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The Impact of Perinatal SARS-CoV2 Infection During the Peripartum Period

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Condensation: SARS-CoV2 infection among peripartum women in our health system tracked as 0.26% of total COVID-19 hospitalizations and did not increase preterm birth or stillbirth.

Short title: Impact of perinatal SARS-CoV2

Keywords: COVID-19, stillbirth, preterm birth, prematurity, miscarriage, spontaneous termination of pregnancy, prediction, hospital operations

Introduction:

Our large integrated health system in New York City implemented universal screening for infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV2), the virus causing pandemic coronavirus disease (COVID-19) 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 SARS-CoV2 positive mothers. Here we report perinatal SARS-CoV2 infection outcomes in our population during the complete period of peak COVID-19 incidence and inpatient volume in the New York City area, March 25 – May 15, 2020. We also describe how perinatal SARS-CoV2 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.

Objective:

The objective of this study was to assess the impact of SARS-CoV2 on the delivery and postpartum services in a single health system in New York City during the period of peak COVID-19. Specifically, we were interested in the clinical impact of SARS-CoV2 infection on the adverse pregnancy outcomes of stillbirth and preterm birth during the period of peak pandemic. We were also interested in the volume of SARS-CoV2 positive patients presenting to our labor floors as compared to 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.

Methods:

We retrospectively identified women testing positive on a single admission polymerase chain reaction test for SARS-CoV2 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) ≥ 22 weeks gestation and preterm birth prior to 37 weeks gestation. As 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-CoV2 infection on preterm birth and IUFD with power of 0.8 with α=0.05. Inpatient COVID-19 admission volume during the period of interest was obtained from de-identified hospital operation data that was published to health system employees daily during the period of interest. Obstetric SARS-CoV2 positive patient volume was compared to COVID-19 hospitalization data using chi-square test and Pearson correlation. This study was approved by the Mount Sinai Program for the Protection of Human Subjects.

Results:

1794 women delivered 1830 live infants during the study period. Our population was diverse; 16.2% identified as Black, 17.4% as Asian, and 16.4% as Hispanic. One hundred eighty women tested positive for SARS-CoV2 upon labor floor admission Up to 28% of women admitted to the labor floors each day tested positive for SARS-CoV2 with a median of 8% (interquartile range 0, 14%) of labor floor patients testing SARS-CoV2 positive daily during the period of interest. Of these, 7 (3.9%) had severe disease requiring intensive care, 37 (20.6%) required some respiratory support, and 136

(75.6%) were mildly or asymptomatic. Risk factors for severe COVID-19 were present in many of our labor floor patients: 9.8% had pre-gestational or gestational diabetes mellitus and 35.5% had a body mass index (BMI) > 30 and 5.7% had BMI > 40 at the time of delivery. No neonate demonstrated illness consistent with COVID-19. Three tested positive for SARS-CoV2.

The preterm birth rate in our SARS-CoV2 positive population was 8.2% compared to 7.5% among SARS-CoV2 negative mothers in the comparative period of January and June 2020 (p=0.74), including only 4 births prior to 35 weeks gestation. One of these births before 35 weeks was spontaneous, two were deliveries for severe maternal COVID-19 and one was for vaginal bleeding in the setting of placenta previa.

There were 14 IUFDs (0.76% of births) during the period of peak pandemic. This was not statistically different from the 15 IUFDs (0.84% of births) at our hospitals during January and June of 2020 (p=1). During the period of peak pandemic there were 2 IUFDs among asymptomatic SARS-CoV2 positive patients and 12 among SARS-CoV2 negative patients (1.11% vs 0.86%, p=0.35). All IUFDs occurred prior to arrival to the hospital, and none were attributed to SARS-CoV2 infection by the clinical teams. Although one patient reported deferring prenatal care due to 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 this contact was via telehealth whereas prior to the COVID-19 pandemic all visits would have been office visits.

We conducted two power calculations, one to determine the sample size needed to conclusively determine the impact of SARS-CoV2 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 SARS-CoV2 positive obstetric patients and 113,971 CoV2 negative obstetric patients would be needed to detect a difference in preterm birth rate and 287 SARS-CoV2 positive obstetric patients and 2567 SARS-CoV2 negative obstetric patients would be needed to detect a difference in IUFD.

The number of SARS-CoV2 positive women on the obstetric service was 0.26% ± 0.002% of the number of patients admitted to our hospitals with COVID-19 (Pearson's r=0.61). The number of obstetric SARS-CoV2 cases did not correlate as closely with COVID-19 ICU admissions (Pearson's 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-CoV2 infection in the labor and delivery population compared to the overall number of patients with COVID-19 admitted to our hospitals and ICUs. Figure 2 shows only SARS-CoV2 positive obstetric patients.

Comment:

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] the majority of these women were mildly or asymptomatic. In this study, we examined the adverse pregnancy outcomes of preterm birth and stillbirth during the period of peak pandemic in our region, as there has been concern that COVID-19 may increases these outcomes.[4] We chose to compare the period of peak pandemic in our region, March 25-May 15, with low prevalence months of January and June 2020. We did not evaluate outcomes in February and early March as poor availability of testing meant that SARS-CoV2 was likely spreading undetected in our region during that period.

The rate of preterm birth among SARS-CoV2 positive women was lower than both the national preterm birth rate of 10.02%[5] and in among SARS-CoV2 negative women. Additionally, the number of preterm births before 35 weeks, those at highest risk for child morbidity related to prematurity, was exceedingly low. These data are reassuring.

Only three infants born to a SARS-CoV2 positive mother tested positive for SARS-CoV2 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 SARS-CoV2 positive women was not significantly higher than among SARS-CoV2 negative women. Additionally, there was no increase in the number of stillbirths during the period of peak 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 symptomatic women.[6] Unlike that report, we did not find an increase in stillbirth related to COVID-19, likely because we were able to correctly classify asymptomatic and mildly symptomatic women by SARS-CoV2 status.

Another strength of our study is the diverse nature of our patient population with representative rates of risk factors for 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 obstetric patients with SARS-CoV2 infection. Our power calculations indicate that definitive answers to the question of impact of SARS-CoV2 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 resulted, and as vaginal delivery was considered an aerosolizing procedure. Extra pediatric staff were needed for neonatal resuscitation due to the time involved in donning PPE. Significant policy changes around family visitation were needed to accommodate the high prevalence of SARS-CoV2 in our community. The need for private rooms and isolation nurseries for SARS-CoV2 positive families outstripped availability rapidly, particularly on days when a large percentage of obstetric patients tested positive. This resulted in a shortening of the "standard" postpartum stay to 24 hours.

As predictions of hospital and ICU admissions are readily available data in most communities, extrapolation from these data is useful for predicting needs of perinatal services facing rising community COVID-19. Although there was day-to-day variation, the number of obstetric patients with SARS-CoV2 strongly correlated with the number of patients hospitalized with COVID-19 through the period of peak pandemic.

Conclusions:

There was no increase in preterm birth or stillbirth rates related to SARS-CoV2 infection. The number of SARS-CoV2 positive women admitted to the labor floor correlated with the number of COVID-19 admissions to other hospital services.

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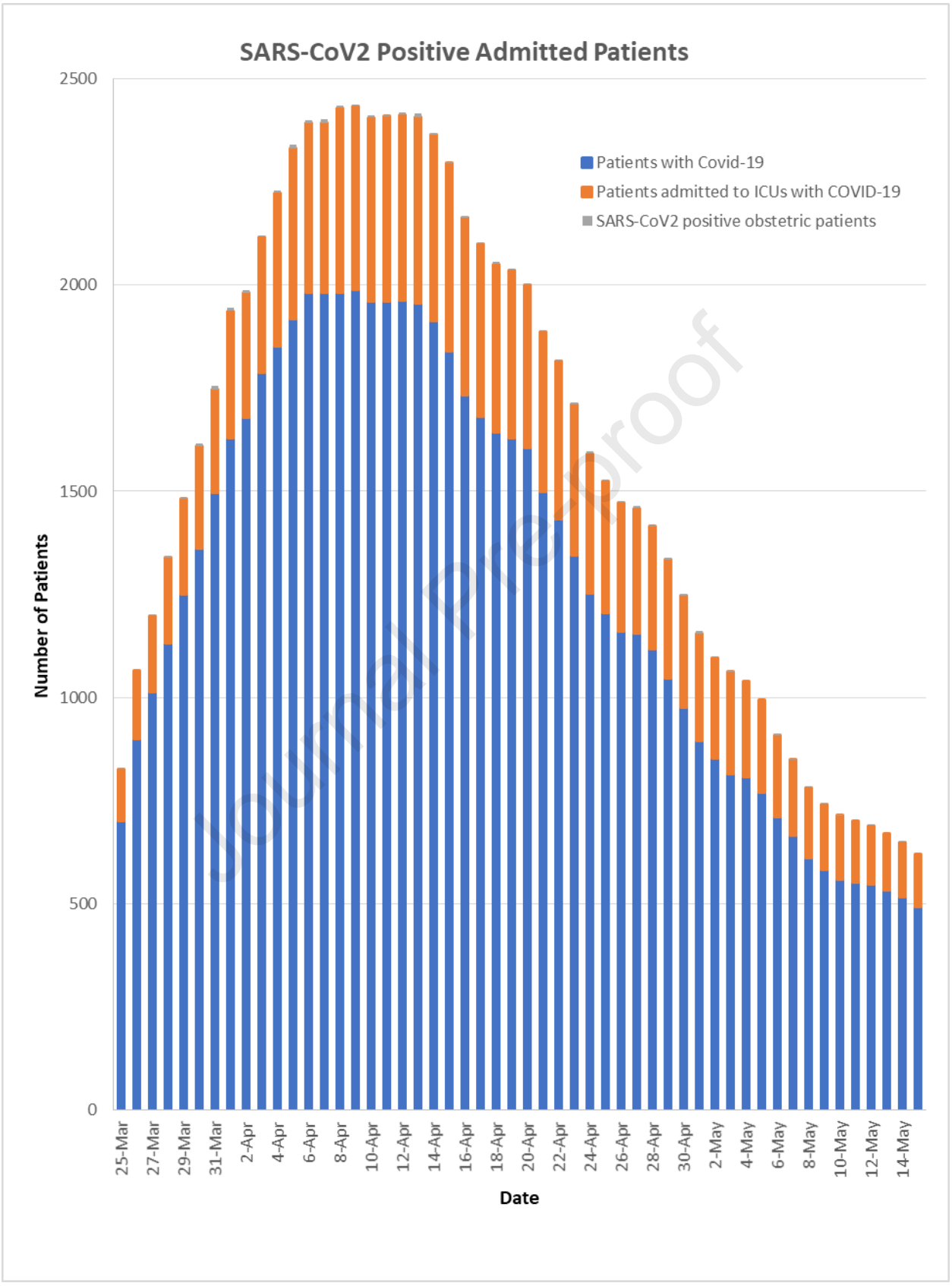
Tables:

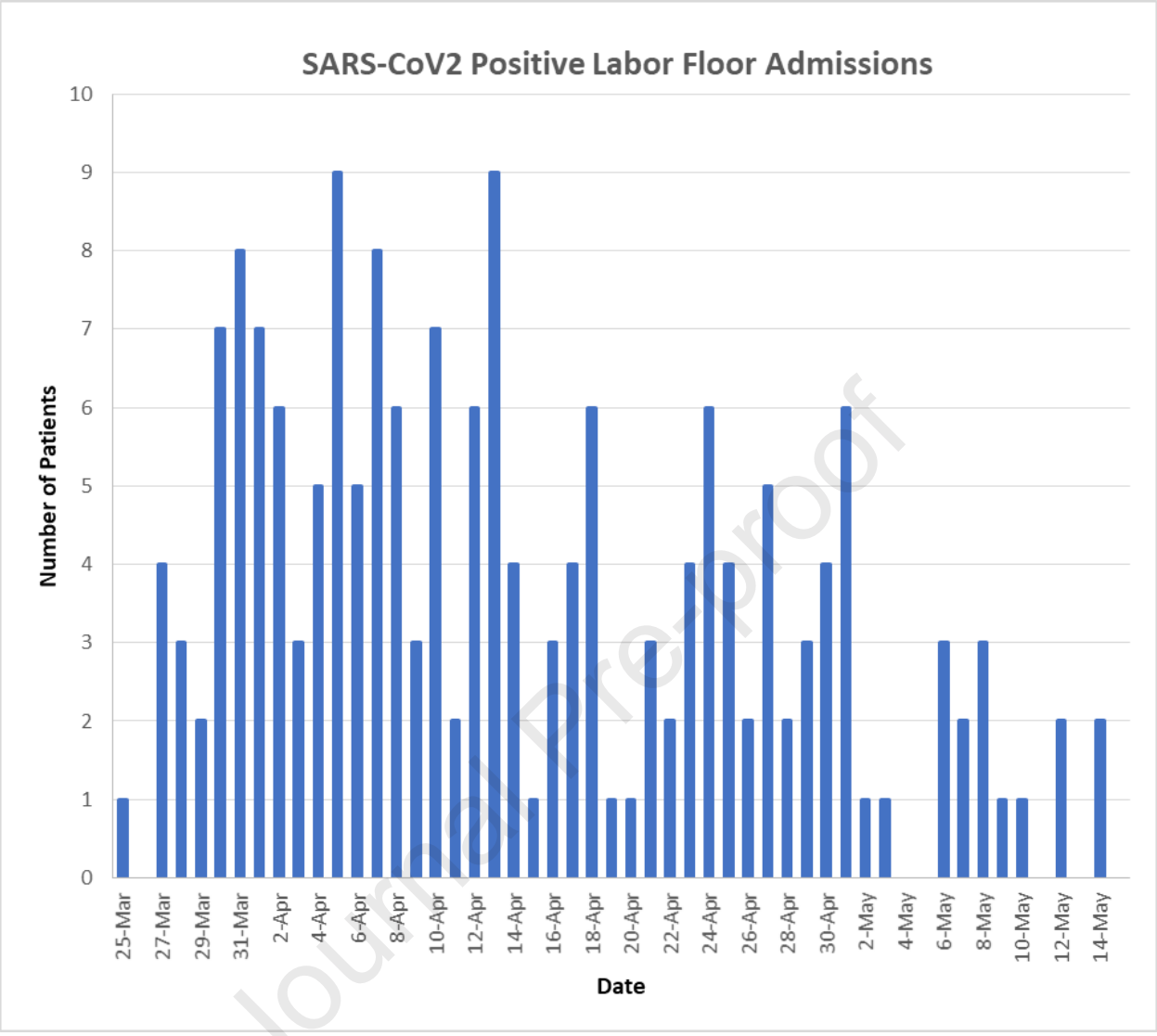
None

Figure legends:

Figure 1. Hospitalized SARS-CoV2 positive patients by admitting unit

Figure 2. SARS-CoV2 positive patients admitted to the labor floor





Highlights

- What is the impact of perinatal SARS-CoV2 infection on the incidence of preterm birth and stillbirth?
- Is the rate of SARS-CoV2 infection predictable based on prevalence of significant disease in the community?
- SARS-CoV2 infection did not increase the incidence of preterm birth or stillbirth.
- The rate of SARS-CoV2 infection in women admitted to the delivery service tracked as 0.26% +/- 0.002% of total COVID-19 hospitalizations in our health system.
- SARS-CoV2 infection in the labor and delivery population is predictable, and did significantly not increase rates of preterm birth or stillbirth in our health system.