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Racial disparity in inflammatory bowel disease-related complications: a nationwide cohort study

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Abstract

Background Racial disparities in inflammatory bowel disease (IBD)-related complications are increasingly recognized, yet nationwide data remain limited. This study examined racial differences in IBD-related complications across diverse patient populations.

Methods We analyzed data from the Nationwide Inpatient Sample 2016-2021, on over 1.7 million weighted hospitalizations for IBD. Adults with Crohn's disease (CD) or ulcerative colitis (UC) were identified using ICD-10 codes. Key outcomes included anal abscess, intestinal obstruction, rectal bleeding and anal fissure/fistula, were compared across racial groups. Multivariate logistic regression was used to estimate the odds of complications, adjusting for age, sex, insurance, comorbidities, and hospital factors.

Results Compared to White patients, Black and Hispanic patients with CD had higher rates of anal abscesses (2.8% and 2.57% vs. 1.25%) and rectal bleeding (2.85% and 2.51% vs. 1.79%). Multivariate logistic regression showed that Black and Asian patients had higher odds of developing anal abscess compared to White patients (adjusted OR [aOR] 1.41, 95% confidence interval [CI] 1.38–1.45] and aOR 1.19, 95%CI 1.13-1.29, respectively). In UC, Black (aOR 1.33, 95%CI 1.29-1.37), Hispanic (aOR 1.23, 95%CI 1.21-1.27), and Asian patients (aOR 1.12, 95%CI 1.04-1.20) had higher odds of rectal bleeding, while the odds of intestinal obstruction were lower in Black (aOR 0.74, 95%CI 0.67-0.82), compared to White patients.

Conclusions Racial disparities exist in complications associated with IBD. Black and Hispanic patients had higher odds of perianal complications, while White patients had more intestinal obstruction. These findings emphasize the need for earlier intervention and improved access to advanced therapies in diverse populations.

Keywords Disparities, race, inflammatory bowel disease, Crohn's disease, ulcerative colitis

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Introduction

Inflammatory bowel disease (IBD), which includes Crohn's disease (CD) and ulcerative colitis (UC), is a chronic, relapsing inflammatory condition of the gastrointestinal tract that imposes a significant health burden globally [1-4]. The healthcare costs associated with IBD are considerable, with annual US expenditure estimates exceeding $6.3 billion [5,6].

Recent trends in the United States (US) indicate a shift in the epidemiology of IBD, with increasing incidence rates among non-White populations [7]. Between 1970 and 2010, IBD incidence increased by 39% in White patients, but by 134% in minority populations [7]. This shift is particularly concerning, as the US population is projected to become majority-minority by 2050, with Hispanics and Non-Hispanic Blacks comprising almost half of the total population [8,9]. Understanding the burden of IBD across diverse ethnic populations is critical, as these groups are disproportionately affected by healthcare

access disparities that lead to worse outcomes [5,6]. Black patients with UC, for example, are less likely to be under the care of a gastroenterologist and more likely to experience emergency department visits and delayed colectomy [5].

Previous studies examining the racial differences in IBD presentations were mostly small and have yielded conflicting results. As the incidence of IBD among non-White populations continues to rise, there is a need for robust and generalizable data to guide healthcare delivery. It is crucial to understand disease trends and characteristics among different racial and ethnic groups, as these differences may have implications for diagnosis, prognosis, and management of IBD [7]. Therefore, the aim of the present study was to use data from the largest nationwide inpatient database to investigate differences in IBD-related complications between racial groups, providing comprehensive insights to inform more equitable healthcare delivery and improve outcomes for all patients.

Materials and methods

Data source

This study used data from the Nationwide Inpatient Sample (NIS), as part of the Healthcare Cost and Utilization Project (HCUP), which houses the health information of about 8 million patients annually. The NIS is the largest publicly available all-payer inpatient healthcare database in the US, designed to produce nationally representative estimates of hospital inpatient stays. The NIS includes data from a stratified 20% sample of all hospital discharges from non-federal hospitals across 48 States. Each discharge record is weighted to ensure national representativeness, allowing for the projection of nationwide estimates of healthcare utilization, hospitalizations and outcomes. We used data from 2016-2021, which included over 120 million discharges. It is important to note that the NIS database does not provide patient-specific clinical data. Detailed information on the NIS can be found on its website (https://www.hcup-us.ahrq.gov/databases.jsp).

Study population

This study included an unweighted total of 397,314 patients diagnosed with IBD. After applying the discharge weights, this corresponds to a nationally representative cohort of 1,986,570 hospitalizations. We included all hospitalizations for patients aged ≥18 years with any diagnosis of IBD (CD or UC), whether recorded as a primary or secondary diagnosis (Fig. 1). See Appendix 1 for the list of codes from the International Classification of Diseases, Tenth Revision (ICD10), used in this study.

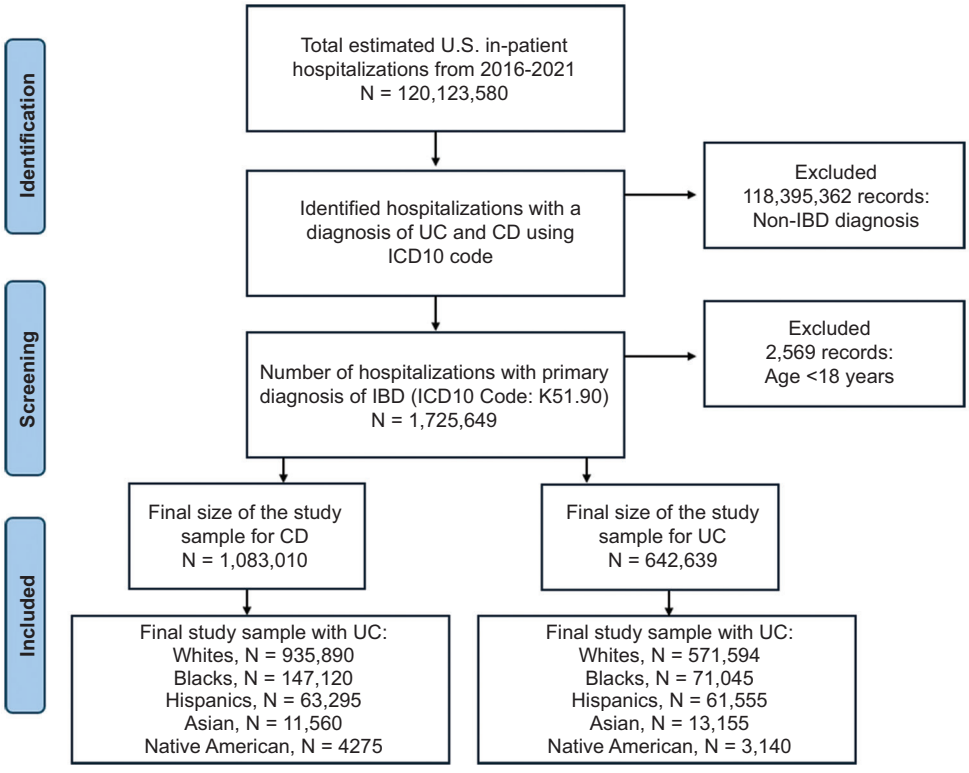

Figure 1 Selection of study population
US, United States; UC, ulcerative colitis; CD, Crohn's disease; IBD, inflammatory bowel disease

Outcome measures

The primary exposure variable was race, categorized as White, Black, Hispanic, Asian or Native American, based on self-reported data. The primary outcome was defined as the occurrence of IBD-related complications during the hospitalization, identified by ICD-10 codes for anal abscess (K61.x), intestinal obstruction (K56.x), rectal bleeding (K62.5) and anal fissure/fistula (K60.x). Secondary outcomes included measures of healthcare use, such as length of stay and total hospital charges, as well as hospital-related variables, including insurance status, median household income quartile, geographic region (Northeast, Midwest, South, West), teaching status (rural, urban teaching), and the presence of comorbidities. Hospital charges for each study year were adjusted to 2021 US dollar equivalents using the Consumer Price Index (CPI) from the US Bureau of Labor Statistics. The adjustment factor was calculated as the CPI for 2021 divided by the CPI for the specific year, and hospital charges were multiplied by this factor.

Statistical analysis

Weighted discharge data were applied to generate national estimates, accounting for the stratified sampling design of the NIS. Descriptive statistics were calculated to compare demographic, clinical and hospital characteristics between the racial groups (White, Black and Hispanic). Continuous variables were summarized as means with standard deviations, and categorical variables were represented as frequencies with percentages. The comparisons across the 3 groups were performed using 1-way analysis of variance, while categorical variables were compared using chi-square tests. Multivariate logistic regression models were constructed to assess the association between race and the odds of each IBD-related complication. In these models, race was treated as a nominal categorical variable, with White patients serving as the reference group and indicator variables created for Black, Hispanic, Asian and Native American patients. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. Additionally, linear regression models were employed to assess the impact of race on secondary outcomes, including length of stay and total hospital charges. Both regression models were adjusted for confounding variables, and all analyses were conducted using SAS software version 9.4 (SAS Institute, Cary, NC). Statistical significance was defined as a P-value of less than 0.05.

Ethics statement

As the study utilized publicly available, de-identified data, it was exempt from institutional review board approval [10]. The NIS adheres to the Health Insurance Portability and Accountability Act (HIPAA) to protect patient privacy.

Results

Demographics

The study included a total of 936,135 White, 147,155 Black, 63,295 Hispanic, 11,560 Asian and 4275 Native American patients with CD, and 571,594 White, 71,074 Black, 61,555 Hispanic, 13,155 Asian and 3140 Native American patients with UC (Fig. 1). The mean age of Black patients with CD was significantly lower than that of White patients (44.36±17.38 vs. 53.35±19.36 years, P<0.001). Similarly, Hispanic patients (43.99±19.39 years), Asian patients (45.84±21.22 years), and Native American patients (48.40±18.07 years) were also younger than White patients (P<0.001; Table 1). For UC, Black patients were younger than their White counterparts (48.94±19.48 vs. 57.80±20.34 years, P<0.001), as were Hispanic (45.49±20.99 years), Asian (51.51±21.60 years), and Native American (49.12±18.60 years) patients (P<0.001). A higher proportion of Black patients with CD were in the 20-39 age group (38.19%) compared to Whites (24.01%), while a greater percentage of White patients were aged ≥60 years (41.80%). Hispanic, Asian and Native American patients also had a higher proportion in the 20-39 age group (36.6%, 32.9% and 32.5%, respectively), compared to Whites (P<0.001). Similarly, for UC, Black patients had the highest proportion in the 20-39 age group (30.77%), followed by Hispanic (34.3%), Asian (27.4%) and Native American (30.3%) patients, all significantly higher than Whites (P<0.001; Table 2).

The proportion of females was higher across all racial groups. Among CD patients, females accounted for 57.38% of Whites, 58.79% of Blacks, 54.15% of Hispanics, 47.83% of Asians and 61.29% of Native Americans (P<0.001). For UC, females comprised 53.41% of Whites, 58.90% of Blacks, 52.5% of Hispanics, 52.5% of Asians and 55.4% of Native Americans (P<0.001).

Insurance status

White patients had higher rates of Medicare and private insurance than Black patients (43.45% vs. 32.39% for Medicare and 37.06% vs. 27.36% for private insurance). Conversely, Black patients had higher rates of Medicaid (30.80% vs. 13.67%) and self-pay status (5.94% vs. 3.01%) (P<0.001). Hispanic patients had the highest percentage of Medicaid coverage (29.6% for CD, 29.4% for UC), followed by Black patients (30.8% for CD, 24.7% for UC). Asian patients had the highest proportion of private insurance coverage (49.6% for CD, 49.5% for UC), while Native Americans had the highest proportion of Medicare coverage (34.5% for CD, 26.9% for UC) (P<0.001; Tables 1 and 2).

Healthcare utilization and charges

Among CD patients, Black patients had a significantly longer mean hospital stay compared to White patients

Table 1 Comparison of demographic and clinical characteristics among patients with CD stratified by race

Condition	White (N=935,890)	Black (N=147,120)	Hispanics (N= 63,295)	Asian (N= 11,560)	Native American (N = 4275)	P-value
Sex						<0.001
Male	398,830 (42.62)	60,635 (41.21)	29,015 (45.85)	6,030 (52.16)	1,655 (38.71)	
Female	537,060 (57.38)	86,485 (58.79)	34,280 (54.15)	5,530 (47.83)	2,620 (61.29)	
Age, mean±SD	53.35±19.36	44.36±17.38	43.99±19.39	45.84±21.22	48.40±18.07	<0.001
Age category (years)						<0.001
<20	34,820 (3.72)	8,440 (5.74)	5985 (9.5)	1290 (11.1)	190 (4.4)	
20-39	224,750 (24.01)	56,195 (38.19)	23155 (36.6)	3805 (32.9)	1390 (32.5)	
40-59	285,230 (30.47)	51,095 (34.72)	19495 (30.8)	3035 (26.2)	1400 (32.7)	
≥ 60	391,335 (41.80)	31,425 (21.36)	14655 (23.2)	3440 (29.7)	1295 (30.3)	
Length of stay	5.21±6.36	5.55±6.95	5.32±8.02	5.41±7.32	5.11±6.54	<0.001
Total charges	$59,905.22±97,051.24	$60,063.18±103,060.33	74,465.36±128,699.66	78,873.56±135,032.17	55,184.25±87,425.40	<0.001
In-hospital mortality	14025 (1.50)	1490 (1.01)	740 (1.2)	135 (1.2)	85 (2.0)	<0.001
IBD-related complications						
Anal Abscess	11655 (1.25)	4240 (2.88)	1630 (2.57)	311 (2.69)	40 (0.9)	<0.001
Intestinal Obstruction	77910 (8.32)	11665 (7.93)	5005 (7.9)	1360 (11.8)	350 (8.2)	<0.001
Rectal Bleeding	16,720 (1.79)	4,195 (2.85)	1585 (2.51)	255 (2.21)	60 (1.40)	<0.001
Anal Fissure/Fistula	33,575 (3.59)	8,020 (5.45)	2660 (4.21)	655 (5.66)	165 (3.85)	<0.001
Type of admission						<0.001
Non-elective	781,465 (83.61)	130,300 (88.7)	55,960 (88.5)	9,820 (85.0)	3,520 (82.7)	
Elective	15,3310 (16.42)	16,680 (11.3)	7,280 (11.5)	1,735 (15.0)	735 (17.3)	
Residential income						<0.001
First quartile (lowest)	204,830 (22.2)	69,825 (48.3)	19,490 (31.3)	1250 (10.9)	1,770 (42.6)	
Second quartile	245,665 (26.6)	32,725 (22.6)	15,625 (25.1)	2,015 (17.6)	1,085 (26.1)	
Third quartile	246,695 (26.7)	25,360 (17.5)	15,635 (25.1)	2,650 (23.1)	805 (19.4)	
Fourth quartile (highest)	226,380 (24.5)	16,805 (11.6)	11,520 (18.5)	5,560 (48.5)	495 (11.9)	
Insurance						<0.001
Medicare	406,255 (43.4)	47,595 (32.4)	17,110 (27.1)	3,120 (27.0)	1,475 (34.5)	
Medicaid	127,805 (13.7)	45,260 (30.8)	18,730 (29.6)	2,090 (18.1)	1,160 (27.2)	
Private Insurance	346,525 (37.1)	40,205 (27.4)	21,145 (33.4)	5,735 (49.6)	1,225 (28.7)	
Self-pay	28,160 (3.0)	8,725 (5.9)	3745 (5.9)	305 (2.6)	190 (4.4)	
Disposition						<0.001
Home discharge	645330 (68.97)	108930 (74.05)	49790 (78.72)	8985 (77.66)	3150 (73.68)	
Transfer to other short-term hospital	19195 (2.05)	2340 (1.59)	915 (1.45)	510 (4.41)	105 (2.46)	
Transfer to SNF	98020 (10.48)	9975 (6.78)	6150 (9.72)	1160 (10.03)	715 (16.73)	
Transfer to home health care	141265 (15.10)	18495 (12.57)	6840 (10.81)	1465 (12.66)	460 (10.76)	

(*Contd...*)

Table 1 (*Continued*)

Condition	White (N=935,890)	Black (N=147,120)	Hispanics (N= 63,295)	Asian (N= 11,560)	Native American (N = 4275)	P-value
Hospital region						<0.001
Northeast	241625 (25.82)	22975 (15.62)	13950 (22.04)	2315 (20.01)	315 (7.37)	
Midwest	256635 (27.42)	33730 (22.93)	5785 (9.14)	1550 (13.40)	970 (22.69)	
South	450410 (48.13)	77900 (52.95)	26725 (42.22)	2610 (22.56)	1765 (41.29)	
West	179390 (19.17)	12525 (8.53)	16850 (26.62)	5095 (44.04)	1225 (28.65)	
Alcohol use disorder	34065 (3.64)	4850 (3.30)	1885 (2.98)	190 (1.64)	295 (6.90)	0.0033
Anemia	96755 (10.34)	19035 (12.94)	7210 (11.39)	1225 (10.59)	410 (9.59)	<0.001
Congestive heart failure	85770 (9.16)	12705 (8.63)	3390 (5.36)	750 (6.48)	485 (11.35)	<0.001
Cardiac arrhythmia	58110 (6.21)	8815 (5.99)	3130 (4.95)	645 (5.57)	195 (4.56)	<0.001
Valvular disease	3845 (0.41)	299.99 (0.20)	145 (0.23)	40 (0.35)	45 (1.05)	<0.001
Peripheral vascular disorders	15600 (1.67)	1890 (1.28)	750 (1.18)	100 (0.86)	55 (1.29)	<0.001
Hypertension	266680 (28.49)	40060 (27.22)	13785 (21.78)	2390 (20.66)	1160 (27.13)	<0.001
Diabetes (uncomplicated)	52020 (5.56)	8640 (5.87)	4060 (6.41)	675 (5.83)	360 (8.42)	<0.001
Diabetes (complicated)	62255 (6.65)	11485 (7.80)	4350 (6.87)	785 (6.78)	465 (10.88)	<0.001
Hypothyroidism	70910 (7.57)	3525 (2.40)	2970 (4.69)	685 (5.92)	240 (5.61)	<0.001
Chronic kidney disease	80125 (8.56)	15025 (10.21)	3890 (6.15)	805 (6.96)	310 (7.25)	<0.001
Liver disease	36265 (3.87)	4235 (2.88)	2795 (4.42)	475 (4.11)	220 (5.15)	<0.001
Peptic ulcer disease (non-bleeding)	7,865 (0.84)	1,675 (1.14)	785 (1.24)	185 (1.60)	65 (1.52)	<0.001
HIV/AIDS	1,170 (0.13)	1,370 (0.93)	200 (0.32)	20 (0.17)	0 (0.00)	<0.001
Metastatic cancer	685 (0.07)	65 (0.04)	30 (0.05)	10 (0.09)	0 (0.00)	<0.001
Rheumatoid arthritis	445 (0.05)	35 (0.02)	25 (0.04)	5 (0.04)	5 (0.12)	<0.001
Coagulopathy	47815 (5.11)	5590 (3.80)	2865 (4.53)	530 (4.58)	295 (6.90)	<0.001
Obesity	65350 (6.98)	11045 (7.51)	4555 (7.20)	345 (2.98)	340 (7.95)	<0.001
Smoking	26065 (2.78)	5205 (3.54)	1790 (2.83)	150 (1.30)	185 (4.33)	<0.001
Depression	2135 (0.23)	220 (0.15)	145 (0.23)	0 (0.00)	15 (0.35)	<0.001
Electrolyte fluid disorders	104940 (11.21)	14815 (10.07)	6,205 (9.8)	1,425 (12.3)	510 (11.9)	<0.001
Drug abuse	7670 (0.82)	1460 (0.99)	500 (0.8)	15 (0.1)	70 (1.6)	<0.001

CD, Crohn's disease; SD, standard deviation; IBD, inflammatory bowel disease; SNF, skilled nursing facility; HIV/AIDS, human immunodeficiency virus/acquired immunodeficiency syndrome

Table 2 Comparison of demographic and clinical characteristics among patients with UC stratified by race

Condition	White (N=571,594)	Black (N=71,045)	Hispanics (N=61,555)	Asian (N=13,155)	Native American (N=3,140)	P-Value
Sex						<0.001
Male	266,120 (46.59%)	29,190 (41.10%)	29,225 (47.5%)	6,255 (47.5%)	1,400 (44.6%)	
Female	305,270 (53.41%)	41,855 (58.90%)	32,320 (52.5%)	6,900 (52.5%)	1,740 (55.4%)	
Age, mean±SD	57.80±20.34	48.94±19.48	45.49±20.99	51.51±21.60	49.12±18.60	<0.001
Age category (years)						<0.001
<20	21,430 (3.75%)	3,870 (5.45%)	6,400 (10.4%)	960 (7.3%)	170 (5.4%)	
20-39	108,065 (18.90%)	21,865 (30.77%)	21,115 (34.3%)	3,600 (27.4%)	950 (30.3%)	
40-59	136,960 (23.96%)	22,260 (31.32%)	16,710 (27.1%)	3,365 (25.6%)	1,025 (32.6%)	
≥60	305,140 (53.39%)	23,080 (32.46%)	17,330 (28.2%)	5,230 (39.8%)	995 (31.7%)	
Length of stay	5.63±6.79	6.33±9.08	5.73±7.45	6.30±8.74	6.20±13.06	<0.001
Total charges	$69,304.65±118,860.66	$72,871.76±156,202.10	81,123.00±126,146.58	96,300.85±171,145.05	75,521.66±188,065.29	0.0016
In-hospital mortality	12,555 (2.2%)	1,480 (2.1%)	1,070 (1.7%)	330 (2.5%)	65 (2.1%)	<0.001
IBD-related complications						
Anal abscess	3,690 (0.6%)	685 (1.0%)	630 (1.0%)	140 (1.1%)	15 (0.5%)	<0.001
Intestinal obstruction	4,940 (0.9%)	440 (0.6%)	480 (0.8%)	105 (0.8%)	40 (1.3%)	<0.001
Rectal bleeding	32755 (5.7)	6412 (9.0)	5410 (8.8)	915 (7.0)	210 (6.7)	<0.001
Anal fissure/fistula	2,770 (0.5%)	410 (0.6%)	400 (0.6%)	60 (0.5%)	0 (0.0%)	<0.001
Type of admission						<0.001
Non-elective	474,395 (83.0%)	64,045 (90.1%)	54,415 (88.5%)	11,165 (84.9%)	2,635 (83.9%)	
Elective	96,445 (16.9%)	6,910 (9.7%)	7,100 (11.5%)	1,985 (15.1%)	505 (16.1%)	
Residential income						<0.001
First quartile (lowest)	106615 (18.9%)	30405 (43.6%)	18620 (30.8%)	1280 (9.8%)	1175 (38.7%)	
Second quartile	141910 (25.2%)	15995 (23.0%)	15505 (25.7%)	1965 (15.1%)	700 (23.0%)	
Third quartile	154080 (27.3%)	13450 (19.3%)	14980 (24.8%)	3175 (24.4%)	615 (20.2%)	
Fourth quartile (highest)	161200 (28.6%)	9825 (14.1%)	11295 (18.7%)	6605 (50.7%)	550 (18.1%)	
Insurance						<0.001
Medicare	270,295 (47.3%)	24,325 (34.2%)	15,815 (25.7%)	3,980 (30.3%)	840 (26.9%)	
Medicaid	54,925 (9.6%)	17,540 (24.7%)	18,070 (29.4%)	1,965 (14.8%)	700 (23.0%)	
Private insurance	215,855 (37.8%)	22,130 (31.1%)	20,840 (33.9%)	6,500 (49.5%)	1,065 (34.9%)	
Self-pay	13,915 (2.4%)	4,220 (5.9%)	4,180 (6.8%)	385 (2.9%)	385 (3.5%)	
Disposition						<0.001
Home discharge	369,530 (64.7%)	50,535 (71.1%)	47,740 (77.6%)	9,295 (70.7%)	2,360 (75.2%)	
Transfer to other short-term hospital	78,410 (13.7%)	10,375 (14.6%)	4,045 (6.6%)	2,080 (15.8%)	530 (16.9%)	
Transfer to SNF	78,410 (13.7%)	10,375 (14.6%)	4,045 (6.6%)	2,080 (15.8%)	530 (16.9%)	
Transfer to home health care	92,675 (16.2%)	8,945 (12.6%)	6,740 (11.0%)	2,085 (15.1%)	530 (16.9%)	

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Table 2 (*Continued*)

Condition	White (N=571,594)	Black (N=71,045)	Hispanics (N=61,555)	Asian (N=13,155)	Native American (N=3,140)	P-Value
Hospital region						<0.001
Northeast	134310 (23.5%)	13720 (19.3%)	10725 (17.4%)	2710 (20.6%)	310 (9.9%)	
Midwest	142375 (24.9%)	14355 (20.2%)	4675 (7.6%)	1540 (11.7%)	145 (4.6%)	
South	191180 (33.4%)	35810 (50.4%)	12850 (20.9%)	2465 (18.7%)	625 (19.9%)	
West	103730 (18.1%)	7360 (10.4%)	23305 (37.9%)	6005 (45.6%)	805 (25.6%)	
Alcohol use disorder	22250 (3.9%)	2835 (4.0%)	2220 (3.6%)	175 (1.3%)	255 (8.1%)	<0.001
Anemia	63425 (11.1%)	9145 (12.9%)	7825 (12.7%)	1670 (12.7%)	330 (10.5%)	<0.001
Congestive heart failure	64240 (11.2%)	7885 (11.1%)	3850 (6.3%)	985 (7.5%)	255 (8.1%)	<0.001
Cardiac arrhythmia	40025 (7.0%)	4685 (6.6%)	3895 (6.3%)	920 (7.0%)	185 (5.9%)	<0.001
Valvular disease	2775 (0.5%)	140 (0.2%)	130 (0.2%)	50 (0.4%)	15 (0.5%)	<0.001
Peripheral vascular disorders	15040 (2.6%)	1505 (2.1%)	1105 (1.8%)	340 (2.6%)	55 (1.8%)	<0.001
Hypertension	186670 (32.7%)	21665 (30.5%)	13965 (22.7%)	3280 (24.9%)	775 (24.7%)	<0.001
Diabetes (uncomplicated)	37855 (6.6%)	5170 (7.3%)	4540 (7.4%)	1000 (7.6%)	255 (8.1%)	<0.001
Diabetes (complicated)	42875 (7.5%)	7010 (9.9%)	4625 (7.5%)	1090 (8.3%)	375 (11.9%)	<0.001
Hypothyroidism	48695 (8.5%)	2120 (3.0%)	2940 (4.8%)	710 (5.4%)	170 (5.4%)	<0.001
Chronic kidney disease	43,800 (7.7%)	7,515 (10.6%)	3,875 (6.3%)	1,125 (8.6%)	240 (7.6%)	<0.001
Liver disease	25,905 (4.5%)	3,690 (5.2%)	3,575 (5.8%)	625 (4.8%)	180 (5.7%)	<0.001
Peptic ulcer disease (non-bleeding)	4,285 (0.7%)	710 (1.0%)	480 (0.8%)	140 (1.1%)	35 (0.6%)	<0.001
HIV/AIDS	1,010 (0.2%)	1,200 (1.7%)	450 (0.7%)	45 (0.3%)	5 (0.0%)	<0.001
Metastatic cancer	660 (0.1%)	65 (0.1%)	50 (0.1%)	5 (0.0%)	5 (0.2%)	<0.004
Rheumatoid arthritis	410 (0.1%)	40 (0.1%)	30 (0.0%)	0 (0.0%)	5 (0.2%)	0.51
Coagulopathy	33,200 (5.8%)	4,000 (5.6%)	3,565 (5.8%)	790 (6.0%)	175 (5.6%)	0.27
Obesity	43,015 (7.5%)	5,920 (8.3%)	4,210 (6.8%)	330 (2.5%)	225 (7.2%)	<0.001
Smoking	9,110 (1.6%)	1,675 (2.4%)	1,210 (2.0%)	110 (0.8%)	100 (3.2%)	<0.001
Depression	925 (0.2%)	55 (0.1%)	55 (0.1%)	20 (0.2%)	10 (0.3%)	<0.001
Electrolyte/fluid disorders	80,600 (14.1%)	9,095 (12.8%)	8,295 (13.5%)	2,075 (15.8%)	505 (16.1%)	<0.001
Drug abuse	2,475 (0.4%)	415 (0.6%)	340 (0.6%)	15 (0.1%)	25 (0.8%)	<0.001

CD, Crohn's disease; SD, standard deviation; IBD, inflammatory bowel disease; SNF, skilled nursing facility; HIV/AIDS, human immunodeficiency virus/acquired immunodeficiency syndrome

(5.55±6.95 vs. 5.21±6.36 days, P<0.001), while Hispanic (5.73±7.45 days), Asian (6.30±8.74 days), and Native American (6.20±13.06 days) patients also had longer stays than White patients. The total hospital charges were highest among Asian patients ($78,873.56±135,032.17), followed by Hispanic ($74,465.36±128,699.66) and Black ($60,063.18±103,060.33) patients, with the lowest charges observed in Native Americans ($55,184.25±87,425.40) (P<0.001; Table 1). Similarly, among UC patients, Black patients had longer hospital stays than their White counterparts (6.33±9.08 vs. 5.63±6.79 days, P<0.001), with Asian (6.30±8.74) and Native American (6.20±13.06) patients also experiencing significantly longer stays. The mean total hospital charges were highest among Asian patients ($96,300.85±171,145.05), followed by Hispanic ($81,123.00±126,146.58) and Black patients ($72,871.76±156,202.10), while Native American patients had the lowest charges ($75,521.66±188,065.29) (P=0.0016; Table 2).

Gastrointestinal and perianal complications in CD and UC

Among CD patients, the highest prevalence of anal abscess was observed in Black patients (2.88%), followed by Hispanic (2.57%), Asian (2.69%), White (1.25%) and Native American (0.9%) patients (P<0.001). Intestinal obstruction was most common in Asian patients (11.8%), followed by Native American (8.2%), White (8.32%), Black (7.93%) and Hispanic (7.9%) patients (P<0.001). Rectal bleeding was also most frequent among Black patients (2.85%), followed by Hispanic (2.51%), Asian (2.21%), White (1.79%) and Native American (1.4%) patients (P<0.001). The highest occurrence of anal fissure/fistula was found in Asian patients (5.66%), followed by Black (5.45%), Hispanic (4.21%), White (3.59%) and Native American (3.85%) patients (P<0.001; Table 1).

Among UC patients, rectal bleeding was the most common complication, affecting Black patients (9.0%) at the highest rate, followed by Hispanic (8.8%), Asian (7.0%), Native American (6.7%) and White (5.7%) patients (P<0.001). Anal abscess was most frequent in Asian (1.1%) and Hispanic (1.0%) patients, followed closely by Black (1.0%) patients, with White patients (0.6%) having a lower rate and Native American patients the lowest (0.5%) (P<0.001). Intestinal obstruction was highest among Native American patients (1.3%), followed by White (0.9%), Hispanic (0.8%) and Asian (0.8%) patients, with Black patients having the lowest rate (0.6%) (P<0.001). Anal fissure/fistula remained uncommon across all groups, occurring slightly more frequently in Black (0.6%) and Hispanic (0.6%) patients compared to White (0.5%) and Asian (0.5%), while it was not recorded in Native American patients (P<0.001; Table 2).

Logistic regression analysis of race and sex as a predictor for complications

Multivariate logistic regression analysis demonstrated that, among patients with CD, Black patients had the highest odds of developing anal abscesses compared to White patients, with a 41% higher risk (adjusted OR [aOR] 1.41, 95%CI 1.38-1.45; P<0.001), followed by Asian patients, who had a 19% greater likelihood than White patients (aOR 1.19, 95%CI 1.13-1.29; P<0.001). In contrast, Native American patients had significantly lower odds of anal abscesses, with a 41% lower risk compared to White patients (aOR 0.59, 95%CI 0.48-0.72; P<0.001). For rectal bleeding, Black patients had the highest odds compared to White patients, with a 42% higher risk (aOR 1.42, 95%CI 1.37-1.48; P<0.001), followed by Hispanic patients, who had a 28% greater likelihood than White patients (aOR 1.28, 95%CI 1.21-1.35; P<0.001). Asian patients also had a 14% higher risk of rectal bleeding compared to White patients (aOR 1.14, 95%CI 1.03-1.41; P<0.001). The greatest racial disparity was observed for anal fissure/fistula, where Asian patients had 76% higher odds compared to White patients (aOR 1.76, 95%CI 1.64-1.89; P<0.001). Black patients had 32% higher odds than White patients (aOR 1.32, 95%CI 1.28-1.37; P<0.001), while Hispanic patients had 15% lower odds than White patients (aOR 0.85, 95%CI 0.82-0.89; P<0.001). No significant difference was found between Native American patients and White patients (aOR 1.05, 95%CI 0.87-1.26; P=0.42). Regarding intestinal obstruction, Asian patients had the highest odds, with a 9% higher risk compared to White patients (aOR 1.09, 95%CI 1.03-1.15; P<0.001), while Hispanic and Black patients had lower odds of developing intestinal obstruction compared to White patients (12% and 6% respectively, P<0.001; Table 3).

In UC-related complications, Native American patients had the highest odds of intestinal obstruction, with a 59% higher risk compared to White patients (aOR 1.59, 95%CI 1.16-2.18; P<0.001). In contrast, Black patients had significantly lower odds of intestinal obstruction, with a 26% lower risk compared to White patients (aOR 0.74, 95%CI 0.67-0.82; P<0.001). For anal abscesses in UC, Asian patients had the highest odds, with a 47% higher risk compared to White patients (aOR 1.47, 95%CI 1.24-1.75; P<0.001), followed by Black patients, who had a 33% higher risk relative to White patients (aOR 1.33, 95%CI 1.22-1.45; P<0.001), and Hispanic patients, who had a 24% higher risk compared to White patients (aOR 1.24, 95%CI 1.14-1.35; P<0.001). For rectal bleeding in UC, Black patients had the highest odds, with a 33% higher risk compared to White patients (aOR 1.33, 95%CI 1.29-1.37; P<0.001), followed by Hispanic patients, who had a 23% greater risk than White patients (aOR 1.23, 95%CI 1.21-1.27; P<0.001). Asian patients had a more modest 12% higher risk compared to White patients (aOR 1.12, 95%CI 1.04-1.20; P<0.001; Table 4).

Multivariate logistic regression analysis also showed that females had significantly lower odds of developing perianal complications compared to males. Among patients with CD, females had a 21% lower risk of developing anal abscesses compared to males (aOR 0.79, 95%CI 0.75-0.83; P<0.001) and a 19% lower risk of developing anal fissure/fistula (aOR 0.81, 95%CI 0.78-0.85; P<0.001). Similarly, in UC, females had a 15% lower likelihood of developing anal abscesses compared to males (aOR 0.85, 95%CI 0.78-0.92; P<0.001). In contrast, the odds of intestinal obstruction did not significantly differ between sexes.

Table 3 Association of races with CD-related complications

Complications	Race (reference White)							
	Black		Hispanic		Asian		Native American	
	Unadjusted OR (95%CI)	Adjusted OR[b] (95%CI)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Anal abscess	1.71 (1.67-1.76)	1.41 (1.38-1.45)	1.49 (1.43-1.54)	1.03 (0.99-1.07)*	1.82 (1.67-1.94)	1.19 (1.13-1.29)	0.61 (0.51-0.75)	0.59 (0.48-0.72)
Intestinal obstruction	0.94 (0.92-0.96)	0.94 (0.92-0.95)	0.94 (0.91-0.97)	0.88 (0.86-0.91)	1.46 (1.38-1.55)	1.09 (1.03-1.15)	0.98 (0.88-1.09)*	1.07 (0.97-1.18)*
Rectal bleeding	1.61 (1.55-1.67)	1.42 (1.37-1.48)	1.41 (1.34-1.48)	1.28 (1.21-1.35)	1.23 (1.09-1.41)	1.14 (1.03-1.41)	0.78 (0.61-1.01)*	0.73 (0.59-1.28)*
Anal fissure/ fistula	1.63 (1.61-1.67)	1.32 (1.28-1.37)	1.34 (1.31- 1.39)	0.85 (0.82-0.89)	1.76 (1.64-1.89)	1.12 (1.04-1.22)	1.03 (0.92-1.21)*	1.05 (0.87-1.26)*

P-values for statistically significant associations (adjusted OR) are <0.001, unless otherwise indicated.

*Indicate not statistically significant

[b]Adjusted for age, sex, type of admission, residential income, insurance, hospital location, hospital region, CHF, hypertension, CKD, COPD, hypothyroidism, diabetes mellitus, obesity smoking, drug abuse, alcohol abuse, anemia, coagulopathy, depression, electrolyte fluid disorders, HIV, liver disease

CD, Crohn's disease; OR, odds ratio; CI, confidence interval; CHF, congestive heart failure; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus

Table 4 Association of races with UC-related complications

Complications	Race (reference White)							
	Black		Hispanic		Asian		Native American	
	Unadjusted OR (95%CI)	Adjusted OR[b] (95%CI)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)	Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Anal abscess	1.49 (1.38-1.62)	1.33 (1.22-1.45)	1.59 (1.46-1.73)	1.24 (1.14 - 1.35)	1.65 (1.39-1.96)	1.47 (1.24-1.75)	0.73 (0.44-1.22) *	0.65 (0.39-1.09)*
Intestinal obstruction	0.71 (0.64-0.78)	0.74 (0.67-0.82)	0.91 (0.82-0.99)	0.91 (0.83-1.01)*	0.92 (0.76-1.12)*	0.88 (0.72-1.07)*	1.48 (1.08-2.02)	1.59 (1.16-2.18)
Rectal bleeding	1.58 (1.53-1.62)	1.33 (1.29-1.37)	1.58 (1.53-1.63)	1.23 (1.21-1.27)	1.23 (1.14-1.31)	1.12 (1.04- 1.20)	1.17 (1.02-1.35)	1.02 (0.88-1.18)
Anal fissure/ fistula	1.19 (1.07-1.32)	1.16 (1.04-1.29)	1.34 (1.21-1.49)	1.23 (1.11-1.37)	0.94 (0.72-1.21)*	0.89 (0.69-1.15)*	0.89 (0.83-1.09)*	0.98 (0.93-1.23)*

P-values for statistically significant associations (adjusted OR) are <0.001, unless otherwise indicated.

*Indicate not statistically significant

[b]Adjusted for age, gender, type of admission, residential income, insurance, hospital location, hospital region, CHF, hypertension, CKD, COPD, hypothyroidism, diabetes mellitus, obesity smoking, drug abuse, alcohol abuse, anemia, coagulopathy, depression, electrolyte fluid disorders, HIV, liver disease

UC, ulcerative colitis; OR, odds ratio; CI, confidence interval; CHF, congestive heart failure; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus

Discussion

In this study, we analyzed nationwide inpatient data from 2016-2021 to assess racial disparities in IBD-related complications among White, Black, Hispanic, Asian and Native American patients. The present study is the largest study to date to examine these disparities in a nationally representative cohort. Among patients with CD, Black patients had the highest prevalence of anal abscess (2.88%), followed by Asian (2.69%), Hispanic (2.57%), White (1.25%), and Native American (0.9%) patients (P< 0.001). Similarly, rectal bleeding was more common in Black (2.85%), Hispanic (2.51%), and Asian (2.21%) patients compared to White

patients (1.79%) (P< 0.001). After adjusting for confounders, Black (aOR 1.41, 95%CI 1.38-1.45; P<0.001), and Asian patients (aOR 1.19, 95%CI 1.13-1.29; P<0.001) had higher odds of anal abscess compared to White patients. Similarly, the odds of rectal bleeding were significantly higher in Black (aOR 1.42, 95%CI 1.37-1.48; P<0.001), Hispanic (aOR 1.28, 95%CI 1.21-1.35; P<0.001), and Asian patients (aOR 1.14, 95%CI 1.03-1.41; P<0.001) than in White patients. In contrast, intestinal obstruction was more frequent in White patients (8.32%) compared to Black (7.93%), Hispanic (7.9%), and Native American patients (8.2%), but was highest in Asian patients (11.8%) (P<0.001). Adjusted analysis showed lower odds of intestinal obstruction in Black (aOR 0.94, 95%CI 0.92-0.95; P<0.001), and Hispanic (aOR 0.88, 95%CI 0.86-0.91; P<0.001) compared to White patients.

In UC, Native American patients had the highest occurrence of intestinal obstruction, with a 59% higher likelihood than White patients (aOR 1.59, 95%CI 1.16-2.18; P<0.001, while Black patients had the lowest occurrence, at 26% lower (aOR 0.74, 95%CI 0.67-0.82; P<0.001). These disparities persisted after adjusting for demographic and clinical factors, emphasizing the need for further research into the influence of genetic, environmental, and healthcare access factors. Regarding healthcare utilization, Black patients with UC had longer hospital stays and higher total hospital charges ($72,872 vs. White $69,304, P< 0.001). Similarly in Black patients with CD experienced higher total charges than White patients ($60,063 vs. $59,905, P<0.001) despite similar or longer hospital stays.

Previous studies examining racial differences in IBD complications have shown conflicting results. A previous meta-analysis of 47 studies found no major differences in disease location, behavior, upper gastrointestinal tract involvement, perianal involvement or extraintestinal manifestations among racial groups [7]. Other studies with small sample populations have demonstrated that Black patients with IBD are more likely to present with severe complications, particularly in the perianal region [7,11-14]. Our study, leveraging the largest nationally representative dataset, extends these findings by incorporating additional racial groups and providing a more comprehensive assessment of IBD-related complications across diverse populations. Emerging evidence implicates other genetic factors unique to Black populations. Variants in the *STAT3* and *STAT5* genes, which regulate inflammatory responses, have been associated with more severe disease phenotypes, including fistulizing complications [5]. Additionally, HLA-*DRB1*, a gene involved in immune modulation, has been linked to aggressive IBD manifestations in Black patients [15]. The higher prevalence of rectal bleeding and perianal complications in Black and Hispanic patients may also be related to differences in colonic involvement, suggesting a potential genetic predisposition that warrants further investigation. Collectively, these findings emphasize the need for further research into population-specific genetic and environmental influences to improve the understanding and management of IBD in minority groups.

Differences in age at diagnosis between racial groups may also play a role in disease presentation. In our study, Black, Hispanic and Asian patients with CD were younger at the time of hospitalization compared to White patients. This finding is consistent with previous studies that have reported an earlier onset of IBD in Black populations, which may be a contributing factor to the greater severity of disease [5]. The earlier age of onset, combined with potential delays in diagnosis due to healthcare disparities, may result in more advanced disease by the time Black patients seek hospital care [1,5,16]. These disparities in disease phenotypes and complication rates underscore the importance of considering both genetic factors and social determinants of health when managing IBD in diverse populations. The observed differences in perianal and colonic involvement suggest that targeted treatment approaches, and close monitoring for severe complications, may be necessary to improve outcomes in minorities.

The insurance status of patients plays a critical role in access to healthcare and the management of IBD. In our study, Black and Hispanic patients were significantly more likely to rely on Medicaid, and less likely to have private insurance compared to White patients. This aligns with previous findings that minority populations, particularly Black and Hispanic patients, disproportionately rely on public insurance and face greater barriers to accessing specialized care [17,18]. In addition, a higher percentage of Black patients in our study were from lower-income households, as evidenced by their overrepresentation in the lowest income quartile [19]. This socioeconomic disadvantage would be likely to exacerbate disparities in healthcare access and outcomes. Studies have demonstrated that lower socioeconomic status is associated with less access to advanced therapeutic options, such as biologic treatments, which are essential for managing severe IBD [20]. Furthermore, minority patients, including Black and Hispanic patients, are more likely to seek care through emergency departments rather than receiving regular follow-up with gastroenterologists [17]. This pattern of healthcare utilization contributes to delayed diagnoses, inconsistent treatment and more severe disease by the time patients are hospitalized. These disparities probably contribute to the higher rates of severe complications, such as anal abscesses and rectal bleeding, observed in Black patients in our study. Delayed or suboptimal treatment can exacerbate disease progression and lead to poorer outcomes, as Black patients may not receive timely or sufficient care to prevent complications [21].

The racial disparities in IBD-related complications observed in this study have significant implications for prognosis and treatment. The higher prevalence of perianal and severe intestinal complications in Black patients highlights the need for earlier and more aggressive intervention in this population [22]. Given that perianal complications are associated with poorer outcomes and a greater need for surgery, it is crucial to ensure that these patients have timely access to advanced therapies [5,23]. Additionally, healthcare providers should be aware of the increased risk of rectal bleeding and other complications in minority patients with UC, which may necessitate closer monitoring and more frequent use of endoscopic evaluation.

There are several limitations to this study. First, the NIS database lacks patient-specific clinical data, such as disease severity, endoscopic findings and treatment history, limiting our ability to fully assess the clinical factors contributing to the observed disparities. Second, the NIS only reports hospitalization-level data and does not account for multiple

hospitalizations involving the same individual, which could potentially lead to overestimation of outcomes in patients with recurrent hospital admissions. However, this is less of a concern for a condition like IBD, which provides a larger sample size compared to rarer diseases. Additionally, the use of ICD-10 codes to identify complications may result in misclassification, though this is a common limitation in studies using administrative data. Lastly, race and ethnicity in the NIS are self-reported, which could introduce inaccuracies in data collection. Despite these limitations, the NIS is one of the largest national healthcare databases in the country and is frequently used for research purposes, while its data are generally considered representative of the U.S. population.

In conclusion, our study demonstrates significant racial disparities in IBD-related complications, with Black, Hispanic, and Asian patients experiencing higher rates of severe complications, such as anal abscesses and rectal bleeding, compared to White patients, while Native American patients had the highest odds of intestinal obstruction. These findings underscore the need for future research to elucidate the underlying factors contributing to these racial disparities, which may ultimately inform more tailored clinical approaches.

Summary Box

What is already known:

- Racial disparities in inflammatory bowel disease (IBD) management and outcomes are increasingly recognized, yet nationwide data on IBD-related complications across racial groups remain limited
- Black patients with IBD are more likely to experience delayed diagnosis, less access to specialized care, and poorer outcomes
- Previous studies on racial differences in IBD complications are limited by small sample sizes and inconsistent findings

What the new findings are:

- Black, Asian, and Hispanic, patients with Crohn's disease (CD) had 41%, 19%, and 3% higher odds of developing anal abscesses, respectively, compared to White patients, while Native American patients had 41% lower odds
- Black, Hispanic, and Asian patients with CD had 42%, 28%, and 14% higher odds of rectal bleeding, respectively
- Native American patients with ulcerative colitis had the highest likelihood of intestinal obstruction (59% higher odds), while Black, Asian and Hispanic patients had 26%, 12%, and 9% lower odds, respectively, compared to White patients
- These disparities persisted after adjustment for demographic and clinical factors, highlighting the need for targeted interventions to improve healthcare access and disease management across racial groups

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