Pulmonary fibrosis following infection with SARS-CoV-2 in a pregnant woman: case report

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Case Report

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Abstract

Introduction: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the third coronavirus that make a global concern in 21th century. Pregnant women are particularly at higher risk of developing severe viral pneumonia, possibly because of a partial immune suppression during their pregnancy. Under such critical and rapidly evolving circumstances, these poor findings might be helpful for the treatment of infected pregnant women with 2019-nCoV.

Case presentation: In this study, we have reported a pregnant woman at 25 gestational weeks with COVID-19 who has developed severe complications, including hypoxemia, acute respiratory distress syndrome (ARDS), pulmonary fibrosis, and bilateral pleural effusion. In the end, she died one month after admission to the hospital.

Conclusion: Pregnant population are especially more at risk of viral pneumonia caused by coronaviruses, further research on the prevention and treatment of new coronavirus is necessary.

Introduction

Acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the novel coronavirus that was first discovered in the Chinese city Wuhan in December 2019.(1). The outbreak of the 2019 nCoV was declared a global pandemic by world health organization (WHO) on 11 March 2020. Up to date, there have been approximately five million confirmed cases, resulting in thousands of deaths worldwide (2). The severity of symptoms ranges from mild symptoms to severe illness. The most frequent symptoms include cough, pharyngitis, fever, myalgia, chills, and dyspnea (3).

Severe dyspnea is caused by the progression of lung lesions in multiple lung lobes, and in some cases in advanced stages, white lung syndrome is observed. Lung lesions are manifested as airspace opacities on plain chest radiography, or ground-glass opacities or consolidation on chest radiography images, usually with a rounded morphology and a peripheral lung distribution, which is a diagnostic method for the COVID-19 (4-6). Pregnant women are particularly at higher risk of developing severe viral pneumonia, possibly because of a partial immune suppression during their pregnancy (7). Pneumonia was reported as the third most common cause of mortality among pregnant women (8). Previous data on the Middle East respiratory syndrome (MERS) and the severe acute respiratory syndrome (SARS) suggest that adverse pregnancy outcomes may occur due to infection (9). According to the some studies, COVID-19 disease in pregnant population can cause premature delivery and intrauterine growth restriction (6).

The effect of COVID-19 disease on pregnancy outcomes is not clear yet, besides, there has been no consensus on maternal-fetal transmission of 2019-nCoV to date. Also, it has not been well-understood whether preterm delivery ameliorates the symptoms of a critically ill mother. In this case report, we present a 33 years old pregnant woman who infected with SARS-CoV-2 in the late second trimester of pregnancy. Under such critical and rapidly evolving circumstances, these poor findings might be helpful for the treatment of the pregnant women who infected with 2019-nCoV in Iran and elsewhere.

Case Presentation

A 33-year-old pregnant woman para 2, gravida 3, gestational age of 25 weeks, had been hospitalized with fever, chills, shortness of breath, and myalgia about a week earlier. She has delivered her first baby by vaginal delivery five years ago and her second by cesarean section two years ago. The patient had no underlying diseases and did not have direct contact with COVID-19 cases. Vital signs of the patient were recorded at reference as follows: Respiratory Rate (RR): 26 breaths/min, Blood pressure (BP): 110 /70 mm Hg, Temperature (T): 39.5 °c, Heart Rate (HR): 110 beats/min and oxygen saturation (SpO₂): 94%. The laboratory results showed that lymphocyte count were lower than normal (lymphocyte count: $1 \times 10^9/L$) and platelet count, hepatic enzymes and creatinine level were within the normal range while, C-reactive protein levels (CRP) were significantly increased. Coagulation function and blood biochemistry were normal (Table1). A GeneXpert COVID-19 RNA polymerase chain reaction test was performed and the result turned positive. Bilateral involvement was detected in chest CT image. The day after the hospitalization day, the patient was transferred to the intensive care unit (ICU) due to the shortness of breath (RR: 32) and low oxygen saturation (SpO₂: 88%). CT-chest on the second day of hospitalization revealed an exacerbation of pulmonary involvement. The patient was intubated one week after hospitalization due to a reduction in the saturation of oxygen to 80% and exacerbation of respiratory distress. CT-chest on day eight of hospitalization showed extensive bilateral diffuse infiltrates and pulmonary fibrosis (Fig. 1). From the beginning of hospitalization, despite the use of broad-spectrum antibiotic coverage, the patient's fever was intermittent.

One week after transferring to the ICU and due to the patient's deteriorating condition, plasmapheresis was performed twice with 10 units of fresh frozen plasma (FFP) for the patient, which did not improve her condition. Also, due to a decrease in hemoglobin (HB: 8.1), two units of packed cells were transfused twice. Three weeks after hospitalization, ultrasounds were performed several time to assess fetal growth and a sharp decrease in the amniotic fluid (amniotic fluid index: 2.5cm) and fetal growth retardation were observed. In order to rule out the possibility of a preterm ruptured membrane, amniure test was performed twice, which turned negative both times. Due to the condition of the fetus and the exacerbation of the patient's respiratory condition, it was decided in the committee constitutes of specialists in the special care and departments of lung and perinatology that the pregnancy should be terminated to improve the patient's respiratory condition. Therefore, in order to cervical ripening, the intracervical foley catheter was placed and extra-amniotic saline infusion was performed. After receiving three doses of vaginal misoprostol at doses of 50,100 and 200 micrograms every 6 hours, 600 g baby was born with a 1-minute Apgar score of 2 and a 5-minute Apgar score of 4. The newborn was intubated and transferred to the NICU and died after 12 hours.

One week after the termination of pregnancy, due to the observation of bilateral pleural effusion in the CT-chest, a chest tube was installed on both sides. Since no improvement in lung condition was observed and complete destruction of lung tissue was detected, the patient died one month after hospitalization, unfortunately.

Table 1. laboratory characteristics by the day of hospitalization

	Day1	Day4	Day8	Day12	Day16	Day20	Day24	Day28
White blood cell count ×10 ⁹ /L	10.1	9.2	8.1	7.3	9.0	8.3	15.2	20.5
Lymphocyte count×10 ⁹ /L	1.0	1.0	1.0	0.8	0.8	0.5	0.7	0.5
Hemoglobin,g/L	12.8	11	8.8	9.6	9.4	8.3	11	10.5
Platelet count×10 ⁹ /L	310	345	250	210	158	140	144	126
C-reactive protein,mg/L	79	50						
Alanine aminotransferase U/L	15		24		28			35
Aspartate aminotransferase U/L	25		30		30			32
Creatinine,mmol/L	0.6	0.8	0.9	1	1	1.1	1.5	1.5
VBG								
PH,	7.39	7.46	7.41	7.49	7.39	7.42	7.19	
P02,mm Hg	59.5	42	40	35.7	74.9	38	43.7	
PCO2, mm Hg	74.6	41.8	42.3	46.7	48	43.4	68.8	
HCO3,mEq/L	45.1	30.1	30.5	31.5	29.5	28.2	26.2	
BE,mmol/L	17.5	6.7	8.1	12.5	4.6	3.1	43.4	
O2 Sat, %	90.4	80.5	82	80	94.9	72.8%	65.4	

Discussion And Conclusion

In this study, we have reported a pregnant woman at 25 gestational weeks with COVID-19 who has developed severe complications, including hypoxemia, acute respiratory distress syndrome (ARDS), pulmonary fibrosis, and bilateral pleural effusion. In the end, she died one month after admission to the hospital. Lessons learned from the previous viral outbreaks have proven the negative impacts of viral infection on maternal, neonatal and fetal outcomes. For example, the total mortality rate of 1918 influenza was 2.6%, while it was 37% among pregnant women. It was shown that MERS or SARS infection during pregnancy correlated with a higher incidence of severe maternal and fetal complications, such as admission to the ICU, preterm delivery, maternal and fetal mortality, and intrauterine growth restriction (10). According to the Nan Yu and associates study, the pregnancy outcomes of infected

pregnant women with SARS-CoV-2 is considerably better than pregnant women who infected with SARS (11).

As previously discussed, pregnant women are especially susceptible to adverse complications from other types of viral pneumonia. but, there is limited data about difference between clinical features of pregnant women and non-pregnant women who infected with SARS-Cov-2 as yet. Chen et al. have suggested that the clinical signs and symptoms of pregnant women with COVID-19 were similar to non-pregnant women who infected with SARS-CoV-2. Also, in a large case series in the Hubei province in China, the incidence of severe pneumonia in pregnant population was the same to the general population (12).

Consistent with previous studies on general population who infected with 2019-nCoV, our patient presented with fever, chills, dyspnea, and myalgia. It is confirmed that the COVID-19 infection is associated with a decrease in lymphocytes, as observed in our study (13). Many studies have reported that adverse outcomes and mortality are more likely to occur in patients with underlying medical conditions, whereas, the present case did not have any underlying medical condition. What is not clear yet is whether convalescent plasma with specific antibodies against SARS-CoV-2 that is collected from recovered patients from COVID-19 can improve the survival of critically ill patients. However, the plasma therapy has been not yet approved for use by United States Food and Drug Administration, and numerous clinical trials are working on it (14). In our study, the administration of convalescent plasma did not improve the clinical status of the patient, similar to the study of Niveditha that has demonstrated that convalescent plasma has few or no clinical benefit for the treatment of COVID-19 (15). Karuna and colleagues have proven that the presence of bilateral pleural effusion among patients infected with MERS indicates a poor prognosis such as death. Maternal complications were also in line with previous reports, which have found that pregnant women with severe or critical COVID-19 have a higher chance of developing respiratory failure, using mechanical ventilation, and maternal death, as well as fetal complications including preterm birth, intrauterine growth restriction and intrauterine fetal death (16-20). On the contrary, Zaigham et al. have conducted a systematic review and surprisingly, have suggested a lower rate of admission to the ICU, no maternal deaths, and only one neonatal death and one intrauterine fetal death (21).

The limitation of our study was that the real-time polymerase chain reaction test was not taken from the premature infant, so we did not have information about vertical transmission.

In this patient, due to the lack of improvement in respiratory status and progressive course of pulmonary destruction, as well as lack of fetal growth within 3 weeks and decreased immunity, it was decided to terminate the pregnancy in order to improve the respiratory condition. Unfortunately, the mother died.

Since it has been proven in numerous studies that pregnant population are especially more at risk of viral pneumonia caused by coronaviruses, further research on the prevention and treatment of new coronavirus is necessary.

Declarations

Consent for publication

Written informed consent was obtained from the patients for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal

Availability of data and materials

The patient's information and medical records used for the case report are available from the corresponding author upon request.

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Author Contributions

SD and PL conceived the idea. SM collected patient data and described it in the case report with literature review. ZSh, FF, MB, SD and MR had the primary responsibility to the writing of the manuscript. All authors read and approved the final manuscript.

Ethics approval and consent to participate

This study did not include experiments on animals or humans. The patient consented to the use of his personal data for the purpose of this case report.

Competing interests

The authors declare that they have no competing interests.

Abbreviations

COVID 19	2019 coronavirus disease
WHO	World Health Organization
ARDS	Acute Respiratory Distress Syndrome
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
RT-PCR	Real-time polymerase chain reaction
CT	computed tomography
BP	Blood Pressure
HR	Heart Rate
GGO	ground-glass opacity
T	Temperature
RR	Respiratory Rate
CRP	C-reactive protein
ICU	intensive care unit
SpO ₂	oxygen saturation
FFP	fresh frozen plasma
NICU	neonatal intensive care unit
ABG	arterial blood gas
BE	base excess
HB	hemoglobin

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Figures

Figure 1

(A) Axial CT image on day one of hospitalization showed multifocal ground-glass opacities and nodular consolidation in both lungs. (B) Newly-developed opacities and decreasing density of the nodular opacities were detected in follow-up CT on day 2 of hospitalization. (C) Last follow-up CT image on day 8 showed extensive bilateral diffuse infiltrates and deterioration of lung involvement.

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