Case Report

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Outcome of a Neonate Born to a Mother with COVID-19: A Case Report of Vertical Transmission

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ABSTRACT

Background: Although COVID-19 in pregnant women and their neonates has been verified, its impact on neonates born to infected mothers has remained unclear and there is not enough evidence about how this vertical transmission occurs.

Case Report: In this case report, we explained that a neonate girl was born to a mother with COVID-19 infection. Our main goal was to focus on the follow-up and outcome of the neonate. The neonate was at GA = 28 weeks who was born by cesarean section due to respiratory distress of her mother. Also on day 18, she experienced recurrent unilateral seizures so the sample of her cerebrospinal fluid (CSF) was examined.

Results: The neonate had a positive reverse transcription polymerase chain reaction (RT-PCR) test for COVID-19, while this neonate after birth, due to mother's positive PCR, immediately was isolated from the operating room. The neonate's nasal sample was positive for more than 18 days. Twenty-six days after birth, the neonate was re-evaluated for clinical laboratories, all of which were normal and she had favorable outcomes.

Conclusion: In our case report despite the neonate was premature and had seizures, she had favorable outcomes because we quickly started treatment and supportive measures. It is recommended; Symptomatic neonates born to infected mothers must be evaluated for COVID-19 to start proper treatment and quarantine. Additional studies are needed to evaluate the outcomes of COVID-19 in neonates and how to minimize the risk of this disease in neonates.

Introduction

Coronavirus infection 2019 (COVID-19) is a transnational pandemic caused by the Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2 virus). The outbreak of SARS-COV-2 has been shown as a global public health emergency by the World Health Organization (WHO).[1] Former investigations around the pneumonia outbreak caused via COVID-19 were mainly based on data from adult groups. Limited knowledge exists for pediatrics with SARS-COV-2, particularly for infected infants.[2] The main presentations of COVID-19 consist of fever and respiratory symptoms; nevertheless, the clinical manifestations are diverse. The high-risk people for SARS-CoV-2 include old people and individuals with underlying disorders.[3,4] About 20% of infected patients have a severe illness, and the approximate case-fatality rate is 5%-6%.[5] The dynamics of COVID-19 transmission happens from human-to-human via respiratory droplets[6]; however, other ways of transmission have not been entirely described.[7] Evidence indicating transmission for SARS-CoV-2 from mother to her infant was documented in prior studies; nevertheless, if it is an intrauterine or intrapartum or due to environmental exposure is still not transparent.[8] So due to the possibility for mother-to-infant vertical transmission of COVID-19, extensive evaluations are necessary to stop this.[7] Despite the increasingly identified effect of novel SARS-COV-2 on many aspects of health in adults and pediatric the entire characteristics of COVID-19 symptoms and outcomes in pregnant women and neonates born to infected mothers stay unclear.[4] COVID-19 induces severe problems in pregnant women, which raises the risk of maternal morbidity[9,10,7] which consist the risk of preterm delivery, miscarriages, and perinatal fatality.[11] Akbarian-Rad et al. in their study showed the most prominent clinical manifestation in symptomatic neonates infected with SARS-COV-2 were respiratory distress, tachypnea, vomiting, and nutrition intolerance. This appearance and high levels of serum C-reactive protein (CRP) are also common in some neonatal sepsis. They have been successfully treated with their standard therapy.[12] Hosseini and et al., Evaluated clinical outcomes of 44 neonates born to mothers with SARS-COV-2 in Shahid Beheshti Hospitals in Iran. They described epidemiological information, demographics, clinical manisfestation and symptoms, laboratory results, and diseases associated with COVID-19 infection in mothers and neonates. All of the infant's clinical signs were normal during the 3‑day hospital stay for standard postpartum care and twenty-eight days after birth.[13]

Sagheb and et al., evaluated two seriously ill neonates born to mothers with COVID-19 in Iran. Both patients had positive RT-PCR for COVID-19 in the second round of examination but the first evaluation test was negative. Hydroxychloroquine was used to treat both patients. They responded to treatment over a period of 14 and 5 days, respectively. They concluded that focus should be given to clinical signs of neonates, particularly fever.[14] We report a neonate born to a pregnant woman with positive test for COVID-19 infection. This neonate was born at 28 weeks, pre-term, positive for COVID confirmed by RT-PCR after a nasopharyngeal swab was taken at 24 hours of age. At birth, neonate was hospitalized with respiratory distress including tachypnea, grunting, and severe traction. The parent of the affected neonate provided us with written consent to report their neonate. The aim of this case report study is to assess the clinical results of the neonate born to a pregnant woman with SARS-COV-2 infection.

Case Report

The patient was a newborn girl at GA = 28 weeks who was born by cesarean section due to respiratory distress. The mother of the neonate was a G1P1 (gravida/para: GP) pregnant woman who lives in the Yazd City,

the center of Iran. Her Apgar (Appearance, Pulse, Grimace, Activity, and Respiration) score was 9/10 in the first minute and 10/10 in the fifth minute, with a birth weight of 1150 gr. At birth, neonate was hospitalized with respiratory distress which includes tachypnea, grunting, and severe retraction. In the prenatal history, 10 days before delivery, the patient's mother had symptoms of anorexia and fever, so her nasal sample was taken for COVID 19 RT-PCR test which turned out positive. Due to respiratory distress, the infant underwent intubation and received CUROSURF, and was placed under mechanical ventilation with the following settings. (PIP = 13, PEEP = 5, RR = 60, Ti = 35%). Given, the need for a high fraction of inspired oxygen (FiO2), the second dose of CUROSURF was injected into the trachea, 12 hours later and the patient was treated with antibiotics including cefotaxime, vancomycin, and fluconazole (prophylactic dose) and the device settings were gradually reduced.

Table 1. Patient's Paraclinical Tests Results

Variables	Value	Unit
CBC		
WBC	Neu	44%
	Lym	54%
WBC	9800	10^3/µL
Hb	21.6	g/dl
Hct	62	
PLT	200.000	10^3/µL
BS	63	mg/dl
BUN	35	mg/dl
Cr	0.5	mg/dl
Na	127	mmol/L
K	4.8	mmol/L
Ca	8.7	mg/dL
CPK	827	mg/dl
LDH	98	mg/dl
CRP	negative	

Abbreviation: BS: Blood sugar; HB: Hemoglobin; BUN: Blood urea nitrogen; CPK: Creatine phosphokinase; LDH: Lactate dehydrogenase

The first diagram of the lungs: a decrease in the volume of the lungs was observed with diffuse reticular infiltrates and air bronchogram x ray. According to the history of COVID 19 disease in the infant's mother, her nasal sample was taken for COVID19 RT-PCR on the second day of birth, which was positive. Antibiotic treatment continued unchanged and milk from human milk bank was started for her. On the third day of birth, a brain ultrasound was performed, which was normal and total parenteral nutrition (TPN) was started. On the fifth day, the patient's nasogastric tube (NG) secretions was bright red, so abdominal x-ray imaging was performed and dilated loops were seen. Then on suspecting, sepsis or Necrotizing enterocolitis (NEC), antibiotics treatments changed to meropenem, vancomycin and metronidazole then the patient was NPO. Blood culture, CBC diff, and CRP were done which was negative and two other exams were normal. On the seventh day, a second sample was taken for PCR which was positive. From the eighth day, the patient was under continuous positive nasal airway pressure (NCPAP) and on the eleventh day was changed to high flow nasal cannula (HFNC) due to reduction of FiO2. Twelve days after birth, the nose sample was taken again, PCR of which was positive again. On the fourteenth day after birth, due to the improvement of the patient's general condition and the termination of mechanical ventilation, breastfeeding was resumed through gavage, and due to the improvement of the mother's condition, embracing care was started. On the 15th day, in the patient's labs, we noticed an increase in creatinine, but it was not associated with a change in blood pressure. His urine tests included the following. (SG = 1009, WBC = 2-4, RBC = 1-2, Suger = negative, Blood = negative).

Her ultrasound results include: right kidney length = 35mm,

Left kidney length = 44mm.

Right parenchymal thickness = 5mm.

Left parenchymal thickness = 6mm.

On the 18th day, she had recurrent unilateral clonus more than 15 times, so a brain ultrasound was done which was normal, and also a lumbar puncture (LP) was

performed.(WBC = 5000µL 5×10^3/µL, Nuet = 0 , Lymph = 100%, RBC = 0, glucose = 52 mg/dL (Serum sugar simultaneously = 120 mg/dL, protein = 85 mg/dL). Cerebrospinal fluid (CSF) sample was sent for smear and bacterial culture, which was negative and the CSF sample was positive for COVID 19. Antibiotic treatment was continued and no new treatment was added due to the absence of convulsive movements. And the pharyngeal sample, which was sent on the eighteenth day, was positive. The patient continued to receive oxygen therapy through the HFNC and received regular Kangaroo mother care (KMC). On the twenty-third day after birth, another throat and nasal test was taken, COVID-19 RT-PCR of which was negative. On the twenty-sixth day, the LP was performed again, as follows: (WBC = 0, RBC = 0, glucose=95 mg/dL (Serum sugar simultaneously = 153 mg/dL, Pro = 69mg/dL, culture=negative, smear=negative, COVID19 = negative). Eventually, the baby and her mother were discharged with a good and stable condition.

Discussion

Presently there isn't enough information on the clinical features and outcome of a neonate who was born from a mother infected with COVID 19. In this case, we evaluated a preterm neonate who was born from a mother who had respiratory distress due to COVID 19. We followed her up for 26 days. Although, older children usually show mild symptoms to COVID-19, neonates with COVID-19 infection typically exhibit an expanding range of clinical features.[15] Among the neonates born to mothers with COVID 19, respiratory distress syndrome, and pneumonia are common events, Moreover, it appears that preterm neonates may have more severe symptoms compared to full-term neonates which can be attributed to the weaker immune system in preterm neonates[14], there is no specific approach for the management of COVID-19 infection in neonates. As a consequence, generally, expert opinions and protocols for adult infection treatment and control are obeyed. Although this new virus comes out without specific antiviral treatments, neonatologists require more viral, epidemiological, and clinical information to treat and manage COVID-19.[13]

In pregnant women with SARS-CoV-2, hypertensive disease and diabetes are usual comorbidities that are a risk for preterm delivery and maternal deaths. Several studies determined, maternal infection with SARS-CoV-2 increase the rate of pregnancy difficulties including miscarriages and preterm delivery.[12] Evidence propose that high levels of inflammatory cytokines during infection with SARS-CoV-2 and alterations in the balance of inflammatory and anti-inflammatory cytokines in pregnant women can induce pregnancy difficulties.[12] Also neonatal stillbirth and mortality are evidence of vertical transmission of SARS COV-2 infection in women with COVID-19. Therefore, prevention and therapy used by the general public may not be useful and appropriate for pregnant women.[13] Several studies explored the signs and symptoms, laboratory results, and comorbidities, in neonates infected with COVID19, and clinical maternal, and neonatal outcomes.[13] Hsin Chi et al., in a systematic review of 105 neonates, evaluated the presently unknown effect of SARS-CoV-2 on neonates born to mothers with COVID-19. They indicated that most neonates had a favorable outcome. Importantly, 8.8% of the neonates tested were positive for SARS-CoV-2, suggesting that the risk of vertical transmission should be noticed.[4] Though sufficient knowledge is not available on clinical characteristics and neonatal outcomes in pregnant women with SARS-CoV-2, we evaluated short-term outcomes (till 4 weeks after discharge) in neonates born to mothers infected with COVID-19.[16] Tabatabaei and et al., evaluated, a case series of COVID-19 in Neonates from Tertiary Neonatal Centers in Iran. Their study showed that clinical presentations, as well as

laboratory and radiologic results of SARS-CoV-2, are more favorable in neonates than in the older ages. So they concluded that the prognosis of SARS-CoV-2 in the neonatal period is usually good.[17]

In our case report, the neonate was premature and hospitalized with respiratory symptoms. The neonate's nasal sample was positive for more than 18 days, which may be due to a weakened immune system in this premature neonate. Also on day 18, we saw recurrent unilateral seizures in the infant, and a sample of cerebrospinal fluid (CSF) was taken, which was negative for bacterial culture but had high white blood cell counts and high protein levels, indicating meningitis and viral inflammation. Therefore, neurologic manifestations in infants with COVID-19 should also be considered. Although the initial condition was critical, she had a good final outcome and our medical follow-up was successful. We concluded that immediate diagnosis and prompt action are very important in neonates born to mothers with COVID-19. Therefore, additional studies are needed to clarify the impact of SARS-COV-2 on pregnancy and neonatal outcome.

Conclusion

Since the neonate was born to an infected mother and she was infected, we focused on the patient's clinical management from birth and performed regular tests to assess her condition. It can be concluded that determining prevention strategies and early detection of COVID-19 in infants, along with the implementation of standard treatment protocols, can induce good outcomes, even in severe cases. These strategies and protocols need additional studies. Also, the exact probability of vertical transmission of SARS-CoV-2 during pregnancy is still required to be resolved.

Conflict of Interests

Authors have no conflict of interests.

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