from the Statistics

Canada Canadian Community Health Survey Public Use Dataset. Respondents were excluded if they reported that they had IBD or were of Aboriginal (First Nations) descent, as IBD is rare in this group. Residents of Norman, Burntwood, or Churchill health regions of Manitoba were excluded, as these regions are sparsely populated and have a high proportion of Aboriginal peoples. Matching was according to gender and age (collapsed into 5-year groupings) with approximately 2.2 CCHS-to-1 IBD matching, resulting in a total of 779 respondents in the CCHS comparison group.

Assessment of Twelve-month and Lifetime Psychiatric Diagnoses

The Comprehensive International Diagnostic Interview (CIDI) was developed by the World Health Organization[19,20] and is based on diagnostic criteria from the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)* published by the American Psychiatric Association [21]. The DSM-IV is the accepted diagnostic system in North America and is used more commonly in research on psychiatric disorders than the very similar International Classification of Diseases (ICD-10) diagnostic system[22]. For this study, the 1997 version of the CIDI[19,20] was used to establish the 12-month (12 months prior to the interview) and lifetime prevalence of anxiety and mood disorders in the IBD cohort. The CIDI determined age of symptom onset but did not provide detailed information on the course of each disorder (remissions and return of symptoms) over the years. Interviews were conducted in-person by one of the two research nurses with the study trained in the use of the CIDI. Sections of the CIDI on anxiety and mood disorders were administered as these are the most frequent mental health problems seen in the community.

The Canadian Community Health Survey used a more recent version if the CIDI adapted for that survey[18]. In order to ensure consistent diagnostic decisions across the IBD and non-IBD community samples given the slightly different CIDI versions, we reviewed CIDI interview output for all those respondents in the IBD sample who met even partial criteria for a disorder to make sure the same criteria were being applied in our diagnostic decisions as in the Canadian Community Health Survey CIDI[18].

Assessment of Psychological Functioning and Quality of Life

Standardized and validated self-report and interview measures were used to assess recent psychological functioning and quality of life. These measures are based on self-report of functioning over the previous two to four weeks and are intended to provide dimensional measures of characteristics which vary over time. Diagnosis on the other hand is a categorical concept (present or not present) considering a longer time period (12 months or lifetime for example) and particular thresholds of severity. We considered the relationship between psychiatric diagnosis and recent functioning to indicate how a history of psychiatric disorder would relate to day-to-day functioning. Negative psychological functioning was assessed using measures of perceived stress and health anxiety. The 14-item Cohen Perceived Stress Scale (CPSS) was developed to examine the role of stress in disease[23, 24]. The 21-item Health Anxiety Questionnaire (HAQ) assesses extent of health worries and somatic focus[25]. Positive psychological or resiliency factors were assessed with the 25-item, interviewer-administered Psychological Well-being Manifestations Scale (PWB[26]), adopted from the Canadian Community Health Survey [18].

The Inflammatory Bowel Disease Questionnaire (IBDQ[27]) was used to measure disease-specific health-related quality of life. The 32-item IBDQ is the most commonly used and extensively validated quality of life measure in IBD research[28] and has been found to be more sensitive than some more generalized health quality of life measures in the same population[17].

Statistical Methods

Data were analyzed with the Statistical Package for the Social Sciences program (SPSS, Version 13). Proportion of respondents with specific lifetime and twelve-month diagnoses was described with percentages. Conditional logistic regression was used to compare the proportion of respondents in the IBD Cohort and community sample with specific diagnoses using a Cox regression model and stratifying by the matching variable. Bivariate and multiple logistic regression analyses were also conducted to evaluate relationships between the twelve-month and lifetime presence of any anxiety or mood disorder, and the demographic, disease, and psychological functioning variables. For the logistic regression analyses, continuous variables such as age, IBD Quality of Life, Health Anxiety, Perceived Stress, and Psychological Wellbeing were examined, and categorized as high or low based on the distribution in the IBD group.

RESULTS

The IBD cohort participants who completed the psychiatric interview (n=351) had a mean age of 43 years (SD =14.06), ranging from 19 to 81 years old. The average duration of disease was 4.3 years at the time of enrolment, and 6.4 years (SD = 2.1) at the time of this study. The sample was 60% female and 95% Caucasian, with a minority having self-described backgrounds as East Indian, Hispanic, or Metis (of Aboriginal and European ancestry). One quarter of the sample reported a completed university degree. The majority was married (67%)

and employed full time (66%). IBD diagnosis subtype had been verified through chart review[17] and 169 (48%) had Crohn's disease (CD), 163 (46%) had ulcerative colitis (UC, either ulcerative colitis or ulcerative proctitis), and 19 (6%) had indeterminate colitis.

The twelve-month and lifetime prevalence rates for the anxiety and mood disorders are presented in Table 1. To provide a context for these scores, rates are provided from recent large scale studies of representative samples in the U.S.[1,2] and in New Zealand[29] using the CIDI. The comparisons are intended to serve as a point of reference only and are not compared statistically with the values in the IBD group because the samples were not matched directly and may differ in characteristics such as age and sex. Given that caution, a general comparison between the IBD Cohort and national studies for twelve-month prevalence suggests that the rates of panic disorder and major depression may be higher and social anxiety disorder and bipolar disorder lower for the IBD sample. For lifetime prevalence, rates of panic disorder, generalized anxiety disorder, obsessive-compulsive disorder and major depression appear to be higher and social anxiety disorder and bipolar disorder lower for the IBD sample.

The twelve-month and lifetime prevalence rates of psychiatric disorders for the IBD cohort and the matched non-IBD community sample are shown in Table 2 along with results from the conditional logistic regression analyses. The CCHS 1.2 assessed fewer psychiatric disorders than the US or New Zealand surveys, so there were fewer direct comparisons available using this community sample. The 12-month prevalence rates of anxiety and moods disorder were comparable across the IBD and community samples for the most part. The rate of major depressive disorder in IBD was more than 1.5 times higher but was not statistically significant at $\alpha = .05$ (OR = 1.59, 95% CI: 0.96 – 2.45). For lifetime prevalence, the rate for panic disorder likewise showed signs of elevation in IBD, but only approached statistical significance **at α =**

.05. Conversely, those with IBD had only half the rate of social anxiety disorder (6% *vs*. 12%). The lifetime rate of major depressive disorder was more than twice as high in the IBD sample, occurring for more than a quarter of those with IBD.

For the IBD cohort, average age of onset of gastrointestinal symptoms was 31.4 years (SD=14.7) and average age at diagnosis was 36.5 (SD=14.5). Age of onset of IBD symptoms was earlier in the 45.3% of participants with a lifetime anxiety or mood disorder compared to those without (29.1 years vs. 33.1 years, $t = 2.52$, p=.012). For those with a lifetime anxiety or mood disorder there was a trend for age at IBD diagnosis to be younger also (34.9 years vs. 37.8 years, $t = 1.84$, $p \leq 0.066$). As shown in Table 3, for those with IBD and a lifetime history of an anxiety or mood disorder, the first episode of an anxiety disorder predated the diagnosis of IBD by more than two years in 79% of the cases; if specific phobia with its early age of onset was excluded, the first onset of an anxiety disorder was present more than two years before the IBD diagnosis in 64% of the cases. About half of those with a mood disorder (54%) experienced a first episode of depression more than two years before the onset of IBD.

Logistic regression analyses were used to examine the relationship between the presence of any anxiety or mood disorder in the last twelve-months or over the lifetime and a variety of demographic, disease, and psychological functioning variables for the IBD cohort. Preliminary analyses indicated that variables including disease activity, IBD subtype (CD or UC), education level, marital status, employment and age were unrelated to psychiatric diagnosis. As a result, these variables were omitted from further analysis.

Subsequent analyses focused on sex, disease-specific quality of life (IBDQ), health anxiety, perceived stress, and psychological well being. In the analyses, the bivariate relationship was considered first and then the multivariable relationship was assessed using all of

the variables in the analysis. Table 4 summarizes the results for the presence of any recent anxiety or mood disorder. The presence of a disorder was associated with being female, lower quality of life (IBDQ) and psychological well being and higher health anxiety and perceived stress. In a multiple logistic regression with all of the variables included only female sex and poorer psychological well being were uniquely associated with the presence of a recent anxiety or mood disorder. When the relationship was considered with presence of a lifetime anxiety or mood disorder (Table 5) similar bivariate associations were found but in the multivariable analysis female gender, higher perceived stress and lower psychological well being were associated with the presence of a disorder.

We further explored the influence of each of anxiety or mood disorders by considering the mean IBDQ score (the disease specific quality of life measure) for those with and without a history of each disorder (Table 6). In order to allow for comparisons with adequate statistical power, this analysis only included those disorders present in at least 5% of the IBD Cohort participants. It should be noted that participants could have a history of more than one of these disorders. We found that the presence of any of the lifetime anxiety or mood disorders with the exception of social anxiety disorder was associated with a significantly lower quality of life.

DISCUSSION

To our knowledge this is the first study of a population-based sample which describes the comorbidity between IBD and common psychiatric disorders using gold standard diagnostic techniques. The ability to compare rates in the IBD group and a matched community sample without the disease is a strength of this study. This study suggests that lifetime major depression was more common in those with IBD, whereas social anxiety (lifetime) was less

common. We did not have Canadian community data on the rate of generalized anxiety disorder or obsessive compulsive disorder, but comparison of the lifetime rate of these disorders to national samples from the US and New Zealand suggested that they may also be higher in those with IBD. With a larger sample, panic disorder may also be found to be more common in IBD as the difference was just below the level required for statistical significance in this study.

Lifetime rates of anxiety and mood disorders are important even when the person has not had the disorder recently, because previous experience with the disorder can increase vulnerability for subthreshold symptoms or a relapse, particularly during periods of increased stress[30]. A lifetime diagnosis of any of the anxiety or mood disorders was associated with lower current quality of life. The rate of recent major depression (previous 12 months; 9.1%) reported in this study is lower than that reported in previous IBD studies[7-9]. However, the earlier studies, primarily done in the 1980s, relied on symptom screening scales rather than structured diagnostic interviews, producing higher estimates of prevalence. Further, the prevalence of anxiety and mood disorders in clinic populations is generally higher, as persons seeking treatment are likely to be more symptomatic than community samples and experiencing stress due to these health problems[31].

The finding of a lower lifetime rate of social anxiety disorder in the IBD sample than the community sample was unexpected. It may be that persons with a history of social anxiety disorder were more reluctant to participate in the Cohort project, as it involved annual in-person interviews over a five year period and some persons with social anxiety disorder would find it difficult to meet with an unfamiliar person to discuss their health. Another consideration is the recruitment approach, which differed between the IBD Cohort Study and the Canadian Community Health Survey[18]. In the IBD Study, participants in the population-based Research

Registry were contacted by letter and then by telephone inviting them to participate in the study. In community epidemiology studies, including the Canadian Community Health Survey, households are identified in advance using stratified sampling procedures, and the interviewer makes a personal contact with the household in order to identify a member of the household to participate according to selection rules determined by the sampling procedure. Repeated contacts with the household are made and perhaps the persistence of the process facilitates broader participation of persons who may be reluctant to interact with an unfamiliar person because of anxiety or have lower motivation to participate in research.

The finding that the majority of those in our sample who had an anxiety or mood disorder at some point in their lifetime had the onset well before the IBD onset is consistent with previous epidemiological research. Retrospective reports of the age of onset of psychiatric disorders considered across international studies indicate that the median onset of anxiety disorders is age 15 and mood disorders age 26[32]. A Canadian population study[16] found that the peak age of incidence for IBD is in the 20-29 year age range, but new cases continue to be identified at a slightly lower rate over the following decades of age. One would expect that in many cases anxiety and depressive disorders would have a first onset before the onset of IBD. However, new episodes of anxiety and mood disorders may coincide with the development of IBD. Physicians making diagnoses of IBD should be aware of this.

A significant number of participants (29%) experienced first onset of an anxiety or mood disorders around the time the IBD was presenting or after it was clearly established and diagnosed. Certainly, population studies find that the rate of major depression is higher in persons coping with chronic illness[4]. Episodes of major depression and panic disorder are more

likely to occur during periods of acute or chronic stress[33]. In IBD, the period around diagnosis can be especially difficult.

The finding in our study of a higher lifetime rate of depression for those with IBD and the finding of an earlier age of onset of IBD symptoms among those with a lifetime anxiety or mood disorder also suggests that there may be a relationship between these emotional disorders and the development of IBD. The possibility of anxiety and mood disorders as a risk factor for IBD was a focus of research in the 1980's and 1990's but has received less attention recently[10, 11, 34]. Our data suggest that anxiety and mood disorders warrant further exploration as risk factors much like smoking or certain ethnic backgrounds[35]. Recent population studies suggest that generalized anxiety disorder[36] and the personality trait of neuroticism[37] are risk factors for peptic ulcer disease. Another population study[38] found that neuroticism (a risk factor for anxiety and mood disorders) was associated with increased odds of a wide range of self-reported medical conditions including arthritis (OR = 1.5), diabetes (OR = 3.33), kidney/liver disease (OR = 2.56), stomach/gallbladder problems (OR = 2.27), and ulcer (OR = 3.23).

Anxiety and mood disorders are more common among females[1,2] and this was confirmed in the IBD sample as well. It was of note, however, that our study did not support the conclusions of earlier research that had suggested CD and UC patients have different rates of anxiety and depression[39-41]**.** Those earlier studies, however, did not use diagnostic criteria; the one study that did also reported that there was no difference in rates of anxiety and mood disorders between CD and UC[13].

The presence of anxiety or depression has important implications for IBD management. One prospective study of IBD patients enrolled after a flare found that those with clinically significant depressive symptoms at baseline had relapses that occurred sooner and more

frequently during the following 18 months[42]. Similarly, in another clinical sample, depressive symptoms were related to disease activity 8–12 weeks later[38]. In a prospective study of CD patients, major depression was a risk factor for failure to achieve remission with infliximab treatment and an earlier need for reinitiation of treatment[43]. More generally, the presence of a depressive disorder is generally associated with poor compliance in medical patients[44,45] and anxiety and depressive disorders are associated with poorer quality of life and functioning in persons with medical conditions[46]. Clearly, the higher rates of anxiety and mood disorders for those with IBD suggests that review for these conditions is warranted, and may facilitate improved management. Provision of adequate support or additional treatment for psychiatric disorders may improve long term outcome.

This study had a number of limitations. It is important to consider the nature of those who volunteered for the Cohort Study and those who could not be contacted because there is the potential for systematic bias regarding relevant psychosocial characteristics. That is, those with greater distress may be less willing to persevere with the regular demands across the longitudinal study period and thus be less likely to volunteer. Epidemiologic research has found that those with less education, younger age, or more distress are less likely to participate in survey research[47]. This loss of participants with higher levels of distress would tend to attenuate the relationships between anxiety and mood disorders and IBD we evaluated in this study. The analyses presented in this article were cross-sectional and consequently there is a limited ability to examine temporal relationships and causal direction among the key variables.

In conclusion, persons with IBD have a higher lifetime rate of depression and may have higher lifetime rates of some anxiety disorders. For the majority of participants with a lifetime anxiety or mood disorder, the onset of psychiatric disorder preceded the diagnosis of the IBD.

While there can be a tendency to consider that persons with major depression or panic disorder who present with gastrointestinal complaints are more likely to have functional complaints, our study suggests that clinicians will have to pay closer consideration to investigating for IBD.

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STUDY HIGHLIGHTS

What Is Current Knowledge

- Chronic health conditions are associated with a higher rate of major depression.
- Anxiety and mood disorders are associated with a higher level of disability.

- Depression is associated with lower treatment adherence.
- Previous studies with IBD have not used adequate controls nor good diagnostic measures for anxiety and mood disorders.

What Is New Here

- Higher rates of lifetime major depression and panic disorder in IBD.
- In IBD lifetime mood or anxiety disorders are related to lower current quality of life.
- Persons with lifetime anxiety or mood disorder had earlier age of onset of IBD.
- Further research should explore whether anxiety or mood disorder may be a risk factor for IBD.

Table 1. Twelve-month and Lifetime Prevalence (%) of Anxiety and Mood Disorders in the IBD Cohort and Recent National Surveys from the United States and New Zealand

	Twelve-month			Lifetime		
Region	IBD Canada	NCS – R USA	MHS New Zealand	IBD Canada	NCS – R USA	MHS New Zealand
N=	351	9282	12992	351	9282	12992
Anxiety disorders						
Panic disorder	3.7	2.7	1.7	8.0	4.7	2.7
Agoraphobia without panic	0.6	0.8	0.6	1.1	1.4	1.2
Specific phobia	9.7	8.7	7.3	14.8	12.5	10.8
Social anxiety disorder	2.6	6.8	5.1	6.0	12.1	9.4
Generalized anxiety disorder	3.7	3.1	2.0	13.4	5.7	6.0
Post-traumatic stress disorder	4.0	3.5	3.0	7.7	6.8	6.0
Obsessive-compulsive disorder	1.0	1.0	0.6	2.8	1.6	1.2
Any anxiety disorder	17.9	18.1	14.8	31.6	28.8	24.9
Mood disorders						
Major depressive disorder	9.1	6.7	5.7	27.2	16.6	16.0
Dysthymia	0.6		1.1	2.0	2.5	2.1
Bipolar I and II (Mania)	1.1	2.6	2.2	1.7	3.9	3.8
Any Mood disorder	10.5	9.5	8.0	29.9	20.8	20.2
Any anxiety or mood disorder	22.2			45.3		

IBD = Manitoba IBD Cohort; NCS-R = National Comorbidity Survey – Revised[1,2] ; MHS – New Zealand Mental Health Survey[29]

Table 2. Twelve-month and Lifetime Prevalence (%) of Anxiety and Mood Disorders in the IBD Cohort and a Matched nonIBD Community Sample Compared with Conditional Logistic Regression

	Twelve-month				Lifetime			
	IBD Cohort	Community Sample	OR	CI (95%)	IBD Cohort	Community Sample	OR	CI (95%)
N=	351	779			351	779		
Anxiety disorders								
Panic disorder	3.7	2.4	1.41	0.69-2.89	8.0	4.7	1.59	0.96-2.63
Agoraphobia without panic	0.6	0.1	3.77	.32-43.72	1.1	0.6	1.44	0.37-5.55
Social anxiety disorder	2.6	4.5	0.55	0.26-1.16	6.0	11.0	**0.52**	0.32-0.85
Mood disorders								
Major depressive disorder	9.1	5.5	1.53	0.96-2.45	27.2	12.3	**2.20**	1.64-2.95
Bipolar I and II (Mania)	1.1	1.7	0.71	0.23-2.25	1.7	3.0	0.56	0.22-1.40
Any anxiety or mood disorder	13.6	10.8	1.04	0.71-1.52	35.8	22.1	1.24	0.96-1.59

OR = Bivariate Odds Ratio; CI (95%) = 95% Confidence Interval**, statistically significant odds ratios are indicated in bold.**

Table 3. Relationship Between Onset of IBD and Onset of Anxiety or Mood Disorder for Lifetime Prevalence

Timing of onset	Any anxiety or mood disorder (n=157)	Anxiety disorder (n=111)	Anxiety disorder without specific phobia (n=91)	Mood disorder (n=104)
First anxiety or mood episode 10 or more years before IBD	87 (55%)	77 (70%)	46 (51%)	32 (31%)
First anxiety or mood episode 2-9 years before IBD	25 (16%)	10 (9%)	12 (13%)	24 (23%)
First anxiety or mood episode and IBD less than two years apart	28 (18%)	15 (13%)	19 (21%)	24 (23%)
First anxiety or mood episode two or more years after IBD onset	17 (11%)	9 (8%)	14 (15%)	24 (23%)

Table 4. Bivariate and Multivariable Relationship Between Presence of Twelve-month Anxiety or Mood Disorder and Gender, Quality of Life, and Psychological Functioning in the IBD Cohort

		Logistic Regression					
Explanatory Variables	***N***	% with diagnosis	% no diagnosis	OR	CI (95%)	Adjusted OR	CI (95%)
Gender							
Male	139	12	88				
Female	212	28	72	**2.83**	1.57-5.11	**2.72**	1.46-5.06
IBD Quality of Life							
Medium-high	283	20	81				
Low	59	39	61	**2.71**	1.49-4.94	1.49	0.72-3.11
Health Anxiety							
Low-medium	290	20	80				
High	52	37	63	**2.55**	1.36-4.79	1.44	0.68-3.10
Perceived Stress							
Low-medium	180	14	86				
High	162	32	68	**2.93**	1.71-5.01	1.68	0.87-3.25
Psychological Well Being							
Medium-high	282	17	83				
Low	61	46	54	**4.24**	2.34-7.67	**2.60**	1.24-5.41

Adjusted OR (N = 339)

OR = Bivariate Odds Ratio; Adjusted OR = OR controlling for other variables in the table;

CI (95%) = 95% Confidence Interval, **statistically significant odds ratios are indicated in bold**.

Table 5. Bivariate and Multivariable Relationship Between Presence of Lifetime Anxiety or Mood Disorder and Gender, Quality of Life, and Psychological Functioning in the IBD Cohort

		Logistic Regression					
Explanatory Variables	***N***	% with diagnosis	% no diagnosis	OR	CI (95%)	Adjusted OR	CI (95%)
Gender							
Male	139	36	64				
Female	212	49	51	**1.88**	1.22-2.92	**1.71**	1.08-2.72
IBD Quality of Life							
Medium-high	283	43	57				
Low	59	59	41	**1.93**	1.08-3.40	1.07	0.55-2.10
Health Anxiety							
Low-medium	290	42	57				
High	52	64	36	**2.33**	1.26-4.28	1.50	0.73-3.04
Perceived Stress							
Low-medium	180	36	64				
High	162	57	43	**2.44**	1.58-3.78	**1.74**	1.04-3.93
Psychological Well Being							
Medium-high	282	40	60				
Low	61	69	31	**3.31**	1.83-5.97	**2.18**	1.07-4.43

Adjusted OR (N = 339)

Note OR = Univariate Odds Ratio; Adjusted OR = OR controlling for other variables in the table;
CI (95%) = 95% Confidence Interval, **statistically significant odds ratios are indicated in bold**.

Table 6. Relationship Between Lifetime Anxiety or Mood Diagnosis and Current Disease Specific Quality of Life (IBDQ) in the IBD Cohort

	Percent with lifetime diagnosis	IBDQ of respondents with diagnosis mean (SD)	IBDQ of respondents with no diagnosis mean (SD)	*t*-test	*p*
Anxiety disorders					
Panic disorder	**8.0**	**163.71 (29.42)**	**175.59 (28.80)**	**2.09**	**.038**
Specific phobia	**14.8**	**164.47 (30.16)**	**176.40 (28.46)**	**2.74**	**.007**
Social anxiety disorder	**6.0**	**165.24 (32.17)**	**175.23 (28.72)**	**1.53**	**.126**
Generalized anxiety disorder	**13.4**	**163.67 (31.41)**	**176.32 (28.26)**	**2.78**	**.006**
Post-traumatic stress disorder	**7.7**	**160.07 (32.26)**	**175.87 (28.49)**	**2.74**	**.006**
Any anxiety disorder	**31.6**	**166.41 (30.79)**	**178.49 (27.32)**	**3.64**	**.000**
Mood disorders					
Major depressive disorder	**27.2**	**167.26 (30.55)**	**177.34 (27.96)**	**2.88**	**.004**
Any Mood disorder	**29.9**	**166.86 (30.47)**	**177.90 (27.76)**	**3.25**	**.001**
Any anxiety or mood disorder	**45.3**	**168.52 (30.49)**	**179.73 (26.69)**	**3.61**	**.001**

N= 351, statistically significant odds ratios are indicated in bold.