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The impact of perinatal severe acute respiratory syndrome coronavirus 2 infection during the peripartum period

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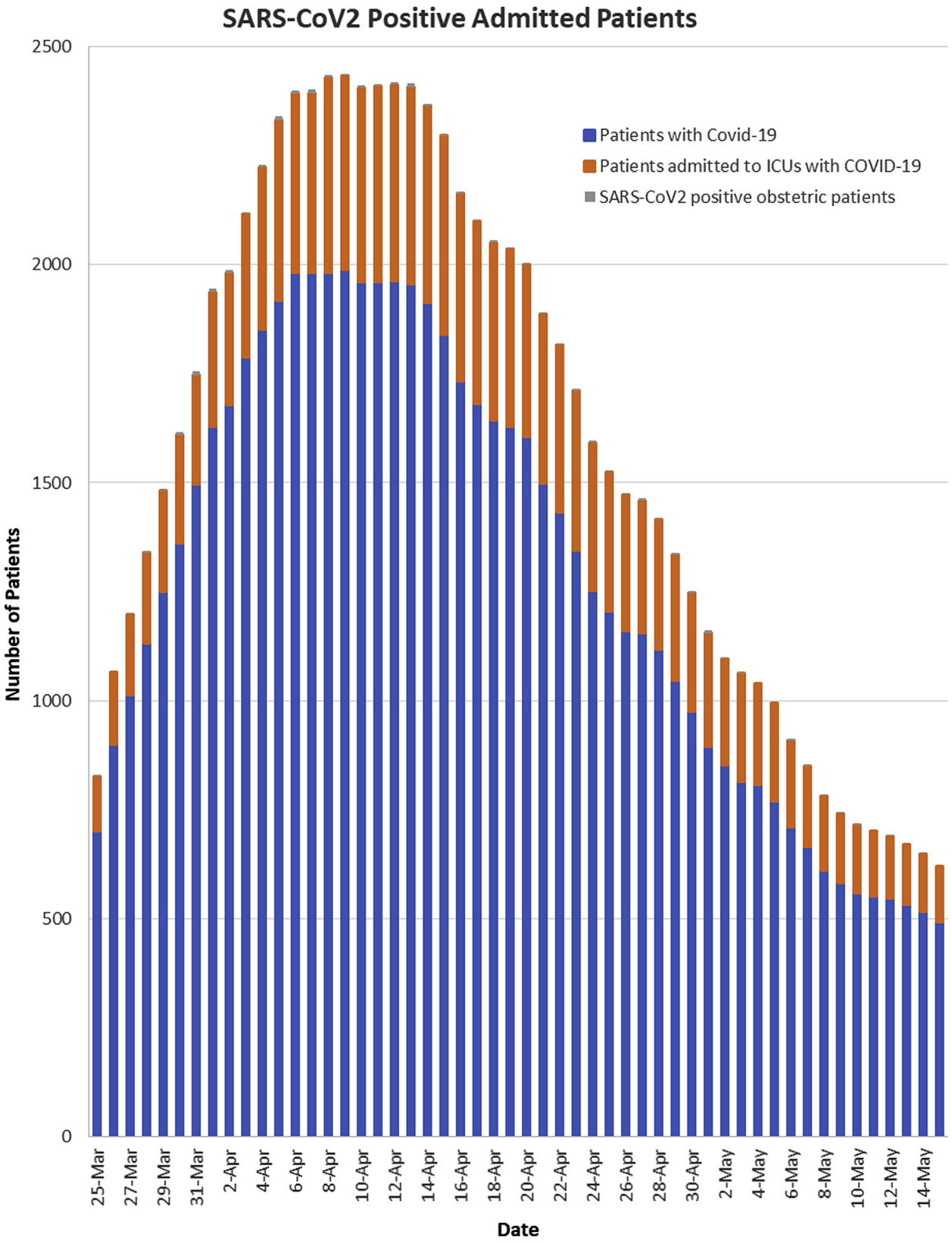
OBJECTIVE: Our large integrated health system in New York City implemented universal screening for infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus causing the coronavirus disease 2019 (COVID-19) pandemic in 2019 and 2020, of all women admitted to the labor service on March 25, 2020. We also implemented universal screening of all neonates born to mothers who were SARS-CoV-2 positive. Here, we report perinatal SARS-CoV-2 infection outcomes in our population during the complete peak period of the COVID-19 incidence and inpatient volume in the New York City area, March 25, 2020, to May 15, 2020. We also describe how perinatal SARS-CoV-2 was tracked with the number of COVID-19 hospitalizations in our hospitals. This information is critically important in planning for future COVID-19 outbreaks either in regions previously minimally impacted by the virus or in an anticipated future resurgence. This study aimed to assess the impact of SARS-CoV-2 on delivery and postpartum services in a single health system in New York City during the peak period of the COVID-19 pandemic. Specifically, we were interested in the clinical impact of SARS-CoV-2 infection on the adverse pregnancy outcomes of stillbirth and preterm birth during the peak period of the pandemic. We were also interested in the volume of patients who were SARS-CoV-2 positive presenting to our labor floors compared with the volume of COVID-19 admissions to other hospital services as we prepare for a possible second wave of the pandemic this fall. Our goal with this study was to provide data necessary for such service preparedness.

STUDY DESIGN: We retrospectively identified women testing positive on a single admission polymerase chain reaction test for SARS-CoV-2 during the period of interest by automated query of the electronic medical record. We then abstracted the maternal and infant medical records for relevant demographic and clinical data, with particular attention to the adverse outcomes of interest intrauterine fetal demise (IUFD) at $\geq$22 weeks' gestation and preterm birth before 37 weeks' gestation. Because our study sample was drawn from available clinical data, we also conducted power calculations to determine the sample size that would be needed to definitively assess the impact of SARS-CoV-2 infection on preterm birth and IUFD with a power of 0.8 with an α of 0.05. Inpatient COVID-19 admission volume during the period of interest was obtained from deidentified hospital operation data that were published to health system employees daily during the period of interest. The volume of obstetrical patients who were SARS-CoV-2 positive was compared with the COVID-19 hospitalization data using the chi-square test and Pearson correlation. This study was approved by the Mount Sinai Program for the Protection of Human Subjects.

RESULTS: Here, 1794 women delivered 1830 live infants during the study period. Our population was diverse; 16.2% identified themselves as black, 17.4% as Asian, and 16.4% as Hispanic. Furthermore, 180 women tested positive for SARS-CoV-2 on labor floor admission Up to 28% of women admitted to the labor floors each day tested positive for SARS-CoV-2 with a median of 8% (interquartile range, 0% −14%) of patients in the labor floor testing positive for SARS-CoV-2 daily during the period of interest. Of these patients, 7 (3.9%) had severe disease requiring intensive care, 37 (20.6%) required some respiratory support, and 136 (75.6%) were mildly symptomatic or asymptomatic. Risk factors of severe COVID-19 were present in many of our patients in the labor floor: 9.8% had pregestational or gestational diabetes mellitus; furthermore, 35.5% had a body mass index (BMI) of >30, and 5.7% had a BMI of >40 at the time of delivery. No neonate demonstrated illness consistent with COVID-19, however 3 tested positive for SARS-CoV-2 following birth. From January through June 2020, the preterm birth rate among SARS-CoV-2 positive mothers was 8.2%, compared to a preterm birth rate among SARS-CoV-2 negative mothers of 7.5% (P=.74). Only 4 preterm births to mothers who were SARS-CoV-2 positive occurred prior to 35 weeks' gestation. Of note, 1 of these births before 35 weeks' gestation was spontaneous, 2 were deliveries for severe maternal COVID-19, and 1 was for vaginal bleeding in the setting of placenta previa. There were 14 IUFDs (0.76% of births) during the peak period of the pandemic. This was not statistically different from the 15 IUFDs (0.84% of births) at our hospitals during January 2020 to June 2020 (P=1). During the peak period of the pandemic, there were 2 IUFDs among asymptomatic patients who were SARS-CoV-2 positive and 12 among patients who were SARS-CoV-2 negative (1.11% vs 0.86%; P=.35). All IUFDs occurred before arrival to the hospital, and none were attributed to SARS-CoV-2 infection by the clinical teams. Although 1 patient reported delaying prenatal care because of fear of contracting COVID-19 through contact with the healthcare system, all remaining patients reported normal frequency of contact with prenatal care providers. Some of these contacts were via telehealth, whereas before the COVID-19 pandemic, all visits would have been office visits. We conducted 2 power calculations, one to determine the sample

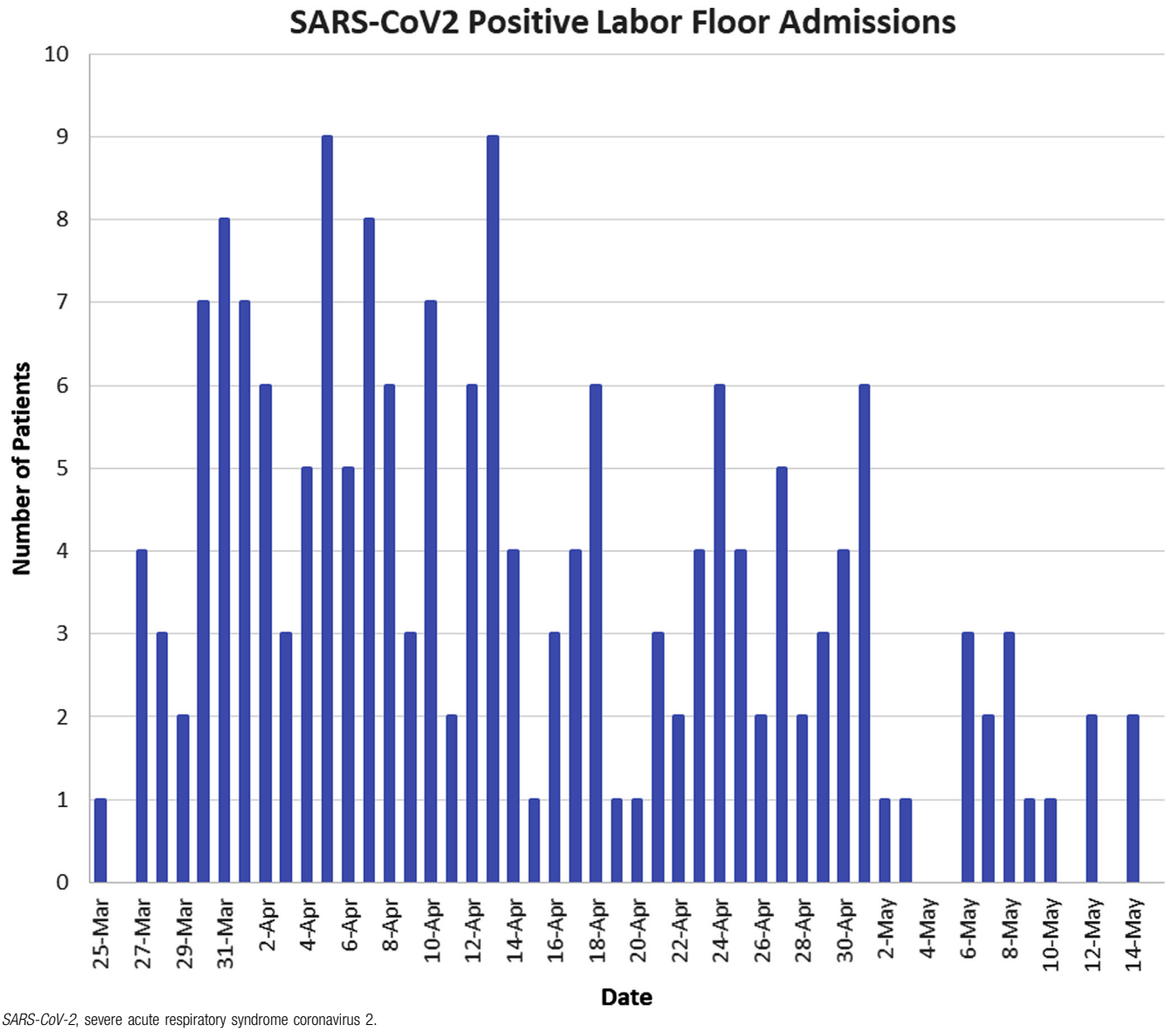
FIGURE 1
Hospitalized SARS-CoV-2–positive patients by admitting unit



COVID-19, coronavirus disease 2019; *SARS-CoV-2*, severe acute respiratory syndrome coronavirus 2.

Janssen. Impact of perinatal severe acute respiratory syndrome coronavirus 2. AJOG MFM 2021.

FIGURE 2
SARS-CoV-2–positive patients admitted to the labor floor



SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

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size needed to conclusively determine the impact of SARS-CoV-2 infection on preterm birth and a second to determine that needed for IUFD. Based on the observed incidence of events in our population, 12,710 obstetrical patients who were SARS-CoV-2 positive and 113,971 obstetrical patients who were SARS-CoV-2 negative would be needed to detect a difference in preterm birth rate, and 287 obstetrical patients who were SARS-CoV-2 positive and 2567 obstetrical patients who were SARS-CoV-2 negative would be needed to detect a difference in IUFD. The number of women who were SARS-CoV-2 positive on the obstetrical service was 0.26%±0.002% of the number of patients admitted to our hospitals with COVID-19 (Pearson r=0.61). The number of obstetrical SARS-CoV-2 cases did not correlate as closely with COVID-19 intensive care unit (ICU) admissions (Pearson r=0.49) as with the total number of patients admitted to our hospitals (floor and ICU beds) with COVID-19. Figure 1 demonstrates the relationship between SARS-CoV-2 infection in the labor and delivery population and the overall number of patients with COVID-19 admitted to our hospitals and ICUs. Figure 2 shows only obstetrical patients who were SARS-CoV-2 positive.

CONCLUSION: Our experience with COVID-19 in the perinatal population was similar to that previously reported by other hospitals in the Northeast.[1,2] As reported in part elsewhere,[3] most of these women were mildly symptomatic or

asymptomatic. In this study, we examined the adverse pregnancy outcomes of preterm birth and stillbirth during the peak period of the pandemic in our region, as there has been concern that COVID-19 may increase these outcomes.[4] We chose to compare the peak period of the pandemic in our region, March 25, 2020, to May 15, 2020, with low prevalence months of January 2020 to June 2020. We did not evaluate the outcomes in February 2020 to early March 2020 as poor availability of testing meant that SARS-CoV-2 was likely spreading undetected in our region during that period. The rate of preterm birth among women who were SARS-CoV-2 positive was lower than both the national preterm birth rate of 10.02%[5] and among women who were SARS-CoV-2 negative. In addition, the number of preterm births before 35 weeks' gestation, those at highest risk of child morbidity related to prematurity, was exceedingly low. These data are reassuring. Only 3 infants born to a mother who was SARS-CoV-2 positive tested positive for SARS-CoV-2, and none were clinically ill. As in other similar reported cases,[6,7] those infections were believed to be due to horizontal transmission. The rate of stillbirth among women who were SARS-CoV-2 positive was not significantly higher than the rate of stillbirth among women who were SARS-CoV-2 negative. In addition, there was no increase in the number of stillbirths during the peak period of the pandemic. Our study's strength, the availability of testing in the entire population of interest, may explain the differing results from a recent report drawn from a population that tested only women with symptoms of COVID-19.[6] Unlike that report, we did not find an increase in stillbirth related to COVID-19, likely because we were able to correctly classify women without symptoms and women with mild symptoms by SARS-CoV-2 status. Another strength of our study is the diverse nature of our patient population with representative rates of risk factors of severe COVID-19. Although our study was conducted in a large health system significantly impacted by the COVID-19 pandemic, we encountered only a small absolute number of obstetrical patients with SARS-CoV-2 infection. Our power calculations indicated that definitive answers to the question of impact of SARS-CoV-2 infection on perinatal outcomes could be determined from a national registry. Although a minority of the cases of COVID-19 in the perinatal population required high-acuity care, the resources needed to care for women and babies during the COVID-19 pandemic were significant. Personal protective equipment (PPE) needs were high as all women admitted to the labor floor were presumed positive until testing results returned and as vaginal delivery was considered an aerosolizing procedure. Extra pediatric staff were needed for neonatal resuscitation because of the time involved in donning PPE. Significant policy changes around family visitation were needed to accommodate the high prevalence of SARS-CoV-2 in our community. The need for private rooms and isolation nurseries for families who were SARS-CoV-2 positive outstripped availability rapidly, especially on days when a large percentage of obstetrical patients tested positive. This resulted in a shortening of the standard postpartum stay to 24 hours. Because predictions of hospital and ICU admissions are readily available data in most communities, extrapolation from these data is useful in predicting the needs of perinatal services facing rising community COVID-19. Although there was a day-to-day variation, the number of obstetrical patients with SARS-CoV-2 strongly correlated with the number of patients hospitalized with COVID-19 through the peak period of the pandemic. There was no increase in preterm birth or stillbirth rates related to SARS-CoV-2 infection. The number of women who were SARS-CoV-2 positive admitted to the labor floor correlated with the number of COVID-19 admissions to other hospital services. ■

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