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Universal testing for severe acute respiratory syndrome coronavirus 2 in 2 Philadelphia hospitals: carrier prevalence and symptom development over 2 weeks

Whitney R. Bender, MD; Adi Hirshberg, MD; Paulina Coutifaris, BA; Alexandra L. Acker, BA; Sindhu K. Srinivas, MD, MSCE

BACKGROUND: The coronavirus disease 2019 pandemic caused by the severe acute respiratory syndrome coronavirus 2 has challenged obstetrical care providers. Universal testing on labor and delivery units has been implemented by many hospitals to ensure patient and staff safety. Asymptomatic carrier rates are expected to vary based on geographic differences in disease prevalence, although differences within the same city have not been reported previously. In addition, clinical follow-up of women who had a negative result for severe acute respiratory syndrome coronavirus 2 during obstetrical hospitalization has not been included in any previous reports.

OBJECTIVE: This study aimed to describe the prevalence of positive severe acute respiratory syndrome coronavirus 2 test results among asymptomatic pregnant women at 2 Philadelphia obstetrical hospitals, characterize the clinical course of those who had a positive result, and report symptom development among all women tested in the 2 weeks after hospitalization.

STUDY DESIGN: This is an observational study of asymptomatic pregnant women who underwent severe acute respiratory syndrome coronavirus 2 testing at 2 academic health centers (Hospital of the University of Pennsylvania and Pennsylvania Hospital) in Philadelphia, Pennsylvania, between April 13, 2020, and April 26, 2020. All women tested were contacted via telephone for symptom follow-up at 1 and 2 weeks after discharge. Asymptomatic positive test rates are reported for the overall population and by hospital. The hospital and 2-week posthospital course are described for women who had a positive result for severe acute respiratory syndrome coronavirus 2. Posthospital symptom development among women who had a negative result for severe acute respiratory syndrome coronavirus 2 is also described.

RESULTS: A total of 318 asymptomatic women underwent severe acute respiratory syndrome coronavirus 2 testing during this 2-week period; 8 women had a positive result. The overall asymptomatic test positive rate was 2.5%. The rate at Hospital of the University of Pennsylvania was 3.8% compared with 1.3% at Pennsylvania Hospital (P=.283). Of note, 3 women (37.5%) who were initially asymptomatic developed mild symptoms in the 2 weeks after a positive test result. Repeat severe acute respiratory syndrome coronavirus 2 testing was performed in 14 of the 310 women (4.5%) who initially had a negative result; 2 women (0.6%) had a positive result on repeat testing. Moreover, 242 (78.1%) and 213 (68.7%) of the 310 women who had a negative result for severe acute respiratory syndrome coronavirus 2 at the time of the initial hospitalization were followed up via telephone at 1 and 2 weeks after admission, respectively. Viral symptoms, including fevers, chills, shortness of breath, or cough, were self-reported in 4.5% and 4.2% of these women at 1 and 2 weeks after discharge, respectively.

CONCLUSION: The asymptomatic positive severe acute respiratory syndrome coronavirus 2 test rate among an obstetrical population in Philadelphia differed between 2 hospitals and was lower than that described in other geographic regions. This supports the importance of institution-specific testing protocols. The development of symptomatic severe acute respiratory syndrome coronavirus 2 infection after hospitalization among women with initial negative test results is uncommon.

Key words: Philadelphia obstetrical hospitals, SARS-CoV-2 testing 2-week follow-up, universal SARS-CoV-2 obstetrical testing

Introduction

The routine care of pregnant women during the coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has proved to be challenging. Outpatient visits, including ultrasound examinations and prenatal visits, have been altered with an unprecedented rapid escalation of telehealth strategies to optimize the safety of patients and healthcare staff. However, admission for labor and delivery often cannot be delayed or considered elective.

Owing to the necessity of contact with the health system and the inability to delay such contact, many hospitals have implemented universal testing for SARS-CoV-2 on labor and delivery. The implementation of universal testing has raised many process-related questions regarding isolation, use of personal protective equipment (PPE), accuracy of the test results, and implications for newborn and postdischarge care. Much of the information regarding universal SARS-CoV-2 testing has focused on the obstetrical population in New York City. The asymptomatic positive rate has been reported as 13.5%. Symptom development occurred in 30% to 70% of women during the course of their hospitalizations or shortly thereafter.[1−4] Geographic differences in asymptomatic carrier rates have not been widely reported, although rates are likely to be based on disease prevalence. To date, 1 additional report outside of New York suggested lower asymptomatic SARS-CoV-2 test positive rate of <3%.[5]

In each of these studies, the follow-up period for asymptomatic patients who had a positive result was variable because delivery hospitalizations are typically short. Therefore, it remains unclear whether these women were truly asymptomatic or presymptomatic. Furthermore, no studies to date have reported on the follow-up of asymptomatic women who had a negative result during their hospitalization.

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AJOG MFM at a Glance

Why was this study conducted?

This study was conducted to compare the asymptomatic severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) carrier rate at 2 Philadelphia obstetrical hospitals and describe the clinical course of all women tested, including women who had a negative result, over a 2-week period.

Key findings

The rate of asymptomatic SARS-CoV-2 carriage in Philadelphia was 2.5%. The rate differed between 2 hospitals that are 4 miles apart (3.8% vs 1.3%; P=.238). In addition, the rate of development of symptomatic SARS-CoV-2 infection in women who initially had a negative result was 0.6%.

What does this add to what is known?

This study highlights the importance of institution-specific testing protocols because regional data may be insufficient to capture hospital-level differences in asymptomatic carrier rates. The low rate of symptomatic infection after hospitalization among the 310 women who initially had a negative result for SARS-CoV-2 may be helpful in counseling and reassuring obstetrical patients.

The objectives of this study are to describe the prevalence of positive SARS-CoV-2 test results at the time of admission for delivery among asymptomatic pregnant women in Philadelphia within 2 large academic hospitals, characterize the inhospital clinical course for those who had a positive result, and report the development of viral symptoms in all women tested for SARS-CoV-2 2 weeks after hospital discharge.

Materials and Methods

This is an observational study of pregnant women presenting for obstetrical care at 2 hospitals within a large academic health system in Philadelphia, PA, between April 13, 2020, and April 26, 2020. Given its retrospective nature, this study was deemed exempt by the University of Pennsylvania Institutional Review Board.

All women presenting for delivery at the Hospital of the University of Pennsylvania (HUP) and Pennsylvania Hospital (PAH) were approached for testing for SARS-CoV-2 via nasopharyngeal and oropharyngeal swab as part of a universal testing clinical protocol. Women admitted for other obstetrical indication and deemed likely to deliver during the admission were also tested. These specimens were collected by physicians and advanced practice providers at HUP and by registered nurses at PAH. All staff received hands-on training on specimen collection at the start of this clinical protocol. A real-time polymerase chain reaction assay was performed for the qualitative detection of nucleic acid of the SARS-CoV-2 virus. Women who reported viral symptoms, were febrile at the time of presentation, or had a known SARS-CoV-2 exposure were deemed persons under investigation and were excluded from this study, specifically evaluating patients who were asymptomatic at the time of admission with no known exposure. Patients with previous positive SARS-CoV-2 test results were also excluded.

While on labor and delivery, patients who had a positive result for SARS-CoV-2 received obstetrical care with the use of appropriate PPE by all employees. After delivery, SARS-CoV-2—positive women and neonates were separated for the duration of the hospitalization per institution protocol. Women who had a positive result were transferred to a separate SARS-CoV-2—dedicated unit with ongoing care from both obstetrical and internal medicine teams. Patients were monitored for symptom development during their hospitalization with care escalation as appropriate. Neonates born to SARS-CoV-2—positive mothers were tested at 24 hours of life and again at hospital discharge. Discharge occurred per standard guidelines, at approximately 1 to 4 days after delivery depending on the mode of delivery.

Patients who had a negative result for SARS-CoV-2 received standard obstetrical care. They remained in the usual postpartum unit. Private rooms were used preferentially, and semiprivate rooms were used as needed for census. Patients and their support persons were asked to wear masks during all interactions with hospital staff. Healthcare workers and hospital employees wore face masks at all times during the study period. Hospital discharge occurred anywhere from 1 to 4 days after delivery depending on the mode of delivery.

Test results and demographic, obstetrical, and neonatal data were abstracted from the electronic medical record by a single investigator (W.R.B.). The development of viral symptoms among those women who had a positive result was also recorded. Telephone calls were made to all of these patients at 7 to 9 days and 12 to 14 days after hospital admission and test date as part of routine clinical follow-up. A total of 2 weeks of follow-up was obtained given the reported potential for gradual symptom onset over this period.[6,7] During these calls, patients were asked about the need for personal medical care or the development of viral symptoms in themselves or their family since hospital discharge. The development of viral symptoms was assessed using standardized scripting. Viral symptoms included in the standard script were fever, shortness of breath, anosmia, cough, headaches, sore throat, rhinorrhea, nausea, vomiting, diarrhea, and muscle aches.

Sample size was fixed based on the number of women admitted during the prespecified time frame. Descriptive statistics were calculated for the population at large. Comparisons were made between hospitals and between women who had positive and negative results for SARS-CoV-2. The association of categorical variables with binary outcomes was analyzed using Fisher exact test or chi-square analyses as appropriate. The association of continuous variables with

TABLE 1
Demographic characteristics of patient population by hospital

Characteristic	Population (N=318)	HUP (n=160)	PAH (n=158)	*P* value
Maternal age, mean (SD)	30.1 (6.1)	29.9 (6.5)	31.2 (5.6)	.053[a]
Maternal race				
White	111 (34.9)	38 (23.8)	73 (46.2)	<.001[b]
Black	137 (43.1)	83 (51.9)	54 (34.2)	
Asian	27 (8.5)	16 (10.0)	11 (19.0)	
Other/unknown	43 (13.5)	23 (14.3)	20. (12.6)	
Maternal ethnicity				
Non-Hispanic	296 (93.0)	152 (95.0)	144 (91.1)	.192[b]
Hispanic	22 (7.0)	8 (5.0)	14 (8.9)	
Insurance status				
Private	190 (59.7)	83 (51.9)	107 (67.7)	.004[b]
Medicaid/public	128 (40.3)	77 (48.1)	51 (32.3)	
Nulliparous	149 (46.9)	71 (44.4)	78 (49.4)	.432[b]
Maternal BMI (kg/m^2) last recorded[c], median (IQR)	30.3 (27.1–34.2)	30.3 (26.2–34.4)	30.3 (27.1–33.6)	.649[d]
Number of prenatal visits[d], median (IQR)	10 (7–11)	9 (7–12)	11 (10–13)	.001[e]
Tobacco use, ever	49 (15.4)	25 (15.6)	24 (15.2)	.832[b]
SARS-CoV-2–positive test result	8 (2.5)	6 (3.8)	2 (1.3)	.283[b]

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

BMI, body mass index; *HUP*, Hospital of the University of Pennsylvania; *IQR*, interquartile range; *PAH*, Pennsylvania Hospital; *SARS-CoV-2*, severe acute respiratory syndrome coronavirus 2; *SD*, standard deviation.

[a] Two-sample *t* test; [b] Fisher exact test; [c] Missing data on 46 women (n=272); [d] Missing data on 53 patients (n=265); [e] Wilcoxon rank-sum test.

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binary outcomes was analyzed using Student *t* test or Wilcoxon rank-sum test for nonnormally distributed variables.

Results

During the specified 2-week time frame, testing was not completed on 7 women across both sites. A total of 318 women were tested for SARS-CoV-2; 160 were tested at HUP and 158 were tested at PAH.

The complete demographic data for the population by hospital site are listed in Table 1. Of note, black women accounted for 43% of the total population. Women delivering at PAH were less likely to be black or publicly insured.

Among the 318 women tested, a total of 8 women (2.5%) were positive for SARS-CoV-2. Although not statistically significant, the rate of women who had a positive result for SARS-CoV-2 differed between the 2 hospitals. Of note, 6 women (3.8%) had a positive result for SARS-CoV-2 at HUP compared with only 2 women (1.3%; 2 of 158) who had a positive result for SARS-CoV-2 at PAH (*P*=.283).

There were no differences in demographic characteristics or delivery outcomes between asymptomatic women with positive and negative SARS-CoV-2 test results (Table 2). Moreover, 7 of the 8 women who had a positive result for SARS-CoV-2 were without medical comorbidities; 1 woman had chronic hypertension. The details of the hospital course for the 8 asymptomatic women with a positive SARS-CoV-2 test result are presented in Table 3. A total of 6 women delivered a full-term living neonate, with negative SARS-CoV-2 test results in all of these infants. One woman was discharged undelivered after a trauma observation. One patient was diagnosed as having an intrauterine fetal demise at 39 weeks and 1 day of gestation during her prenatal visit and underwent an uncomplicated induction. Only 1 of the 8 women developed a fever in the postpartum period. The fever occurred 24 hours after delivery; given the absence of other localizing signs or symptoms, it was attributed to COVID-19. The remaining 7 women were asymptomatic for the duration of their hospitalizations.

All 8 asymptomatic women with a positive SARS-CoV-2 result were contacted via telephone 1 week after discharge; 6 (75%) remained asymptomatic, and 1 developed anosmia. Another patient reported the development of nasal congestion and interval hospitalization of her elderly mother for SARS-CoV-2 pneumonia. There had been no hospitalizations or medical office visits among any of the 8 patients. Of the 8 women, 7 were followed up at 2 weeks after hospitalization. None of the

TABLE 2
Demographic characteristics and obstetrical outcomes by SARS-CoV-2 status

Characteristic	Population (N=318)	SARS-CoV-2 negative (N=310)	SARS-CoV-2 positive (N=8)	*P* value
Maternal age, mean (SD)	30.1 (6.1)	30.1 (6.14)	28.3(6.27)	.402[a]
Maternal race				
White	111 (34.9)	111 (35.8)	0 (0)	.107[b]
Black	137 (43.1)	131 (42.3)	6 (75)	
Asian	27 (8.5)	26 (8.4)	1 (12.5)	
Other/unknown	43 (13.5)	42 (13.5)	1 (12.5)	
Maternal ethnicity				
Non-Hispanic	296 (93.0)	288 (92.9)	8 (100)	.560[b]
Hispanic	22 (7.0)	22 (7.1)	0 (0)	
Insurance status				
Private	190 (59.7)	187 (60.3)	3 (37.5)	.175[b]
Medicaid/public	128 (40.3)	123 (39.7)	5 (62.5)	
Nulliparous	149 (46.9)	146 (47.1)	3 (37.5)	.728[b]
Maternal BMI (kg/m^2) last recorded[c], median (IQR)	30.3 (27.1–34.2)	30.3 (26.8–33.8)	30.4 (26.8–34.0)	.660[d]
Number of prenatal visits[e], median (IQR)	10 (7–11)	10 (8–11)	6 (4–8)	.224[d]
Tobacco use, ever	49 (15.4)	48 (15.5)	1 (12.5)	.319[b]
Gestational age at delivery (wk)[f], median (IQR)	39.14 (38.29–39.71)	39.14 (38.28–40.0)	38.57 (38.43– 38.71)	.174[d]
Mode of delivery[f]				
Vaginal	194 (64.4)	188 (63.7)	6 (100)	.361[b]
Operative vaginal	12 (4.0)	12 (4.1)	0 (0)	
Cesarean delivery	95 (31.6)	95 (32.2)	0 (0)	
Cesarean delivery indication[f]				N/A
Planned primary	14 (15.1)	14 (15.1)	0 (0)	
Elective repeat	33 (35.5)	33 (35.5)	0 (0)	
Laboring	46 (49.4)	46 (49.4)	0 (0)	
Estimated blood loss (cc)[f,g], median (IQR)	400 (300–800)	400 (150–650)	275 (225–325)	.087[d]
Birthweight (g)[f,h], median (IQR)	3220 (2890–3540)	3220 (2890–3550)	3148 (2863–3433)	.660[d]
NICU admission at >48 h[f,h]	25 (8.3)	25 (12.8)	0 (0)	.587[b]

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

BMI, body mass index; *IQR*, interquartile range; *N/A*, not applicable; *NICU*, neonatal intensive care unit; *SARS-CoV-2*, severe acute respiratory syndrome coronavirus 2; *SD*, standard deviation.

[a] Two-sample *t* test; [b] Fisher exact test; [c] Missing data on 46 women (n=272); [d] Wilcoxon rank-sum test; [e] Missing data on 53 patients (n=265); [f] Data reported for a total of 301 women who delivered a live neonate (SARS-CoV-2 negative, n=295; SARS-CoV-2 positive, n=6); [g] Missing from 5 subjects (n=293); [h] Reported for singleton gestation only (n=294).

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patients reported symptoms, interval hospitalizations, or additional office or hospital visits at 2-week follow-up.

The remaining 310 women tested during this 2-week period were negative for SARS-CoV-2 during their admission. Repeat testing was performed for 14 patients (Table 4). Repeat testing was done on the index hospitalization for an unexplained fever at postpartum day 1 for 1 patient and again had a negative result. Another patient had repeat testing before delivery 4 days after the initial admission testing. The remaining 12 repeat tests were performed at either a subsequent emergency evaluation or hospital readmission. One patient had a positive result for SARS-CoV-2 at

TABLE 3
Hospital course and follow-up information for asymptomatic women diagnosed as having SARS-CoV-2

Case	Hospital	Test date	Symptom development in hospital	Hospitalization outcome	Baby test result	Discharge date	Wk 1 call—symptoms	Wk 2 call—symptoms
1	PAH	April 22, 2020	No	FT SVD at 39 wk	April 23—neg April 24—neg	April 24, 2020	April 29, 2020—anosmia	Not reached
2	PAH	April 22, 2020	No	FT SVD at 37 wk 2 d	April 23—neg April 24—neg	April 24, 2020	April 29, 2020—nasal congestion. Mother hospitalized with COVID	May 6, 2020—none
3	HUP	April 14, 2020	No	FT SVD at 39 wk 2 d	April 16—neg April 17—neg	April 17, 2020	April 21, 2020—none	April 28, 2020—none
4	HUP	April 16, 2020	No	Discharge—fall	N/A	April 16, 2020	April 22, 2020—none	April 29, 2020—none
5	HUP	April 16, 2020	No	FT SVD (IUFD) at 39 wk 2 d	N/A	April 18, 2020	April 23, 2020—none	April 30, 2020—none
6	HUP	April 18, 2020	Fever at 100.4°F at PPD#1	FT SVD at 38 wk 4 d	April 19—neg April 20—neg	April 20, 2020	April 25, 2020—none	May 2, 2020—none
7	HUP	April 23, 2020	No	FT SVD at 38 wk 4 d	April 25—neg	April 25, 2020	April 30, 2020—none	May 9, 2020—none
8	HUP	April 25, 2020	No	FT SVD at 38 wk 4 d	April 27—neg	April 27, 2020	May 2, 2020—none	May 9, 2020—none

COVID, coronavirus disease; *FT SVD*, full-term spontaneous vaginal delivery; *HUP*, Hospital of the University of Pennsylvania; *IUFD*, intrauterine fetal death; *N/A*, not applicable; *neg*, negative; *PAH*, Pennsylvania Hospital; *PPD*, postpartum day; *SARS-CoV-2*, severe acute respiratory syndrome coronavirus 2.

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postoperative day 6 after presenting with fever and shortness of breath. She required escalation of her oxygen support and was ultimately transferred to the intensive care unit. She required high-flow nasal cannula support for 5 days before the ultimate discharge. The second patient presented at postpartum day 13 for fever and dyspnea on exertion. She was diagnosed as having COVID-19 in the emergency department and discharged home with supportive care on the same day. Both symptomatic women who were positive for SARS-CoV-2 on repeat testing had delivery hospitalizations at HUP. Repeat testing was negative for the remaining 12 women.

A total of 242 women (78.1%) who were negative for SARS-CoV-2 were followed up via phone call at 1 week after hospitalization; 11 women reported at least 1 viral symptom during this phone call, and 1 woman reported fever at 102°F; she was evaluated, retested negative for SARS-CoV-2, and diagnosed as having endometritis. Furthermore, 6 additional women reported isolated chills with no additional evaluation; 3 women reported shortness of breath that they attributed to fatigue or breastfeeding and declined further work-up, and 1 woman reported an unexplained cough but had not sought any evaluation. The remaining 231 women (95.5%) denied any viral symptoms. Excluding the woman diagnosed as having endometritis described earlier, 8 of the women surveyed (3.3%) had been seen by a physician since hospital discharge—3 for scheduled indications and 5 for non-COVID–related concerns. None of the patients had clinical symptoms concerning COVID-19 at the time of these evaluations.

A total of 213 women (68.7%) who had a negative result for SARS-CoV-2 were followed up via phone call at 2 weeks after hospitalization. Nine women surveyed reported at least 1 viral symptom during this phone call; 2 women reported fever at >100.4°F at home, and 1 had been diagnosed as having mastitis and another as having a urinary tract infection. In addition, 4 women reported chills with no further evaluation, and 3 women reported either shortness of breath or cough but had not sought care. The remaining 204 women (95.8%) denied any viral symptoms. Furthermore, 12 women (5.6%) had been seen by a physician in the intervening week: 2 patients were seen for scheduled obstetrical indications and the remaining 10

TABLE 4
Indications and outcome of repeat SARS-CoV-2 testing after initial negative test result

Case	Repeat testing during initial hospitalization	Indication for repeat testing	Results of repeat testing
1	No	Readmission	Negative
2	No	Readmission	Negative
3	No	Readmission	Negative
4	No	Readmission	Negative
5	No	Readmission	Negative
6	No	Readmission	Negative
7	No	Readmission	Negative
8	No	Unexplained fever at PPD#4	Negative
9	No	Readmission	Negative
10	No	Readmission	Negative
11	No	Respiratory symptoms at PPD#13	Positive
12	Yes	Unexplained fever at PPD#1	Negative
13	Yes	Initial testing done on admission 4/23. Repeat performed before indicated preterm delivery on 4/27	Negative
14	No	Respiratory symptoms at PPD#6	Positive

SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; *PPD*, postpartum day.
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patients were seen for non-COVID–related clinical reasons. None of these patients had clinical symptoms concerning COVID-19–related illness.

Comment

Principal findings

In this retrospective cohort study, the asymptomatic SARS-COV-2 test positive rate among pregnant women in Philadelphia was 2.5%. However, it is important to note that the asymptomatic test positive rates differed between the 2 hospitals (3.8% vs 1.3%) despite only 4 miles separating the 2 sites. There were 8 asymptomatic women who had a positive result, only 1 of whom developed a fever during the hospitalization; the other 7 remained asymptomatic during their hospitalization. None of the women required additional care during the 2-week follow-up period. In addition to the patient who developed a fever while in the hospital, 2 women subsequently developed mild symptoms within 1 week of being tested. Therefore, 5 of the 8 women (62.5%) with a positive SARS-CoV-2 test result remained asymptomatic. Women who had a negative result for SARS-CoV-2 were also followed up for 2 weeks after hospitalization; 2 women developed fever and respiratory symptoms during this time frame and were diagnosed as having COVID-19 on repeat testing; in both cases, this occurred more than 5 days after the initial negative test result.

Results

This study adds to the growing body of literature on asymptomatic testing for SARS-CoV-2 in the obstetrical patient. Our rate of asymptomatic positive tests is lower than that reported for similar programs in New York City, likely secondary to differences in local disease prevalence. In addition, the development of symptoms in our asymptomatic population who had a positive test result (3 of 8; 37.5%) is lower than that described in the New York City cohort (>70%).[2]

Clinical implications

Interestingly, however, 2 hospitals within the same city and health system had clinically though not statistically different asymptomatic positive test rates during the same time frame. The reason for this difference could be several-fold. Although all providers received similar instructions on specimen collection, testing was performed by different personnel at each site. In addition, there are some notable differences in the patient population. The difference in rates despite the close proximity of the hospitals supports the need for institution-driven testing rather than reliance on regionally or nationally reported information.

The inclusion of follow-up data from SARS-CoV-2–negative women allows us to comment on the potential for false-negative test results, negative test results during a potential presymptomatic period, or the risk of viral acquisition during hospitalization. Less than 1% of women (2 of 310) developed SARS-CoV-2 during their 2-week follow-up. Although we cannot ascertain when or how these infections were acquired, the low rate of symptomatic infection after discharge may be useful for counseling and providing reassurance to women who have anxiety about disease exposure during their delivery hospitalization throughout the pandemic. Although an additional 4% to 5% of women reported viral symptoms including chills, shortness of breath, or cough in the 2-week follow-up period, none of these women were tested for SARS-CoV-2 infection. Therefore, the true significance of these symptoms remains unknown. Of the 8 women who had a positive result for SARS-CoV-2, 5 women remained asymptomatic during the 2-week follow-up period. Repeat testing was not performed routinely in this population in the 2 weeks after delivery, and as such, the possibility for false-positive test results cannot be adequately addressed with the data available.

Research implications

As additional testing becomes available, future research is needed to determine the true significance of any viral symptoms after hospitalization. This study reports on the clinical follow-up from asymptomatic women who had a negative test result, but additional studies are warranted to confirm its findings. Further work to confirm geographic variations within cities and investigate the reasons for their existence is also warranted. Finally, additional studies are warranted to determine the impact of universal SARS-CoV-2 testing on population spread and patient and provider anxiety.

Strengths and limitations

This study has several strengths. This was a large cohort study of all asymptomatic pregnant women presenting for care at 2 hospitals in an academic health system. Data describing hospitalization were abstracted by a single author. The inclusion of telephone call–derived data until 2 weeks after hospitalization for both SARS-CoV-2–positive and SARS-CoV-2–negative women allows us to comment on the symptom development in both populations.

This study is not without limitations. Because this study was conducted within a single academic health system, the data may not be generalizable to the population at large. Follow-up information regarding interval symptom development was based on patient report. However, this is the most accurate way to comprehensively assess this information. Finally, most patients (95%) were not retested in a short interval to determine the conversion of asymptomatic patients who had a negative test result to a positive test result. This is particularly important for the 4.5% and 4.2% of women who reported viral symptoms at 1 and 2 weeks after delivery, respectively. The seroconversion of these women to SARS-CoV-2 positive would not have been noted given that they did not all undergo repeat SARS-CoV-2 testing. Therefore, it remains possible that the rate of infection development after hospitalization is higher than the reported <1% in this cohort. However, if these were true SARS-CoV-2 infections, they were likely mild in nature. Overall, the absence of the development of symptoms in the vast majority of women (95%) during the 2 weeks after delivery is reassuring.

Conclusions

This retrospective cohort study found an asymptomatic carrier rate ranging from 1.3% to 3.8% in the Philadelphia obstetrical population. The difference found between the 2 hospitals highlights the importance of institution-specific information and approaches to universal testing and PPE protocols. Less than 1% of women who had a negative test result developed SARS-CoV-2 in the 2 weeks after hospitalization. This information may be an important component of provider counseling as obstetricians continue to determine the best means of providing high-quality care during the pandemic. ■

References

1. Sutton D, Fuchs K, D'Alton M, Goffman D. Universal screening for SARS-CoV-2 in women admitted for delivery. N Engl J Med 2020;382:2163–4.

2. Breslin N, Baptiste C, Gyamfi-Bannerman C, et al. Coronavirus disease 2019 infection among asymptomatic and symptomatic pregnant women: two weeks of confirmed presentations to an affiliated pair of New York City hospitals. Am J Obstet Gynecol MFM 2020;2:100118.

3. Andrikopoulou M, Madden N, Wen T, et al. Symptoms and critical illness among obstetric patients with coronavirus disease 2019 (COVID-19) infection. Obstet Gynecol 2020;136:291–9.

4. Khoury R, Bernstein PS, Debolt C, et al. Characteristics and outcomes of 241 births to women with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection at five New York City medical centers. Obstet Gynecol 2020;136:273–82.

5. Campbell KH, Tornatore JM, Lawrence KE, et al. Prevalence of SARS-CoV-2 among patients admitted for childbirth in Southern Connecticut. JAMA 2020;323:2520–2.

6. Jiang X, Rayner S, Luo MH. Does SARS-CoV-2 has a longer incubation period than SARS and MERS? J Med Virol 2020;92:476–8.

7. Xu XW, Wu XX, Jiang XG, et al. Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-CoV-2) outside of Wuhan, China: retrospective case series. BMJ 2020;368:m606.

Author and article information

From the Division of Maternal Fetal Medicine, Department of Obstetrics and Gynecology, Maternal and Child Health Research Center (Drs Bender, Hirshberg, and Srinivas), Perelman School of Medicine at the University of Pennsylvania (Ms Coutifaris and Ms Acker), Philadelphia, PA.

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Corresponding author: Whitney R. Bender, MD. Whitney.bender@pennmedicine.upenn.edu