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Establishment of a COVID-19 perinatal biorepository in a safety net population

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1. INTRODUCTION

Pregnant people and minorities are at increased risk for severe COVID-19 infection, including hospitalization, ICU admission and death.[1-3] Early research on the maternal and fetal implications of SARS-CoV-2 infection in pregnancy focused on maternal outcomes and was limited by lack of patient diversity and biospecimen data to answer questions related to maternal immunity and passive immunity.[4] The Grady Memorial Hospital obstetrics service, which is a large publicly supported hospital in Atlanta (970 beds, approximately 2500 deliveries per year), a tertiary referral hospital, and a safety net institution, is uniquely poised to address this literature gap. Despite this, an infrastructure did not previously exist for biologic sample collection.

2. OBJECTIVES

To create a biorepository including maternal serum, umbilical cord blood and placental tissue in an effort to better understand maternal adaptive immune response, neonatal passive immunity, and the risk of vertical transmission of the SARS-CoV-2 virus at the level of the placenta in a population under-represented by existing data. With these goals in mind, the Study of Pregnancy Outcomes in women with REspiratory illness due to suspected or confirmed coronavirus infection (SPORE) was developed.

3. METHODS

Eligible subjects were pregnant persons either under investigation or with documented SARS-CoV-2 infection by nasopharyngeal rt-PCR. Participants were identified and enrolled by the study team, which included six resident physicians. Informed consent was obtained at enrollment. Maternal blood samples were collected into EDTA tubes at the time of diagnosis, during prenatal visits, or during the delivery admission. Umbilical cord blood and placentas were collected by the delivering resident or midwife. The umbilical cord blood was collected into a cord blood kit using sterile technique. Blood samples were processed to obtain plasma and stored at -80C. Additional phenotypic data collected included COVID-related symptoms, mode of delivery, perinatal outcomes, race/ethnicity, insurance type, education level, BMI, chronic medical conditions, and substance use. The study was approved by the Emory IRB and the Grady Research Oversight Committee.

4. RESULTS

Between April 27, 2020, and February 26, 2021, 176 pregnant patients tested positive for SARS-CoV-2 infection via RT-PCR. 83 subjects were enrolled in SPORE and 258 biospecimens were collected. 80 (96.4%) had samples collected at the time of delivery. 55 (66.2%) had maternal blood/cord blood/placenta, 15 (18.1%) had maternal blood/placenta, 6 (7.2%) had cord blood/placenta, 3 (3.6%) had maternal blood/cord blood, and 1 (1.2%) had only placenta collected. The majority of participants identified as non-Hispanic black and reported Medicaid insurance coverage. Although there were no instances of maternal or neonatal mortality in our cohort, 6 (7.2%) patients

experienced a severe maternal morbidity (SMM) event as defined by the Centers for Disease Contol.[5] Among those who experienced an SMM event, 1 (1.2%) had heart failure, 2 (2.4%) had sepsis, 2 (2.4%) had disseminated intravascular coagulation, and 1 (1.2%) received transfusion >4 units pRBC. Biologic data from this cohort has previously been published elsewhere and demonstrated a robust maternal IgG response after COVID-19 infection, associated with high levels of cord blood IgG, but less than expected levels of cord blood neutraliation.[6]

5. CONCLUSION

The successful establishment of a COVID-19 perinatal biorepository in this population hinged on collaboration with trainees and patient participation. Importantly, the goal of collecting maternal blood, cord blood and placenta at delivery was achieved in two-thirds of cases. Although there were no neonatal or maternal deaths, a high rate of SMM was observed in our cohort. A major barrier to subject enrollment was that we initially only recruited English-speaking individuals. Importantly, a large portion of our patient population speaks languages other than English, so the IRB was subsequently modified to allow for recruitment of Spanish-speaking individuals, which is the second most common language among our patients. Additional limitations were that not all specimens were collected at delivery and specimen collection times were not uniform. Future aims to improve the rates of specimen collection at the time of delivery will focus on empowering patients to remind the delivery physician of their enrollment status and continued resident training and engagement in research. This biorepository will serve as a critical resource for our future research, which includes investigation of the maternal antibody response following vaccination when compared to natural SARS-CoV-2 infection and the role of inflammatory biomarkers on preterm birth associated with SARS-CoV-2 infection.

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