7-19-2021

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Abstract   Integrated, data-driven criteria are necessary to evaluate delivery outcomes in pregnancies affected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) during the ongoing COVID-19 pandemic. This study analyzed maternal demographics, clinical characteristics, treatments, and delivery outcomes of 85 ethnically diverse, adult pregnant women who tested positive for SARS-CoV-2 at the time of delivery. Median maternal and gestational ages were 27 years (interquartile range [IQR]: 23–31) and 39 weeks (IQR: 37.3–40.0), respectively. Of the 85 SARS-CoV-2–positive participants, 67 (79%) had no COVID-19 symptoms at the time of routine COVID-19 admission testing, 14 (16%) reported mild COVID-19 symptoms, and 4 (5%) presented severe COVID-19 symptoms that required hospitalization. Patients in the severe COVID-19 group had significantly longer hospitalizations than those with nonsevere COVID-19 (7 [IQR: 4.5–9.5] vs 2 [IQR: 2–3] days; P<0.01). Neonatal outcomes included 100% live births with a median 1-minute Apgar score of 8 and 15% preterm births. No neonatal deaths or vertical transmissions were reported, and all neonatal intensive care unit admissions were related to prematurity. Overall, maternal symptom prevalence and peripartum complication rates were low, suggesting a generally good prognosis for pregnant women with SARS-CoV-2 infections at the time of delivery. (*J Patient Cent Res Rev.* 2021;8:286-289.)

Keywords   COVID-19 symptoms; pregnancy; maternal health; neonatal outcomes; SARS-CoV-2

The potential risks of becoming pregnant during the ongoing COVID-19 pandemic are concerning, as pregnancy confers increased susceptibility to respiratory infectious diseases[1-9] and pregnant research subjects were not included in COVID-19 vaccine trials.[10,11] Although most human coronavirus infections are mild, the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) viral epidemics of the past two decades have been especially grave, with high maternal mortality rates.[1,12] In a recent morbidity and mortality report by the Centers for Disease Control and Prevention on 326,335 women of reproductive age (15–44 years) with COVID-19, pregnant women reported similar or milder symptoms than nonpregnant counterparts. Nonetheless, pregnant women were found to be more likely to be hospitalized and at increased risk for intensive care unit admission and receipt of mechanical ventilation (1.5%) than nonpregnant ones (0.9%), with similar risk of mortality.[12,13]

The timing of infection is a key factor to consider in the clinical management of pregnancies affected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the viral strain responsible for COVID-19. Given the low occurrence of vertical transmission reported in the literature,[1,3,14-20] it becomes important to understand the characteristics and outcomes of maternal COVID-19 in terms of pregnancies at the time of delivery. These unique challenges call for integrated, data-driven criteria to understand susceptibility to severe illness and minimize potential complications in the peripartum period.

This study sought to investigate maternal clinical characteristics and pregnancy outcomes in pregnant women infected with SARS-CoV-2 at the time of delivery to help inform patient management challenges in real inpatient settings.

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METHODS

All consecutive deliveries from adult pregnant women with a positive reverse transcriptase-polymerase chain reaction nasopharyngeal swab test result for SARS-CoV-2 admitted to any of 14 Advocate Aurora Health medical centers in Wisconsin and Illinois up to October 3, 2020, were included in this study. The first study participant to meet inclusion criteria was admitted on March 23, 2020.

The Advocate Aurora institutional review board approved the abstraction of data generated for routine clinical practice and waived the requirement for informed patient consent. A comprehensive retrospective review of maternal demographics, clinical characteristics, treatments, and delivery outcomes was performed, and participants were divided according to COVID-19 severity into 3 groups: asymptomatic (no COVID-19 symptoms reported), mild COVID-19 (symptoms not requiring hospitalization), and severe COVID-19 (symptoms requiring hospitalization).

Descriptive statistics were calculated and presented as median and interquartile range (IQR) for continuous variables and as percentage for categorical variables.

RESULTS

A total of 85 deliveries from adult, ethnically diverse, pregnant women who tested positive for SARS-CoV-2 at hospital admission were investigated. Median maternal and gestational ages were 27 years (IQR: 23–31) and 39 weeks (IQR: 37.3–40.0], respectively. Participant characteristics are summarized in Table 1.

Overall, symptom prevalence was low, with fever being the most common COVID-19 symptom reported (8%), followed by dyspnea, cough, and loss of taste or smell (6% each). Maternal SARS-CoV-2–positive status was an incidental finding of routine COVID-19 admission testing in 79% of patients (asymptomatic group, n=67), mild COVID-19 symptoms were present in 16% of patients (mild COVID-19 group, n=14), and maternal COVID-19 symptoms were the primary reason for hospitalization in 5% of cases (severe COVID-19 group, n=4). Figure 1 illustrates symptom prevalence and distribution by group.

Maternal comorbidity rates also were low, with few complications during hospitalization. Of 36 participants with baseline creatinine laboratory tests at admission, 4 asymptomatic patients and 2 patients with severe COVID-19 developed a creatinine increase of ≥25% during the course of the hospitalization, and 1 severe COVID-19 patient went on to develop acute respiratory distress syndrome necessitating mechanical ventilation. Overall median length of stay was 2 days [IQR: 2–3]. When compared using Wilcoxon rank-sum test, patients in the severe COVID-19 group were found to have had significantly longer hospitalizations than those with nonsevere COVID-19 (7 [IQR: 4.5–9.5] vs 2 [IQR: 2–3] days; P<0.01).

Table 1. Characteristics of Hospitalized SARS-CoV-2–Positive Pregnant Women (N=85) at Delivery

Characteristic	n (%) or median [IQR]
Maternal age	27 [23–31] years
Gestational age	39 [37.3–40.0] weeks
Ethnicity	
Hispanic	33 (39%)
Caucasian	28 (33%)
Black	17 (20%)
Other	7 (8%)
Signs and symptoms	
Fever	7 (8%)
Dyspnea	5 (6%)
Cough	5 (6%)
Loss of sense of taste or smell	5 (6%)
Headache	4 (5%)
Congestion and rhinorrhea	3 (4%)
Fatigue	2 (2%)
Sore throat	2 (2%)
Sputum production	1 (1%)
Nausea/vomiting	1 (1%)
Diarrhea	1 (1%)
Muscle aches	0 (0%)
Comorbidities	
Asthma	9 (11%)
Hypertension	6 (7%)
Dyslipidemia	2 (2%)
Diabetes	2 (2%)
Coronary artery disease	1 (1%)
Management	
Oxygen required	6 (7%)
Ventilator use	3 (4%)
Acute respiratory distress syndrome	1 (1%)
Outcomes	
Hospital stay	2 [2–3] days
Live births	n=92*
Preterm births	13 (15%)*
1-minute Apgar score	8 [8–9]
Neonatal SARS-CoV-2 detected at 24 hours	0 (0%)
Neonatal death	0 (0%)

*7 sets of twins were delivered, resulting in 92 live births; preterm birth percentage was calculated from total of 85.

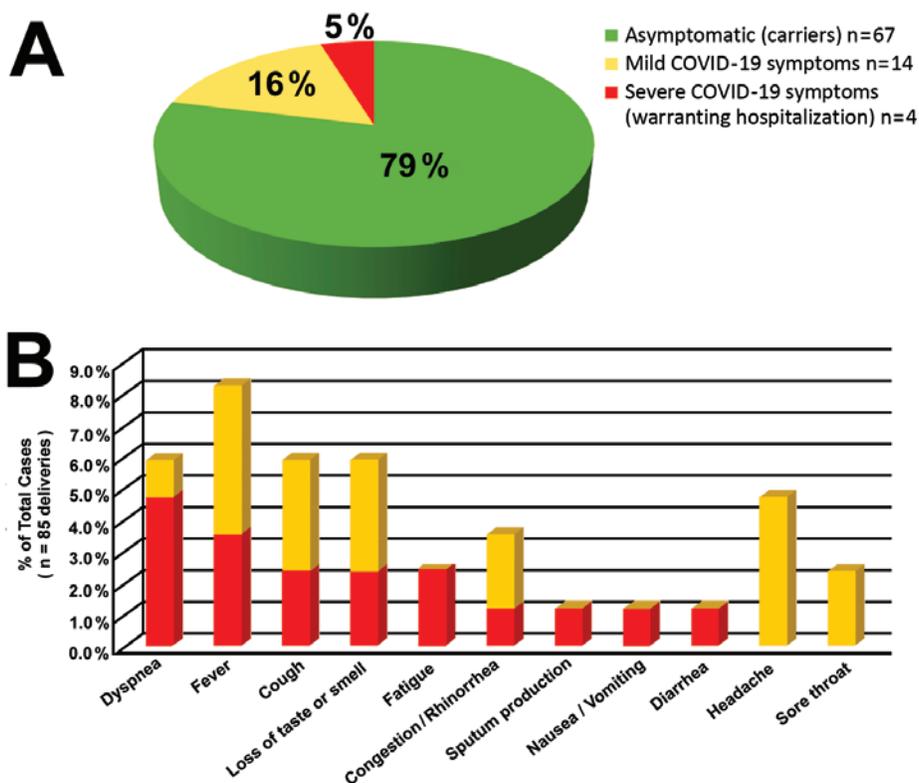IQR, interquartile range; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

Figure 1. Maternal symptoms in severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-positive pregnancies at delivery. **A:** Patient distribution according to COVID-19 symptom severity. **B:** COVID-19 symptom prevalence in mildly and severely symptomatic patients.

Neonatal outcomes included 100% live births with a median 1-minute Apgar score of 8 and 15% preterm births (ie, 13 of 85 total deliveries). Two deliveries (2.3% of the overall cohort of 85 and 50% of the severe COVID-19 group of 4) were induced in the 33rd week of pregnancy: one due to preeclampsia in a twin pregnancy and the other due to worsening of COVID-19 symptoms in a pregnancy complicated by asthma. Prematurity was the only indication for neonatal intensive care unit admission. All neonates tested negative for SARS-CoV-2 infection 24 hours after birth.

DISCUSSION

The vast health system interrogated for this study is uniquely positioned to report on large sample populations of COVID-19–positive pregnancies. National COVID-19 surveillance registries lack hospitalization data to distinguish admissions for COVID-19–related circumstances (eg, worsening respiratory status) from hospital admission for pregnancy-related treatment or procedures (eg, delivery). This limitation makes it very difficult to assess whether the outcomes reported are attributable to the pregnancy, the COVID-19 infection, both, or neither.

As clinical and epidemiological data become available, risk and management of COVID-19 pregnancies become increasingly well-informed.[1,17,18,21-23] Since submission of our manuscript, several other descriptive reports on maternal SARS-CoV-2 and deliveries affected by COVID-19 in single U.S. health systems have been published.[24-26] Consistent with our findings, these studies report largely asymptomatic COVID-19 presentation in this patient population and no increased feto-maternal risks compared to SARS-CoV-2–negative cohorts.

Our study timeframe captured the initial experience of COVID-19 in the midwestern United States. During the months of April and early May 2020, COVID-19 hospitalizations saw a positive trend that decreased and plateaued in July until the end of our study in October 2020. Given that all pregnant women were screened for SARS-CoV-2 at admission during this timeframe, we were able to determine that the vast majority (79%) of SARS-CoV-2 maternal infections at the time of delivery are asymptomatic and largely uncomplicated. Neonatal outcomes in our study were excellent; however, 2 of the 4 deliveries in pregnant women hospitalized for severe COVID-19 symptoms had to be induced prematurely.

Results from this retrospective study suggest overall good feto-maternal prognosis for pregnant women with SARS-CoV-2 infections at the time of delivery. Knowing that COVID-19 is unlikely to complicate deliveries endows physicians with data-driven criteria to prioritize minimizing the risk of contagion during lactation and neonatal care.

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