

## Intrauterine transmission of COVID-19 in Pregnancy: case report and review of literature

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**Summary.** We report the first case of SARS-CoV-2 pregnancy in the U.S. Our literature review highlights the rarity of COVID-19 intrauterine transmission and the need for clinicians to promptly test neonates born to SARS-CoV-2 positive mothers at delivery for COVID-19. It is imperative to establish the real risk of intrauterine transmission and to develop appropriate preventive and treatment strategies. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** COVID-19, pregnancy, SARS-CoV-2, neonate, fetus

### Introduction

SARS-CoV-2, the virus responsible for the COVID-19 pandemic has rapidly spread from Asia and Europe to the United States (U.S.). Recent reports of SARS-CoV-2 infections have focused on non-pregnant patients, with only a few reports on pregnant patients. As of March 27, 2020, 63 cases were reported on neonates born to COVID-19 mothers and tested for SARS-CoV-2. 59 cases in China including our case report in the U.S. showed no evidence of intrauterine transmission. Intrauterine transmission of SARS-CoV-2 appears to be rare. COVID-19 has resulted in high morbidity and mortality rates [1]. The effect of COVID-19 on pregnancy and intrauterine transmission is not well-defined [2]. Pregnancy is a state of immunotolerance, a risk factor for acquiring viral and bacterial infections [3–6] Hubei Province, China. COVID-19 has been rapidly spreading out in China and all over the world. SARS-CoV-2 has been known to be genetically similar to severe acute respiratory syndrome coronavirus (SARS-CoV).

We report the first case of a SARS-CoV-2 pregnancy in the U.S. The patient was a 34-year-old Af-

rican American female gravida 2, para 1001 who tested positive for SARS-CoV-2. She delivered at 37 weeks and 2 days via cesarean section and the baby tested negative for SARS-CoV-2 by nasopharyngeal quantitative RT-PCR (qRT-PCR). We also reviewed the current English literature about COVID-19 and pregnancy. We summarized peer-reviewed studies that included neonatal SARS-CoV-2 qRT-PCR testing to establish the rate of intrauterine transmission.

### Case report

The patient was a 34-year-old African American female gravida 2, para 1001 with a past medical history of type II diabetes, treated latent tuberculosis hypertension (we controlled not on medications) and chronic hepatitis B who initially presented at 36 weeks and 2 days to the New York City Health and Hospitals/Lincoln in New York City on March 12, 2020 with complaints of myalgia, fatigue, non-productive cough and a subjective fever. She denied shortness of breath, chest pain, nausea, vomiting or exposure to sick contacts, including a negative epidemiological ex-

posure history to COVID-19. She reported no travel outside of the U.S. over the past two years. In triage, the patient had a temperature of 98.5 degrees Fahrenheit, a pulse of 114 beats per minute, a blood pressure of 124/80 mmHg, a respiratory rate of 20/min and an oxygen saturation of 100% on room air. The patient had no obstetrical complaints and she felt active fetal movements at the time. An Influenza A and B nasopharyngeal swab tested negative. SARS-CoV-2 qRT-PCR nasopharyngeal swab was obtained from the mother and she was discharged.

Seven days later, the patient was recalled to the hospital for laboratory-confirmed SARS-CoV-2 infection. She came to the hospital and was admitted at 37 weeks and 2 days weeks, she stated that her previously noted symptoms had resolved. Given the COVID-19 status and the comorbidities, delivery was indicated. An elective cesarean section was performed because the patient had a previous cesarean section and declined a trial of labor. The delivery and the post-operative course was uneventful. The patient delivered a female neonate weighing 3095 grams with an Apgar score of 9/9/9. The neonate was placed in isolation and transferred the neonatal intensive care unit. The baby was tested for COVID-19 with nasopharyngeal qRT-PCR at delivery and was found to be negative. The neonate had an uneventful first 3 days of life.

## Discussion

Our report is the first case of SARS-CoV-2 pregnancy in the U.S. The viral disease was identified in the mother in the third trimester and the cesarean section was performed for obstetrical indications unrelated to the viral infection. The neonate tested negative for the virus, and both the mother and the neonate had an uneventful hospital course. We identified 7 studies examining SARS-CoV-2 neonatal qRT-PCR testing in COVID-19 positive pregnancies (Table 1). All studies were conducted in China. Chen et al. [2] performed a retrospective review of nine pregnant women hospitalized at Zhongnan Hospital of Wuhan University in Wuhan, China from January 20, 2020 to January 30, 2020. The women had developed SARS-CoV-2 pneumonia in the third trimester. Amniotic fluid sam-

ples were collected via direct syringe aspiration at the time of delivery, while cord blood and neonatal throat swab were collected immediately after delivery. They used qRT-PCR of respiratory tract samples with the CDC recommended kit for SARS-VoV-2. Six neonates were tested, and it resulted in no evidence of intrauterine transmission. The Apgar score ranges for the neonates was 8 – 9 at 1 minute and 9 – 10 at 5 minutes. No intrauterine fetal or neonatal deaths were noted. No complications were reported post-delivery except for one neonate who had a mild increase in cardiac enzymes on the day of birth (myoglobin 170.8 ng/mL and creatine kinase-myocardial band 8.5 ng/mL) but was asymptomatic. Liu et al. [7] conducted a retrospective review of data collected by the Centers for Disease Control and Prevention and the local health commission in China. They identified 13 COVID-19 pregnant women – all residing outside of Wuhan. Three patients did not delivery and were discharged with uncomplicated ongoing pregnancies. The remaining 10 patients delivered via cesarean section. No serological evidence of vertical transmission was noted in the neonates. The authors did not specify the timing nor the modality of neonatal COVID-19 testing. One was a stillborn and the other nine were livebirths. The liveborn neonates were noted with 1-min Apgar scores of 10. Fan et al. [8] reported 2 cases of SARS-CoV-2 in pregnant physician patients admitted at Renmin Hospital of Wuhan University in Wuhan, China. Serial neonatal qRT-PCR assays returned negative for SARS-CoV-2 in nasopharyngeal swab, placenta tissues, umbilical cord blood and amniotic fluid. The authors indicated that the specimens were collected at or after delivery. Both babies developed mild neonatal pneumonia and lymphopenia after delivery, and both responded with good clinical response 2 days after receiving antibiotics. The 1-minute Apgar score was 9 and the 5-minutes Apgar score was 10 for both neonates. Zhu et al. [9] discussed the clinical outcomes of 10 neonates (including 2 twins) born to 9 mothers at the Maternal and Child Health Hospital of Hubei Province in Wuhan, China. Nine neonates had SARS-CoV-2 qRT-PCR pharyngeal swabs after delivery which tested negative. The sampling was performed between 7 and 9 days after birth in 2 neonates and within 72 hours after admission in the remaining 7

**Table 1.** Summary of neonates born from COVID-19 pregnancies and tested for SARS-CoV-2

Study author and location	Neonates tested positive for SARS-CoV-2/all tested	Babies delivered/pregnancies	Maternal age (years)	GA at diagnosis (weeks+days)	Maternal comorbidities	GA at delivery (weeks)	Birth modality (vaginal delivery/cesarean section)	Apgar I/V	Birth weight (grams)	NICU admission
Chen et al. [2]; China	0/6	9/9	26-40	36-39+4	Yes	36+4-40+4	0/9	8-9/9-10	1880-3820	n/a
Liu Y. et al. [7]; China	0/10	10 (1 still-born)/13	22-36	25-38+3	No	n/a	0/10	10/n/a	n/a	n/a
Fan et al. [8], China	0/2	2/2	29-34	36-37	No	36+5-39	0/2	9,9/10,10	2890-3400	n/a
Zhu et al. [9], China	0/9	10/9	25-35	31-39	Yes	n/a	2/7	7-10/8-10	1520-3800	n/a
Wang et al. [10], China	0/1	1/1	28	30	No	30	0/1	9/10	1830	n/a
Li et al. [11], China	0/1	1/1	30	35	n/a	35	0/1	n/a	n/a	n/a
Zeng et al. [12], China*	3/33	33/33	n/a	n/a	No	31+2-40+4	3/3	n/a	1580-3360	n/a
Lincoln Hospital, U.S.	0/1	1/1	34	36+2	Yes	37+2	0/1	9/9/9	3095	Yes

GA = gestational age; c/s = cesarean section; NICU = Neonatal Intensive Care Unit. \*details shown only for the 3 positive cases. U.S. = United States

babies. One neonatal death at postnatal day 9 occurred secondary to refractory shock and gastric bleeding, but the baby tested negative for the virus. Neonates had 1-minute Apgar scores between 7–10 and 5-minute Apgar scores between 8–10. Wang et al. [10] reported on a 28-year-old female at 30 weeks who sought treatment at Suzhou Municipal Hospital in Suzhou, China on February 2, 2020 with complaints of fever. She delivered a male neonate via cesarean section. The baby weighed 1830 grams with Apgar scores of 9 and 10 at 1 and 5 minutes, respectively. SARS-CoV-2 RT-PCR tests done at delivery on the amniotic fluid, placenta, umbilical cord blood, gastric juice and throat swabs of the infant were negative. Li et. al. [11] published a case report on a 30-year-old female at 35 weeks who presented at the First Affiliated Hospital, College of Medicine, Zhejiang University in Hangzhou, China on February 6, 2020 for a 2-day history of dry cough without fever, chills or shortness of breath. She was diagnosed COVID positive (sputum sample) one day prior to admission. The baby was delivered by cesarean section. Oropharyngeal swab on the baby, obtained immediately after delivery, were negative. Zeng et al. [12] collected 33 cases of COVID-19 pregnancies from Wuhan Children's Hospital, in Wuhan, Hubei Province, China. Details of the cases were scant, with the report focusing on 3 SARS-CoV-2 positive livebirths born to SARS-CoV-2 positive mothers. The 3 babies were born via cesarean section with reassuring Apgar scores. The 3 neonates were tested for COVID-19 on day 2 of life with nasopharyngeal and anal swabs. Two neonates developed pneumonia and the third baby developed neonatal respiratory distress syndrome and suspected sepsis, which improved after treatment. The neonatal SARS-CoV-2 testing was done at day 2 after delivery, questioning whether the mother was the actual source of neonatal SARS-CoV-2 infection and if this was an actual case of intrauterine transmission of SARS-CoV-2.

## Conclusions

As of March 27, 2020, there have been a total of 63 cases reported on neonates born to COVID-19 mothers that were tested for SARS-CoV-2. Of the 63 cases

reviewed, 59 cases in China including our case report in the U.S. showed no transmission of maternal COVID-19 infection to the fetus. There were 3 COVID-19 positive livebirths reported. However, neonatal testing was done 2 days after delivery on these livebirths, questioning the credibility of intrauterine transmission in these 3 cases. Intrauterine transmission of SARS-CoV-2 appears to be rare. More studies are needed to examine the effect of COVID-19 on pregnancy and intrauterine transmission. We encourage clinicians to promptly test neonates born to SARS-CoV-2 positive mothers at delivery for COVID-19 to establish the real risk of intrauterine transmission and to develop appropriate preventive and treatment strategies.

**Conflict of interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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