

# Development of ARDS due to COVID-19 in a Pregnant Woman in the Third Trimester and Successful Multidisciplinary Case Management

## Üçüncü Trimester Gebede COVID-19' a Bağlı ARDS Gelişimi ve Başarılı Multidisipliner Olgu Yönetimi

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### Abstract

The course of COVID-19 disease may be more severe in pregnant patients due to the physiologic changes induced by pregnancy. Although most pregnant patients with COVID-19 are followed up as outpatients, requiring no hospitalization, COVID-19 infection, especially in the presence of risk factors such as increased immunosuppression in the third trimester and lack of vaccination, can progress rapidly and lead to respiratory failure, as in our case. Our patient was in the third trimester of her pregnancy, and required intensive care due to COVID-19 pneumonia on the third day of hospitalization, and an emergency delivery was performed initially with a multidisciplinary approach. The patient was then followed up in the respiratory intensive care unit under mechanical ventilation. Our patient is a remarkable example of severe COVID-19 disease in the third trimester of pregnancy.

**Key words:** COVID-19, pregnancy, intensive care unit, multidisciplinary management.

### Öz

Gebe hastalarda COVID-19 hastalığı, gebeliğin getirmiş olduğu fizyolojik değişiklikler nedeni ile daha ciddi seyredebilmektedir. Çoğu COVID-19'lu gebe hastamız, hastane yatışına gerek duyulmadan ayakta takip edilmekle birlikte, özellikle 3. trimesterde artan immüsupresyon, hastanın aşısız olması gibi risk faktörleri varlığında, olgumuzda olduğu gibi COVID-19 enfeksiyonu hızlı progresyon gösterip solunum yetmezliğine neden olabilir. Gebeliğinin 3. trimesterinde olan hastamızın yatışının 3. gününde COVID-19 pnömonisine bağlı yoğun bakım ihtiyacı göstermesi üzerine multidisipliner bir yaklaşım ile önce acil doğum operasyonu gerçekleştirildi ve hasta postop yoğun bakım ünitesinde mekanik ventilasyonda takip edildi. Hastamızı, gebeliğinin 3. trimesterinde ciddi seyreden COVID-19 hastalığına bir örnek teşkil etmesi nedeni ile sunmak istedik.

**Anahtar Sözcükler:** COVID-19, gebelik, yoğun bakım ünitesi, multidisipliner yönetim.

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Since December 2019, when the health facilities of Wuhan city in Hubei province, China, and the Chinese Center for Disease Control and Prevention reported an outbreak of pneumonia of unknown cause, the subsequently named coronavirus disease (COVID-19) has spread rapidly and has come to affect the entire world. The World Health Organization (WHO) declared COVID-19 caused by SARS-CoV-2 a global epidemic (pandemic) on March 11, 2020.

Although all members of society are susceptible to COVID-19, health care workers are the occupational group at the highest risk, with those of the male sex, people older than 50 years, people with comorbidities and people living in community shelters being among the higher risk groups (1).

Pregnancy is a condition that can be difficult to manage in the presence of viral infections. Although coronaviruses are no more virulent in pregnant women than in the normal population, it can complicate clinical management by prolonging and complicating the disease (2). Symptoms in COVID-19-positive pregnant women can take the form of fever, weakness, cough, sore throat, and loss of smell and taste, and patients tend to endure the disease isolated at home.

Our case was admitted to our hospital with radiological findings of viral pneumonia and respiratory failure, unlike in the cases we usually see in pregnant women. We present our case to literature to highlight the importance of the accurate and timely treatment of pregnant COVID-19 patients, as the case became critical in a short time and was intervened with a multidisciplinary approach due to the life-threatening situation of the mother and child.

## CASE

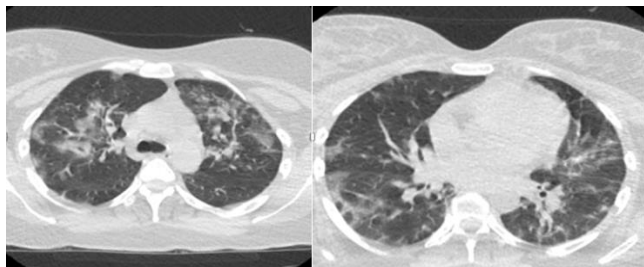
A 31-weeks non-smoking pregnant woman with no known chronic disease history and who had not been vaccinated against COVID-19 complained of cough, shortness of breath and back pain on the 5th day of COVID-19 PCR positivity on 26/11/2021, and was referred to our hospital after extensive COVID-19 pneumonia was detected in a thorax CT at the State District Hospital (Figure 1).

Upon admission to our facility, SpO<sub>2</sub> was 91% (3-4 L/min O<sub>2</sub> mask support), and laboratory tests revealed Wbc: 7400 /mm<sup>3</sup>, CRP: 98 mg/l, Lym: 570 /mm<sup>3</sup> and D-dimer: 1.7 mg/l. No obstetric pathology was detected during the ultrasonography (USG) or in the non-stress test (NST) examination performed by the Department of Obstetrics and Gynecology. The patient was admitted to the pan-

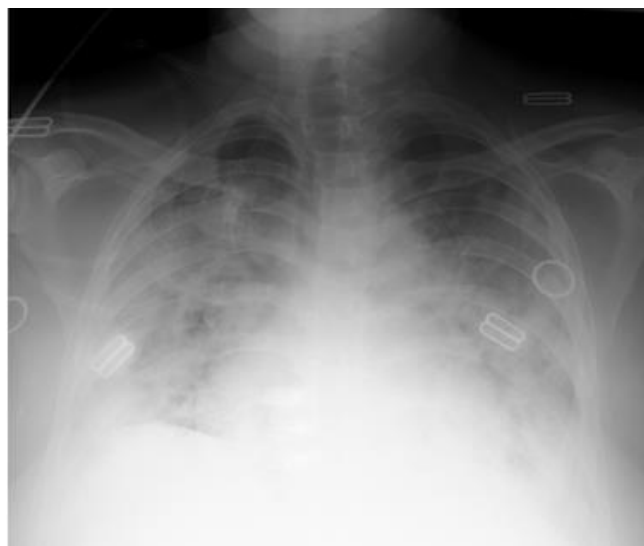
dem ward for further treatment where she was treated with 40 mg of methylprednisolone and a prophylactic dose of low molecular weight heparin (LMWH). After the onset of tachypnea, an increase in oxygen demand (SpO<sub>2</sub>: 88 under 8-10 L/min O<sub>2</sub> support with face mask) and progression on a posteroanterior (PA) chest X-ray (Figure 2), the patient was given a 250 mg methylprednisolone infusion and treated with a broad-spectrum antibiotic on day 3 of follow-up. During follow-up, the patient was taken for an emergency cesarean section by the Gynecology and Obstetrics department due to a worsening of the respiratory symptoms and oxygenation, and the resulting threat to life.

The patient was intubated and monitored in the Respiratory intensive care unit (ICU) in the postoperative period. Upon admission to the ICU, the patient was ventilated with a tidal volume of 6 ml/kg (ideal weight) in assisted volume-controlled mode at 14 cmH<sub>2</sub>O positive end-expiratory pressure after the recruitment maneuver, as part of a lung-sparing ventilation strategy, under sedation and analgesia. The ratio of partial arterial oxygen pressure to oxygen fraction (PaO<sub>2</sub>/FiO<sub>2</sub>) was 135 at blood gas measurement 30 minutes after current settings. The patient could not tolerate the prone position due to recent abdominal surgery. Upon admission to the ICU, her SOFA score was 4, APACHE II score was 19, CRP level was 84.8 mg/L, procalcitonin level was 0.19 ng/mL and ferritin level was 326 ng/mL. The treatment with 1x250 mg methylprednisolone the was started in the ward was completed over 3 days during follow-up, with 2x40 mg methylprednisolone then continued as a maintenance dose. The tidal volume was adjusted so that the plateau pressure was less than 30 cmH<sub>2</sub>O and the driving pressure was less than 15 cmH<sub>2</sub>O. After a blood gas analysis, the value of PEEP was gradually decreased taking into account the FiO<sub>2</sub> requirement (Table 1). When the patient's FiO<sub>2</sub> requirement was 45%, sedation analgesia was discontinued, and the value of PEEP was decreased to 8 cmH<sub>2</sub>O on the 6th day of ICU stay. Regression was revealed on PA chest X-ray, and the patient was extubated on postoperative day 8 when her vital signs had stabilized and successful spontaneous breathing was achieved. After extubation, oxygen therapy was continued with nasal high-flow therapy (flow: 50 L/min, FiO<sub>2</sub>: 35%). During follow-up, the patient, whose oxygenation and other vital signs were stable under low-flow oxygen therapy (4 L/min nasal cannula), was transferred to the chest diseases ward on the 10th day of her intensive care stay. The methylprednisolone dose was reduced but continued. The

patient required no oxygen at follow-up and showed clinical and radiological regression (Figure 3), and was discharged on postoperative day 15 with a recommendation to taper and discontinue the methylprednisolone treatment.



**Figure 1:** Computed tomography showed bilateral consolidation in the lung



**Figure 2:** Chest X-ray showed radiological progression on the 3<sup>rd</sup> day of hospitalization



**Figure 3:** Chest X-ray showed radiological regression on postoperative day 15

**Table 1:** Daily  $PO_2/FiO_2$  ratio and ventilator settings during ICU follow-up

	$PO_2/FiO_2$ (mmHg)	TV/IBW (ml/kg)	PEEP (cmH <sub>2</sub> O)	$FiO_2$
1. 1st Day	135	6	14	0.60
2. 2nd Day	147	6	12	0.55
3. 3rd Day	146	6.5	10	0.55
4. 4th Day	205	7.6	10	0.50
5. 5th Day	195	7.6	8	0.45
6. 6th Day	278	8.0	8	0.40

Abbreviations:  $PO_2$ : partial arterial oxygen pressure,  $FiO_2$ : oxygen fraction, TV/IBW: tidal volume/ideal weight, PEEP: positive end-expiratory pressure

## DISCUSSION

At the outset of the COVID-19 outbreak, many questions arose about its effects on pregnant women. These included whether pregnancy increased susceptibility to COVID-19 infection, whether pregnant women were more susceptible to severe disease, whether SARS-Cov-2 infection increased the risk of adverse pregnancy and neonatal outcomes, as well as the effects of COVID-19 vaccinations on pregnancy and lactation.

To the best of our knowledge, pregnant women are affected by COVID-19 infection to the same extent as non-pregnant women (3-5), although pregnant women are known to be at increased risk of morbidity and mortality from such respiratory infections as influenza and SARS-CoV-2 (6), placing them among the populations considered at risk of COVID-19 infection. SARS-Cov-2 infections are more common in pregnant women living in socially and economically disadvantaged areas than in non-pregnant women. A report from New York City reported that pregnant women living in buildings with lower incomes, higher unemployment and more households are more likely to develop a SARS-Cov-2 infection (7).

There have been many studies reporting the prevalence of SARS-Cov-2 infection in pregnant women at rates ranging from 3-20% (8,9). In cases of pregnancy, the COVID-19 diagnostic algorithm is the same as for non-pregnant women.

There have been several studies reporting an increase severity of COVID-19 during pregnancy. Some of the best-informed information comes from the COVID-19 tracking system of the U.S. Centers for Disease Control and Prevention (CDC), which includes the data of 400,000 reproductively competent people with symptomatic COVID-19, ranked by age, race, ethnicity and underlying medical conditions. Compared to non-pregnant women, pregnant women are three times more

likely to be admitted to the ICU, 2.9 times more likely to require invasive ventilation, 2.4 times more likely to require extracorporeal membrane oxygenation and 1.7 times more likely to die (10). Other studies from the United States and from Europe have reached similar conclusions. For example, in a study of four European hospitals, pregnant and non-pregnant women were compared for age, body mass index and comorbidities, and an increased risk of developing severe disease during pregnancy was identified, including increased risk of ICU admission (11). An increased risk of hospitalization, need for oxygen therapy and need for endotracheal intubation in infected pregnant women was identified also in the present study. The increased risk of severe disease during pregnancy may be attributable to such mechanical factors as decreased lung volume, immunologic changes and increased risk of thromboembolic disease during fetal growth (10).

A cohort study of 5,183 pregnant and 175,905 non-pregnant women identified pregnancy as a risk factor for death, pneumonia and ICU hospitalization in women of reproductive age (12).

Studies of corticosteroids in patients with viral pneumonia and ARDS have yielded mixed results (13,14). In the Randomized Evaluation of COVID-19 Therapy (RECOVERY) study, in which 2,104 patients with COVID-19 were randomized to receive 6 mg of dexamethasone daily for up to 10 days, showed that dexamethasone reduced 28-day all-cause mortality (15), and the greatest benefit was noted in patients who had been symptomatic for more than 7 days and required mechanical ventilation. Conversely, there was no benefit to patients who were symptomatic for a shorter period and that did not require any supplemental oxygen. A cohort study of 201 patients with COVID-19 pneumonia and ARDS in Wuhan, China, reported that treatment with methylprednisolone was associated with a lower risk of death (16). In our patient, the administration of a corticosteroid dose of 250 mg methylprednisolone/3 days contributed to the positive evolution of the patient's critical condition due to the deepening of respiratory failure.

## CONCLUSION

Pregnant women can be considered a special healthcare population in whom a multidisciplinary team approach involving chest diseases, gynecology and obstetrics, infectious diseases and intensive care physicians is critical for the management of viral infections with potential for a progressive course, such as COVID-19. Such an ap-

proach can support the timely administration of appropriate treatments for maternal and child health, the appropriate follow-up care, the identification of a need for mechanical ventilation in the event of progressive respiratory failure, and the development of an individualized delivery plan. The importance of high-dose corticosteroid therapy and vaccination to prevent severe disease development in the event of severe disease due to COVID-19 is particularly evident.

## CONFLICTS OF INTEREST

None declared.

## AUTHOR CONTRIBUTIONS

Concept - İ.Y., P.H.; Planning and Design - İ.Y., P.H.; Supervision - İ.Y., P.H.; Funding - İ.Y., P.H.; Materials - İ.Y., P.H.; Data Collection and/or Processing - İ.Y., P.H.; Analysis and/or Interpretation - İ.Y.; Literature Review - İ.Y.; Writing - İ.Y., P.H.; Critical Review - İ.Y., P.H.

## YAZAR KATKILARI

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