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COVID-19 Outcomes Among Racial and Ethnic Minority Individuals With Inflammatory Bowel Disease in the United States

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The coronavirus disease 2019 (COVID-19) has affected more than 29 million people and led to more than 542,000 deaths in the United States.1 Older age, comorbidities, and racial and ethnic minority status are associated with severe COVID-19.2 Among patients with inflammatory bowel disease (IBD), racial and ethnic minorities have worse outcomes, mediated in part by inequitable health care access.3 Racial and ethnic minority patients with IBD and COVID-19 may be an especially vulnerable population. The purpose of this study was to evaluate racial and ethnic disparities in COVID-19 outcomes among IBD patients and the impact of non-IBD comorbidities on observed disparities.

Methods

The Surveillance of Coronavirus Under Research Exclusion for Inflammatory Bowel Disease (SECURE-IBD) database was established in March 2020 to determine the impact of COVID-19 on patients with IBD and evaluate factors affecting COVID-19 outcomes. Details of the data collection and quality control have been described in a previous publication.4 Details of statistical analyses are provided in the Supplementary Methods section.

Results

Population Characteristics

We evaluated 2019 US cases reported to SECURE-IBD, of which 161 (8.0%) were Hispanic, 211 (10.5%) were non-Hispanic black, 1502 (74.4%) were non-Hispanic white, and 145 (7.2%) were reported as unknown or another race/ethnicity. In the entire cohort, the mean age was 35.7 years, 52.1% were female, and 23.4% were obese. Other baseline characteristics are described in Supplementary Table 1.

Associations Between Race, Ethnicity, and Coronavirus Disease 2019 Outcomes Among Inflammatory Bowel Disease Patients in the United States

Hospitalization occurred in 12.4% of Hispanic, 7.1% of non-Hispanic white, and 20.4% of non-Hispanic black individuals (P < .001) (Supplementary Table 2). No reported deaths occurred outside of the hospital. Severe

Abbreviations used in this paper: aOR, adjusted odds ratio; COVID-19, coronavirus disease 2019; IBD, inflammatory bowel disease; SECURE-IBD, Surveillance of Coronavirus Under Research Exclusion for Inflammatory Bowel Disease.

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COVID-19 occurred in 3.1% of Hispanic, 1.6% of non-Hispanic white, and 7.6% of non-Hispanic black individuals (P < .001).

In the first set of models, compared with non-Hispanic white individuals, Hispanic individuals had an increased risk of hospitalization (adjusted odds ratio [aOR], 2.70; 95% CI, 1.56–4.66; P = .0004) and severe COVID-19 (aOR, 3.04; 95% CI, 1.09–8.49; P = .03) (Figure 1). After additional adjustment for comorbidities, region, and IBD medications, the effect estimates were attenuated slightly compared with the initial analyses (hospitalization: aOR, 2.45; 95% CI, 1.35–4.44; P = .003; severe COVID-19: aOR, 2.74; 95% CI, 0.84–9.01; P = .096) (Figure 1).

Similarly, in the first set of models, compared with non-Hispanic white individuals, non-Hispanic black individuals had higher odds of hospitalization (aOR, 3.58; 95% CI, 2.34–5.47; P < .0001) and severe COVID-19 (aOR, 5.43; 95% CI, 2.72–10.83; P < .0001). After
further adjustment for comorbidities, region, and IBD medications, the aOR for hospitalization was 3.62 (95% CI, 2.27–5.77; \( P < .0001 \)), and for severe COVID-19 the aOR was 4.96 (95% CI, 2.28–10.88; \( P < .0001 \)). Effect estimates were similar without adjustment for IBD medications in otherwise identical models.

**Discussion**

We report that Hispanic and black individuals had higher odds of hospitalization and severe COVID-19 compared with non-Hispanic white individuals. Upon adjusting for comorbid conditions, region, and IBD medications, the effect estimates, although slightly attenuated, remained significant for hospitalization in both groups, and for severe COVID-19 among black individuals.

Underlying comorbid conditions in both groups partially explain these findings, and are consistent with previous data. In a study of 3626 patients in Louisiana, the odds of hospitalization and death were higher among black individuals compared with white individuals, the latter explained by comorbid conditions and social determinants of health. \(^5\) Limited access to health care, economic and educational disadvantages, and disparities in social determinants of health contributed directly to worse COVID-19 outcomes, and indirectly through a higher prevalence of comorbid conditions. \(^6\) The role of a biological basis for differences in COVID-19 outcomes by race/ethnicity is less clear. \(^7,8\)

Our study had several strengths. In this large collaborative registry, we have data on COVID-19 in IBD patients from most US states for more than 1 year. Limitations included the risk of unmeasured confounding, reporting bias with potential under-representation of vulnerable groups, missing data (although <4% for all variables except ethnicity), and lack of data on social determinants of health.

In summary, we highlight disparities in COVID-19 outcomes in IBD patients based on race and ethnicity, mediated in part by comorbid conditions. These findings underscore the clinical importance of considering social determinants of health and higher risk in minority groups. Ultimately, health policies are needed to bridge these gaps and improve health care access and outcomes for all.

**Supplementary Material**

Note: To access the supplementary material accompanying this article, visit the online version of *Clinical Gastroenterology and Hepatology* at [www.cghjournal.org](http://www.cghjournal.org), and at [http://doi.org/10.1016/j.cgh.2021.05.060](http://doi.org/10.1016/j.cgh.2021.05.060).

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Supplementary Methods

Statistical Analysis

We included US cases reported to the registry between March 2020 and March 2021. We used descriptive statistics to summarize demographic and disease characteristics. The outcomes were as follows: adverse COVID-19 outcomes, a composite of hospitalization or death from COVID-19; and severe COVID-19, a composite of intensive care unit stay, mechanical ventilation, and/or death.

We categorized race/ethnicity into Hispanic, non-Hispanic black, non-Hispanic white, and other. We excluded individuals with missing race/ethnicity data and those in the other category (n = 4 and 149, respectively). We used multivariable logistic regression to analyze the impact of race/ethnicity on outcomes. In the first set of models, we included race/ethnicity, age, sex, IBD activity by physician global assessment. Because IBD medications were not associated with race/ethnicity on bivariate analysis except for a heterogeneous other IBD medications category, we did not include this variable in the models.

For each outcome variable, we conducted a second analysis. In these models, we included race/ethnicity, age, sex, IBD activity, obesity (body mass index, ≥30 kg/m²), systemic corticosteroids (vs not), tumor necrosis factor antagonists (vs not), 6-mercaptopurine/azathioprine (vs not), and mesalamine/sulfasalazine (vs not) a priori. We then used backward selection of all variables associated with each outcome (P ≤ .10 on bivariate analysis), including comorbid conditions, US Census regions (Northeast, Midwest, South and West), interleukin 12/23 inhibitor (vs not), anti-integrin agent (vs not), and Janus kinase inhibitor (vs not). Medications included in the model a priori were the most commonly used IBD medications, while less common medications were subject to backward selection. We additionally performed otherwise identical models without adjustment for IBD medications. SAS version 9.4 (SAS Institute, Cary, NC) was used for data preparation and analyses.
**Supplementary Table 1.** Baseline Demographic and Clinical Characteristics for US Cases Reported to SECURE-IBD: Overall and Stratified by Race/Ethnicity

| Characteristic                        | All patients | Hispanic | Non-Hispanic | Non-Hispanic | Other/unknown |
|--------------------------------------|--------------|----------|--------------|--------------|--------------|
|                                      | N | %       | N | %       | N | %       | N | %       | P value | N | %       |
| Total patients, n                    | 2019 | 100.0 | 161 | 8.0 | 211 | 10.5 | 1502 | 74.4 | 145 | 7.2 |
| Age (mean, SD)                       | 35.7 | 17.87 | 30.0 | 15.06 | 36.6 | 19.07 | 36.3 | 17.95 | .121 | 34.9 | 17.20 |
| Female sex                           | 1051 | 52.1 | 75 | 46.6 | 126 | 59.7 | 784 | 52.2 | 66 | 45.5 |
| US Census region                     | Midwest | 638 | 31.6 | 19 | 11.8 | 64 | 30.3 | 511 | 34.0 | 44 | 30.3 |
|                                      | Northeast | 521 | 25.8 | 49 | 30.4 | 38 | 18.0 | 386 | 25.7 | 48 | 33.1 |
|                                      | South | 568 | 28.1 | 42 | 26.1 | 96 | 45.5 | 402 | 26.8 | 28 | 19.3 |
|                                      | West | 230 | 11.4 | 46 | 28.6 | 7 | 3.3 | 153 | 10.2 | 24 | 16.6 |
|                                      | Other/unknown | 62 | 3.1 | 5 | 3.1 | 6 | 2.8 | 50 | 3.3 | 1 | 0.7 |
| BMI                                  | <.001 |
| <30                                  | 1359 | 67.3 | 107 | 66.5 | 116 | 55.0 | 1040 | 69.2 | 96 | 66.2 |
| ≥30                                  | 473 | 23.4 | 37 | 23.0 | 79 | 37.4 | 329 | 21.9 | 28 | 19.3 |
| Missing                              | 187 | 9.3 | 17 | 10.6 | 16 | 7.6 | 133 | 8.9 | 21 | 14.5 |
| Disease type                         | .038 |
| Crohn’s disease                      | 1297 | 64.2 | 88 | 54.7 | 110 | 53.0 | 982 | 65.4 | 87 | 60.0 |
| Ulcerative colitis                   | 658 | 32.6 | 66 | 41.0 | 68 | 32.2 | 477 | 31.8 | 47 | 32.4 |
| IBD-unspecified                      | 52 | 2.6 | 7 | 4.3 | 3 | 1.4 | 33 | 2.2 | 9 | 6.2 |
| IBD disease activity                 | .002 |
| Remission                            | 1145 | 56.7 | 80 | 49.7 | 114 | 54.0 | 884 | 58.9 | 67 | 46.2 |
| Mild                                 | 396 | 19.6 | 34 | 21.1 | 48 | 22.7 | 273 | 18.2 | 41 | 28.3 |
| Moderate                              | 263 | 13.0 | 27 | 16.8 | 30 | 14.2 | 186 | 12.4 | 20 | 13.8 |
| Severe                               | 62 | 3.1 | 9 | 5.6 | 12 | 5.7 | 32 | 2.1 | 9 | 6.2 |
| Unknown                              | 119 | 5.9 | 10 | 6.2 | 6 | 2.8 | 97 | 6.5 | 6 | 4.1 |
| IBD medication                       | .77 |
| Any medication                       | 1905 | 94.4 | 151 | 93.8 | 196 | 92.9 | 1429 | 95.1 | .328 | 129 | 89.0 |
| Sulfasalazine/mesalamine             | 302 | 15.0 | 32 | 19.9 | 26 | 12.3 | 217 | 14.4 | .107 | 27 | 18.6 |
| Budesonide                           | 67 | 3.3 | 5 | 3.1 | 9 | 4.3 | 47 | 3.1 | .680 | 6 | 4.1 |
| Oral/parenteral steroids             | 94 | 4.7 | 11 | 6.8 | 9 | 4.3 | 69 | 4.6 | .420 | 5 | 3.4 |
| 6MP/AZA†                            | 80 | 4.0 | 9 | 5.6 | 7 | 3.3 | 55 | 3.7 | .443 | 9 | 6.2 |
| Methotrexate‡                        | 12 | 0.6 | 0 | 0.0 | 2 | 0.9 | 9 | 0.6 | .490 | 1 | 0.7 |
| Anti-TNF‡                            | 807 | 40.0 | 68 | 42.2 | 87 | 41.2 | 606 | 40.3 | .881 | 46 | 31.7 |
| Anti-TNF + IMM                       | 178 | 8.8 | 16 | 9.9 | 17 | 8.1 | 133 | 8.9 | .819 | 12 | 8.3 |
| Anti-integrin                        | 272 | 13.5 | 17 | 10.6 | 28 | 13.3 | 213 | 14.2 | .437 | 14 | 9.7 |
| IL12/23 inhibitor                    | 287 | 14.2 | 21 | 13.0 | 26 | 12.3 | 217 | 14.4 | .654 | 23 | 15.9 |
| JAK inhibitor                        | 41 | 2.0 | 5 | 3.1 | 3 | 1.4 | 30 | 2.0 | .512 | 3 | 2.1 |
| Other IBD medication                 | 62 | 3.1 | 8 | 5.0 | 8 | 3.8 | 40 | 2.7 | .202 | 6 | 4.1 |
| Comorbid conditions                  | .001 |
| Any condition                        | 594 | 29.4 | 53 | 32.9 | 90 | 42.7 | 410 | 27.3 | .41 | 28.3 |
| Cardiovascular disease               | 93 | 4.6 | 6 | 3.7 | 13 | 6.2 | 68 | 4.5 | .485 | 6 | 4.1 |
| Diabetes                             | 78 | 3.9 | 10 | 6.2 | 15 | 7.1 | 46 | 3.1 | .004 | 7 | 4.8 |
### Supplementary Table 1. Continued

| Characteristic               | All patients | Hispanic | Non-Hispanic black | Non-Hispanic white (reference) | Other/unknown | P value<sup>b</sup> |
|-----------------------------|--------------|----------|--------------------|--------------------------------|---------------|---------------------|
|                             | N  %         | N  %     | N  %               | N  %                          | N  %          |                    |
| Lung disease                | 183 9.1      | 14 8.7   | 33 15.6            | 129 8.6                       | .004          | 7 4.8              |
| Hypertension                | 192 9.5      | 15 9.3   | 37 17.5            | 129 8.6                       | <.001         | 11 7.6             |
| Cancer                      | 25 1.2       | 0 0.0    | 3 1.4              | 20 1.3                        | .333          | 2 1.4              |
| History of stroke           | 12 0.6       | 1 0.6    | 4 1.9              | 7 0.5                         | .051          | 0 0.0              |
| Chronic renal disease       | 40 2.0       | 3 1.9    | 6 2.8              | 30 2.0                        | .708          | 1 0.7              |
| Chronic liver disease       | 55 2.7       | 7 4.3    | 8 3.8              | 36 2.4                        | .210          | 4 2.8              |
| Other                       | 197 9.8      | 19 11.8  | 27 12.8            | 130 8.7                       | .085          | 21 14.5            |
| Current smoker              | 51 2.5       | 3 1.9    | 11 5.2             | 34 2.3                        | .033          | 3 2.1              |

AZA, azathioprine; BMI, body mass index; COVID-19, coronavirus disease 2019; IL, interleukin; IMM, immunomodulator (includes 6-mercaptopurine, azathioprine, methotrexate); JAK, Janus kinase; SECURE-IBD, Surveillance Epidemiology of Coronavirus Under Research Exclusion for Inflammatory Bowel Disease; 6MP, 6-mercaptopurine; TNF, tumor necrosis factor.

<sup>a</sup>Unless otherwise specified, percentages do not include missing values or unknown values. For all characteristics, less than 4% of data was missing and unknown, respectively, for each category. Percentages and numbers from each subcategory may not add up to the exact number of total reported cases owing to missing values and/or non–mutually exclusive variables.

<sup>b</sup>P values include Hispanic, non-Hispanic white, and non-Hispanic black. They do not include other/unknown.

### Supplementary Table 2. COVID-19 Outcomes for US Cases Reported to SECURE-IBD, Overall and Stratified by Race/Ethnicity

|                       | All patients | Hispanic | Non-Hispanic black | Non-Hispanic white (reference) | Other/unknown | P value<sup>c</sup> |
|-----------------------|--------------|----------|--------------------|--------------------------------|---------------|---------------------|
|                       | N  %         | N  %     | N  %               | N  %                          | N  %          |                    |
| Hospitalization       | 187 9.3      | 20 12.4  | 43 20.4            | 106 7.1                       | <.001         | 18 12.4            |
| ICU/ventilator/death  | 47 2.3       | 5 3.1    | 16 7.6             | 24 1.6                        | <.001         | 2 1.4              |

COVID-19, Coronavirus Disease 2019; ICU, intensive care unit; SECURE-IBD, Surveillance Epidemiology of Coronavirus Under Research Exclusion for Inflammatory Bowel Disease.

<sup>c</sup>P values include Hispanic, non-Hispanic white, and non-Hispanic black. They do not include other/unknown.