Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Adverse perinatal outcomes in a large United States birth cohort during the COVID-19 pandemic

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BACKGROUND: The impact of coronavirus disease 2019 (COVID-19) on adverse perinatal outcomes remains unclear.

OBJECTIVE: This study aimed to investigate whether COVID-19 is associated with adverse perinatal outcomes in a large national dataset and to examine the rates of adverse outcomes during the pandemic compared with the rates of adverse outcomes during the prepandemic period.

STUDY DESIGN: This observational cohort study included 683,905 patients, between the ages of 12 and 50, hospitalized for childbirth and abortion between January 1, 2019, and May 31, 2021. During the prepandemic period, 271,444 women were hospitalized for childbirth. During the pandemic, 308,532 women were hospitalized for childbirth, and 2708 women had COVID-19. The associations between COVID-19 and inhospital adverse perinatal outcomes were examined using propensity score–adjusted logistic regression.

RESULTS: Women with COVID-19 were more likely to experience both early and late preterm birth (adjusted odds ratios, 1.38 [95% confidence interval, 1.1–1.7] and 1.62 [95% confidence interval, 1.3–1.7], respectively), preeclampsia (adjusted odds ratio, 1.2 [95% confidence interval, 1.0–1.4]), disseminated intravascular coagulopathy (adjusted odds ratio, 1.57 [95% confidence interval, 1.1–2.2]), pulmonary edema (adjusted odds ratio, 2.7 [95% confidence interval, 1.1–6.3]), and need for mechanical ventilation (adjusted odds ratio, 8.1 [95% confidence interval, 3.8–17.3]) than women without COVID-19. There was no significant difference in the prevalence of stillbirth among women with COVID-19 (16/2708) and women without COVID-19 (174/39,562) (P=.257). There was no difference in adverse outcomes among women who delivered during the pandemic vs prepandemic period. Combined inhospital mortality was significantly higher for women with COVID-19 (147 [95% confidence interval, 3.0–292.0] vs 2.5 [95% confidence interval, 0.0–7.5] deaths per 100,000 women). Women diagnosed with COVID-19 within 30 days before hospitalization were more likely to experience early preterm birth, placental abruption, and mechanical ventilation than women diagnosed with COVID-19 >30 days before hospitalization for childbirth (4.0% vs 2.4% for early preterm birth [adjusted odds ratio, 1.7; 95% confidence interval, 1.1–2.7]; 2.2% vs 1.2% for placental abruption [adjusted odds ratio, 1.86; 95% confidence interval, 1.0–3.4]; and 0.9% vs 0.1% for mechanical ventilation [adjusted odds ratio, 13.7; 95% confidence interval, 1.8–107.2]).

CONCLUSION: Women with COVID-19 had a higher prevalence of adverse perinatal outcomes and increased in-hospital mortality, with the highest risk occurring when the diagnosis was within 30 days of hospitalization, raising the possibility of a high-risk period.

Key words: adverse perinatal outcomes, COVID-19, high-risk pregnancy

Introduction

Scientific consensus has yet to be achieved regarding the clinical impact of COVID-19 in pregnancy. A recent meta-analysis of a global population demonstrated worsened maternal and fetal outcomes during the COVID-19 pandemic, with large disparities between high- and low-resource countries.[1] Although some studies[2,3] support this meta-analysis, other studies[4–7] have demonstrated a mixed effect of the impact of COVID-19 on pregnancy. Of note, one of the largest US study showed a significant difference in mortality rates, intensive care unit admission, and preterm birth among women with COVID-19.[3] However, most US studies were smaller in size and were conducted during the first few months of the pandemic, before the largest increase in COVID-19 case numbers and fatalities in the United States, during fall and winter of 2020.[8] We used a large cohort to study the effect of COVID-19 on perinatal outcomes. We investigated the relationship between the timing of COVID-19 diagnosis and childbirth to adverse perinatal outcomes. In addition, we examined the change in adverse perinatal outcomes by comparing the 14-month pandemic period to the 13 months before the pandemic.

Methods

Women who gave birth between January 1, 2019, and May 31, 2021, were identified by International Statistical Classification of Disease and Related Health Problems, Tenth Revision (ICD-10) codes from Cerner Real-World Data, which is extracted from the electronic health records of hospitals with which Cerner has a data use agreement. Childbirth during the pandemic was defined as occurring between March 1, 2020, and May 31, 2021, whereas childbirth before the pandemic (prepandemic period) was defined as occurring between January 1, 2019, and February 28, 2020. Race and ethnicity were self-reported, body mass index was calculated using measured height and weight, COVID-19 status was determined using the COVID-19 polymerase chain reaction (PCR) test result, and comorbidities and inhospital outcomes were identified using the ICD-10 and billing codes (Appendix 1). The cohort with COVID-19 included only women with a positive PCR result during pregnancy. The cohort without COVID-19 included women with a negative PCR result on admission who never had a positive PCR result during pregnancy. The

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AJOG MFM at a Glance

Why was this study conducted?

This study aimed to investigate whether COVID-19 is associated with adverse perinatal outcomes using a nationally representative dataset of 683,905 pregnancies, including 2708 patients with COVID-19.

Key findings

Women with COVID-19 were more likely to experience both early and late preterm birth, preeclampsia, and venous thromboembolism than women without COVID-19. Combined in-hospital mortality was considerably higher for women with COVID-19. Women diagnosed with COVID-19 within 30 days before hospitalization were more likely to experience adverse pregnancy outcomes than women diagnosed with COVID-19 >30 days before hospitalization for childbirth.

What does this add to what is known?

Women with COVID-19 had a higher prevalence of adverse perinatal outcomes and increased in-hospital mortality, with the highest risk occurring when the diagnosis was within 30 days of hospitalization, raising the possibility of a high-risk period.

difference between the date of hospitalization and PCR test result was used to calculate the days since COVID-19. Early and late preterm births were defined as live births between 24 and 33 and 34 and 36 completed weeks of gestation, respectively. Stillbirth was defined as fetal death >19 completed weeks of gestation.

The percentage of women with COVID-19 by first, second, and third trimesters of pregnancy were 12.7%, 26.1%, and 61.2%, respectively. Of note, 877 pregnant women with a positive COVID-19 PCR result were excluded (592 women did not have a documented gestational age, and 285 women had a positive result before pregnancy). Most COVID-19 diagnoses occurred near hospitalization, with 49.5% within 0 to 30 days, 10.2% within 31 to 60 days, 17.6% within 61 to 120 days, and 22.6% >120 days before hospitalization.

The institutional review board approved the study protocol and waived the requirement for patient informed consent. Multivariable logistic regression was used to derive a propensity score of COVID-19 based on baseline conditions to estimate the probability of developing COVID-19 as a function of 17 baseline covariates, including age, ethnicity, race, single-digit zip code, trimester, asthma, autoimmune disease, chronic hypertension, chronic kidney disease, gestational hypertension, gestational diabetes mellitus, major mental illness, morbid obesity, obesity, pregestational diabetes mellitus, pulmonary disease, and tobacco use. The associations between COVID-19 and inhospital outcomes were examined using propensity score −adjusted regression. Analyses were conducted using scikit-learn[9] and statsmodels[10] Python Library, with a 2-tailed P value of <.05 considered significant. Categorical variables, such as demographics, preexisting conditions, and outcomes, were compared using the chi-squared test. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines.[11]

Results

During the pandemic, 308,532 women were hospitalized for childbirth. Of those tested, 39,562 had a negative COVID-19 PCR result, and 2708 (6.4%) had COVID-19. Of those who tested positive, 1342 (49.5%) were diagnosed with COVID-19 within 30 days before hospitalization for childbirth. Women with COVID-19 were younger, more likely to identify as Hispanic, and more likely to have comorbid asthma, pulmonary disease, hypertension, gestational hypertension, diabetes mellitus, gestational diabetes mellitus, obesity, or morbid obesity than women without COVID-19 (Table 1).

Women with COVID-19 were more likely to experience preterm birth (early preterm birth, 3.2% vs 2.2%; adjusted odds ratio [aOR], 1.38; 95% confidence interval [CI], 1.1−1.7), late preterm birth (9.0% vs 5.8%; aOR, 1.62; 95% CI, 1.3−1.7), preeclampsia (8.0% vs 6.1%; aOR, 1.2; 95% CI, 1.0−1.4), placental abruption (1.7% vs 0.9%; aOR, 1.86; 95% CI, 1.4−2.5), disseminated intravascular coagulopathy [DIC] (1.3% vs 0.8%; aOR, 1.57; 95% CI, 1.1−2.2), and pulmonary edema (0.3% vs 0.1%; aOR, 2.67; 95% CI, 1.0−6.3) and require mechanical ventilation (0.5% vs 0.05%; aOR, 8.12; 95% CI, 3.8−17.3) (Table 2).

Women diagnosed with COVID-19 within 30 days of hospitalization for childbirth had the highest prevalence of adverse perinatal outcomes (Appendix 2). Among women diagnosed with COVID-19 in pregnancy, women diagnosed with COVID-19 within 30 days of hospitalization for childbirth had the highest risk of early preterm birth (4.0% vs 2.4%; aOR, 1.7; 95% CI, 1.1−2.6), placental abruption (2.2% vs 1.2%; aOR, 1.8; 95% CI, 1.0−3.4), and need for mechanical ventilation (0.9% vs 0.1%; aOR, 13.7; 95% CI, 1.8−107.1) (Table 2).

In-hospital mortality was significantly higher for women with COVID-19 than women without COVID-19 (147 [95% CI, 3.0−292] vs 2.5 [95% CI, 0.0−7.5] deaths per 100,000 women; P<.0001). Most in-hospital deaths among women with COVID-19 occurred in women who were diagnosed with COVID-19 within 30 days of hospitalization (Appendix 2).

There was no significant difference in the prevalence of stillbirth between women with and without COVID-19 (0.6% vs 0.5%; aOR, 1.46; 95% CI, 0.8−2.4) (Table 2). However, the prevalence of stillbirths occurring in women diagnosed with COVID-19 within the previous 30 days was significantly greater than women diagnosed with

TABLE 1
Baseline characteristics of hospitalized pregnant woman during the COVID-19 pandemic by COVID-19 status

Characteristics	n (%)			*P* value[a]
	COVID-19 within 30 d (n=1342)	COVID-19 positive (n=2708)	Without COVID-19 (n=39,562)	
Trimester				
First	16 (1.2)	22 (0.8)	478 (1.2)	
Second	23 (1.7)	29 (1.1)	412 (1.0)	.824
Third	1303 (97.1)	2657 (98.1)	38, 672 (97.8)	
BMI[b]	32.0 (27.0–37.0)	32.0 (28.0–37.0)	31.0 (27.0–36.0)	
Age (y), mean (SD)	28.8 (5.8)	28.9 (5.8)	29.7 (5.7)	
Age category (y)				
≤24	322 (24.0)	656 (24.2)	7923 (20.0)	
25–34	769 (57.3)	1550 (57.2)	23,311(57.0)	.015
35–44	248 (18.5)	498 (18.4)	8,207 (20.7)	
≥45	3 (0.2)	4 (0.2)	121 (0.3)	
Race and ethnicity				
White, non-Hispanic	521 (38.9)	1052 (38.9)	20,696 (52.3)	
Black, non-Hispanic	119 (8.9)	293 (10.8)	3595 (9.1)	.095
Hispanic	580 (43.2)	1142 (42.2)	12,047 (30.5)	
Asian	26 (1.9)	45 (1.7)	852 (2.1)	
Other or unknown	96 (7.1)	176 (6.5)	2372 (6.0)	
Comorbidities				
Asthma	148 (11.0)	414 (15.3)	2193 (5.5)	<.001
Autoimmune disease	4 (0.3)	10 (0.4)	128 (0.3)	.687
Chronic kidney disease	8 (0.6)	21 (0.8)	219 (0.6)	.138
Diabetes mellitus	29 (2.2)	83 (3.1)	756 (1.9)	<.001
Gestational diabetes mellitus	100 (7.5)	214 (7.9)	2769 (7.0)	.087
Gestational hypertension	44 (3.2)	114 (4.2)	1338 (3.4)	.025
Hypertension	50 (3.7)	155 (5.7)	1896 (4.8)	.033
Major mental illness	86 (6.4)	245 (9.0)	3521 (8.9)	.804
Morbid obesity	45 (3.4)	139 (5.1)	1349 (3.4)	<.001
Obesity	263 (19.6)	630 (23.3)	6679 (16.9)	<.001
Pulmonary disease	70 (5.2)	182 (6.7)	1846 (4.7)	<.001
Smoking	35 (2.6)	101 (3.7)	11,675 (4.2)	.216

BMI, body mass index.

[a] Reflects the comparisons between patients with COVID-19 and patients without COVID-19; [b] BMI calculated as weight in kilograms divided by height in meters reported as median (interquartile range).

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COVID-19 31 to 60, 60 to 120, or >120 days before hospitalization (11/16 [68.8%], 0/16 [0 %], 3/16 [18.7%], and 2/16 [12.5%], respectively; *P*<.001) (Appendix 2). A similar pattern was observed for the prevalence of placental abruption, DIC, preterm premature rupture of membranes (PPROM), and need for mechanical ventilation (Appendix 2).

During the prepandemic period, 271,444 women were hospitalized for childbirth. Women hospitalized for childbirth during the pandemic period were more likely to have comorbid

TABLE 2
Comparison of inhospital outcomes of pregnant woman during the COVID-19 pandemic based on COVID-19 status

Outcome	n (%)			Without COVID-19 vs COVID-19 positive[b]		COVID-19 within 30 d vs COVID-19 >31 d[b]	
	COVID-19 within 30 d[a] (n=1342)	COVID-19 positive (n=2708)	Without COVID-19 (n=39,562)	Unadjusted OR (95% CI)	Adjusted OR[b] (95% CI)	Unadjusted OR (95% CI)	Adjusted OR[b] (95% CI)
Early preterm birth	52 (4.0)	84 (3.2)	844 (2.2)	1.47 (1.20–1.80)[c]	1.38 (1.10–1.70)[c]	1.70 (1.10–2.60)[c]	1.70 (1.10–2.60)[c]
Late preterm birth	113 (8.6)	239 (9.0)	2230 (5.8)	1.62 (1.40–1.90)[c]	1.50 (1.30–1.73)[c]	0.90 (0.70–1.20)	1.00 (0.80–1.30)
Term birth	1151 (87.7)	2349 (88.3)	35,646 (92.3)	0.72 (0.60–0.80)[c]	0.73 (0.70–0.80)[c]	0.90 (0.70–1.10)	0.90 (0.70–1.10)
Cesarean delivery	419 (31.9)	826 (31.1)	12,916 (33.4)	0.91 (0.80–1.00)[c]	0.91 (0.80–1.00)[c]	1.11 (0.90–1.20)	1.14 (1.00–1.30)
Birthweight (g)[d]	3396 (2698–3769)	3418 (3093–3780)	3400 (2950–3785)				
PPROM	33 (2.5)	72 (2.7)	814 (2.1)	1.30 (1.00–1.70)	1.20 (1.00–1.60)	0.86 (0.50–1.40)	0.83 (0.50–1.30)
Stillbirth	11 (0.8)	16 (0.6)	174 (0.5)	1.35 (0.80–2.30)	1.50 (0.90–2.50)	1.25 (0.80–6.50)	1.66 (0.60–4.90)
Blood product transfusion	15 (1.1)	23 (0.9)	237 (0.6)	1.42 (0.90–2.20)	1.41 (0.90–2.20)	1.92 (0.80–4.50)	1.76 (0.70–4.20)
Sepsis	19 (1.4)	22 (0.8)	71 (0.2)	4.56 (2.80–7.40)[c]	3.73 (2.30–6.20)[c]	6.52 (1.90–22.10)[c]	6.93 (2.00–23.80)[c]
Shock	91 (6.8)	161 (6.0)	2313 (5.9)	1.02 (0.90–1.20)	0.95 (0.80–1.30)	1.35 (0.98–1.90)	1.48 (1.10–2.10)[c]
Preeclampsia	103 (7.7)	215 (7.9)	2407 (6.1)	1.32 (1.20–1.50)[c]	1.20 (1.00–1.40)[c]	0.93 (0.70–1.23)	1.10 (0.80–1.50)
Eclampsia	2 (0.2)	7 (0.3)	21 (0.1)	4.88 (2.10–11.50)[c]	4.71 (2.00–11.35)[c]	0.41 (0.10–2.10)	0.38 (0.10–2.00)
DIC	21 (1.6)	35 (1.3)	345 (0.9)	1.49 (1.10–2.10)[c]	1.57 (1.10–2.20)[c]	1.54 (0.80–3.00)[c]	1.59 (0.80–3.20)[c]
HELLP	4 (0.3)	6 (0.2)	76 (0.2)	1.20 (0.50–2.70)	1.16 (0.50–2.70)	0.40 (0.40–11.20)[c]	2.10 (0.40–12.00)[c]
Myocardial infarction[e]	2 (0.2)	4 (0.2)	8 (0.0)	7.31 (2.20–24.30)[c]	7.48 (2.20–25.50)[c]	1.00 (0.10–7.20)	1.23 (0.20–9.20)
VTE	3 (0.2)	5 (0.2)	55 (0.1)	1.30 (0.50–3.30)	1.24 (0.50–3.20)	1.53 (0.30–9.20)	1.87 (0.30–11.70)
Mechanical ventilation	12 (0.8)	13 (0.5)	18 (0.1)	10.60 (5.20–21.70)[c]	8.12 (3.80–17.30)[c]	12.32 (1.60–94.90)[c]	13.70 (1.80–107.20)[c]
Length of stay[f]	3 (3–4)	3 (3–4)	3 (3–4)				
Discharge disposition							
Home	1299 (96.8)	2610 (96.4)	38,117 (96.4)				
Postacute care	12 (0.9)	37 (1.4)	324 (0.8)				
Death	3 (0.2)	4 (0.1)	1 (0.0)				
Rehab	8 (0.6)	10 (0.4)	209 (0.5)				
Hospice	1 (0.1)	1 (0.0)	49 (0.1)				
Other	19 (1.4)	46 (1.7)	862 (2.2)				

ARDS, acute respiratory distress syndrome; *DIC*, disseminated intravascular coagulopathy; *HELLP*, hemolysis, elevated liver enzymes, low platelet count; *IQR*, interquartile range; *OR*, odds ratio; *PPROM*, preterm premature rupture of membranes; *VTE*, venous thromboembolism.

[a] Trimester-specific information was missing for 10.4% of patients with COVID; [b] Adjusted for propensity score, which estimates the probability of developing COVID-19 as a function of 17 baseline covariates, including age, race, ethnicity, single-digit zip code, trimester, chronic kidney disease, asthma, pulmonary disease, autoimmune disease, chronic hypertension, gestational hypertension, pregestational diabetes mellitus, gestational diabetes mellitus, major mental illness, morbid obesity, obesity, and tobacco use. The propensity score was defined as the logistic regression of the predicted probability of COVID-19 status; [c] Statiscally significant outcomes, $P<.05$; [d] Birthweight in grams reported as median (IQR); [e] Myocardial infarction was defined as the composite of myocardial infarction and cardiac arrest; [f] Length of stay in days reported as median (IQR).

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gestational diabetes mellitus, gestational hypertension, hypertension, obesity, morbid obesity, and major mental illness than women hospitalized for childbirth during the prepandemic period (Appendix 3). Compared with women who delivered during the prepandemic period, there was no significant difference in the number of stillbirths, the prevalence of early or late preterm birth, or in-hospital mortality among women who delivered during the pandemic period (Table 3).

Discussion

Principal findings

In a large cohort of US women hospitalized for childbirth, we found that inhospital mortality, preterm birth, preeclampsia, placental abruption, and DIC were statistically significantly higher among women with COVID-19 than women without COVID-19. Women with COVID-19 who were diagnosed within 30 days of hospitalization had the highest prevalence of in-hospital mortality, stillbirth, placental abruption, PPROM, DIC, early and late preterm births, and need for mechanical ventilation.

TABLE 3
Comparison of inhospital outcomes for women hospitalized for childbirth before and during the COVID-19 pandemic

	n (%)		
Outcome	Prepandemic[a] (n=271,444)	Pandemic[a] (n=308,532)	*P* value
Early preterm	7848 (2.9)	9059 (2.9)	.317
Late preterm	18,812 (6.9)	21,573 (7.0)	.373
Term	221,135 (81.5)	252,190 (81.7)	.252
Cesarean delivery	70,008 (25.8)	81,556 (26.4)	.001
Birthweight[b]	3332 (2885–3760)	3327 (2888–3740)	
PPROM	8115 (2.5)	8999 (2.5)	.183
Stillbirth	1697 (0.6)	2018 (0.7)	.170
Blood product transfusion	3044 (0.9)	3665 (1.0)	.012
Sepsis	561 (0.2)	598 (0.1)	.308
Shock	19,416 (6.1)	22,069 (6.1)	.663
Preeclampsia	19,131 (6.0)	22,895 (6.3)	<.001
Eclampsia	241 (0.1)	330 (0.1)	.024
DIC	1933 (0.6)	2289 (0.6)	.143
HELLP	755 (0.2)	840 (0.2)	.733
Myocardial infarction[c]	58 (0.0)	96 (0.0)	.021
VTE	378 (0.1)	465 (0.1)	.229
Mechanical ventilation	80 (0.0)	133 (0.0)	.006
Length of stay[d]	3 (2–4)	3 (2–4)	
Discharge disposition			
Home	246,659 (90.6)	281,286 (91.2)	
Postacute care	9259 (3.4)	9811 (3.1)	
Death	27 (0.0)	39 (0.0)	.231
Hospice	39 (0.0)	132 (0.0)	
Rehabilitation	815 (0.3)	916 (0.3)	
Other or unknown	14,645 (5.3)	16,348 (5.2)	

DIC, disseminated intravascular coagulopathy; *HELLP*, hemolysis, elevated liver enzymes, low platelet count; *IQR*, interquartile range; *PPROM*, preterm premature rupture of membranes; *VTE*, venous thromboembolism.

[a] The prepandemic period includes hospitalizations between January 01, 2019, and February 28, 2020. The pandemic period includes hospitalizations between March 01, 2020, and May 31, 2021; [b] Birthweight in grams reported as median (IQR); [c] Myocardial infarction was defined as the composite of myocardial infarction and cardiac arrest; [d] Length of stay in days reported as median (IQR).

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Results

To date, this is the third-largest US cohort of pregnancies during the COVID-19 pandemic and the second-largest US cohort of patients with COVID-19. The use of a large childbirth cohort enabled us to detect statistically significant differences in mortality and adverse outcomes, even though absolute rates of death and adverse perinatal outcomes were low overall.[12–14] Moreover, we could demonstrate a temporal effect of COVID-19 on adverse perinatal outcomes, suggesting a high-risk period.

Our findings of increased risk of preterm birth, preterm labor, and development of preeclampsia among women found to have COVID-19 who were hospitalized for childbirth have not been consistently reported in previous US studies,[1,5] which may be because of a longer study period, larger sample size in the current study, and the development of novel variants during the study period. Interestingly, in the largest reported US cohort to date, Chinn et al[3] demonstrated a greater degree of risk of preterm birth among women diagnosed with COVID-19 and hospitalized for childbirth than the current study. However, unlike Chinn et al,[3] our study accounted for differences in preexisting comorbid conditions in the cohort, which may account for the variation.

This study did not demonstrate a difference between the prevalence of adverse perinatal outcomes in the year preceding the pandemic and the first 16 months of the pandemic, which was surprising, given the disruptive nature of the COVID-19 pandemic. Some studies have reported decreased premature birth rates during the pandemic; however, smaller sample sizes and shorter study periods may have biased

the results.[15,16] Women hospitalized for childbirth during the pandemic period were more likely to have comorbid asthma, gestational diabetes mellitus, gestational hypertension, hypertension, obesity, and major mental illness than women hospitalized for childbirth during the prepandemic period, which may be related to noninfectious, environmental disruptive effects of the pandemic. However, any relationship of these findings to the absence of differences in perinatal adverse outcomes between the prepandemic and pandemic periods is speculative, and it was not adequately addressed by our study design.

Strengths and limitations

Our study has other limitations that may affect the veracity of our findings. Our study was an observational study with data abstracted from medical records, which were subject to potential misclassification or information bias. Because of the development of readily accessible COVID-19 testing and routine screening of all hospitalized patients, women who seemed clinically ill may have experienced selection bias toward more frequent testing. Furthermore, this study was unable to provide information about the severity of COVID-19 among patients who tested positive. This study was unable to differentiate iatrogenic preterm birth from spontaneous preterm birth, which may be an important driver of preterm birth. Lastly, low case rates and residual confounding may further impact the clinical significance of the results.

Clinical implications

Despite the limitations, our study, which focused on a longer peak period of COVID-19, demonstrated that women hospitalized for childbirth with a history of COVID-19 have a higher prevalence of adverse perinatal outcomes and increased in-hospital mortality, consistent with previously reported global results. Future investigation is warranted and should include the delineation of a high-risk period for adverse perinatal outcomes after COVID-19 diagnosis, as enhanced antenatal surveillance may be warranted for women recently diagnosed with COVID-19.

Conclusion

Women with COVID-19 had a higher prevalence of adverse perinatal outcomes and increased in-hospital mortality, with the highest risk period occurring when a COVID-19 test positive result was present within 30 days of hospitalization for childbirth. ■

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.ajogmf.2022.100577.

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