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# Impact of COVID-19 pandemic on maternal and neonatal morbidities in the United States



**OBJECTIVE:** Although SARS-CoV-2 infection in pregnancy is associated with several adverse pregnancy outcomes,<sup>1,2</sup> data exploring the impact of the COVID-19 pandemic on maternal and neonatal morbidities in the United States have been limited. Therefore, we set out to evaluate whether the COVID-19 pandemic had an impact on the overall rates of preterm birth and maternal and neonatal complications in the United States.

**STUDY DESIGN:** This retrospective cohort study used the US Department of Health and Human Services, the Centers for Disease Control and Prevention, the National Center for Health Statistics (NCHS), and the Division of Vital Statistics Natality online database. The study group included all singleton live births from April 1, 2020, to December 31, 2020 (ie, pandemic group), whereas the comparison group included similar births from January 1, 2016, to February 29, 2020 (ie, prepandemic group). March 2020, when the COVID-19 outbreak was declared a global pandemic,<sup>3</sup> was considered a washout period and excluded from our analysis. In addition, cases with missing data were excluded. Baseline characteristics, incidences of preterm birth (<24, 28, 34, and 37 weeks of gestation), and several maternal and neonatal complications were compared between the 2 groups using the Pearson chi-squared test with statistical significance set at  $P < .05$ . Multivariable logistic regression was used to adjust for the following potential confounders: maternal age, body mass index, race or ethnic group, chronic hypertension, pregestational diabetes mellitus, history of preterm birth, and tobacco use. Data were presented as unadjusted odds ratios (ORs) and adjusted ORs (aORs) with 95% confidence intervals (CIs). An institutional review board approval was not required as the reported deidentified data are publicly available through a data use agreement with the NCHS.<sup>4</sup>

**RESULTS:** Overall, 18,071,658 live births were included, of which 2,641,746 (14.6%) were in the pandemic group and 15,429,912 (85.4%) were in the prepandemic group. The pandemic group had higher rates of chronic hypertension, gestational hypertension or preeclampsia, pregestational diabetes mellitus, and previous preterm birth, and lower rates of tobacco use than the prepandemic group (Table 1). The rates of preterm birth were nearly identical between the 2 groups, conferring no clinical difference in this outcome during the COVID-19 pandemic (Table 2). The pandemic group had slightly higher odds of several complications, such as maternal transfusion (aOR, 1.17; 95% CI, 1.15–1.19), uterine

rupture (aOR, 1.16; 95% CI, 1.08–1.22), and immediate and prolonged neonatal assisted ventilations (aORs, 1.18 [95% CI, 1.17–1.19] and 1.15 [95% CI, 1.13–1.17], respectively) (Table 2).

**CONCLUSION:** Based on a large US population database, we reported several characteristics and pregnancy complications that increased during the COVID-19 pandemic. Specifically, we detected higher rates of chronic hypertension, gestational hypertension or preeclampsia, pregestational diabetes mellitus, and previous preterm birth, and lower rates of tobacco use. In addition, pregnancies in the pandemic group had slightly higher odds of maternal transfusion, uterine rupture, and immediate and prolonged neonatal assisted ventilations. Despite previous data suggesting that COVID-19 in pregnancy is associated with an increased risk of preterm birth,<sup>1,5</sup> we did not detect a difference in overall preterm birth rates in the US population during the pandemic. Given that preterm birth is more common in symptomatic patients with COVID-19, which represent a minority of pregnancies during the pandemic,<sup>1,5</sup> this did not translate to a clinically significant difference in preterm birth rates on a national level. It is unclear why the COVID-19 pandemic was associated with higher odds of immediate and prolonged neonatal assisted ventilations despite similar preterm birth rates and adjustments for potential confounders, such as pregestational diabetes mellitus. Unmeasured confounders may have contributed to these findings.

An association between SARS-CoV-2 infection and hypertensive disorders of pregnancy has been suggested in previous smaller studies,<sup>6</sup> and our findings confirmed this association in a large population-based cohort. The decreased incidence of tobacco use may reflect an overall trend to stop smoking during the pandemic given concerns regarding SARS-CoV-2 being a respiratory pathogen.

Our study was limited by the retrospective nature of birth certificate databases and the information available for analysis. Furthermore, as often seen in large population-based studies, although the comparison of several baseline characteristics and outcomes reached statistical significance, the magnitude of some of these differences was very small, suggesting limited, if any, clinical significance. In summary, our findings exploring the impact that the COVID-19 pandemic had on the overall rate of pregnancy complications in the United States were overall reassuring. ■

**TABLE 1**  
**Baseline characteristics compared between the 2 groups**

Characteristic	Pre-COVID-19 (Jan. 1, 2016, to Feb. 29, 2020; n=15,429,912)	COVID-19 (April 1, 2020, to Dec. 31, 2020; n=2,641,746)	P value
Maternal age (y)	28.9±5.8	29.2±5.8	<.001
Body mass index (kg/m <sup>2</sup> )	28.8±13.1	28.9±12.0	<.001
Race or ethnic group			
Non-Hispanic White	7,926,922 (51.8)	1,345,279 (51.4)	<.001
Non-Hispanic Black	2,213,816 (14.5)	381,258 (14.6)	
American Indian or Alaskan Native	120,137 (0.8)	19,750 (0.8)	
Asian or Pacific Islander	1,030,471 (6.7)	166,163 (6.4)	
Non-Hispanic multiracial	332,954 (2.2)	61,921 (2.4)	
Hispanic	3,667,846 (24.0)	642,235 (24.5)	
Chronic hypertension	300,433 (1.9)	66,933 (2.5)	<.001
Gestational hypertension or preeclampsia	1,027,175 (6.7)	217,641 (8.2)	<.001
Eclampsia	39,280 (0.3)	6994 (0.3)	<.001
Pregestational diabetes mellitus	141,945 (0.9)	28,294 (1.1)	<.001
History of preterm birth	511,938 (3.3)	95,518 (3.6)	<.001
Tobacco use	1,016,627 (6.6)	143,367 (5.4)	<.001
Chorioamnionitis	246,957 (1.6)	42,221 (1.6)	<.001

Data are presented as mean±standard deviation or number (percentage), unless otherwise specified.

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**TABLE 2**  
**Adverse maternal and neonatal outcomes compared between the 2 groups**

Outcome	Pre-COVID-19 (Jan. 1, 2016, to Feb. 29, 2020; n=15,429,912)	COVID-19 (April 1, 2020, to Dec. 31, 2020; n=2,641,746)	Unadjusted OR (95% CI)	Adjusted OR (95% CI) <sup>a</sup>
Preterm birth at <37 wk	1,268,316 (8.2)	221,074 (8.4)	1.02 (1.02–1.03)	0.99 (0.98–0.99)
Preterm birth at <34 wk	326,868 (2.1)	55,635 (2.1)	0.99 (0.99–1.00)	0.95 (0.95–0.96)
Preterm birth at <28 wk	82,904 (0.5)	13,834 (0.5)	0.97 (0.96–0.99)	0.95 (0.93–0.96)
Preterm birth at <24 wk	27,185 (0.2)	4455 (0.2)	0.96 (0.93–0.99)	0.93 (0.90–0.96)
Cesarean delivery	4,688,227 (30.4)	805,296 (30.5)	1.00 (1.00–1.01)	0.97 (0.96–0.97)
Maternal transfusion	54,044 (0.4)	11,034 (0.4)	1.19 (1.17–1.22)	1.17 (1.15–1.19)
Uterine rupture	4779 (0.04)	974 (0.03)	1.19 (1.11–1.28)	1.16 (1.08–1.22)
Unplanned hysterectomy	6400 (0.04)	1117 (0.04)	1.02 (0.96–1.09)	0.96 (0.90–1.02)
ICU admission	22,631 (0.1)	4172 (0.2)	1.08 (1.04–1.11)	1.02 (0.99–1.05)
Immediate assisted ventilation	613,572 (4.0)	126,757 (4.8)	1.22 (1.21–1.23)	1.18 (1.17–1.19)
Prolonged assisted ventilation	198,522 (1.3)	40,754 (1.5)	1.20 (1.19–1.22)	1.15 (1.13–1.17)
Surfactant replacement therapy	60,027 (0.4)	10,503 (0.4)	1.02 (1.00–1.04)	0.96 (0.93–0.98)
Antibiotics for suspected neonatal sepsis	310,594 (2.0)	46,986 (1.8)	0.88 (0.87–0.89)	0.87 (0.86–0.88)
Seizures	5343 (0.04)	902 (0.03)	0.99 (0.92–1.06)	0.99 (0.92–1.06)

Data are presented as number (percentage), unless otherwise specified.

CI, confidence interval; ICU, intensive care unit; OR, odds ratio.

<sup>a</sup> Models were adjusted for maternal age, body mass index, race or ethnic group, chronic hypertension, pregestational diabetes mellitus, history of preterm birth, and tobacco use.

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