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ORIGINAL ARTICLE

Racial and gender-based disparities and trends in common psychiatric conditions for patients with inflammatory bowel disease in the United States: an 11-year national cross-sectional study

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Abstract

Background and Aim: Inflammatory bowel disease (IBD) is a chronic, debilitating disease that has been extensively studied. However, the clinical evidence remains limited regarding the racial and gender-based disparities in psychiatric illnesses in IBD patients. We aim to evaluate trends and socio-demographic disparities in psychiatric disorders in patients with IBD.

Methods: The United States National Inpatient Sample (NIS) database was retrospectively investigated from 2009 to 2019 to report trends and disparities in common psychiatric comorbidities in hospitalized patients with IBD.

Results: For the study period (2009–2019), the prevalence of generalized anxiety disorder (GAD) in IBD patients increased from 0.36% to 1.78%, depression increased from 9% to 13%, attention-deficit hyperactivity disorder increased from 0.49% to 2%, and post-traumatic stress disorder (PTSD) increased from 0.39% to 1.23% ($P < 0.001$). The prevalence of somatization (0.004%), schizophrenia (0.43%), schizoaffective disorder (0.18%), and bipolar disorder (2.28%) showed no significant trend ($P > 0.05$). Compared to males, females had a higher association with GAD, with an adjusted odds ratio (aOR) of 1.74 (95% confidence interval [CI]: 1.54–1.97, $P < 0.001$), depression (aOR = 1.85 [95% CI: 1.79–1.92] $P < 0.001$), bipolar disorder (aOR = 1.39 [95% CI: 1.29–1.51] $P < 0.001$), PTSD (aOR = 1.38 [95% CI: 1.21–1.57] $P < 0.001$), and chronic fatigue (aOR = 2.91 [95% CI: 1.71–4.95] $P < 0.001$). Blacks, Hispanics, and Asian/Native Americans had a lower association with psychiatric illnesses compared to Whites ($P < 0.001$).

Conclusions: This population-based study shows a rising prevalence of common psychiatric disorders in hospitalized patients with IBD, particularly in females. These mental illnesses were more commonly associated with Whites than Blacks, Hispanics, and Asian/Native Americans.

Relevance for Patients: Our findings highlight the need for effective screening and treatment protocols for psychiatric disorders in patients with IBD. It can potentially improve the quality of life and medication adherence and reduce the use of valuable healthcare resources. Prompt recognition of these mental illnesses followed by early treatment initiation can be of paramount clinical importance for sustained IBD remission.

1. Introduction

Inflammatory bowel disease (IBD) is a chronic, progressive condition affecting an estimated 4.90 million individuals worldwide [1]. Conventionally, it is considered a

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disease of the Western world; contemporary research highlights an increasing incidence in the Middle East, Asia, and South America [2]. Despite advances in IBD therapeutics, disparities in care persist across different races and ethnicities. The previous research has documented disparities in treatment initiation and utilization of advanced therapies among different ethnic groups [3,4]. Furthermore, it is recognized that IBD exhibits gender-specific alterations, highlighting the need for targeted care strategies for female patients [5]. Liu *et al.* further emphasized the importance of understanding and addressing these disparities to promote health equity among IBD populations [6]. Mental illnesses, affecting nearly one in five adults in the United States, represent a considerable public health concern [7]. Therefore, it is critical to understand the influence of racial and gender-based disparities on the clinical care of IBD patients, particularly concerning psychiatric comorbidities.

The incidence of psychiatric illnesses has increased among IBD patients compared to the general population [8-10]. It can significantly impact disease progression and healthcare utilization [11]. Comorbid depression and anxiety are linked to poorer clinical outcomes in IBD patients, including higher odds of emergency room visits and hospitalizations [12]. IBD has been independently associated with an increased risk of deliberate self-harm and other mental health illnesses [13]. Specific attention must be paid to gender-based disparities in the IBD population, as some studies suggest an association between female gender, active IBD, and the onset of depression [14]. Therefore, early detection and treatment of psychiatric disorders in the IBD population may become vital components of clinical management. It may have crucial clinical importance regarding disease progression, treatment compliance, and quality of life.

Despite the recognized importance of these topics, there is a lack of large-scale, data-driven studies investigating racial and gender-based disparities and trends in psychiatric comorbidities among IBD patients. To the best of our knowledge, this article represents the first National Inpatient Sample (NIS)-based retrospective study, providing a comprehensive evaluation of these disparities in common psychiatric conditions among IBD patients over a decade. Our findings hold significant clinical implications, offering a foundation of data-driven evidence that highlights racial and gender-based disparities in psychiatric comorbidities among IBD patients. This work is anticipated to heighten community awareness, support the establishment of effective psychiatric screening protocols, and promote timely referrals to mental health professionals. These measures will contribute to improve clinical care and health outcomes for patients with IBD.

2. Materials and Methods

2.1. Design and data source

The NIS is designed by the Agency for Healthcare Research and Quality [15]. It is the largest inpatient database in the United States [15]. The design of this particular database is to approximate a 20% stratified sample of hospitals along with sampling weights to calculate national estimates [15]. Additional information on the design of NIS and sampling methods is available at https://www.hcup-us.ahrq.gov. The data in NIS are provided using the International Classification of Diseases (ICD) 9 (before September 2015) and 10 (after October 2015) coding systems. The present retrospective study utilized the NIS database to identify patients with a primary diagnosis of IBD from January 2009 to December 2019. All patients below the age of 18 were excluded. The codes utilized for each variable in this study are outlined in Table S1.

2.2. Outcome measures

Primary outcomes included the prevalence of common psychiatric conditions that included generalized anxiety disorder (GAD), depression, somatization, bipolar disorder, attention-deficit hyperactivity disorder (ADHD), schizophrenia, schizoaffective disorder, post-traumatic stress disorder (PTSD), and chronic fatigue in IBD patients. Trend analysis for respective outcomes was also reported to ascertain any time-based shifts. Secondary outcomes were associations between gender, race, and psychiatric disorders among hospitalized IBD patients.

2.3. Statistical analysis

This study utilized Statistical Software for Data Science (STATA) (StataCorp LLC, College Station, TX, USA), version 16.0. The analysis had 0.05 as the threshold for statistical significance, and all *P*-values were 2-sided. Bivariate analysis was conducted using a Chi-square test for categorical variables and an independent-samples t-test for continuous variables. Categorical variables were presented as frequency (N) and percentage (%), and continuous variables were reported as mean with standard deviation (SD), as appropriate. For outcomes such as the length of stay and mean inpatient charges, a hierarchical multivariate linear regression analysis was conducted to adjust patient- or hospital-level factors. Multivariate logistic regression was conducted to assess the relationship between gender, race, and psychiatric conditions among hospitalized patients with IBD. The outcomes were reported as adjusted odds ratios (aOR) with 95% confidence intervals (CI) and *P*-values. The adjusted Wald test was utilized to compare slopes of time-based linear regression outcomes and Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) to generate figures.

2.4. Ethical consideration

The NIS database contains de-identified information for the protection of the privacy of patients, physicians, and hospitals. Therefore, it did not require institutional review board approval. Patient consent was also waived, as each hospitalization was stripped of any patient identifiers.

3. Results

3.1. Demographic characteristics of study sample

The total IBD hospitalizations decreased from 75,813 (200/100,000 total NIS hospitalizations) in 2009 to 70,210 (198/100,000 total NIS hospitalizations) in 2019, without

any statistical significance (P = 0.30) (Figure 1). During the study period, there was a higher frequency of females compared to males (54% vs. 46%) in hospitalized patients with IBD (P < 0.001). Most patients belonged to the age group 18–33 years (35%), followed by 34–49 years (27%) and 50–64 years (21%) (P < 0.001). There was a higher frequency of IBD hospitalizations among Whites (77%), followed by Blacks (14%), and Hispanics (8%) (P = 0.052). A vast majority of hospitalized patients with IBD had a Charlson Comorbidity Index (CCI) score of 0 (70%) (P < 0.001). Urban teaching hospitals had the highest frequency of IBD hospitalizations (62%), followed by urban non-teaching (29%) and rural (8%) hospitals (P < 0.001). Private insurance remained the primary payer for 50% of hospitalized patients with IBD, followed by Medicare (26%) and Medicaid (17%) (P < 0.001). Inpatient mortality significantly decreased from 0.51% in 2009 to 0.32% in 2019 (P = 0.016). The outcomes such as length of stay, mean inpatient charges, and additional demographic characteristics over the study period are described in Table 1.

3.2. Prevalence and trends of common psychiatric conditions in the IBD population

The prevalence of GAD in hospitalized patients with IBD was 0.83% for the study period, with increasing trends from 0.36% in 2009 (2.91/1000 IBD patients) to 1.78% in 2019 (17.8/1000 IBD patients) (P < 0.001). The prevalence of depression was 11.81%, with increasing trends from 9% in 2009 (85.7/1000 IBD patients) to 13% in 2019 (133.5/1000 IBD patients) (P < 0.001). The prevalence of ADHD was 1.04%, with increasing trends from 0.49% in 2009 (4.9/1000 IBD patients) to 2% in 2019 (15.5/1000 IBD patients) (P < 0.001). The prevalence of PTSD was 0.74%, with increasing trends from 0.39% in 2009 (3.9/1000 IBD patients) to 1.23% in 2019 (12.3/1000 IBD patients) (P < 0.001). The prevalence of somatization (0.004%), schizophrenia (0.43%), schizoaffective disorder (0.18%), and bipolar disorder (2.28%) showed no significant trend (P > 0.05) (Table 2).

3.3. Gender-based disparities of common psychiatric conditions in IBD population

Among hospitalized patients with IBD, females had a higher association with GAD (aOR = 1.74 [95% CI: 1.54–1.97] P < 0.001), depression (aOR = 1.85 [95% CI: 1.79–1.92] P < 0.001), bipolar disorder (aOR = 1.39 [95% CI: 1.29–1.51] P < 0.001), PTSD (aOR = 1.38 [95% CI: 1.21–1.57] P < 0.001), and chronic fatigue (aOR = 2.91 [95% CI: 1.71–4.95] P < 0.001), compared to males. There was a lower association with ADHD, schizophrenia, and schizoaffective disorders for females when compared to males with IBD (Table 3).

3.4. Race-based disparities of common psychiatric conditions in IBD population

Blacks, Hispanics, and Asian/Native Americans had a lower association with GAD, depression, bipolar disorder, PTSD, and ADHD compared to Whites in hospitalized patients with IBD (P < 0.001). Blacks and Hispanics had a higher association with schizophrenia than Whites (P < 0.001). Blacks also had a higher association with schizoaffective disorder (aOR = 1.66 [95% CI: 1.22–2.25] P = 0.001) compared to Whites with IBD. There was no significant difference in the association among Hispanics and Asian/Native Americans when compared to Whites for schizoaffective disorder. Blacks had a lower association with chronic fatigue compared to Whites (aOR = 0.43 [95% CI: 0.18–1.001] P = 0.05). For chronic fatigue, Hispanics showed no significant difference, whereas Asian/Native Americans could not be compared due to the smaller sample size (Table 4).

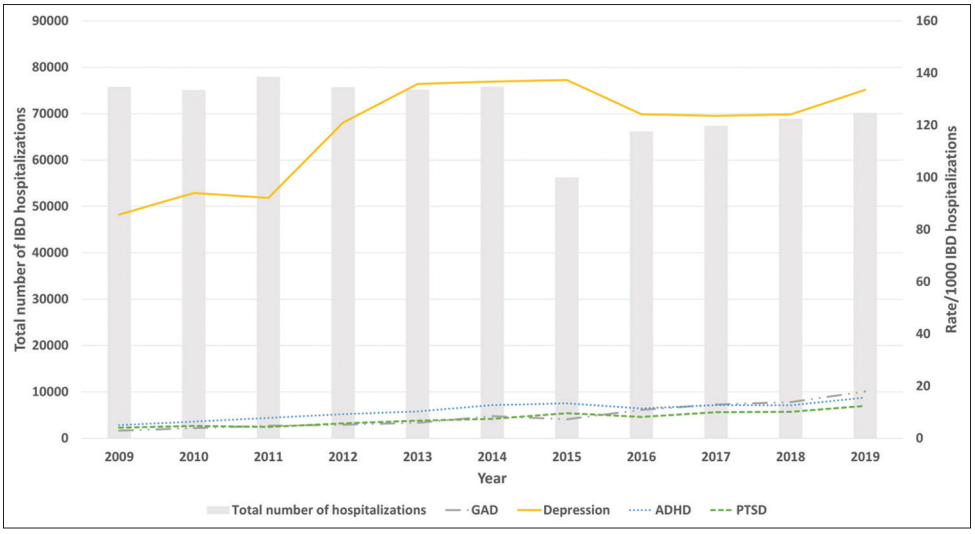

Figure 1. Rate of common psychiatric conditions in primary inflammatory bowel disease (IBD) hospitalizations in the National Inpatient Sample from 2009 to 2019. Bars show the total IBD hospitalizations per year. The line shows the rate per 1000 IBD hospitalizations for the study period for psychiatric conditions with significant trends in the present study (P < 0.05).
GAD: Generalized anxiety disorder; ADHD: Attention-deficit hyperactivity disorder; PTSD: Post-traumatic stress disorder.

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Table 1. Sociodemographic trends of inflammatory bowel disease hospitalizations in the National Inpatient Sample from 2009 to 2019

Variables	Years											*P*-values
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Total hospitalizations	75813	75092	77943	75720	75169	75815	56219	66164	67364	68939	70210	0.30
Mean age (years)	44.9±0.69	44.6±0.77	45.0±0.36	44.9±0.12	44.7±0.69	44.5±0.78	44.8±0.71	45.5±0.62	45.7±0.29	46.2±0.17	46.6±0.86	<0.001
Adjusted mean length of stay (days)	5.53±0.1	5.51±0.1	5.29±0.08	5.18±0.06	5.24±0.05	5.19±0.07	5.01±0.07	5.40±0.06	5.18±0.06	5.16±0.06	5.17±0.06	<0.001
Adjusted mean inpatient cost ($)	33090±1331	34998±1469	36352±1477	36784±960	38810±788	40546±868	40639±904	47318±1126	47989±1155	51201±1303	55138±1600	<0.001
Age groups (years)												<0.001
18–33	26124 (34%)	26741 (36%)	27616 (35%)	26620 (35 %)	26849 (35%)	27440 (36%)	19920 (35%)	22589 (34%)	22594 (34%)	22615 (33%)	22335 (32%)	
34–49	21731 (29%)	21111 (28%)	20747 (27%)	20405 (27%)	20389 (27%)	20510 (27%)	15055 (27%)	17360 (26%)	18065 (27%)	17864 (26%)	18310 (26%)	
50–64	15497 (20%)	15206 (20%)	16584 (21%)	15995 (21%)	15604 (21%)	15685 (21%)	11964 (21%)	14339 (22%)	14830 (22%)	15260 (22%)	15350 (22%)	
65–79	8776 (12%)	8454 (11%)	9106 (12%)	9325 (12%)	9099 (12%)	8750 (12%)	6915 (12%)	8909 (13%)	8789 (13%)	10019 (15%)	10995 (16%)	
≥80	3683 (5%)	3577 (5%)	3888 (5%)	3375 (4%)	3225 (4%)	3430 (5%)	2365 (4%)	2965 (4%)	3085 (5%)	3180 (5%)	3220 (5%)	
Gender												<0.001
Male	33377 (44%)	33263 (44%)	34227 (44%)	33915 (45%)	34249 (46%)	34935 (46%)	25709 (46%)	32429 (49%)	32754 (49%)	32665 (47%)	33660 (48%)	
Female	42246 (56%)	41700 (56%)	43574 (56%)	41805 (55%)	40909 (54%)	40855 (54%)	30485 (54%)	33664 (51%)	34610 (51%)	36269 (53%)	36340 (52%)	
Race												0.052
White	50281 (80%)	51659 (77%)	53655 (76%)	55305 (77%)	54099 (76%)	55025 (77%)	40244 (75%)	48849 (77%)	49864 (77%)	51439 (77%)	53255 (77%)	
Black	7259 (12%)	9638 (14%)	10268 (15%)	10170 (14%)	9775 (14%)	10000 (14%)	8104 (15%)	8234 (13%)	8615 (13%)	8725 (13%)	9035 (13%)	
Hispanic	4409 (7%)	5053 (8 %)	5496 (8 %)	5385 (8 %)	5960 (8 %)	5785 (8 %)	4270 (8 %)	5050 (8 %)	5420 (8 %)	5880 (9%)	5395 (8 %)	
Asian/Native American	797 (1%)	919 (1%)	943 (1%)	900 (1%)	955 (1%)	1020 (2%)	900 (2%)	930 (1%)	1010 (2%)	1145 (2%)	1070 (2%)	
CCI												0.001
CCI=0	55726 (74%)	54253 (72%)	55454 (71%)	54060 (71%)	53129 (71%)	54370 (72%)	39979 (71%)	45564 (69%)	45819 (68%)	45309 (66%)	45640 (65%)	
CCI=1	12791 (17%)	13108 (17%)	13668 (18%)	13370 (18%)	13399 (18%)	13140 (17%)	9735 (17%)	11749 (18%)	12215 (18%)	13175 (19%)	13290 (19%)	
CCI=2	4066 (5%)	4217 (6%)	4626 (6%)	4410 (6%)	4590 (6%)	4370 (6%)	3435 (6%)	4570 (7%)	4475 (7%)	5260 (8%)	5325 (8%)	
CCI≥3	3229 (4%)	3512 (5%)	4194 (5%)	3880 (5%)	4050 (5%)	3935 (5%)	3070 (5%)	4279 (6%)	4855 (7%)	5195 (8%)	5955 (8%)	
Hospital location and teaching status												<0.001
Rural	7855 (10%)	8215 (11%)	7437 (10%)	7610 (10%)	7324 (10%)	6240 (8%)	4520 (8%)	4274 (6%)	4369 (6%)	4109 (6%)	4335 (6%)	
Urban nonteaching	30154 (40%)	29896 (40%)	29840 (39%)	27169 (36%)	26345 (35%)	18775 (25%)	14254 (25%)	14724 (22%)	13379 (20%)	12275 (18%)	10749 (15%)	
Urban teaching	36819 (49%)	36146 (49%)	39860 (53%)	40940 (54%)	41499 (55%)	50800 (67%)	37444 (67%)	47165 (71%)	49614 (74%)	52554 (76%)	55125 (79%)	
Primary payer												<0.001
Medicare	17782 (25%)	18097 (26%)	19503 (26%)	19185 (27%)	19044 (27%)	18660 (26%)	14310 (26%)	16384 (26%)	16589 (26%)	17679 (27%)	18565 (27%)	
Medicaid	9608 (13%)	11278 (16%)	11376 (15%)	11195 (16%)	11195 (16%)	14239 (20%)	10835 (20%)	11819 (18%)	11744 (18%)	12235 (18%)	11925 (18%)	
Private	37915 (53%)	34791 (49%)	36892 (50%)	34739 (48%)	34334 (48%)	34895 (48%)	25744 (48%)	32454 (51%)	32890 (51%)	32754 (49%)	33270 (49%)	
Other	6427 (9%)	6645 (9%)	6107 (8%)	6525 (9%)	6644 (9%)	4875 (7%)	3150 (6%)	3270 (5%)	3685 (6%)	3590 (5%)	3815 (6%)	
Died	384 (0.51%)	357 (0.47%)	385 (0.49%)	275 (0.36%)	265 (0.35%)	220 (0.29%)	180 (0.32%)	225 (0.34%)	255 (0.37%)	235 (0.34%)	230 (0.32%)	0.016

CCI: Charlson Comorbidity Index

Table 2. Trends of psychiatric comorbidities in patients hospitalized with a primary diagnosis of inflammatory bowel disease in the National Inpatient Sample database from 2009 to 2019

Variables	Years										*P*-values
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
GAD	221 (0.36%)	292 (0.38%)	374 (0.47%)	390 (0.51%)	445 (0.59%)	640 (0.84%)	410 (0.72%)	720 (1.1%)	870 (1.29%)	955 (1.38%)	1255 (1.78%)	<0.001
Depression	6500 (9%)	7060 (9%)	7182 (9%)	9160 (12%)	10210 (14%)	10365 (14%)	7720 (14%)	8219 (12%)	8325 (12%)	8555 (12%)	9375 (13%)	<0.001
Somatization	0 (0%)	10 (<1%)	4 (<1%)	5 (<1%)	0 (0%)	5 (<1%)	0 (0%)	0 (0%)	5 (<1%)	0 (0%)	5 (<1%)	0.31
Bipolar disorder	1748 (2%)	1860 (2%)	1826 (2%)	1895 (2%)	1690 (2%)	1865 (2%)	1365 (2%)	1325 (2%)	1415 (2%)	1350 (2%)	1590 (2%)	0.37
ADHD	377 (0.49%)	479 (1%)	606 (1%)	700 (1%)	775 (1%)	960 (1%)	750 (1%)	755 (1%)	855 (1%)	870 (1%)	1090 (2%)	<0.001
Schizophrenia	331 (0.43%)	283 (<1%)	278 (<1%)	300 (<1%)	300 (<1%)	270 (<1%)	265 (<1%)	290 (<1%)	365 (1%)	365 (1%)	340 (0.48%)	0.90
Schizoaffective disorder	123 (<1%)	117 (<1%)	82 (<1%)	165 (<1%)	125 (<1%)	115 (<1%)	85 (<1%)	120 (<1%)	210 (<1%)	165 (<1%)	145 (<1%)	0.56
PTSD	302 (0.39%)	350 (0.46%)	336 (0.43%)	430 (0%)	505 (1%)	560 (1%)	540 (1%)	540 (1%)	675 (1%)	700 (1%)	870 (1.23%)	<0.001
Chronic fatigue	30 (<1%)	22 (<1%)	37 (<1%)	29 (<1%)	50 (<1%)	50 (<1%)	20 (<1%)	35 (<1%)	55 (<1%)	55 (<1%)	60 (<1%)	0.16

GAD: Generalized anxiety disorder; ADHD: Attention-deficit hyperactivity disorder; PTSD: Post-traumatic stress disorder.

Table 3. Gender-based disparities with common psychiatric conditions in inflammatory bowel disease hospitalizations (females compared against males)

Variables	Adjusted odds ratio with 95% confidence interval	*P*-values
GAD	1.74 (1.54–1.97)	<0.001
Depression	1.85 (1.79–1.92)	<0.001
Somatization	4.8 (0.57–3.98)	0.14
Bipolar disorder	1.39 (1.29–1.51)	<0.001
ADHD	0.77 (0.69–0.86)	<0.001
Schizophrenia	0.43 (0.36–0.51)	<0.001
Schizoaffective disorder	0.67 (0.52–0.86)	0.002
PTSD	1.38 (1.21–1.57)	<0.001
Chronic fatigue	2.91 (1.71–4.95)	<0.001

GAD: Generalized anxiety disorder; ADHD: Attention-deficit hyperactivity disorder; PTSD: Post-traumatic stress disorder

4. Discussion

This study found a decrease in hospitalizations with IBD as a primary diagnosis. While there has been an overall increase in IBD cases, newer and more effective treatments have possibly resulted in a drop in hospital admissions. Our findings show that several psychiatric disorders are becoming more common in hospitalized patients with IBD. Whites were more commonly associated with GAD, depression, bipolar disorder, PTSD, and ADHD compared to Blacks, Hispanics, and Asian/Native Americans. Furthermore, females had a higher association with GAD, depression, bipolar disorder, PTSD, and chronic fatigue than male IBD patients.

IBD patients may have a significantly higher prevalence of serious psychological distress (7.4% vs. 3.4%) compared to those without IBD [16]. A retrospective cohort study from Canada revealed an increased incidence and prevalence of psychiatric disorders in IBD patients than in the general population, including anxiety, depression, and bipolar disorder [9]. In our study, depression was the most common psychiatric disorder among IBD patients. Mardini *et al.* demonstrated that in patients with Crohn's disease, the presence of depressive symptoms was associated with increased disease activity over an 18-month follow-up [17]. The presence of depression has also been shown to increase the risk of relapse in IBD and can lead to reduced quality of life and low medication adherence [18-20].

IBD patients with anxiety have been shown to have an increased risk of surgery, poorer treatment compliance, and decreased quality of life [18,21,22]. A study in Switzerland showed an increased recurrence of IBD in patients with depression and anxiety [23]. A Korean study revealed that IBD patients in remission with concomitant functional gastrointestinal and mood disorders demonstrated a lower health-related quality of life [24]. The young adult patients face multiple financial, academic, and personal challenges, which may lead to an increased risk of developing psychiatric disorders [25]. Our study also showed an increased rate of IBD hospitalizations in young adults. It may potentially be attributed to the worsening of IBD disease activity due to the aforementioned factors in this age group.

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Table 4. Racial disparities with common psychiatric conditions in inflammatory bowel disease hospitalizations (compared against White race)

Variables	Adjusted odds ratio with 95% confidence interval	*P*-values
GAD		
White	-	
Black	0.42 (0.34–0.53)	<0.001
Hispanic	0.53 (0.40–0.69)	<0.001
Asian/Native American	0.15 (0.04–0.47)	0.001
Depression		
White	-	
Black	0.62 (0.59–0.66)	<0.001
Hispanic	0.60 (0.56–0.65)	<0.001
Asian/Native American	0.39 (0.32–0.48)	<0.001
Bipolar disorder		
White	-	
Black	0.77 (0.68–0.86)	<0.001
Hispanic	0.71 (0.61–0.83)	<0.001
Asian/Native American	0.30 (0.18–0.51)	<0.001
ADHD		
White	-	
Black	0.22 (0.17–0.28)	<0.001
Hispanic	0.33 (0.25–0.44)	<0.001
Asian/Native American	0.22 (0.10–0.47)	<0.001
Schizophrenia		
White	-	
Black	3.84 (3.2–4.60)	<0.001
Hispanic	1.52 (1.14–2.02)	0.004
Asian/Native American	0.56 (0.21–1.51)	0.25
Schizoaffective disorder		
White	-	
Black	1.66 (1.22–2.25)	0.001
Hispanic	0.88 (0.54–1.44)	0.62
Asian/Native American	0.79 (0.25–2.45)	0.69
PTSD		
White		
Black	0.57 (0.46–0.72)	<0.001
Hispanic	0.62 (0.47–0.81)	0.001
Asian/Native American	0.46 (0.23–0.93)	0.032
Chronic fatigue		
White	-	
Black	0.43 (0.18–1.001)	0.05
Hispanic	0.39 (0.12–1.26)	0.11
Asian/Native American	-	-

GAD: Generalized anxiety disorder; ADHD: Attention-deficit hyperactivity disorder; PTSD: Post-traumatic stress disorder.

In our study, females had a higher frequency of IBD hospitalizations than males. Furthermore, female IBD patients were more commonly associated with diagnoses of GAD, depression, bipolar disorder, PTSD, and chronic fatigue. An increased genetic susceptibility to psychiatric disorders, hormonal fluctuations, alterations in microbiome composition, and various environmental factors can possibly contribute to these trends [26]. In addition, it is also critical to take into account the fact that women are more likely than men to face physical, sexual, and emotional abuse [27]. These factors could also be driving the observed gender differences in mental health disorders among IBD patients in our analysis. Moreover, it is known that women with IBD show increased odds of poor maternal and fetal outcomes, and a pre-pregnancy IBD diagnosis may increase the risk for mood and anxiety disorders [28,29].

Smoking is a known risk factor for the development of Crohn's disease in both males and females [30]. A Swiss study found that young women had a higher smoking rate of 51.7% than young men [31]. Similarly, a Dutch study revealed that there were more female current smokers among patients with IBD than males [32]. The higher smoking rate in young females may contribute to the increased IBD-related hospitalizations observed in our study. The present study showed an increased prevalence of anxiety in female IBD patients, which mirrors the gender differences in anxiety among the general population [33]. Genetic predisposition due to known susceptibility gene variants is one of the causes of the increased prevalence of IBD in the female population. Females are more commonly associated with familial than sporadic IBD (61% vs. 54%) [34]. Females are also more likely to develop ulcerative colitis if they have a single nucleotide polymorphism in the promoter region of interleukin-10 [35]. A number of immune-mediated diseases result from the loss of the X-chromosome in peripheral T and B lymphocytes, including primary biliary cholangitis, autoimmune thyroid disease, Raynaud's syndrome, and systemic sclerosis [36,37]. A similar mechanism may contribute to the prevalence of IBD in females. However, the exact mechanism remains unclear. Compared to males, IBD in females is more often associated with a negative body image and reduced sexual activity [38,39]. This may further contribute to the development of psychiatric disorders. Other factors that result in gender disparities among IBD patients include occupation, lifestyle, and dietary habits. However, a clear causal relationship remains to be established.

Racial disparities among IBD patients have previously been studied. However, less is known about their impact on IBD patients with common psychiatric conditions. IBD is typically more prevalent among populations in Western and Northern Europe [40]. However, its incidence among non-White populations has also increased in recent years [41]. In our study, Whites had the highest rate of IBD hospitalizations (77%), followed by Blacks (14%) and Hispanics (8%). In a large survey-based study, Wang *et al.* revealed similar findings in the United States [42]. Moreover, in a recent retrospective study based on 132,894 IBD hospitalizations with substance use disorder, White was the most common race (N = 98,147; 79%) [43]. Our data showed that GAD, depression, bipolar disorder, PTSD, and ADHD were more prevalent in White IBD patients than in Black, Hispanic, and Asian/Native American IBD patients. In contrast, a retrospective cohort study conducted at a large urban outpatient center revealed

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that Black patients had an increased prevalence of depression with low screening rates [44]. Several studies have demonstrated racial disparities in outcomes in patients hospitalized with IBD, with Blacks having higher readmission rates, a longer length of stay, and increased morbidity and mortality compared to White patients [45,46]. This may be due to several sociocultural factors and barriers to healthcare utilization. One study revealed that Whites were more likely to be seen by gastroenterologists annually than Black IBD patients [47]. These disparities have been attributed to the underutilization of specialist care as a result of difficulties in obtaining specialist referrals and financial concerns among Black patients [47]. Similar reasons may contribute to decreasing healthcare utilization for psychiatric disorders in non-White patients, leading to poor prognoses and worse outcomes. Contrarily, schizophrenia and schizoaffective disorder were less likely to be seen in Whites than in Blacks and Hispanics. This trend may be attributed to the disproportionate number of schizophrenia diagnoses among African Americans and Latino Americans [48].

The prognosis of IBD can be negatively impacted by psychiatric disorders, often due to medication non-adherence, resulting in worsened clinical outcomes, functional disability, and reduced quality of life [18-21,49,50]. The previous investigations have examined the impact of psychiatric disorders on the IBD patient population [11,49,50]. However, the clinical evidence on race and gender disparities in IBD patients remains sparse. Our study represents one of the largest analyses exploring racial and gender-based disparities in psychiatric comorbidities in IBD patients, identifying females and Whites as particularly susceptible. It is essential to consider how social and structural norms may influence the diagnosis of IBD and psychiatric illnesses. For instance, it is known that women are more likely to access health services, particularly mental health support. This observation could possibly be overrepresented in our findings. Similarly, the barriers faced by racial and ethnic minorities in accessing healthcare could lead to delayed or missed diagnoses. As the prevalence of psychiatric comorbidities increases in chronic medical conditions, it is important for clinicians and policymakers to consider the racial and gender-based disparities in these psychiatric illnesses [51,52]. Our results highlight the need for further research to develop effective screening and treatment guidelines for IBD patients with psychiatric disorders. This could improve the prognosis, enhance the quality of life, and reduce healthcare costs. Beyond medical treatment, addressing psychosocial concerns in IBD is critical. Mussell *et al.* described the efficacy of outpatient psychological group therapy in the short- and long-term reduction of psychological distress in IBD patients, but they simultaneously emphasized gender-specific interventions [53]. Further studies examining the correlation between IBD and psychiatric comorbidities across different genders and races are warranted. It would be helpful to shed light on the interplay of psychiatric disorders, IBD, and potential genetic, environmental, and social factors affecting outcomes.

It is critical to consider implementing culturally sensitive mental health screening and treatment protocols. It can help to cater to the specific needs of diverse patient populations to address the observed disparities in psychiatric comorbidities among IBD patients. This strategy may assist in lowering barriers to receiving care for mental health and enhancing the general standard of care for IBD patients with psychiatric comorbidities. The complex and potentially bidirectional relationship between IBD and psychiatric disorders should be the subject of further investigation, considering elements such as cultural background, gender, and social determinants of health [54]. A deeper understanding of these relationships will facilitate the development of focused interventions to address these disparities. It will improve the overall clinical care and outcomes for IBD patients with comorbid psychiatric conditions. In light of the trends observed over a decade-long span in our study, we speculate that increased disease awareness, advancements in diagnostic methodologies, societal attitudes toward mental health, and potential changes in lifestyle and environmental factors may have influenced the prevalence and recognition of IBD and associated psychiatric illnesses. This further emphasizes the importance of ongoing research to better understand and address these evolving trends.

5. Limitations

We acknowledge several limitations to our study, primarily grounded in the inherent restrictions of using the NIS. While it presents a large database for generalized interpretation, hospital data in NIS do not evaluate non-hospitalized individuals. Therefore, this dataset could lead to an underrepresentation of psychiatric disorders within the broader IBD population. The database also lacks supplementary data on treatments such as antidepressants and antipsychotic usage. It could provide a more holistic view of the prevalence of psychiatric disorders in IBD patients. Another limitation is the reliance on ICD codes as the primary indicator of psychiatric disorders. Despite being systematic in their disease classification, these codes may not fully capture the complexity of mental health diagnoses [55]. The exclusive reliance on ICD codes could also lead to the misclassification or underrepresentation of certain mental health conditions. The study does not account for changes in mental health reporting patterns due to increasing societal awareness. The increased awareness may lead to improved identification and reporting of mental health disorders, causing an apparent rise in prevalence. Simultaneously, heightened awareness might also encourage individuals to report milder distress as mental health issues, potentially overestimating the prevalence rates. The study does highlight ethnic disparities in the prevalence of psychiatric disorders, observing higher rates among White IBD patients compared to other ethnic groups. However, these findings should be interpreted cautiously due to potential confounding factors. Sociocultural influences, healthcare access disparities, and systemic biases could potentially contribute to underdiagnosis or underreporting in minority populations.

6. Conclusions

This study revealed that females had a higher frequency of IBD hospitalizations compared to males. Most patients were in the younger age group of 18–33 years. The most frequent

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psychiatric diagnosis among hospitalized IBD patients was depression, which was followed by bipolar disorder, ADHD, GAD, PTSD, schizophrenia, schizoaffective disorder, chronic fatigue, and somatization. Depression, GAD, bipolar disorder, PTSD, and chronic fatigue were more commonly associated with females compared to males. Whites had the highest rate of IBD hospitalizations, followed by Blacks and Hispanics. GAD, depression, bipolar disorder, PTSD, and ADHD were more commonly associated with Whites compared to Blacks, Hispanics, and Asian/Native Americans. However, schizophrenia and schizoaffective disorder were less likely to be seen in Whites than in Blacks and Hispanics. Our findings highlight the importance of recognizing these racial and gender-based disparities and trends among IBD patients. Effective screening and treatment protocols for psychiatric comorbidities in IBD patients may aid in their early recognition and management. It will also increase IBD treatment compliance, which will help in achieving sustained remission. The quality of life for IBD patients will be improved and valuable healthcare resources will be saved.

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Conflicts of Interest

There are no conflicts of interest associated with the publication of this manuscript.

Ethics Approval and Consent to Participate

The data of patients was not acquired from any specific institution but rather open-access United States National Inpatient Sample (NIS) database. The NIS contains de-identified information, protecting the privacy of patients, physicians, and hospitals. Therefore, ethics approval and consent to participate were deemed exempt for this study.

Consent for Publication

Participants were not required to give informed consent for publication of this study since the analysis of baseline characteristics used anonymized clinical data.

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ORIGINAL ARTICLE

Racial and gender-based disparities and trends in common psychiatric conditions for patients with inflammatory bowel disease in the United States: an 11-year national cross-sectional study

Supplementary File

Table S1. ICD 9 and ICD 10 codes for the present study

Category	ICD-9-CM Codes	ICD-10-CM Codes
Inflammatory bowel disease	5560, 5561, 5562, 5563, 5565, 5566, 5568, 5569, 5550, 5551, 5552, and 5559	K5100, K51011, K51012, K51013, K51014, K51015, K51016, K51017, K51018, K51019, K5120, K51211, K51212, K51213, K51214, K51218, K51219, K5130, K51311, K51312, K51313, K51314, K51318, K51319, K5140, K51411, K51412, K51512, K51513, K51514, K51518, K51519, K5180, K51811, K51812, K51813, K51814, K51818, K51819, K5190, K51911, K51912, K51913, K51914, K51918, K51919, K50011, K50012, K50013, K50014, K50018, K50019, k5010, K50111, K50112, K50113, K50114, K50118, K50119, k5080, K50811, K50812, K50813, K50814, K50818, K50819, k5090, K50911, K50912, K50913, K50914, K50918, K50919, and k5000
Generalized anxiety disorder	30002	F411
Depression	29621, 29622, F29623, 29624, 2980, 29625, 29626, 29682, 29620, and 311	F320, F321, F322, F323, F324, F325, F3289, and F329
Somatization	30081	F450
Bipolar disorder	29640, 29641, 29642, 29643, 29644, 29650, 29651, 29652, 29653, 29654, 29660, 29661, 29662, 29663, 29664, 2967, 29645, 29646, 29655, 29656, 29665, 29666, 29689, 29640, and 29680	F310, F3110, F3111, F3112, F3113, F312, F3130, F3131, F3132, F314, F315, F3160, F3161, F3162, F3163, F3164, F3170, F3171, F3172, F3173, F3174, F3175, F3176, F3177, F3178, F3181, F3189, and F319
Attention deficit hyperactivity disorder	31400, 31401, and 3142	F900, F901, F902, F908, and F909
Schizophrenia	29530, 29510, 29520, 29590, 29560, 29540, and 29590	F200, F201, F202, F203, F205, F2081, F2089, and F209
Schizoaffective disorder	29570	F250, F251, F258, and F259
Post traumatic stress disorder	30981	F4310, F4311, and F4312
Anorexia	3071	F5000, F5001, and F5002
Binge eating disorder	30759	F5081
Chronic fatigue	78071	R5382

ICD: International Classification of Disease

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