Research Letter

Influence of Race and Ethnicity on Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Infection Rates and Clinical Outcomes in Pregnancy

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INTRODUCTION

Racial and ethnic disparities in health care delivery and outcomes are described in most areas of medicine.[1] Preliminary data from coronavirus disease 2019 (COVID-19) epicenters suggest racial–ethnic disparities in disease-related morbidity and mortality in the general population that mirror longstanding health care trends.[2,3] Our objective was to evaluate infection rates and perinatal outcomes among pregnant women with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection by race and ethnicity.

METHODS

We conducted a retrospective cohort study of women delivering at two NewYork-Presbyterian–affiliated hospitals in Manhattan from March 13 through April 23, 2020. Infection with SARS-CoV-2 was identified by nasopharyngeal swab collection, initially through symptom-based testing before a universal testing protocol was implemented on March 22.

Demographic and clinical data were abstracted from the electronic medical record. The exposure of interest, self-reported race and ethnicity, as classified by the National Institutes of Health,[4] was recorded with prespecified categories and ascertained from administrative data. Categories then were combined by the investigators into four groups: non-Hispanic Black, non-Hispanic White, Hispanic, and other. For our analysis, American Indian–Alaska Native, Asian, Native Hawaiian–Other Pacific Islander, and unknown race or ethnicity were categorized as other. We determined the infection rate per racial–ethnic group, defined as cases of confirmed SARS-CoV-2 infection divided by total deliveries among women of the same race–ethnicity.

Additional demographic and outcome data for pregnant women who tested positive for SARS-CoV-2 infection, including a neighborhood-level socioeconomic status index as adapted from the Agency for Healthcare Research and Quality, were compared among racial–ethnic groups using non-Hispanic

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Each author has confirmed compliance with the journal's requirements for authorship.

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White as the reference, with appropriate statistical testing on SAS 9.4 software.

This study was approved by the Columbia University Irving Medical Center Institutional Review Board with a waiver of informed consent.

RESULTS

We identified 100 women who tested positive for SARS-CoV-2 infection among 673 gravid patients (14.9%) who delivered during the study period. There was a significantly higher SARS-CoV-2 infection rate among Hispanic women compared with non-Hispanic White women (18.1% vs 9.4%, $P \leq .01$). The rate of positive SARS-CoV-2 reverse transcription polymerase chain reaction results in non-Hispanic Black women (12.7%) was not significantly different. Mean body mass index (BMI, calculated as weight in kilograms divided by height in meters squared) for Hispanic women with a positive SARS-CoV-2 test result was higher than that of non-Hispanic White women (Table 1). Compared with non-Hispanic White women, who were more evenly distributed across

Table 1. Baseline Demographic and Clinical Characteristics

Characteristic	Racial–Ethnic Group*				
	Non-Hispanic White (n=13)	Hispanic (n=73)	Non-Hispanic Black (n=10)	Other (n=4)†	All (N=100)
Total patients delivered (% positive for SARS-CoV-2 infection)	138 (9.4)	**403 (18.1)**‡	79 (12.7)	53 (7.5)	673 (14.9)
Demographics					
Maternal age at delivery (y)	32 (22–45)	28 (18–47)	32.5 (17–39)	30.5 (27–37)	28.5 (17–47)
Parity (n=68)	1 (0–8)	1 (0–5)	1 (0–5)	1 (0–1)	1 (0–8)
Prepregnancy BMI (kg/m^2) (n=64)	26.0 (16.5–31.9)	**28.4 (21.9-45.0)**§	27.7 (27.0–30.4)	26.7 (26.7–26.7)	28.0 (16.5–45.0)
Borough of residence		‡			
Bronx	3 (23)	**36 (49)**	3 (30)	3 (75)	45 (45)
Manhattan	2 (15)	**28 (38)**	2 (20)	1 (25)	33 (33)
Brooklyn	1 (8)	**2 (3)**	2 (20)	0	5 (5)
Queens	2 (15)	**0**	1 (10)	0	3 (3)
Other cities in New York state or New Jersey	5 (39)	**7 (10)**	2 (20)	0	14 (14)
Insurance (n=99)		‡			
Public	4 (31)	**59 (82)**	3 (30)	3 (75)	69 (70)
Private	9 (69)	**13 (18)**	7 (70)	1 (25)	30 (30)
AHRQ SES index (n=61)‖	57.2 (51.1–66.0)	**48.2 (41.3-61.4)**‡	**50.6 (41.6-55.1)**‡	**47.0 (41.3-51.1)**§	48.3 (41.3–66.0)
Comorbidities					
Chronic hypertension	0	4 (5)	1 (10)	0	5 (5)
Gestational hypertension	2 (15)	13 (18)	2 (20)	0	17 (17)
Preeclampsia	1 (8)	6 (8)	0	**3 (75)**§	10 (10)
Other cardiac disease	1 (8)	1 (1)	0	0	2 (2)
Pregestational diabetes	0	3 (4)	0	0	3 (3)
Gestational diabetes	1 (8)	8 (11)	0	1 (25)	10 (10)
Asthma	1 (8)	10 (14)	0	1 (25)	12 (12)
Other pulmonary disease	0	3 (4)	0	0	3 (3)

SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; BMI, body mass index; AHRQ, Agency for Healthcare Research and Quality; SES, socioeconomic status.

Data are n (%) or median (range).

Bold indicates statistical significance.

* Numbers may not add up to column total because of missing values.

† "Other" is comprised of two Asian women and two women with unknown or unreported race–ethnicity.

‡ $P \leq .01$, for differences between racial–ethnic groups where the comparison group is non-Hispanic White women.

§ $P \leq .05$.

‖ A neighborhood SES index was computed from U.S. Census New York City neighborhood tabulation areas adapted from the AHRQ, including the following building-level variables: number of residential units per building and mean assessed value (per square foot); and neighborhood-level variables: median household income, poverty rate, unemployment rate, population density, household membership (persons per household), and household crowding (percentage of households with more than one person per room).

Table 2. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)–Related and Perinatal Outcomes

	Racial–Ethnic Group*				
	Non-Hispanic White (n=13)	Hispanic (n=73)	Non-Hispanic Black (n=10)	Other (n=4)†	All (N=100)
SARS-CoV-2 clinical characteristics					
Symptoms on admission					
Asymptomatic	10 (77)	54 (74)	5 (50)	3 (75)	72 (72)
Symptomatic	3 (23)	19 (26)	5 (50)	1 (25)	28 (28)
Indication for testing					
Symptoms (PUI)	3 (23)	22 (30)	4 (40)	1 (25)	30 (30)
Universal testing	10 (77)	51 (70)	5 (50)	3 (75)	69 (69)
Exposure	0	0	1 (10)	0	1 (1)
Gestational age at diagnosis (wk) (n=99)					
Symptoms (PUI)	37 (35–40)	36.5 (15–40)	38 (37–40)	37 (37–37)	37 (15–40)
Universal testing	38.5 (36–40)	39 (31–42)	37 (18–40)	39 (32–40)	39 (18–42)
Disease severity					
Asymptomatic	4 (31)	23 (32)	4 (40)	2 (50)	33 (33)
Mild	8 (62)	43 (59)	5 (50)	1 (25)	57 (57)
Severe	0	4 (5)	1 (10)	1 (25)	6 (6)
Critical	1 (7)	3 (4)	0	0	4 (4)
Outcomes					
Hospitalization for COVID-19 indications	1 (8)	4 (5)	1 (10)	0	6 (6)
Patient received oxygen therapy	1 (8)	4 (5)	1 (10)	0	6 (6)
Diagnosis of pneumonia	1 (8)	9 (12)	1 (10)	2 (50)	13 (13)
Patient received any COVID-19 treatment	1 (8)	10 (14)	1 (10)	0	12 (12)
Patient received Plaquenil	1 (8)	7 (10)	1 (10)	0	9 (9)
Patient received any antibiotics (n=99)	1 (8)	7 (10)	1 (10)	0	9 (9)
Patient received any other treatments	1 (8)	9 (12)	1 (10)	0	11 (11)
Delivery complications					
Chorioamnionitis	0	9 (12)	0	0	9 (9)
Preterm delivery (wk)					
Less than 37 (n=99)	1 (8)	9 (12)	2 (22)	1 (25)	13 (13)
Less than 34 (n=99)	0	6 (8)	1 (10)	1 (25)	8 (8)
Postpartum hemorrhage	2 (15)	13 (18)	1 (10)	1 (25)	17 (17)
Gestational age at delivery (wk) (n=99)					
Symptoms (PUI)	39 (37–40)	38 (15–41)	39 (37–40)	37 (37–37)	38 (15–41)
Universal testing	39 (36–40)	39 (32–41)	37 (18–40)	39 (32–40)	39 (18–41)
Type of delivery (n=99)		‡			
Spontaneous vaginal	11 (85)	**34 (47)**	5 (50)	3 (75)	53 (54)
Cesarean	2 (15)	**38 (53)**	4 (40)	1 (25)	45 (45)
Spontaneous abortion	0	**0**	1 (10)	0	1 (1)
Birth weight (g) (n=99)	3,320 (2,400–4,210)	3,350 (1,660–4,100)	3,113 (212–3,510)	2,920 (1,540–3,105)	3,290 (212–4,210)
5-min Apgar score less than 7	0	1 (1)	1 (10)	0	2 (2)

SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; PUI, person under investigation; COVID-19, coronavirus disease 2019.
Data are n (%) or median (range).
Bold indicates statistical significance.
* Numbers may not add up to column total because of missing values.
† "Other" is comprised of two Asian women and two women with unknown or unreported race–ethnicity.
‡ $P \leq .05$, for differences between racial–ethnic groups where the comparison group is non-Hispanic White women.

New York state and New Jersey, 49% of Hispanic women lived in the Bronx and few lived outside of New York City (10%). Additionally, a higher proportion of Hispanic women had public insurance compared with non-Hispanic White women (Table 1). Hispanic women, non-Hispanic Black women, and women in the "other" race–ethnicity group had a lower mean neighborhood socioeconomic status index compared with non-Hispanic White women. Other differences are noted in Table 1.

Disease-specific outcomes and perinatal complications did not differ between groups (Table 2). Hispanic women, however, were more likely to deliver by cesarean than were non-Hispanic White women (53% vs 15%, $P \leq .05$). There were no differences in neonatal outcomes.

DISCUSSION

In this cohort, Hispanic women were disproportionately represented among those affected by SARS-CoV-2 infection, suggesting some disparity in infection risk. Although all racial–ethnic minority groups had lower neighborhood socioeconomic status scores compared with non-Hispanic White women, only Hispanic women differed significantly in borough of residence and insurance type. Consistent with data demonstrating higher morbidity by borough and household crowding, this may suggest that variations in urban environment and insurance-associated inequities play a greater role than socioeconomic status alone in observed disparities related to SARS-CoV-2 infection risk in our obstetric population.[5–7]

The observed difference in cesarean delivery rate notwithstanding, our data do not demonstrate any racial–ethnic differences in infection-associated or perinatal outcomes among pregnant women with SARS-CoV-2 infection. Although we may be underpowered to detect existing disparities, it is alternatively possible that disparities in SARS-CoV-2–specific outcomes in fact did not exist in this population. During the pandemic, strategies to preserve provision of care for pregnant women at our institution who tested positive for SARS-CoV-2 infection included the rapid creation of dedicated COVID-19 telehealth clinics,[8] which may have mitigated differences between groups.

Limitations of this study include its retrospective design, small sample size, and lack of a control group of patients without SARS-CoV-2 infection. Key strengths are the adoption of universal testing and 96% complete racial and ethnic data. Given ongoing nationwide spread of SARS-CoV-2 infection, these findings may provide important guidance for targeted prevention efforts for systemically disadvantaged populations.

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