

# Pregnant Patient with Severe COVID-19 Pneumonia Treated by Intensive Immune Suppression Therapy during the Omicron (B.1.1.529) Variant Outbreak: A Successfully Treated Case

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**Abstract** A 35-year-old pregnant woman (gestational age, 35 weeks) developed general fatigue, headache, and joint pain following the onset fever, cough, and nasal discharge after the outbreak of the Omicron variant in Japan. The patient had obesity (body mass index, 41), depression and gestational diabetes mellitus, which was treated with insulin. On the 8th day after the onset of initial flu-like symptoms, she was admitted to our hospital because polymerase chain reaction for COVID-19 became positive. Initially, her vital signs were stable without any oxygen demand. On day 11, she required oxygen therapy (4 L/min). Chest computed tomography (CT) showed multiple bilateral centrilobular patch consolidations with several subpleural lesions. As she had multiple risk factors for acute respiratory distress syndrome (ARDS), she underwent emergency cesarean section and immune modulation therapy was initiated. After the operation, her oxygenation deteriorated and she underwent tracheal intubation and mechanical ventilation on day 13. After multimodal therapy, her lung function improved and she was extubated on day 16. After rehabilitation and baby care training, she was discharged on day 27 without sequelae. This is the case of a pregnant woman with severe COVID-19 pneumonia who was successfully treated by emergency cesarean section, intensive immune suppression therapy and mechanical ventilation during the Omicron variant outbreak in Japan. The present case suggests that even pregnant women should receive COVID-19 vaccination to avoid the onset of ARDS, a potentially fatal condition.

**Keywords:** COVID-19, omicron variant, steroid pulse, pregnant

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## 1. Introduction

COVID-19 in pregnancy is associated with consistent and substantial increases in severe maternal morbidity and mortality and neonatal complications in comparison to COVID-19 diagnosis were compared. [1] Specifically, women with COVID-19 were found to be at higher risk for preeclampsia/eclampsia, severe infection, intensive care unit admission, maternal mortality, preterm birth, medically indicated preterm birth, severe neonatal morbidity index, and severe perinatal morbidity and mortality index values. [1] In addition to pregnancy, a large number of risk factors for adverse outcomes of COVID-19 have been reported. Patient characteristics that are commonly reported as risk factors for adverse

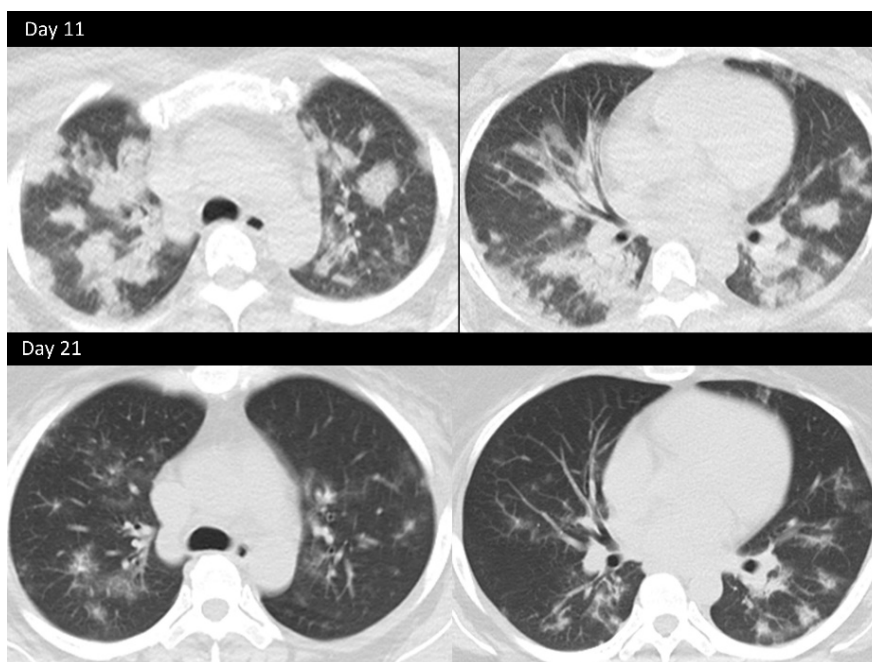
outcomes of COVID-19 include old age, male sex, obesity, diabetes mellitus, cardiovascular disease, hypertension, and active cancer. [2,3]

The earliest known case of Omicron infection in South Africa was diagnosed with COVID-19 on Nov 9, 2021, although it is probable that there were unidentified cases in several countries across the world before then. [4] The Omicron variant has resulted in a significant increase in infections worldwide. While >80% of patients experience mild symptoms, a significant proportion becomes critically ill, including older patients and patients with comorbidities. [5] We were not able to identify any reports about Omicron infection in pregnant women. We herein report the case of a pregnant woman with severe COVID-19 pneumonia treated by emergency Cesarean section, intensive immune suppression therapy and mechanical ventilation during the Omicron variant outbreak in Japan.

## 2. Case Report

A 35-year-old pregnant woman (gestational age, 35 weeks) developed general fatigue, headache, and joint pain following the onset of fever, cough and nasal discharge after the Omicron variant outbreak in Japan. The patient had obesity (body mass index, 41), depression and gestational diabetes mellitus (GDM), which was treated with insulin. Her family history was no specific. On the 8th day after the onset of flu-like symptoms, she admitted to our hospital because a rapid antigen test and polymerase chain reaction for COVID-19 became positive. Initially, her vital signs were stable without any oxygen demand; thus, she only received insulin injections and

underwent body weight control without any drugs for COVID-19. However, on day 11 after the onset of symptoms, her percutaneous saturated oxygen (SPO<sub>2</sub>) was <90% on room air; thus, she received oxygen by nasal cannula (4 L/minute) and our department was consulted. On examination, her consciousness was clear. Her initial vital signs were as follows: blood pressure, 152/104 mmHg; heart rate, 80 beats per minute (BPM); respiratory rate, 20 breaths per minute; body temperature, 36.8°C. Fetal ultrasound revealed that the heart rate was 150 BPM with temporary deceleration down to 60-70 BPM. Chest computed tomography (CT) showed bilateral multiple centrilobular patch consolidations with several subpleural lesions (Figure 1).

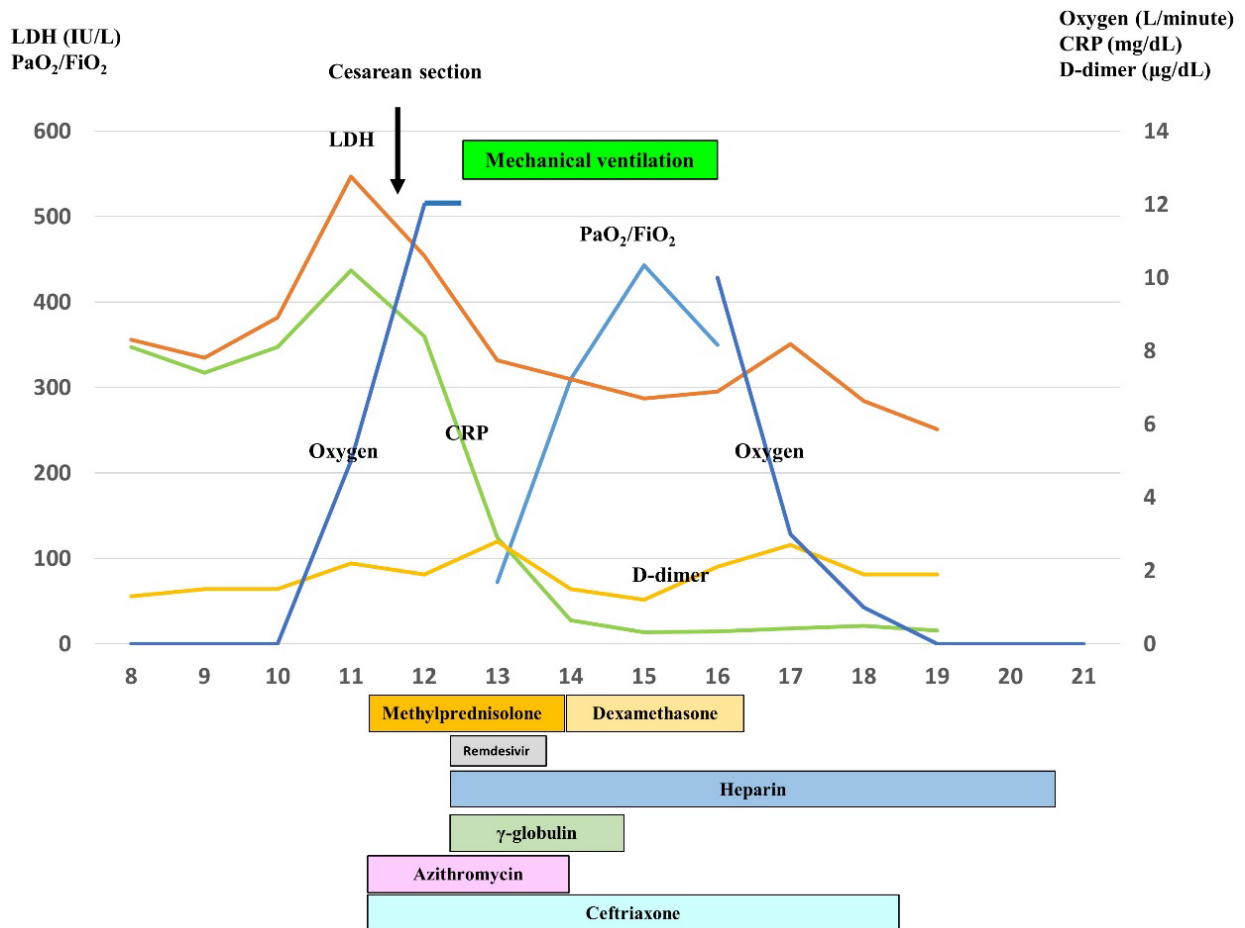


**Figure 1.** Chest computed tomography (CT) on days 11 and 21 (CT on day 11 demonstrated bilateral multiple centrilobular patch consolidations with several subpleural lesions. CT on day 21 showed the improvement of multiple consolidation)

The results of the biochemical analysis on day 11 are shown in Table 1.

**Table 1 Results of the biochemical analysis on day 11**

Variables	Value
white blood cell count	12,000 / $\mu$ L
hemoglobin	13.8 g/dL
platelet	13.7 $\times$ 10 <sup>4</sup> / $\mu$ L
total protein	5.4 g/dL
albumin	1.9 g/dL
aspartate aminotransferase	30 U/L
alanine aminotransferase	8 U/L
glutamyl transpeptidase	7 IU/L
creatinine phosphokinase	47 U/L
amylase	33 U/L
glucose	61 mg/dL
blood urea nitrogen	8.5 mg/dL
creatinine	0.68 mg/dL
sodium	142 mEq/L
potassium	3.6 mEq/L
chloride	108 mEq/L
C-reactive protein	10.2 mg/dL
lactate dehydrogenase	356 IU/L
prothrombin time international normalized ratio	0.92
activated partial thromboplastin time	41.0 seconds
D-dimer	2.2 $\mu$ g/mL



**Figure 2.** The time course of intensive treatment (After immune modulation therapy and mechanical ventilation without the prone position, the PaO<sub>2</sub>/FiO<sub>2</sub> ratio smoothly increased. On day 16, the tracheal tube was removed. PaO<sub>2</sub>/FiO<sub>2</sub>, ratio of arterial oxygen partial pressure to fractional inspired oxygen; LDH, lactate dehydrogenase; CRP, C-reactive protein.)

As she had multiple risk factors for acute respiratory distress syndrome (ARDS), we decided to provide intensive treatment for COVID-19 infection. Accordingly, she underwent emergency cesarean section under general anesthesia (spinal anesthesia failed because of obesity) after the administration of 1 g of methylprednisolone, 1 g of ceftriaxone and 500 mg of azithromycin. The newborn was delivered safely (body weight, 2059 g; Apgar score, 4/7; pH, 7.207). After Cesarean section, she was extubated and admitted to the intensive care unit with 94% SPO<sub>2</sub> under 5 L/minute of oxygen. From day 12, methylprednisolone (1 g/day for 2 days), azithromycin (500 mg/day for 2 days), remdesivir (100 mg/day for 5 days), γ-globulin (5 g/day for 3 days), glycyrrhizin (80 mg/day), and continuous infusion of heparin were initiated. From that night, her SPO<sub>2</sub> decreased and her oxygen demand increased. On day 13, she required 12 L per minute of oxygen using a reservoir mask to maintain an SPO<sub>2</sub> level of >90% (estimated PaO<sub>2</sub>/FiO<sub>2</sub> was 72), she underwent tracheal intubation and mechanical ventilation. Complete mechanical ventilation with high positive end-expiratory pressure (PEEP) and pressure support ventilation (PSV) using muscle relaxant and sedative resulted in the improvement of the PaO<sub>2</sub>/FiO<sub>2</sub> ratio. The time course of treatments, main blood test results and PaO<sub>2</sub>/FiO<sub>2</sub> are shown in Figure 2.

As she showed temporally developed ARDS, the third and subsequent infusion of remdesivir were cancelled. As her PaO<sub>2</sub>/FiO<sub>2</sub> ratio was maintained at >300 after

treatment, even PEEP and PSV were decreased, she was extubated on day 16. From day 17, she could stand and eat food with assistance. From day 19, her SPO<sub>2</sub> improved to 98% under room air, and oxygen therapy was ceased. From day 20, she could walk for herself and continuous heparin infusion was ceased. On day 21, chest CT revealed the improvement of lung lesions (Figure 1). On the same day, the results of a lung function test were within the normal limits (forced vital capacity, 91% and forced expiratory volume at 1 second, 99%). After baby care training, she was discharged on day 27 without sequelae. Favorable outcomes of both she and her baby were observed in at a 1-month follow-up.

### 3. Discussion

This patient was successfully treated by emergency cesarean section, intensive immune suppression therapy, and mechanical ventilation during the outbreak of the Omicron variant in Japan. A PubMed search was undertaken to identify articles using the key words “omicron” and “pregnant” on February 27, 2022. This search did not yield any reports about pregnancy in individuals infected with the Omicron variant.

One of the differences between the Omicron variant in the present case and previous reports on COVID-19 pneumonia was the initial lung CT image. The typical image of COVID-19 pneumonia in patients infected with

previous variants was ground-glass opacity lesions that mainly spread in the subpleural area. [6,7] The main findings in the present case were multiple centrilobular patch consolidations in addition to subpleural lesions. The centrilobular patch consolidations had the typical appearance of non-bacterial community-acquired pneumonia or hypersensitivity pneumonitis. [8,9] The Omicron variant tends to affect the upper respiratory tract. [10] This affinity for respiratory tract infection may have resulted in the multiple centrilobular lesions in the present case. A Japanese report from National Institute of Infectious Disease (February 10, 2022) also showed multiple centrilobular lesions on chest CT in 4 of 40 cases with confirmed Omicron infection. (<https://www.niid.go.jp/niid/ja/2019-ncov/2488-idsc/iasr-news/10961-505p01.html>).

Another point of difference between the Omicron variant in the present case and previous cases of COVID-19 pneumonia was the good response to our immune suppression therapy and mechanical ventilation. In cases of COVID-19 pneumonia after the Delta variant outbreak, our immune suppression therapy was not sufficient to obtain survival. [11,12,13] While the patient in the present case was young and the Omicron variant is thought to be less severe and to be associated with less mortality in comparison to previous COVID-19 pneumonia variants, both experimentally and clinically. [14,15,16] This different background may have contributed to the good response to multimodal therapy, including immune suppression therapy.

The patient in the present case had not received COVID-19 vaccination. COVID-19 vaccination is thought to be safe, even for pregnant women. [17] COVID-19 booster vaccination is thought to be preventative measure, even against Omicron variant infection. The present case suggests that even pregnant woman should receive COVID-19 vaccination to avoid the possible onset of ARDS, which is a potentially fatal condition. [18]

## 4. Conclusion

We present the case of severe COVID-19 pneumonia in a pregnant woman who was treated by emergency Cesarean section, intensive immune suppression therapy and mechanical ventilation during the Omicron variant outbreak in Japan. The present patient developed ARDS; however, a favorable outcome was obtained after multimodal therapy, despite the presence of risk factors, including pregnancy, obesity and GDM. The present case suggests that even pregnant woman should receive COVID-19 vaccination to avoid the possible development of ARDS, which can be a fatal condition.

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