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INCLUSIVITY IN PEOPLE, METHODS, AND OUTCOMES

RESEARCH ARTICLE

Racial and Ethnic Disparities in Glycemic Control Among Patients With SARS-CoV-2 in the Baltimore—Washington, District of Columbia Region

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Introduction: Diabetes is a leading risk factor for COVID-19, disproportionally impacting marginalized populations. We analyzed racial/ethnic differences in glycemic control among patients who tested positive for SARS-CoV-2 in the Baltimore—Washington, District of Columbia region.

Methods: Glycemic control measured by HbA1c was compared by race and ethnicity among patients with a positive SARS-CoV-2 test at the Johns Hopkins Health System between March 1, 2020, and March 31, 2022. Risk factors associated with poor glycemic control (HbA1c≥8) were identified using logistic regression.

Results: Black, Latino, and Asian patients had a higher rate of prediabetes (HbA1c=5.7%−6.49%) and diabetes (HbA1c≥6.5%) than non-Hispanic White patients. Among patients with diabetes, poor glycemic control (HbA1c≥8%) was significantly higher among young adults (aged ≤44 years), Latino patients (AOR=1.5; 95% CI=1.1, 1.9), Black patients (AOR=1.2; 95% CI=1.0, 1.5), uninsured patients (AOR=1.5; 95% CI=1.2, 1.9), and those with limited English proficiency (AOR=1.3; 95% CI=1.0, 1.6) or without a primary care physician (AOR=1.6; 95% CI=1.3, 2.1).

Conclusions: Disparities in glycemic control among patients who tested positive for SARS-CoV-2 were associated with underlying structural factors such as access to care, health insurance, and language proficiency. There is a need to implement accessible, culturally and language-appropriate preventive and primary care programs to engage socioeconomically disadvantaged populations in diabetic screening and care.

INTRODUCTION

Racial and ethnic minorities have been disproportionately impacted by coronavirus disease 2019 (COVID-19) in the U.S., with a higher risk of infection, hospitalization, and age-adjusted mortality than non-Hispanic (NH) Whites.[1] Various socioeconomic and structural factors have been associated with these disparities, including a higher prevalence of comorbidities, such as diabetes, a leading risk factor for severe COVID-19.[2−4]

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In addition, Latino and Black individuals have a higher risk of diabetic complications, including end-organ damage and death, as well as elevated rates of undiagnosed diabetes than NH White individuals.[2–4] It has been postulated that differences in diabetes prevalence and glycemic control have contributed to COVID-19 disparities among marginalized communities in the U.S.[5] During the pandemic, there was a 30% rise in diabetic-related deaths, with Latino individuals experiencing almost 3 times higher excess diabetic-related deaths than NH White individuals.[6]

In this study, we assessed racial/ethnic differences in prediabetes, diabetes, and glycemic control among patients who tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in the Baltimore−Washington, District of Columbia region. We also examined associations between glycemic control and language proficiency, insurance status, and access to a primary care provider (PCP).

METHODS

Study Sample

Data were obtained from the JH-CROWN, the COVID-19 Precision Medicine Analytic Platform Registry that captures all individuals tested for SARS-CoV-2 using reverse transcriptase−polymerase chain reaction at the Johns Hopkins Health System.

Measures

Demographics, comorbidities, and glycemic control status using HbA1c were extracted from the integrated electronic health record system. This work was deemed exempt by the Johns Hopkins IRB.

The first positive SARS-CoV-2 test was documented for adults (aged ≥18 years) between March 1, 2020 and March 31, 2022. Patients with an HbA1c recorded up to 90 days before or after a positive SARS-CoV-2 test were included. HbA1c results were classified as normal (<5.7%), prediabetes (5.7%−6.49%), and diabetes (≥6.5%).[7] *Possibly undiagnosed diabetes* was defined as patients who did not have a past medical history or an active problem reflecting diabetes or who were not on diabetic medications at the time of the HbA1c test. Patients were classified with poor glycemic control if their HbA1c was ≥8. Patients self-identified from fixed racial and ethnic categories.

Statistical Analysis

We built multivariate logistic regression models to determine the OR for poor glycemic control, adjusting for age and sex. All analyses were performed with R, Version 4.2.0; a 2-sided $p<0.05$ was determined statistical significance.

RESULTS

A total of 12,111 patients had an HbA1c after or within 3 months of the first positive SARS-CoV-2 test, of whom 5,052 (41.7%) were NH White; 4,443 (36.7%) were Black; 1,593 (13.2%) were Latino; and 649 (5.4%) were Asian. Among all patients, 3,306 (27.3%) had a HbA1c between 5.7 and 6.4 (prediabetes); 2,642 (21.8%) had a HbA1c ≥6.5 (diabetes); and 1,209 (10.0%) had a HbA1c ≥8 (poorly controlled diabetes). The Latino group had a higher proportion of patients with no health insurance (26.2%), no PCP (17.5%), and limited English proficiency (51.2%) than any other racial/ethnic group. In addition, Latinos with low English proficiency (LEP) were more likely to be uninsured than those with English proficiency (43.7% LEP vs 7.8% no LEP).

Latino, Black, and Asian patients had a higher prevalence of prediabetes (27.5%, 31.3%, and 27.0%, respectively) and diabetes (25.0%, 25.5%, and 27.0%, respectively) than NH White patients (23.6% and 16.5%, respectively) (Table 1). Poor glycemic control was more common among Latino and Black patients (55.1% and 47.3%) than among NH White patients (40.3%), and possibly undiagnosed diabetes was more common among Latino (71.4%), Asian (63.6%), and Black (57.0%) patients than among NH White patients (51.2%).

Among all patients with diabetes, poor glycemic control was associated with younger age, Latino ethnicity, Black race, insurance status, LEP, and not having a PCP (Table 2). After adjustment for age and sex, Latino ethnicity, Black race, lack of insurance, and not having a PCP remained significantly associated with poor glycemic control. Subgroup analysis of Latino patients with diabetes showed that poor glycemic control was more common among Latinos with LEP (57.9% LEP vs 50.3% no LEP), no health insurance (61.5% uninsured vs 49.8% insured), and no PCP (63.5% no PCP vs 50.7% PCP). After adjusting for age and sex, only LEP was significantly associated with higher odds of poor glycemic control among Latinos. There was no difference in glycemic control by English proficiency among Asians (AOR=0.7; 95% CI=0.4, 1.5).

DISCUSSION

We found a higher prevalence of prediabetes and diabetes among Latino, Black, and Asian patients diagnosed with COVID-19 than among NH White patients. Poor glycemic control was more common among Latino and

Table 1. Characteristics of Patients With a Positive SARS-CoV-2 Test and HbA1c Stratified by Race and Ethnicity

	Mean or % (95% CI)[a]				
Characteristics	**NH White *n*=5,052**	**Black *n*=4,443**	**Latino *n*=1,593**	**Asian *n*=649**	**Other *n*=374**
Age, years (mean±SD)	54.5±18.2	49.9±17.1	46.1±15.2	51.4±17.8	52.7±17.2
Age, years					
18−44	32.1 (30.9, 33.4)	40.0 (38.6, 41.5)	50.4 (48.0, 52.9)	38.7 (35.0, 42.5)	34.8 (30.1, 39.7)
45−64	37.2 (35.9, 38.5)	39.8 (38.4, 41.2)	37.3 (34.9, 39.7)	36.1 (32.5, 39.8)	40.6 (35.8, 45.7)
≥65	30.7 (29.4, 32.0)	20.2 (19.0, 21.4)	12.3 (10.8, 14.0)	25.3 (22.1, 28.8)	24.6 (20.5, 29.2)
Sex					
Male	46.1 (44.7, 47.5)	39.1 (37.7, 40.5)	47.0 (44.6, 49.5)	43.0 (39.2, 46.8)	47.3 (42.3, 52.4)
Female	53.9 (52.5, 55.3)	60.9 (59.5, 62.3)	53.0 (50.5, 55.4)	57.0 (53.2, 60.8)	52.7 (47.6, 57.7)
Insurance status					
Commercial	63.7 (62.3, 65.0)	65.1 (63.7, 65.5)	45.4 (43.0, 47.9)	64.1 (60.3, 67.7)	58.8 (53.8, 63.7)
Medicare/Medicaid	24.2 (23.0, 25.4)	19.7 (18.6, 20.9)	12.3 (10.8, 14.0)	18.8 (16.0, 22.0)	22.2 (18.3, 26.7)
No insurance	1.9 (1.6, 2.4)	2.6 (2.2, 3.1)	26.2 (24.1, 28.5)	4.0 (2.7, 5.8)	9.4 (6.8, 12.7)
Other	1.4 (1.1, 1.7)	2.6 (2.1, 3.1)	5.1 (4.1, 6.3)	2.0 (1.2, 3.4)	2.4 (1.3, 4.5)
Unknown	8.8 (8.1, 9.6)	9.9 (9.1, 10.8)	10.9 (9.5, 12.5)	11.1 (8.9, 13.7)	7.2 (5.0, 10.3)
Limited English proficiency	1.0 (0.7, 1.3)	0.9 (0.6, 1.2)	51.2 (48.7, 53.6)	19.1 (16.3, 22.3)	24.1 (20.0, 28.6)
PCP					
Has PCP[b]	90.7 (89.9, 91.5)	86.4 (85.3, 87.4)	77.0 (74.9, 79.0)	89.7 (87.1, 91.8)	78.6 (74.2, 82.5)
Unknown	4.2 (3.7, 4.8)	5.4 (4.8, 6.1)	5.5 (4.5, 6.8)	4.0 (2.7, 5.8)	8.0 (5.7, 11.2)
No PCP	5.0 (4.5, 5.7)	8.2 (7.4, 9.1)	17.5 (15.7, 19.4)	6.3 (4.6, 8.5)	13.4 (10.3, 17.2)
HbA1c					
<5.7	59.9 (58.5, 61.2)	43.1 (41.7, 44.6)	47.5 (45.0, 49.9)	46.1 (42.3, 49.9)	44.4 (39.4, 49.5)
5.7−6.4	23.6 (22.5, 24.8)	31.3 (30.0, 32.7)	27.5 (25.4, 29.7)	27.0 (23.7, 30.5)	28.6 (24.3, 33.4)
≥6.5	16.5 (15.5, 17.5)	25.5 (24.3, 26.8)	25.0 (23.0, 27.2)	27.0 (23.7, 30.5)	27.0 (22.8, 31.7)
Patients who had HbA1c≥6.5					
Poor glycemic control (HbA1c≥8)	40.3 (37.1, 43.7)	47.9 (45.0, 50.8)	55.1 (50.2, 59.9)	37.1 (30.3, 44.5)	44.6 (35.2, 54.3)
Possibly undiagnosed DM[c]	32.8 (29.7, 36.0)	37.7 (35.0, 40.6)	46.6 (41.8, 51.5)	34.3 (27.7, 41.6)	36.6 (27.9, 46.4)

Note: HbA1c is within a 3-month window before or after the first SARS-CoV-2 test.
[a]The 95% CIs for proportions were calculated using the Wilson score method without continuity correction, comparing Latinos with other racial/ethnic groups.
[b]Documented in the integrated JHHS electronic medical record system.
[c]Prior is defined as a diagnosis before the first positive SARS-CoV-2 test.
DM, diabetes mellitus; JHHS, Johns Hopkins Health System; NH, non-Hispanic; PCP, primary care provider.

Black patients and was associated with a lack of health insurance, LEP, and not having a PCP. These findings have public health significance because diabetes is a leading risk factor for severe COVID-19, and diabetes-associated deaths in the U.S. increased drastically during the pandemic, especially among Latinos.[6]

The association between poor glycemic control and access to care factors as well as language proficiency is not surprising given the many structural barriers faced by socially marginalized groups, particularly foreign-born individuals excluded from many social safety net services. Immigrants in the U.S. have the lowest rates of health insurance coverage largely owing to eligibility restrictions under the Affordable Care Act.[8,9] In addition, low-income immigrants experience other barriers to care, such as language differences, medical mistrust, and immigration concerns. During the COVID-19 pandemic, the Coronavirus Aid, Relief, and Economic Security Act and community-based interventions expanded access to COVID-19 services to all residents, including immigrants. This expansion and the disproportionate impact of COVID-19 among low-income immigrants likely enriched the representation of LEP patients in our sample.

Access to linguistically and culturally appropriate care is needed to mitigate health disparities. Investment in preventive care is critical to reduce the risk and prevent the progression and associated complications of chronic illnesses. For example, community-based testing for SARS-CoV-2 testing and point-of-care HbA1c testing in an impoverished setting has demonstrated a very high prevalence of undiagnosed diabetes and prediabetes, especially among Latinos without health insurance or

Table 2. OR for Poor Glycemic Control (HbA1c≥8) Among Patients With HbA1c ≥6.5 During the First COVID-19 Diagnosis

	Total (*N*=2,642)			Latino (*n*=399)		
Characteristics	**Patients with HbA1c≥8**	**OR (95% CI)**	**Age−sex AOR (95% CI)**	**Patients with HbA1c≥8**	**OR (95% CI)**	**Age−sex AOR (95% CI)**
Age, years			—			—
≤44	287 (60.4)	1.0 (ref)		83 (64.8)	1.0 (ref)	
45−64	578 (49.5)	**0.6 (0.5, 0.8)*****		104 (56.2)	0.7 (0.4, 1.1)	
≥65	344 (34.4)	**0.3 (0.3, 0.4)*****		33 (38.4)	0.3 (0.2, 0.6)	
Sex			—			—
Male	674 (47.0)	1.0		134 (56.8)	1.0 (ref)	
Female	535 (44.3)	0.9 (0.8, 1.0)		86 (52.8)	0.9 (0.6, 1.3)	
Race/ethnicity				—	—	—
NH White	**336 (40.3)***	1.0 (ref)	1.0 (ref)			
Black	543 (47.9)	**1.4 (1.1, 1.6)*****	**1.2 (1.0, 1.5)***			
Latino	220 (55.1)	**1.8 (1.4, 2.3)*****	**1.5 (1.1, 1.9)****			
Asian	65 (37.1)	0.9 (0.6, 1.2)	0.9 (0.7, 1.3)			
Other	45 (44.6)	1.2 (0.8, 1.8)	1.2 (0.8, 1.8)			
Limited English proficiency						
No	1,013 (44.8)	1.0 (ref)	1.0 (ref)	73 (50.3)	1.0 (ref)	1.0 (ref)
Yes	196 (51.3)	**1.3 (1.0, 1.6)***	**1.3 (1.0, 1.6)***	147 (57.9)	1.4 (0.9, 2.0)	**1.6 (1.0, 2.4)***
Insurance[a]						
Yes	957 (44.0)	1.0 (ref)	1.0 (ref)	122 (49.8)	1.0 (ref)	1.0 (ref)
No	104 (61.5)	**2.0 (1.5, 2.8)*****	**1.5 (1.2, 1.9)***	64 (61.5)	**1.6 (1.0, 2.6)***	1.3 (0.8, 2.1)
PCP[b]						
Yes	911 (43.0)	1.0 (ref)	1.0 (ref)	140 (50.7)	1.0 (ref)	1.0 (ref)
No	190 (57.6)	**1.8 (1.4, 2.3)*****	**1.6 (1.3, 2.1)*****	61 (63.5)	**1.7 (1.0, 2.7)***	1.6 (1.0, 2.6)

Note: Boldface indicates statistical significance (*$p<0.05$, **$p<0.01$, and ***$p<0.0001$).
[a]N=2,343 for total, and *n*=349 for Latinos. Patients without listed insurance were excluded.
[b]N= 2,448 for total, and *n*=372 for Latinos. Patients with unknown PCP status were excluded.
NH, non-Hispanic; PCP, primary care provider.

PCP.[10] National data shows that the prevalence of undiagnosed diabetes is highest among Latinos overall and even more common among those of Mexican or Central American descent. Language access services are essential to improve patient−provider communication, and language-congruent care has been shown to improve glycemic control among Spanish-speaking patients.[11] Evidence-based interventions such as the Centers for Disease Control and Prevention−endorsed diabetes prevention program have been adapted to Spanish and other languages and should be widely implemented at community sites.[12,13]

Limitations

This report has several limitations. The association between lack of health insurance and PCP with poor glycemic control in our study suggests that some of the patients may have had undiagnosed diabetes. Although Latino, Black, and Asian individuals in our study had a higher prevalence of possibly undiagnosed diabetes than NH White individuals, our ability to establish prior diabetes diagnosis was limited. Our data only included patients tested for SARS-CoV-2 at Johns Hopkins Health System, and some patients may have sought prior care at other health systems. However, this limitation is probably less likely among immigrants who are ineligible for health insurance coverage.

CONCLUSIONS

The association between poor glycemic control and structural factors identified in this study highlights the importance of addressing root causes of health inequalities through policy, through a more inclusive healthcare workforce, and by expanding community-based preventive care interventions to reduce disparities in both COVID-19 and diabetes outcomes.

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