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Obstetrical outcomes and follow-up for patients with asymptomatic COVID-19 at delivery: a multicenter prospective cohort study



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BACKGROUND: Universal testing for COVID-19 on admission to the labor and delivery unit identifies asymptomatic patients. Whether or not these patients are at increased risk for adverse outcomes and go on to develop clinically significant disease is uncertain.

OBJECTIVE: This study aimed to assess the prevalence of asymptomatic COVID-19 presentation among pregnant patients admitted for delivery and to determine whether these patients become symptomatic or require hospital readmission after discharge.

STUDY DESIGN: We performed a multicenter, prospective cohort study of pregnant patients who delivered between 20^{0/7} and 41^{6/7} weeks' gestation and who were found to have COVID-19 based on universal screening on admission for delivery at 1 of 4 medical centers in New Jersey (exposed group). The unexposed group, comprising patients who tested negative for COVID-19, were identified at the primary study site. The primary outcomes were the rates of asymptomatic COVID-19 presentation, the development of symptoms among the asymptomatic positive patients, and hospital readmission rates in the 2 weeks following discharge. We compared the frequency of the distribution of risk factors and outcomes in relation to the COVID-19 status among patients with COVID-19 across all centers and among those without COVID-19 at the primary site. Associations between categorical risk factors and COVID-19 status were expressed as relative risks with 95% confidence intervals.

RESULTS: Between April 10, 2020, and June 15, 2020, there were 218 patients with COVID-19 at the 4 sites and 413 patients without COVID-19 at the primary site. The majority (188 [83.2%]) of patients with COVID-19 were asymptomatic. Compared with the negative controls, these asymptomatic patients were not at increased risk for obstetrical complications that may increase the risk associated with COVID-19, including gestational diabetes (8.2% vs 11.4%; risk ratio, 0.72; 95% confidence interval, 0.24–2.01) and gestational hypertension (6.1% vs 7.0%; risk ratio, 0.88; 95% confidence interval, 0.29–2.67). Postpartum follow-ups via telephone surveys revealed that these patients remained asymptomatic and had low rates of family contacts acquiring the disease, but their adherence to social distancing guidelines waned during the 2-week postpartum period. Review of inpatient and emergency department records revealed low rates of hospital readmission.

CONCLUSION: Most of the pregnant patients who screened positive for COVID-19 are asymptomatic and do not go on to develop clinically significant infection after delivery. Routine surveillance of these patients after hospital discharge appears to be sufficient.

Key words: asymptomatic disease, COVID-19, multicenter prospective cohort study, pregnancy, SARS-CoV-2

Introduction

Pregnancy is a risk factor for severe COVID-19,¹⁻³ but a significant percentage of obstetrical patients who test positive are asymptomatic.⁴ In 1 hospital system that performed universal COVID-19 testing on admission (March 22, 2020–April 4, 2020), 87.9% of patients who tested positive were asymptomatic.⁵ At another institution, the rate was 54.1%.⁶ Although lower asymptomatic carrier rates have been

reported in some areas,⁷ these patients can spread COVID-19, contributing to the difficulty encountered with containing the disease.^{8,9} Some of these patients with COVID-19 may actually be pre-symptomatic¹⁰ and develop clinically significant disease after hospital discharge.

The follow-up strategy for asymptomatic patients with COVID-19 should be to contain the disease and to monitor for the development of symptoms. Various follow-up strategies exist for patients who have recovered from symptomatic disease, ranging from self-imposed quarantine to repeat testing.¹¹ However, the optimal follow-up strategy for asymptomatic patients with COVID-19 is uncertain.

Currently, limited studies have evaluated the course of asymptomatic COVID-19 in pregnancy,¹²⁻¹⁴ and

most of the COVID-19 research in pregnancy has focused on severe and critical disease.^{15,16} Therefore, we undertook a multicenter, prospective cohort study of obstetrical patients with COVID-19 to assess the prevalence of asymptomatic disease and to determine whether these patients become symptomatic or require hospital readmission after discharge. To achieve these objectives, we implemented a new clinical program that allowed for tracking and monitoring of patients with COVID-19 after discharge. We hypothesized that most pregnant patients who tested positive for COVID-19 during their delivery hospitalizations would be asymptomatic and that the risk for developing symptoms or requiring hospital readmission for COVID-19 symptoms in the first 2 weeks after delivery would be small.

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AJOG MFM at a Glance

Why was this study conducted?

This study was conducted to determine the clinical course of asymptomatic par-turients with COVID-19 and to track their outcomes after discharge.

Key findings

In this multicenter prospective cohort study, most of the pregnant patients who tested positive for COVID-19 during their delivery admissions were asymptomatic. Compared with pregnant patients who tested negative for COVID-19, these asymptomatic patients were not at increased risk for adverse maternal and neonatal outcomes. Postpartum follow-up via telephone surveys revealed that these patients remained asymptomatic and had low rates of family contacts who acquired the disease, but their adherence to social distancing guidelines waned in the 2 weeks postpartum. Review of inpatient and emergency department records revealed that these patients had low rates of hospital readmissions.

What does this add to what is known?

This study demonstrated that most of the pregnant patients who returned a positive screen for COVID-19 were asymptomatic and did not go on to develop clinically significant disease symptomology after delivery. These patients do not seem to be at increased risk for decompensation in the postpartum period, suggesting that routine postpartum surveillance is appropriate.

Materials and Methods

This was a multicenter, prospective cohort study of obstetrical patients with COVID-19 that was conducted within the Robert Wood Johnson Barnabas Health System in Central and Northern New Jersey from April 10, 2020, to June 15, 2020. Patient recruitment occurred at the following 4 sites: the Robert Wood Johnson University Hospital (RWJUH) in New Brunswick, Saint Barnabas Medical Center (SBMC) in Livingston, Monmouth Medical Center (MMC) in Long Branch, and Clara Maass Medical Center (CMMC) in Belleville. The RWJUH, SBMC, and MMC are designated by the state as Regional Perinatal Centers, and the CMMC is a community hospital with a level II neonatal intensive care unit (NICU). The institutional review boards (IRBs) at the Rutgers Robert Wood Johnson Medical School, New Brunswick, New Jersey, and the SBMC, MMC, and CMMC granted ethics approval under a waiver of informed consent (IRB numbers, PRO2020000940, 20-38, 20-035, and R2020-02cmmc).

All patients who delivered between 20^{0/7} and 41^{6/7} weeks' gestation at the RWJUH from April 10, 2020, through June 15, 2020, were included in the

study. The start date corresponds with the initiation of universal COVID-19 testing at the RWJUH. The remaining 3 sites contributed consecutive patients who also delivered between 20^{0/7} and 41^{6/7} weeks' gestation and who tested positive for COVID-19 after initiation of universal testing at each institution (April 6, 2020, at the SBMC; April 13, 2020, at the CMMC; and April 17, 2020, at the MMC) to June 15, 2020. Patients at these sites were not included if they tested positive before initiation of universal testing or if they did not deliver during the hospital admission in which testing was performed. Patients under 20 weeks' gestation were excluded from the study because these patients would not present to the labor and delivery unit and the emergency departments at each institution were not tracking pregnant patients with COVID-19 in the same manner.

All patients underwent COVID-19 testing to detect SARS-CoV-2 infection by quantitative polymerase chain reactions of nasopharyngeal swabs. Each study site used the Cepheid Xpert Xpress SARS-CoV-2 test (Cepheid, Sunnyvale, CA), which has a 99.4% sensitivity, 96.8% specificity, 77% positive

predictive value, and 100% negative predictive value.¹⁷

We had 2 primary outcomes. The first was the rate of asymptomatic COVID-19 cases. The second was the rate of development of self-reported COVID-19 symptoms among the asymptomatic patients with COVID-19 or the rate of hospital readmissions for manifestations of COVID-19 in the first 2 weeks after their positive test on admission to the labor and delivery unit.

Maternal outcomes were collected for a descriptive analysis and included intensive care unit admission, need for mechanical ventilation, need for supplemental oxygen, and death. Neonatal outcomes collected were the incidence of intrauterine fetal demise, neonatal demise, neonatal respiratory distress syndrome, neonatal intraventricular hemorrhage, and necrotizing enterocolitis. Other variables collected included baseline maternal demographics and clinical outcomes such as pregnancy complications (gestational diabetes, gestational hypertension, and preeclampsia), preterm delivery, mode of delivery (spontaneous vaginal delivery, operative vaginal delivery, vaginal delivery after cesarean delivery, primary cesarean delivery, and repeat cesarean delivery), and delivery complications (preterm labor, chorioamnionitis, venous thromboembolism, abnormal biophysical profile, and category 2 fetal heart rate tracing despite intrauterine resuscitation). These outcomes and clinical characteristics were defined clinically, and a patient was considered to have an outcome if it was documented in the electronic medical record; if the outcome was not documented, it was assumed to be negative.

As part of a clinical program to monitor the well-being of patients with COVID-19 after hospital discharge, a team of physicians and clinical nurses performed follow-up telephone calls during the 2 weeks after hospital discharge. At the RWJUH, the primary site, patients were contacted regardless of the results of their COVID-19 test because it was believed that some of these patients would develop COVID-19 following hospitalization. Members

of this team attempted to call each patient twice per week for 2 weeks with the first phone call within 3 days of discharge. At the secondary sites, the follow-up phone calls were made only to patients with COVID-19. Patients with COVID-19 were assessed using a questionnaire to inquire about the presence of any symptoms, the development of new symptoms, any additional doctor's visits or visits to the emergency room, readmissions, compliance with the Centers for Disease Control and Prevention's recommended isolation precautions,¹⁸ household contacts developing symptoms, and household contacts testing positive. At the RWJUH, patients with a negative COVID-19 test were assessed using a questionnaire to inquire about the development of COVID-19 symptoms, testing for COVID-19, and any unscheduled physician visits. Given that we anticipated difficulties in contacting some postpartum patients, we planned to review inpatient and emergency department records at each institution for patients who could not be contacted to determine whether they had hospital readmissions or emergency department visits with COVID-19–related symptoms or complaints. We only had access to patient records within our hospital system and could not account for hospital admissions or emergency department visits at other institutions.

Statistical analysis

We performed descriptive statistics to calculate the rate of asymptomatic COVID-19 presentation and the rate of symptom development in the asymptomatic patients with COVID-19, including means (standard deviations) for normally distributed data and medians (interquartile ranges) for non-normally distributed data.

We compared the frequency of distribution of risk factors and outcomes in relation to COVID-19 status between patients with COVID-19 across all 4 centers and patients without COVID-19 at the RWJUH. Because there was substantial heterogeneity (Supplemental Table 1) in the distributions across the 4 centers (for patients with COVID-19), the

demographic characteristics and outcomes of patients restricted to the RWJUH site were compared for patients with COVID-19 and patients without COVID-19. Associations between risk factors for COVID-19 and COVID-19 status were expressed as relative risks (RRs) with 95% confidence intervals (CIs). The RRs were estimated by fitting log-linear regression models with a Poisson error structure and a log-link function. All analyses were performed in SAS (version 9.4; SAS Institute Inc, Cary, NC).

Results

During the study period (April 10, 2020–June 15, 2020), there were 218 patients with COVID-19 across the 4 sites (49 at the RWJUH, 61 at SBMC, 70 at MMC, and 38 at CMMC) and 413 patients without COVID-19 at the primary site, the RWJUH. Only 21 of the 218 patients with COVID-19 tested positive before admission. Of those 21 patients, 14 were still asymptomatic on presentation to the labor and delivery unit. Most of the patients with COVID-19 were asymptomatic at the time of testing (188; 86.2%). The demographic characteristics for the patients with COVID-19 are depicted in Table 1 and the Supplemental Table. The patients with COVID-19 were predominantly White, obese, and had no medical problems. There was a nearly even distribution of patients with commercial and public insurance.

Data from the follow-up phone calls are noted in Table 2. About a third (81; 37.2%) of the patients who tested positive, including 74 of the asymptomatic positive patients, and 145 (35.1%) patients who tested negative were reached at least once. Most of the asymptomatic patients with COVID-19 adhered to isolation precautions, however, adherence waned over the 2-week follow-up period. There were low rates of reported transmission to family members for asymptomatic patients with COVID-19. Only 1 asymptomatic patient with COVID-19 reportedly developed any symptoms after discharge, and these symptoms were mild. No asymptomatic patients

with COVID-19 required readmission for COVID-19 symptoms, however, 2 patients without COVID-19 required readmission for issues not related to COVID-19.

To identify risk factors for COVID-19, we compared the demographics of patients with COVID-19 with those of negative controls at the RWJUH (Table 1). The demographic characteristics were similar between the groups and there was no significant difference in pregnancy complications, including gestational diabetes (8.2% vs 11.4%; RR, 0.72; 95% CI, 0.24–2.01) and gestational hypertension (6.1% vs 7.0%; RR, 0.88; 95% CI, 0.29–2.67).

The obstetrical and neonatal outcomes based on COVID-19 status are depicted in Table 3. Adverse maternal outcomes were uncommon in both patients with COVID-19 and those without COVID-19. Compared with patients without COVID-19 at the RWJUH, those at RWJUH who tested positive were more likely to require supplemental oxygen (4.1% vs 0.5%; RR, 4.87; 95% CI, 1.76–13.47). There was 1 maternal death during the study period in the group of patients without COVID-19; the patient had an underlying cardiac condition. In the early stages of the COVID-19 pandemic, all neonates delivered to mothers with COVID-19 were admitted to the NICU leading to an increased risk for NICU admissions among neonates exposed to mothers with COVID-19 (83.7% vs 15.7%; RR, 17.21; 95% CI, 8.33–35.57).

In addition to reaching out to patients by telephone, inpatient and emergency department records were assessed for all patients who did not respond to the follow-up phone calls to determine whether they had any COVID-19–related complaints that required evaluation within the health-care system. Among the patients with and without COVID-19, there were 7 patients who presented to the emergency department after discharge. The reasons for visiting the emergency department included bleeding after intrauterine device placement (n=1), superficial phlebitis (n=1),

TABLE 1

Demographic characteristics of all patients and comparison between Robert Wood Johnson University Hospital patients with and without COVID-19

Demographic	All 4 centers COVID-19 positive (N=218)	RWJUH COVID-19 positive (n=49)	RWJUH COVID-19 negative (n=413)	Relative risk (95% confidence interval) ^a
Asymptomatic	188 (86.2)	35 (71.4)	—	—
Maternal age (y) ^b	29.7 (5.9)	30.1 (6.0)	30.9 (5.9)	—
Gravidity ^c	3 (1–5)	3 (2–4)	2 (1–4)	—
Parity ^c	2 (1–4)	2 (1–4)	2 (1–3)	—
Body mass index at delivery (kg/m ²) ^a	30.3 (5.6)	30.5 (6.6)	30.7 (6.5)	—
Maternal race and ethnicity				
Non-Hispanic White	115 (53.7)	30 (61.2)	179 (43.3)	1.00 (Ref)
Non-Hispanic Black	30 (14.0)	1 (2.0)	37 (9.0)	0.18 (0.03–1.30)
Hispanic	24 (11.2)	16 (32.6)	94 (22.8)	1.01 (0.58–1.78)
Asian or Indian	3 (1.4)	2 (4.1)	75 (18.2)	0.18 (0.04–0.74)
Other	42 (19.6)	0 (0)	28 (6.8)	—
Maternal insurance status				
Private	93 (44.3)	30 (61.2)	269 (65.1)	—
Medicaid or Charity Care	101 (48.1)	19 (38.8)	144 (34.9)	—
Self-pay	7 (3.3)	0 (0)	0 (0)	—
Other	9 (4.3)	0 (0)	0 (0)	—
Maternal medical history				
No medical history	154 (71.6)	24 (49.0)	197 (47.7)	—
Medical comorbidities	61 (28.4)	25 (51.0)	216 (52.3)	0.96 (0.56–1.62)
Pregestational diabetes	0 (0)	0 (0)	11 (2.7)	—
Chronic hypertension	3 (1.4)	0 (0)	23 (5.6)	—
Renal disease	0 (0)	0 (0)	3 (0.7)	—
Immunocompromised	4 (1.9)	2 (4.1)	4 (1.0)	3.23 (1.01–10.35)
Asthma	7 (3.3)	2 (4.1)	11 (2.7)	1.47 (0.40–5.41)
Anemia	10 (4.7)	1 (2.0)	16 (3.9)	0.55 (0.08–3.72)
Twins	6 (2.8)	0 (0)	16 (3.9)	—
Obstetrical clinical characteristics				
Gestational diabetes	9 (4.2)	4 (8.2)	47 (11.4)	0.72 (0.24–2.01)
Gestational hypertension	7 (3.3)	3 (6.1)	29 (7.0)	0.88 (0.29–2.67)
Preeclampsia	9 (4.2)	5 (10.2)	43 (10.4)	0.98 (0.41–2.35)

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

Ref, reference.

^a Relative risk for patients with COVID-19 compared with those without COVID-19; ^b Data are presented as mean (standard deviation); ^c Data are presented as median (interquartile range).

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constipation (n=1), abdominal trauma (n=1), hypertension (n=1), leg swelling (n=1), and vaginal bleeding (n=1). None of these patients presented to the hospital for evaluation of COVID-19 symptoms.

Comment

Principal findings

In this multicenter, prospective cohort study of pregnant patients who were determined to have COVID-19 on hospital admission to 1 of 4 New Jersey

hospitals, most of the patients with COVID-19 were asymptomatic. Compared with pregnant patients without COVID-19, these asymptomatic patients were not at increased risk for adverse maternal and neonatal outcomes.

TABLE 2
Follow-up phone calls

Outcome	COVID-19 positive (N=218)	Asymptomatic COVID-19 positive (n=188)	COVID-19 negative (n=413)
Patient reached			
1 time	81 (37.2)	74 (39.4)	145 (35.1)
2 times	37 (17.0)	36 (19.1)	103 (24.9)
3 times	20 (9.2)	19 (10.1)	60 (14.5)
4 times	11 (5.0)	11 (5.9)	22 (5.3)
Patient developed symptoms after discharge	1 (1.3)	1 (1.4)	0 (0)
Tested after discharge	0 (0)	0 (0)	7 (1.7)
Patient required unscheduled emergency room or doctor's visit after discharge	1 (1.3)	1 (1.4)	4 (2.8)
Patient readmitted	0 (0)	0 (0)	2 (1.4) ^a
Patient practicing isolation precautions			
First call	71 (87.7)	64 (86.5)	0 (0)
Fourth call	5 (45.5)	5 (45.5)	0 (0)
Household contacts developed symptoms	3 (3.7)	3 (4.1)	0 (0)
Household contacts tested positive	6 (7.4)	2 (2.7)	4 (1.0)

Data are presented as number (percentage).

^a All readmissions were unrelated to COVID-19.

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Postpartum follow-ups via telephone surveys and review of inpatient and emergency department records revealed that most of the asymptomatic patients remained asymptomatic, did not spread the disease to their immediate family members, and had low rates of hospital readmissions including no readmissions for COVID-19 symptoms.

Results of the study in context

Most of the patients who were determined to have COVID-19 on hospital admission were asymptomatic. This is potentially important because asymptomatic patients are thought to be major contributors to the spread of the disease¹⁹ and screening for COVID-19 with symptom questionnaires and temperature checks may not be an effective way to identify many patients with the potential to spread the disease. Although there is some debate about the utility of universal testing when the prevalence of COVID-19 is low in a community,⁷ we believe that this policy

is justified because it protects healthcare workers and other patients (including neonates) and can be an instrument to monitor local infections.²⁰

In contrast to some studies,^{21–23} the patients in our study who tested positive for COVID-19—asymptomatic and symptomatic patients alike—rarely required treatment for the disease. Testing positive for COVID-19 was not associated with adverse maternal or neonatal outcomes, which has also been found in other studies.²⁴ Indeed, we found a trend toward lower rates of maternal morbidity and preterm birth in our COVID-19 positive group. This may be secondary to the overall lower rate of medical comorbidities in the COVID-19 positive group, which reflects the population that are served by our hospitals. The primary center, the RWJUH, serves predominantly non-Hispanic White and Hispanic patients. The 3 additional hospitals have a high volume of non-Hispanic White patients. Patients who tested

positive for COVID-19 were primarily White and without any significant underlying medical comorbidities, which is in contrast with other studies.²⁵ However, another explanation is that patients with asymptomatic disease are healthier than patients with severe forms of the disease and a healthier baseline status confers some protection against developing symptomatic COVID-19.

Clinical implications

Among the patients with postdischarge follow-ups in the 2 weeks after a positive test result, postpartum patients who were asymptomatic at the time of their positive COVID-19 test result rarely developed symptoms or required readmission or an unscheduled physician visit. There were 12 unscheduled healthcare visits for typical postpartum complications and no visits for COVID-19–related issues. Underlying maternal comorbidities seem to be a far greater risk for adverse outcomes than

TABLE 3
Obstetrical and neonatal outcomes in relation to the COVID-19 status

Outcome	All 4 centers COVID-19 positive (N=218)	RWJUH COVID-19 positive (n=49)	RWJUH COVID-19 negative (n=413)	RWJUH COVID-19 positive vs negative: relative risk (95% confidence interval)
Site of recruitment				
RWJUH	49 (22.5)	49 (100.0)	413 (100.0)	—
SBMC	61 (28.0)	—	—	—
MMC	70 (32.1)	—	—	—
CMMC	38 (17.4)	—	—	—
Gestational age at delivery (wk) ^a	38.9 (2.5)	39.1 (2.8)	38.5 (2.7)	—
Mode of delivery				
Spontaneous vaginal	164 (75.6)	38 (77.6)	266 (64.4)	1.00 (Ref)
Operative vaginal	9 (4.2)	0 (0)	11 (2.7)	—
Vaginal birth after cesarean delivery	3 (1.4)	2 (4.1)	8 (1.9)	1.60 (0.45–5.72)
Primary cesarean delivery	18 (8.3)	7 (14.3)	65 (15.7)	0.78 (0.36–1.67)
Repeat cesarean delivery	23 (10.6)	2 (4.1)	62 (15.0)	0.25 (0.06–1.01)
Delivery complications				
Preterm delivery	50 (2.3)	2 (4.0)	48 (11.4)	0.35 (0.09–1.40)
Spontaneous preterm delivery	9 (4.2)	1 (2.0)	32 (7.8)	0.27 (0.04–1.90)
Chorioamnionitis	7 (3.2)	2 (4.1)	8 (1.9)	1.92 (0.54–6.84)
Abnormal biophysical profile	4 (1.8)	2 (4.1)	8 (1.9)	1.92 (0.54–6.84)
Persistent category 2 tracing	16 (7.4)	4 (8.2)	38 (9.2)	0.89 (0.34–2.35)
Development of symptoms during admission	7 (3.2)	2 (4.1)	0 (0)	—
Maternal outcomes				
Venous thromboembolism	0 (0)	0 (0)	1 (0.2)	—
Intensive care unit admission	0 (0)	0 (0)	3 (0.7)	—
Supplemental oxygen	3 (1.4)	2 (4.1)	2 (0.5)	4.87 (1.76–13.47)
Mechanical ventilation	0 (0)	0 (0)	3 (0.7)	—
Death	0 (0)	0 (0)	1 (0.2)	—
Neonatal outcomes				
Birthweight (g) ^a	3249 (568)	3228 (566)	3191 (624)	—
Neonatal intensive care unit admission	56 (25.8)	41 (83.7)	65 (15.7)	17.21 (8.33–35.57)
Positive COVID-19 PCR test result	1 (0.7)	0 (0)	0 (0)	—
Respiratory distress syndrome	8 (3.7)	2 (4.1)	20 (4.8)	0.85 (0.22–3.28)
Intraventricular hemorrhage	1 (0.5)	0 (0)	1 (0.2)	—
Necrotizing enterocolitis	1 (0.5)	0 (0)	0 (0)	—
Death	1 (0.5)	1 (2.0)	4 (1.0)	1.90 (0.32–11.22)

Data presented as number (percentage), unless indicated otherwise.

CMMC, Clara Maass Medical Center; MMC, Monmouth Medical Center; PCR, polymerase chain reaction; RWJUH, Robert Wood Johnson University Hospital; SBMC, Saint Barnabas Medical Center.

^a Data are presented as mean (standard deviation).

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an asymptomatic positive COVID-19 status.

Asymptomatic patients with COVID-19 reported adherence to guidelines regarding social distancing, however, adherence waned during the 2 weeks after delivery. They reported low rates of immediate family members requiring medical evaluation or hospitalization for COVID-19–related symptoms. Review of inpatient and emergency room records corroborated these survey results and indicated that these asymptomatic patients did not develop severe features of COVID-19 or require hospital evaluation or admission. Although some patients may have sought care outside of the Robert Wood Johnson Barnabas Health Network, the study results suggest that asymptomatic patients remain at low risk for developing significant COVID-19 symptomatology after hospital discharge.

One neonate tested positive for COVID-19 in our study before hospital discharge. Although rates of vertical and neonatal transmission are considered to be low,^{26–28} effective communication between the obstetrical and pediatric providers is essential to ensure that the newborn's provider is aware of maternal infection. This is especially true because self-reported adherence to social distancing guidelines wane among asymptomatic patients with COVID-19 who need interact with the medical system to obtain pediatric care in the first 2 weeks after delivery.

Strengths and limitations

Because patients with symptomatic disease have largely been the focus of COVID-19 research in pregnancy, this study provides information to fill an important knowledge gap. Strengths of the study include its multicenter design, pregnant control patients, and follow-ups after delivery. This was a multicenter study that included patients from 4 hospitals in New Jersey, covering patient populations across northern and central New Jersey, which improves the generalizability of our findings. Although many studies that have investigated the pregnancy outcomes for patients with COVID-19 made comparisons with

nonpregnant patients,^{22,29} we made comparisons with pregnant patients who tested negative for COVID-19. We followed patients with postpartum questionnaires during the first 2 weeks after delivery but ensured follow-up by reviewing the hospital records of all included patients to determine whether these patients went on to develop clinically significant COVID-19.

This study has some limitations. Some patients with COVID-19 may test positive for prolonged periods of time, even after convalescing. In our study, most patients with COVID-19 were found to be positive for the first time and 21 (9.6%) tested positive before admission. This may have introduced bias that could have impacted the results. In addition, the study was underpowered for rare outcomes. Furthermore, we had a low response rate to the follow-up phone calls. We only reached one-third (37.2%) of patients with COVID-19 and 35.1% of patients without COVID-19. Although the low telephone response rate could introduce some bias, we contacted a similar number of patients with and without COVID-19. Moreover, to combat the anticipated low rate of patient responses, we performed a systemwide hospital chart review for all patients who were not reached. Therefore, we believe the results of our study are valid. However, we cannot account for patients who sought care or evaluation at hospitals that were not within our hospital system.

Conclusions

In this multicenter prospective cohort study, we found that most of the pregnant patients who tested positive for COVID-19 at the time of delivery admission were asymptomatic and unlikely to develop symptoms or require hospital readmission for COVID-19–related complications. Compared with pregnant patients without COVID-19, asymptomatic patients with COVID-19 were not at increased risk for adverse obstetrical outcomes. After delivery, these asymptomatic positive patients were adherent with isolation precautions, but this adherence

waned in the first 2 weeks after delivery. These asymptomatic patients reported low rates of household contacts acquiring the disease and had low rates of hospital readmissions for COVID-19 symptoms. Given that these patients have a low risk for decompensation owing to severe COVID-19 symptoms, routine surveillance is sufficient in this low-risk group. ■

Supplementary materials

Supplementary material associated with this article can be found in the online version at <https://doi.org/10.1016/j.ajogmf.2021.100454>.

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