

Vertical Transmission of Coronavirus Disease 2019: A Case Report

Kamran Dehghan^{1*}, Sakineh Aghazadeh²

1. Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran

2. Health Information Management, Urmia University of Medical Sciences, Urmia, Iran

ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) is an emerging viral disease with a high rate of transmissibility that has spread and become the first pandemic of the century. There are limited data available regarding COVID-19 during pregnancy. An important question is whether pregnant mothers transmit the virus to their fetuses or newborns.

Case report: This study was conducted to investigate the vertical transmission of the COVID-19 virus from pregnant mothers to fetuses. This study reported the case of a preterm newborn admitted to the neonatal intensive care unit of Imam Khomeini Hospital Urmia, Iran, from a COVID-19-positive mother with severe respiratory illness. A preterm female newborn with a gestational age of 34 weeks, 1,800 g weight, and 1-minute and 5-minute Apgar scores of 4 and 5, respectively, was born through the emergency cesarean section from a 39-year-old gravid 1 mother. She was positive for COVID-19, in two consecutive reverse transcription polymerase chain reaction tests which were performed 48 h apart from each other.

Conclusion: According to the limited available documents of our case, the researchers claimed that vertical transmission of COVID-19 was possible at this time.

Keywords: Case report, COVID-19, Neonate, Vertical transmission

Introduction

Coronavirus disease 2019 (COVID-19) is an emerging viral disease with a high transmissibility rate that has spread and become the first pandemic of the century. The newly emerged COVID-19, which appears to be originated from Wuhan, the capital city of Hubei province in central China, is spreading rapidly nationwide from December 8, 2019 (1). This issue has caused a great concern in the community, particularly when numerous infected people, who can spread the infection to others, are asymptomatic or have mild symptoms. Although limited data are available about COVID-19 during pregnancy, information on illnesses associated with other highly pathogenic coronaviruses (i.e., severe acute respiratory syndrome and the Middle East respiratory syndrome) might provide insights into the effects of COVID-19 during pregnancy (2, 3). Coronavirus causes illnesses ranging in severity from the common cold to severe respiratory

illness and death (1, 3, 4). As little is known about maternal, fetal, and neonatal complications since its inception, controlling the disease and preventing pregnant mothers from developing COVID-19 infection and its vertical transmission to their newborns have become a major concern. Pregnancy creates physiological conditions that predispose a person to viral diseases (4, 5). The important questions in this pandemic are whether pregnant mothers show more symptoms and whether their fetuses or newborns are affected by the disease. Most importantly, it is unknown whether the mortality rate of pregnant mothers due to this disease is different from that of non-pregnant mothers. The infected individuals are similar to normal ones in society and there is no evidence that pregnancy causes an increase in Covid-19 infection (5, 6).

This study reported a preterm newborn who was admitted to the neonatal intensive care unit

* Corresponding author: Kamran Dehghan, Faculty of Medicine, Urmia University of Medical Sciences, Urmia, Iran. Tel: 09144468267; Email: k.dehghannnn1@gmail.com

Please cite this paper as:

Dehghan K, Aghazadeh S. Vertical Transmission of Coronavirus Disease 2019: A Case Report. Iranian Journal of Neonatology. 2021 Jul; 12(3). DOI: [10.22038/ijn.2021.50271.1878](https://doi.org/10.22038/ijn.2021.50271.1878)

(NICU) of Shahid Motahari Hospital, Urmia, Iran. This study aimed to investigate the vertical transmission of the COVID-19 virus from pregnant mothers to fetuses. After the deterioration of the mother's respiratory condition, the neonate was born through an emergency cesarean section from a 39-year-old COVID-19-positive mother. The first throat/nasopharyngeal swab for reverse transcription polymerase chain reaction (RT-PCR), which was taken at 2 h of her life, was positive for COVID-19. The second swab was also positive at 48 h of life. After respiratory care, she was discharged in good condition, with no specific treatments for COVID-19 after 3 days. Based on the limited available documents of our case, vertical transmission of COVID-19 was possible at this time.

Case report

A preterm female newborn with the gestational age of 34 weeks, 1,800 g weight, and 1-minute and 5-minute Apgar scores of 4 and 5, respectively, was born through the emergency cesarean section from a 39-year-old gravida 1 mother. The mother was admitted to the ICU of Imam Khomeini Hospital, Urmia, Iran, because of severe respiratory illness, which was started one week before. She tested positive for COVID-19 using RT-PCR (Power Check™ 2019-nCoV Real-time PCR kit) performed in the Laboratory of Cellular and Molecular Medicine Institute, Urmia University of Medical Sciences, Urmia, Iran, approved by the Ministry of Health. Since the neonate was premature and had respiratory distress, she was transferred to the NICU of Motahari Hospital, Urmia, West Azarbaijan, Iran, to get medical care. She was bathed and isolated from other neonates since she was suspicious of being infected with COVID-19. She had respiratory distress and her respiratory distress syndrome score was obtained at 6 according to Downes' scoring system (7). The patient's characteristics, physical examination, and vital signs are presented in Table 1.

The researchers started ampicillin and gentamicin and performed serology and blood culture tests because of suspected neonatal sepsis. The subject received a nasal continuous positive airway pressure (NCPAP) of 5 cm H₂O with FiO₂ of 40%. The medical team decided to



Figure 1. The CXR of the patient at 8 h of her life. The lungs are well aerated without any pathology

administer surfactant with the INTubation-SURfactant-Extubation (INSURE) procedure. The first throat/nasopharyngeal swab for the RT-PCR test was taken during the intubation of the trachea for surfactant administration at 2 h of her life. Just 6 h after INSURE, the researchers took the patient's first chest X-ray at 8 h of her life. The lungs were well aerated and there was no pathology on the chest x-ray (CXR) (Figure 1).

After 2 days, the respiratory distress decreased and NCPAP was discontinued afterward. The laboratory test results were normal and the blood culture was negative for any organism (Table 2). Nevertheless, a positive result was also obtained through a second RT-PCR test performed at 48 h of the infant's life. On day 3, the researchers started feeding the subject with a formula. The researchers did not start any specific treatment for COVID-19. The neonate was fully fed, did not need oxygen supplement, was late preterm, her CXR was good, and recovered rapidly; therefore, the researchers considered early discharge and close patient follow-up. She was then discharged home on day 4 of her life. The researchers did not perform any other PCR test to reach a negative result since they knew that it would take at least 2 weeks to reach a negative PCR test after recovery from the disease. However, the researchers recommended her family isolate the patient from the mother and the other caregivers to reduce the risk of virus transmission to other members of the family. On follow-up visits, the neonate was well without any sign of COVID-19.

Table 1. Patient's characteristics

Variable	Result
Gestational age	34 weeks
Gender	Female
Birth weight	1,800 g
Mode of delivery	Cesarean section
Apgar scores	4-5

Table 2. Patient's vital signs

Variable	Result
Temperature	36.8°C
Heart rate	145/min
Respiratory rate	68/min
Oxygen saturation	92%

Table 3. Laboratory tests results

Variable	Result
Hemoglobin	14.7
White blood cells	12,400
Neutrophils (%)	32%
Lymphocytes (%)	60%
Platelets (x 103/ μ L)	202,000
CRP	Negative
CPK	196
LDH	579
RT-PCR (COVID-19)	Positive
Blood culture	Negative

CRP: C-reactive protein, CPK: Creatine phosphokinase, LDH: Lactate dehydrogenase, RT-PCR: Reverse transcription polymerase chain reaction

Discussion

From the emergence of the COVID-19 pandemic, the possibility of vertical transmission (transplacental) has been a matter of research (7). Vertical transmission is one of the most serious effects of viral diseases, which occurs during maternal viral infection in pregnancy. Since the virus is present in the bloodstream and reaches the placenta, it is hematogenous (8). The best strategy to prevent perinatal transmission of COVID-19 is to bathe the newborn as soon as he/she is stabilized after birth to clear the secretions of amniotic fluid and maternal blood (9). To confirm the congenital COVID-19 infection, it is generally suggested to perform PCR on the amniotic fluid before the membranes rupture. The first PCR test for the neonate is suggested to be performed at 12-24 h of life since the colonization of the virus on the throat or nasopharynx of the newborn may bring about the falsely positive test (7, 9). In our case, the researchers took the swab at 2 h of life from the opening of the trachea during the intubation for surfactant administration (INSURE). The result of the PCR test was positive. To rule out the probable colonization, the second throat/nasopharynx swab taken at 48 h of life was also positive. Accordingly, the researchers reported the first case of vertical transmission of COVID-19 at late pregnancy. Recently, the results of some studies have reported the vertical transmission of COVID-19 with no adverse outcomes for the fetus or newborn; however, some of them were based on clinical diagnosis and could not detect COVID-19 by PCR in newborns or report special antibodies (10, 11). Furthermore, some researchers detected COVID-19 in the newborn's blood; nevertheless, it was not determined whether the route of transmission was placenta, blood, or amniotic fluid (12, 13). According to the World Health Organization, if COVID-19 is detected in amniotic

fluid before the rupturing of membranes or in the newborn blood at the first days of life, it is classified as a congenital infection (14).

Our case was classified as congenital COVID-19; nonetheless, other reported cases might be or even were not classified as congenital infections. In our case, the PCR test of the opening of the trachea swab was positive at 2 h of birth and the second test of throat/nasopharyngeal was also positive at 48 h of life, which was a confirmatory test. The researchers assumed that the first PCR test might have become positive due to the contamination of the infant with maternal secretions during delivery. It is recommended to perform the first PCR test after bathing the newborn, at least 12 h of delivery. However, in the current case, the second test was also positive, which was conducted at 48 h of life. The second confirmatory test ruled out the probability of contamination and even colonization in the throat/nasopharynx of the neonate with infection. In this respect, the researchers of the present study claimed that this case was congenital COVID-19.

There were conflicting results of 70 investigated cases reported in various studies. According to oropharyngeal or nasopharyngeal swabs taken in the first few hours or days of life, a total of 65 newborns (i.e., 92.9% of cases) from 7 independent studies were negative for a transplacental infection (1, 6, 15-17). Accordingly, early-onset infection was detected in 4 patients (i.e., 5.7% of cases) on the second day of life, for which vertical transmission could not be excluded (12-17). Finally, as reported by Wang et al., one patient had a negative throat swab, however, positive Immunoglobulin M (IgM) and Immunoglobulin G count, and was considered possibly infected in utero (17). On the other hand, Dong et al. reported the case of a neonate (born to a mother with COVID-19) who had elevated antibody levels and abnormal cytokine test results 2 h after birth. The elevated IgM antibody level suggested that the neonate was infected in utero since IgM antibodies were not transferred to the fetus via the placenta (11). The hypothesis of possible transplacental transmission, in this case, was based on a strong scientific rationale, which was the well-known mechanisms of permeability of the placental barrier to different classes of antibodies and the use of IgM as the markers of the recent immune response to a specific pathogen. Wang et al. studied a newborn born from a mother infected with COVID-19 and detected that the transmission from mother to

fetus could not be ruled out using positive throat swab samples taken 36 h after birth (12). The researchers did not check the antibodies as markers of infection, since they lacked the kits of antibody tests. Nevertheless, the researchers of the present study performed an RT-PCR test which was the gold standard for COVID-19 detection. According to limited available documents of our case, vertical transmission of COVID-19 was possible at this time.

Conclusion

Based on the obtained results, the researchers concluded that the current case was classified as congenital COVID-19. Accordingly, the researchers reported the first case of vertical transmission of COVID-19 at late pregnancy.

Acknowledgments

The authors get permission to publish their case report from the Ethical Committee of Urmia University of Medical Sciences (IR.UMSU.REC.1399.169). The authors would like to express their sincere acknowledgments to all participants in the study.

Conflicts of interest

The authors declare no conflict of interest regarding the publication of the present article.

References

- Zhu H, Wang L, Fang C, Peng S, Zhang L, Chang G, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. *Transl Pediatr.* 2020; 9(1):51-60.
- Paules CI, Marston HD, Fauci AS. Coronavirus infections-more than just the common cold. *JAMA.* 2020; 323(8):707-8.
- Xu J, Zhao S, Teng T, Abdalla AE, Zhu W, Xie L, et al. Systematic comparison of two animal-to-human transmitted human coronaviruses: SARS-CoV-2 and SARS-CoV. *Viruses.* 2020; 12(2):244.
- Rasmussen SA, Smulian JC, Lednický JA, Wen TS, Jamieson DJ. Coronavirus disease 2019 (COVID-19) and pregnancy: what obstetricians need to know. *Am J Obstet Gynecol.* 2020; 222(5):415-26.
- Qiao J. What are the risks of COVID-19 infection in pregnant women? *Lancet.* 2020; 395(10226):760-2.
- Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet.* 2020; 395(10226):809-15.
- Schwartz DA, Graham AL. Potential maternal and infant outcomes from (Wuhan) coronavirus 2019-nCoV infecting pregnant women: lessons from SARS, MERS, and other human coronavirus infections. *Viruses.* 2020; 12(2):194.
- Schwartz DA. COVID-19, SARS-CoV-2 and pregnancy: does the past predict the present. *Contagion Live.* Available at: URL: <https://www.contagionlive.com/view/covid19-sarscov2-and-pregnancy-does-the-past-predict-the-present>; 2020.
- Fornari F. Vertical transmission of Covid-19-a systematic review. *J Pediatr Perinatol Child Health.* 2020; 4(2):7-13.
- Zeng H, Xu C, Fan J, Tang Y, Deng Q, Zhang W, et al. Antibodies in infants born to mothers with COVID-19 pneumonia. *JAMA.* 2020; 323(18):1848-9.
- Dong L, Tian J, He S, Zhu C, Wang J, Liu C, et al. Possible vertical transmission of SARS-CoV-2 from an infected mother to her newborn. *JAMA.* 2020; 323(18):1846-8.
- Zeng L, Xia S, Yuan W, Yan K, Xiao F, Shao J, et al. Neonatal early-onset infection with SARS-CoV-2 in 33 neonates born to mothers with COVID-19 in Wuhan, China. *JAMA Pediatr.* 2020; 174(7):722-5.
- Yu N, Li W, Kang Q, Xiong Z, Wang S, Lin X, et al. Clinical features and obstetric and neonatal outcomes of pregnant patients with COVID-19 in Wuhan, China: a retrospective, single-center, descriptive study. *Lancet Infect Dis.* 2020; 20(5):559-64.
- Shah PS, Diambomba Y, Acharya G, Morris SK, Bitnun A. Classification system and case definition for SARS-CoV-2 infection in pregnant women, fetuses, and neonates. *Acta Obstet Gynecol Scand.* 2020; 99(5):565-8.
- Liu W, Wang Q, Zhang Q, Chen L, Chen J, Zhang B, et al. Coronavirus disease 2019 (COVID-19) during pregnancy: a case series. *Preprints.* 2020; 2020:20373.
- Zhang L, Jiang Y, Wei M, Cheng BH, Zhou XC, Li J, et al. Analysis of the pregnancy outcomes in pregnant women with COVID-19 in Hubei Province. *Zhonghua Fu Chan Ke Za Zhi.* 2020; 55(3):166-71.
- Wang S, Guo L, Chen L, Liu W, Cao Y, Zhang J, et al. A case report of neonatal COVID-19 infection in China. *Clin Infect Dis.* 2020; 71(15):853-7.