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Case Report

Paediatrics Section

Vertical Transmission of COVID-19 Infection in a Newborn

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ABSTRACT

Coronavirus Disease-2019 (COVID-19), in its second wave, is infecting the young children and newborns too. Increasing number of pregnant women with COVID-19 is being reported globally, and the potential for vertical transmission of Severe Acute Respiratory Syndrome- Coronavirus-2 (SARS-CoV-2), either in-utero, intrapartum or in the early postnatal period is of concern. At present, the extent to which SARS-CoV-2 vertical transmission occurs, and timing of such transmission is unclear. This report describes the clinical course and laboratory findings in a neonate in whom SARS-CoV2 infection most likely occurred via vertical transmission. As the baby developed audible grunting and tachypnoea, 10 minutes after birth, all the relevant laboratory investigations were done. The chest X-ray showed bilateral lung opacities. The neonate developed signs and symptoms of severe COVID-19 pneumonia on day 1 of life, completely manifesting within few hours of birth. The nasopharyngeal swab was sent for Reverse Transcriptase- Polymerase Chain Reaction (RT-PCR) for SARS-CoV 2 after two days of birth. The RT-PCR test came out positive. With all other causes been ruled out and contributory laboratory findings (raised D-Dimer, lactate dehydrogenase and erythrocyte sedimentation rate) it can positively be labelled as a case of vertically transmitted intrauterine COVID-19 pneumonia in a newborn. The baby was treated with ventilator support, antibiotics and Low Molecular Weight Heparin (LMWH), and finally discharged after nine days of life and management at the hospital.

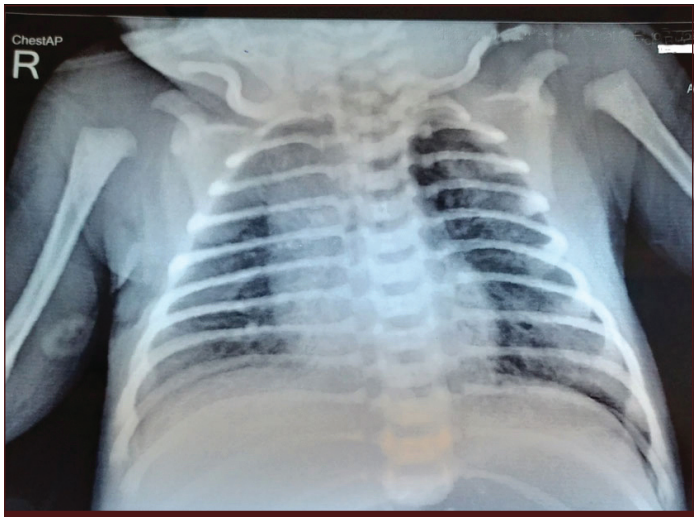
Keywords: Coronavirus disease-2019, Intrauterine, Neonate, Pneumonia, Severe acute respiratory syndrome- coronavirus-2

CASE REPORT

A 28-year-old pregnant female patient (G2P1A0) was admitted on 20th April 2021 for safe confinement. There was no history of contact with any COVID-19 patient or any person with suggestive symptoms. RT-PCR for SARS-CoV-2, both of mother and her companion (mother-in-law) was negative on admission. A term (37+4 weeks) 3.2 kg male baby was born on 24th April 2021 at 09:57 am by Caesarean section. The baby at birth did not require any resuscitation and Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score at 1 and 5 minutes was 8 and 9, respectively. Liquor was clear. The baby developed audible grunting and tachypnoea 10 minutes after birth, and was started oxygen by hood. Nasal Continuous Positive Airway Pressure (CPAP) was started at three hours of life.

Chest X-ray of neonate was done the next day, showed bilateral lung opacities [Table/Fig-1]. Intravenous (i.v.) antibiotics (ampicillin and gentamycin) were started at 24 hours life. He was given a trial of surfactant on 25th April 2021 at 30 hours life, and put on CPAP again thereafter. But he continued to deteriorate and had to be put on ventilator support on that same day at 9:30 pm. Sepsis screen was negative. C-Reactive Protein (CRP) levels test repeated thrice on intermittent days till 29th April 2021, all were within normal range. Blood culture after 48 hours were sterile. As the diagnosis and the cause of deterioration could not be established, nasopharyngeal swab of baby was sent for RT-PCR for SARS-CoV2 (CRI Kasauli lab using Trivitron covidsure kit) at approximately 52 hours of life.

Midazolam infusion was given for sedation. The baby remained on feeds by nasogastric tube along with i.v. fluids. Both expressed mother's milk and formula milk was used. The i.v. fluids were discontinued from evening of 26th April 2021, as he tolerated full nasogastric tube feeds. Ventilator pressure and oxygen requirements decreased over next 36 hours and he was extubated on the next day



[Table/Fig-1]: Chest X-ray of neonate depicting bilateral lung opacities.

morning to nasal CPAP. On 28th April, 2021 the report of RT-PCR (for SARS-CoV-2) came as positive. The baby was immediately shifted to COVID-19 designated Neonatal Intensive Care Unit (NICU).

Repeat antigen-based rapid diagnostic test and RT-PCR of mother was sent was sent on 10th day of her admission, and were positive for SARS-CoV-2. Antigen-based rapid test for SARS-CoV-2 of the father was negative, while the grandmother's was positive. The mother and the grandmother were discharged on the same day as they were asymptomatic and was advised home quarantine. All the doctors and nursing staff who were involved in the management of the baby were tested for SARS-CoV-2 by RT-PCR, and they all were reported as negative.

Investigations [Table/Fig-2,3] of the baby was done as per the COVID-19 protocol. Serum lactate dehydrogenase levels were

Investigations	On the day of birth	Second day	Fourth day	Fifth day	Sixth day	Seventh day	Ninth day
C-Reactive protein	Negative	Negative	--	Negative	--	--	--
Total bilirubin (mg/dL)	--	6.6	--	--	14.3	15.9	15.8
Direct bilirubin (mg/dL)	--	0.2	--	--	0.2	0.2	0.3
Aspartate aminotransferase (U/L)	--	--	--	44	--	--	--
Alanine aminotransferase (U/L)	--	--	--	38	--	--	--
Alkaline phosphatase (U/L)	--	--	--	222	--	--	--
Calcium (mg/dL)	--	9.82	--	--	--	--	--
Blood urea (mg/dL)	--	16	--	48	--	--	--
Creatinine (mg/dL)	--	0.5	--	0.04	--	--	--
Sodium (meq/L)	--	140	--	--	--	--	--
Potassium (meq/L)	--	4.3	--	--	--	--	--
Chloride (meq/L)	--	99	--	--	--	--	--
Albumin (g/dL)	2.83	--	3.38	--	--	--	--
Total protein (g/dL)	--	--	5.3	--	--	--	--
Urine routine exam	--	--	Normal	--	--	--	--
Blood culture	Sterile after 5 days	--	--	--	--	--	--
D-Dimer (ng/mL) Normal 580-2470	--	--	--	>5000	3301	3210	860
Haemoglobin (g/dL)	21.5	--	--	19.8	--	16	--
Total leucocyte count (×10^3/μL)	16.5	--	--	9.5	--	12	--
DLC (P/L/E/M) %	76/14/5/5	--	--	76/14/2/8	--	38/37/5/26	--
ESR (mm First hr)	--	--	--	101	--	03	--
Platelets (×10^3/μL)	263	--	--	182	--	303	--
Red blood count (×10^6/μL)	6.0	--	--	5.86	--	3.47	--
Ferritin (ng/mL) Normal 0 to 400	--	--	--	--	374.9	--	--
LDH (U/L) Normal 170-580	--	--	--	816	--	--	--
Blood group	O Rh positive	--	--	--	--	--	--

[Table/Fig-2]: Neonate's blood tests -Days and details of investigations since the birth of neonate.
ESR: Erythrocyte sedimentation rate; DLC (P/L/E/M): Differential leukocyte count (Polymorphs/Lymphocytes/Eosinophils/Monocytes); LDH: Lactate dehydrogenase

raised (816 U/L). Neutrophil-Lymphocyte ratio was 5.43. As the baby's Erythrocyte Sedimentation Rate (ESR) (101 mm first hour) and D-Dimer (>5000 ng/mL) was significantly raised, LMWH was started subcutaneously at a dose of 1.5 units/kg/dose every 12 hourly, since the night of 6th day of birth. The baby was weaned off CPAP and put on oxygen by hood on 7th day of birth. He accepted katori spoon feeds since that same day. Oxygen supplementation was finally stopped on the evening of 8th day.

VBG	25th April 2021 09:55 am VBG	25th April 2021 12:53 pm VBG	26th April 2021 10:35 am VBG	27th April 2021 9:54 am ABG
pH	7.342	7.262	7.284	7.356
pCO_2 (mmHg)	37.39	53.50	55	53.63
pO_2 (mmHg)	45.62	47.84	29.13	53.29
HCO_3 (mmol/L)	20.46	24.34	26.33	30.29
BE (mmol/L)	-4.45	-1.94	0.21	4.88

[Table/Fig-3]: Neonate's blood gas analysis reports.
ABG: Arterial blood gas; BE: Base excess; VBG: Venous blood gas; pH: Potential of hydrogen; pCO_2: Partial pressure of carbon dioxide; pO_2: Partial pressure of oxygen; HCO_3: Bicarbonate ion

The baby was finally discharged after nine days of management, i.e. on 3rd May 2021. Antibiotics and LMWH were discontinued on the day of discharge. Both mother and baby were normal as per the regular telephonic conversations with the mother, till one month of discharge.

DISCUSSION

It is very likely that the index newborn acquired the infection vertically. The transmission can occur either via the transplacental route antenatally close to delivery or via intrapartum route. In this case, as the mother (on admission for delivery) was negative for SARS-CoV-2, the samples of placental tissues/umbilical cord or respiratory tract of newborn within first 24 hours of life were not taken. The baby had pneumonia in both the lungs. There was no antenatal history of risk factors for neonatal sepsis. Blood culture was sterile at 48 and 120 hours and serial serum CRP levels (done thrice on intermittent days till 29th April 2021) were normal. A trial of surfactant administration was given but baby showed no response and had to be put on ventilator support after few hours. Nasopharyngeal sample of baby at about 52 hours of life was positive for SARS-CoV-2. According to current guidelines [1-3], intrauterine transmission can be confirmed if the mother has been positive for SARS-CoV-2 within 14 days before or two days after birth and, the virus has been detected in amniotic fluid, placental tissue/umbilical cord, neonatal blood or respiratory tract collected within first 24 hours of birth, as well as in repeat neonatal blood or respiratory tract specimens at 24-48 hours of life. If the amniotic fluid, placental tissue/umbilical cord and neonatal samples at <24 hours life are negative but subsequent ones between 24 hours to 2 weeks of life are positive, it is likely that the virus was acquired intrapartum or in early postpartum period.

The case does not fulfil the criteria for being labelled as intrauterine or intrapartum transmission as RT-PCR samples of neonate were sent after 48 hours of life. But as the baby was symptomatic since birth and continued to progressively deteriorate thereafter, there are high chances that the transmission was intrauterine. Considering incubation period of COVID-19 infection to be 2-14 days, it is highly unlikely to be a case of intrapartum or early postnatal transmission. Though RT-PCR (for SARS-CoV-2) of mother was negative before delivery but repeat sample sent after five days of childbirth was positive. This is explainable because a single negative RT-PCR test does not help in ruling out an infection and the test needs to be repeated [2]. Also, later on, though the baby was stable haemodynamically with no clinical evidence of disseminated intravascular coagulation, D-Dimer levels were highly raised. Serum LDH and ESR were also significantly raised. Neutrophil-Lymphocyte ratio was 5.43. All these go in favour of COVID-19. Though, breast milk was given to the baby, it is unlikely to be a route of transmission [4,5]. As intrauterine mode of transmission is not common, thereby the case deserves a mention in the literature [6]. The present case, to the best of our knowledge, is one of the earliest published case of COVID-19 pneumonia requiring ventilator support in the state of Himachal Pradesh, India.

CONCLUSION(S)

This is a case of severe neonatal presentation of COVID-19 pneumonia, after birth requiring mechanical ventilation, which most probably has been transmitted via intrauterine route. The baby improved and was finally discharged. These findings have important public implications both due to the severity of disease presentation, and the concern for vertical transmission. The awareness about neonatal and maternal COVID-19 status provides opportunities to implement infection prevention and control measures. Cases missed through lack of clinical suspicion or under-testing may facilitate the transmission of SARS-CoV-2 infection because asymptomatic infected neonates may serve as reservoirs of infection. A large cohort of such case report and series may help in developing or changing recommendations of mode of delivery of COVID-19 positive pregnant women. It also suggests that in the current scenario of pandemic, early respiratory deterioration in a full term newborn, intrauterine SARS COVID-19 pneumonia should also be a differential diagnosis in the mind of paediatricians.

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