

# Maternal and perinatal outcomes of vaginal delivery of pregnant women with COVID-19 in Wuhan

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## Abstract

**Background:** Most of the pregnant women with 2019 novel coronavirus pneumonia are terminated by cesarean section because the risk of mother-to-child transmission is not yet clear. The aim of this study was to evaluate maternal and perinatal outcomes of vaginal delivery of pregnant women with COVID-19 infection. **Design:** 8 pregnant women who were suspected or confirmed with COVID-19 infection between 31 January and 20 April, 2020, gave birth vaginally in Wuhan Union hospital were included. Clinical manifestations, laboratory test results, chest CT scans and maternal and perinatal outcomes were recorded. Evidence of perinatal infection of virus was assessed by using SARS-COV-2 associated coronavirus reverse-transcriptase polymerase chain reaction in neonatal throat and anal swab samples. **Results:** None of the 8 pregnant women experienced dystocia and severe postpartum complications, 8 livebirths were recorded, no fetal distress or asphyxia was observed. No newborn infant had clinical COVID-19 and all investigations were negative for SARS-COV-2. **Conclusions:** Our study showed that vaginal delivery does not increase the probability of mother-to-child transmission of SARS-COV-2, maternal and neonatal outcomes were not affected. We suggest that pregnant women with COVID-19 pneumonia without severe systemic complications and respiratory failure can be considered for vaginal delivery.

## Introduction

Since the outbreak of the novel coronavirus pneumonia (COVID-19) in Wuhan in December 2019<sup>[1]</sup>, the epidemic has spread rapidly throughout the world, especially in Europe and North America. There have been almost 90 million cases worldwide<sup>[2]</sup>. It was declared to be a pandemic and one of the most important public health issues worldwide. Till now, there are many studies on the epidemiology, clinical characteristics and treatment of novel coronavirus pneumonia<sup>[3-4]</sup>, and the novel virus that caused the pneumonia was named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)<sup>[5]</sup>. Studies about pregnant women with COVID-19 were limited, and vaginal delivery in such patients was not reported so far. We admitted 30 pregnant women in Union Hospital (Wuhan, China) between 31 January to 20 April 2020, eight of them delivered vaginally. This study retrospectively analyzed the clinical features and maternal and fetal outcomes of these 8 patients, with the aim of discussing the indications of vaginal delivery and whether vaginal delivery increases the probability of mother to child transmission of SARS-COV-2.

## Materials and methods

Between 31 January to 20 April 2020, 8 pregnant women had experienced vaginal delivery in Union Hospital affiliated hospital of Tongji Medical College, Huazhong University of Science and Technology (Wuhan, China). These patients fulfilled the diagnosis criteria for COVID-19 pneumonia according to New Coronavirus Pneumonia Prevention and Control Program (7th edition) which was published by the National

Health Commission of China<sup>[6]</sup>. All the eight patients didn't have contraindications for vaginal delivery. In accordance with patients' wishes, all of them delivered in a negative pressure operating room after fully communications with patients about the advantages and disadvantages of vaginal delivery and cesarean section.

The clinical data including basic information, duration of labor, whether there was an episiotomy or poor healing of episiotomy, postpartum hemorrhage, clinical classification of pneumonia, lung CT images and laboratory data were collected. All eight pregnant women with COVID-19 pneumonia tested SARS-CoV-2 by using quantitative RT-PCR (qRT-PCR) on samples from the respiratory tract. Pregnant women who were admitted after March venous blood was collected and tested for antibodies IgM/G by Enzyme linked immunosorbent assay. When the cervix dilatation reached 4cm, pregnant women were sent to negative pressure rooms for delivery. Pregnant women were advised to wear surgical mask all the time, and newborns were prevented from touching their mothers.

The neonatal outcomes were recorded. Neonatal throat secretions and anal swabs were taken immediately after birth to test SARS-COV-2 by using quantitative RT-PCR (qRT-PCR), and then the newborns were sent to the isolation ward. Two newborns were taken home instead of isolation ward because their mothers' SARS-COV-2 PCR results came negative. We followed up the mothers and babies for one month after delivery. Followed up information included the maternal vaginal bleeding, clinical symptoms of COVID-19 pneumonia such as fever, diarrhea and so on. We also recorded the hospital stay of neonates, neonatal complications and weight of the neonates after a month.

### Statistical analysis

Statistical analysis was performed with SPSS, version 20.0. Categorical variables were presented as numbers and percentages. Continuous variables were presented as mean and standard deviation.

### Results

Eight of the pregnant women aged at 25-31years, all of them were at the third trimester, two of them were multipara, six of them were primipara. The time from onset to delivery were 2-8 days. Case 3 complicated with mild anemia and thrombocytopenia, the platelet count was 90G/L, case 8 complicated with premature rupture of membranes, case 2 and case 5 complicated with mild anemia(table 1). Three of the eight pregnant women had pneumonia related symptoms, case 1 had dry cough, case 5 had intermittent fever and general weakness on the third day before delivery, the maximum body temperature was 38 degrees, the body temperature was normal at the time of delivery, case 6 had fever and dry cough from a week before delivery, the maximum body temperature was 39 degrees, and she was still febrile at the time of delivery. The oxygen saturation of all eight prenatal pregnant women was higher than 93% in resting state, no one had shortness of breath. According to the 7th edition of New Coronavirus Pneumonia Prevention and Control Program<sup>[6]</sup>, there was no pneumonia changes on lung CT in case 3,7,8, they were mild cases, the rest five cases were normal cases(table 1). Case 6 had a maximum body temperature to 40 degree, with severe cough, needed high flow rate of oxygen to maintain oxygen saturation, and the lowest oxygen saturation was 90% at rest. Her pneumonia aggravated after childbirth and became a severe case. Four days after delivery, her pneumonia gradually started to improve, body temperature and cough were getting relieved, oxygen saturation turned normal at rest. Pneumonia in the rest seven puerperants was not getting worse after childbirth. In laboratory examination, there were 6 cases(case1,2,4,5,6,7) of lymphocytopenia and 2 cases(case5,6) of leukocytopenia. Pregnant women who were hospitalized before March 2020 were not able to carry out the detection of SARS-COV-2 IgM/G when they were in hospital,case 3, case 7 and case 8 were positive for SARS-COV-2 IgM/G(table 1).

In all eight cases labor progressed smoothly. Postpartum hemorrhage was defined as a cumulative blood loss of greater than or equal to 1,000 mL or blood loss accompanied by signs or symptoms of hypovolemia within 24 hours after the birth process<sup>[7]</sup>. The amount of bleeding was evaluated by weighing method and comparison of hemoglobin before and after delivery<sup>[8]</sup>. No postpartum hemorrhage occurred(table 2). In order to deliver the fetuses as soon as possible to reduce the risk of mother to child transmission of

the SARS-COV-2, perineum lateral resection was performed in all the patients except the multipara in the second stage of labor.

Case 6 experienced wound healing complication, the incision of perineum was split after the suture was removed, and it healed one week later. To other patients with lateral incisions, sutures were removed on the 5th day postnatal, and healed well(table 2). Hospital discharge standards<sup>[6]</sup> included patients with no fever for 3 days or more, no obvious self-conscious symptoms, negative SARS-COV-2 PCR twice in a row, obvious absorption of pulmonary inflammation on CT. The hospital stay of all eight patients were 4-23 days(table 2).

Eight livebirths were recorded, no perinatal death, no low birth weight no fetal distress was observed, case 6 had Amniotic fluid stained with feces. All eight livebirths had a 1-min Apgar score of 8 and a 5-min Apgar score of 9 (table 3). Throat swabs and anal swabs of all the newborns were negative for the presence of SARS-CoV-2. Six of the newborns were sent to neonatology department for medical observation, the length of stay were 3-15days. Newborn 5 and newborn 6 had pneumonia during hospitalization(table 3).

Seven of the family accepted follow-up after a month since they gave birth, case 3 accepted follow-up on call only. No maternal and newborn deaths were recorded, case 6 reported to have dry cough occasionally, no abnormal or vaginal bleedings were reported(table 4,5). Detection of SARS-CoV-2 nucleic acid in throat swabs of all the seven parturient women were negative. SARS-COV-2 IgM/G was positive in the venous blood of case 5 and case 6. Case 7 and case 8 had positive results of SARS-COV-2 IgG , the other five were negative(table 4). All the eight infants were gaining weight and no infant was hospitalized again. All the seven infants' throat swabs and anal swabs were negative for SARS-COV-2 nucleic acid detection, and SARS-COV-2 IgM/G were all negative in venous blood.

## Discussion

COVID-19 is not yet under control globally, with the spread of 2019-ncov, the number of pregnant women with COVID-19 also increased. As for the choice of delivery mode, expert's consensus<sup>[9]</sup> showed that COVID-19 pneumonia couldn't not be used as an indication for cesarean section, but in fact, most of the pregnant women with COVID-19 terminated pregnancy by cesarean section in fear of additional risk of mother to child transmissions<sup>[10-11]</sup>. Therefore, there were few studies on vaginal delivery in pregnancy women with COVID-19. It is uncertain whether SARS-COV-2 is transmitted by mother-to-child transmission during delivery.

Several studies<sup>[11-14]</sup> had suggested that there is a possibility of vertical transmission of SARS-COV-2, while the newborns who were reported to have positive viral nuclear acid detection were all delivered by cesarean section. The antibodies IgM /IgG of SARS-COV-2 were positive while the nucleic acid was negative in these newborns. In this study, no definite evidence of SARS-COV-2 infection was found in neonates who were delivered vaginally. Neonate 5 and neonate 6 experienced pneumonia after birth, which may be related to the fever of their mothers before delivery, in addition, case 6 had meconium stained amniotic fluid, which also increased the probability of neonatal pneumonia and infection<sup>[15]</sup>. Follow up results showed that no serious complications had occurred in the newborns, the antibody IgM /IgG and nuclear acid detection of SARS-COV-2 were negative in seven neonates under follow up. In our patients,no SARS-CoV-2 transmission occurred. But it is important to note that all the pregnant women in this study had a short course of COVID-19 pneumonia (2-8 days) before birth, and it was possible that the virus had not yet affected the fetus. However, what was clear was that vaginal delivery does not increase the probability of SARS-COV-2 mother-to-child transmission under strict protective measures (delivered in a negative pressure operating room, pregnant women always wearing mask, avoiding contacting between the newborns and their mother).

A case report<sup>[13]</sup> showed that the SARS-COV-2 antibodies IgM and IgG of a newborn delivered by a pregnant woman at 34 weeks with COVID-19 were positive. SARS-COV-2 nucleic acid test for mother's throat swabs were positive, while the nucleic acid test for vaginal secretions was negative. Another study<sup>[16]</sup>included 35 females showed that no positive SARS-COV-2 RT-PCR result was found in the vaginal environment perhaps due to the lack of the receptor of SARS-CoV-2 in the vagina and cervix tissues. It suggests that it would

not increase the risk of mother-child transmission when the fetus passed through the mother's birth canal. Therefore, we believe that there was no relationship between mother-child transmission and mode of delivery.

In this study, case 6's pneumonia worsened after childbirth, reviewing the clinical features of the pregnant woman, we found that she had got a high fever for a long period that continued to birth before delivery. The results of laboratory examination indicated that her inflammatory markers, C-reactive protein (CRP) and Procalcitonin (PCT), increased progressively, it suggested that she may be in the acute stage of viral infection. During labor, maternal breathing pattern was affected by labor pain, in the second stage of labor, the need to hold their breath to force the baby out, caused maternal oxygen consumption to increased. Infection of SARS-CoV-2 mainly attacked body respiratory system, the progressive exacerbation of lung lesions might lead to respiratory distress especially in labor, and the fetus might experience fetal distress or even fetal death. In this case, there was no maternal respiratory distress or fetal distress during delivery, however the patient who had a long term of high fever, oxygen saturation decreased, and healing of the perineal incision was poor. Therefore, we suggest that only after careful consideration we may decide to choose vaginal delivery as a preferred mode of delivery to women who are in acute inflammatory progress of COVID-19 pneumonia.

We suggest that pregnant women with SARS-COV-2 infection who do not have respiratory failure or multi-functional organ dysfunction, and also, when they are in a stable stage of pneumonia should be considered for vaginal delivery if there is contraindications for vaginal delivery trial and if the patient has an intention of vaginal delivery. However, it should be noted that vaginal delivery should be carried out in the negative pressure delivery room, and the medical staff and pregnant women should be strictly protected, at the same time, newborns should be avoided to have direct contact with their mothers.

The limitations of this study lie in the few patients and the limited follow-up time. Long-term follow-up is needed to observe whether there are long-term maternal and neonatal complications.

### **Disclosure of interests**

We declare no competing interests.

### **Contribution to authorship**

MW, HC and GQX conceived the study. WM drafted the manuscript and contributed to data acquisition, analysis, and interpretation. HC and GQX obtaining written consent from patients, obtaining ethical approval, and participated in revising the final manuscript. XZZ, JWZ and LC were the obstetricians of the pregnant women, and took responsibility for collecting samples, and confirming data accuracy. LX, DJY, QMZ and QQT were in charge of following up the mothers and the babies and collecting the followed-up materials. QQL and HAK were in charge of the laboratory tasks, including sample processing and detection.

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### **Details of ethics approval**

The study was approved by the Ethics Committee of the Union hospital, Tongji Medical College, Huazhong University of Science and Technology (date of approval: 20 February 2020 and approval number: 2020(0047). All the pregnant women provided written informed consent.

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## Tables

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