

1. Department of Obstetrics and Gynecology, Preventative Gynecology Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2. Department of Radiology, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3. Department of Infectious Disease, Infectious Diseases and Tropical Medicine Research Center, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
4. Department of Anesthesiology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran
5. Department of Anesthesiology, Anesthesiology Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
6. Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran


The mortality rate of this acute resolving disease is about 2%, mostly due to massive alveolar damage and progressive respiratory failure (1-2), and less common due to severe heart complications, digestive symptoms, and skin manifestations (3-6). According to previous studies, COVID-19 PCR testing and/or Chest CT scan are the gold standard diagnostic methods (7-10).

Although after nearly one year of investigations, the data revealed that pregnant women with COVID-19 are at increased risk of severe COVID-19, still, many questions remain (11-14). Some case reports and case
series lead to overestimating risks because outpatients or uncomplicated pregnant women are not considered.

The aim of this case series is to report the outcome of 25 pregnant women infected with COVID-19 registered in four large university hospitals in Tehran.

Methods

In this case series, the course of the disease and the outcome of 25 pregnant women diagnosed with COVID-19 are reported during one year. All women were referred to 4 university hospitals: Taleghani, Tajrish, Imam Hossein, and Mahdieh, Tehran, Iran. The clinical signs and symptoms, laboratory findings, and CT manifestations of these infected pregnant women are reported. The patients' condition and pregnancy outcomes were monitored for 6 to 12 months after diagnosis. All survived women (not admitted or discharged from the hospitals) were visited every week for one month and monthly for six months.

Since February 2020, all pregnant women suspected of being infected with COVID-19 referred to 4 university hospitals were triaged for oxygen (O₂) saturation, fever, and other disease-related symptoms, based on WHO guidelines (15). In case of strong suspicion, COVID-19 PCR was performed (using nasopharyngeal or oropharyngeal swabs) on patients. A chest CT scan was also done (if indicated). In case of a definitive diagnosis of the disease (based on chest CT scan or PCR), subjects were registered in our study.

The demographic information, initial symptoms and their duration, past obstetric, medical, surgical, and drug history were noted. For all pregnant women, maternal vital signs, O₂ saturation, laboratory tests, and pregnancy status were recorded.

Patients were either treated on an outpatient basis, admitted into the COVID-19 Ward (C-Ward) or COVID-19 ICU (C-ICU) based on their obstetric condition and infectious status.

All CT images were reported by an experienced radiologist. The manifestation of lung involvement in the axial and coronal CT imaging was classified, and the severity of each lobe involvement was scored according to the percentage of involvement: <5% score 1, 5%-25% score 2, 26%-49% score 3, 50%-75% score 4, and >75% score 5. And the total chest CT score of the patient is equal to the sum of each lobe involvement and can range from 0 (no involvement) to 25 (maximum involvement).

If pregnancy terminated during the active phase of COVID-19 infection, the newborn was immediately isolated from the mother and tested for COVID-19 PCR. The neonates’ conditions, including Apgar score, birth weight, oxygen requirement, or need for antiviral treatment were recorded.

Results

Data were analyzed using SPSS version 23 (SPSS Inc., Chicago, Ill., USA). Frequency and percentage were used to describe qualitative variables and chart to compare patients’ symptoms.

Over one year, from February 2020 to February 2021, 25 pregnant women with the mean age of 32 (19-48 years) infected by COVID-19 were registered in our database. COVID-19 PCR testing was reported positive in 24 (96%) patients.

Five mothers with mild illness, mostly less than 25 weeks of pregnancy, were treated as outpatients. Fifteen patients were admitted to C-Ward (66% > 30 weeks), and 5 were monitored in C-ICU, mostly (26-30weeks).

About 50% experienced their first pregnancy, 12% had one or two abortions in the past, and there was no history of IUFD or neonatal death. Two mothers had twin pregnancies, both with a history of infertility (IVF and ICSI).

Eleven patients (44%) had a contact history with infected patients. None of 25 infected pregnant women were vaccinated against flu before contracting COVID-19.

The five most common symptoms at the first visit were cough (72%), feeling feverish (68%), dyspnea (60%), sweating (52%), decrease or loss of taste or smell (52%) (Figure 1).

The vital signs of all outpatients were normal, and their O₂ saturation was above 95%.

Among twenty admitted patients, 17 women needed O₂ therapy, including 3 patients who were intubated in C-ICU with O₂ saturation ≤ 90 % (86-90%). Six patients, had respiratory rate> 22 breath/min. Nine patients (45%) had the oral T >37.7°C, and 2 had blood pressure>140/90 mmHg. Ten patients (50%) were tachycardic.

The most common abnormal laboratory findings were related to CRP and ESR.

Chest CT scan was performed for 13 admitted pregnant women based on clinical necessity. The frequency of chest CT abnormality was not significantly different in 5 different lobes (77-92%). The majority of Chest CT scans demonstrated a ground glass appearance (77%) (Table 1). The highest severity of pulmonary involvement was related to intubated patients. Three patients had a CT severity score>13, all intubated in the C-ICU.

The Data of all 25 pregnant women with COVID-19 infections are listed in Table 2.
Figure 1. The frequency of symptoms in infected women with COVID-19

Table 1. Chest CT scan report in 13 admitted pregnant patients with COVID-19 infection

<table>
<thead>
<tr>
<th>Variable</th>
<th>N0. Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground glass</td>
<td>10 (77)</td>
</tr>
<tr>
<td>Consolidation</td>
<td>6 (46)</td>
</tr>
<tr>
<td>Crazy paving</td>
<td>6 (46)</td>
</tr>
<tr>
<td>Vascular thickening</td>
<td>4 (31)</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>1 (8)</td>
</tr>
<tr>
<td>Reversed Halo sign</td>
<td>0</td>
</tr>
<tr>
<td>Lymphadenopathy</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 2. The Chief Complaints, Clinical Characteristics, Treatments, and Outcomes of 5 outpatients, 20 C-Ward and 5 C-ICU admitted Women with COVID-19 infections

<table>
<thead>
<tr>
<th>Presenting complaints</th>
<th>GA</th>
<th>M Age</th>
<th>CT score</th>
<th>Respiratory Status</th>
<th>H/p delay</th>
<th>Medical treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* Feeling feverish, cough, dyspnea</td>
<td>23w+3d</td>
<td>Twin</td>
<td>35 14</td>
<td>Invasive ventilatiation</td>
<td>10</td>
<td>H.Chl/ Azi/ Kaletra/ oseltamivir/ ceftriaxone/ DiPhen/ vancomycin/ meropenem/ IVIG=60mg/FFP=2/Pack cell=2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dead Myocarditis IUFD</td>
</tr>
<tr>
<td>2* FOF and chills, cough, dyspnea</td>
<td>28w+2d</td>
<td>Twin</td>
<td>48 20</td>
<td>Invasive ventilatiation</td>
<td>16</td>
<td>H.Chl/ Kaletra/ oseltamivir/ DiPhen/ vancomycin/ meropenem/ IVIG=60mg/ plasmapheresis/ Corticosteroid/ Tocilizomab/ Ribavirin</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dead NEG Dead (DIC)</td>
</tr>
<tr>
<td>3* Itching 6 mo/</td>
<td>27w+6d</td>
<td></td>
<td>25 11</td>
<td>O2 with mask</td>
<td>18</td>
<td>H.Chl/ Azi/ ceftriaxone/ kaletra/ oseltamivir/</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dead Cholestasis liver failure Dead (RDS)</td>
</tr>
<tr>
<td>Presenting complaints</td>
<td>GA</td>
<td>Age</td>
<td>CT scor e</td>
<td>Respiratory Status</td>
<td>H p/da y</td>
<td>Medical treatment</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----------</td>
<td>--------------------</td>
<td>---------</td>
<td>------------------</td>
</tr>
<tr>
<td>cough/jaund ice 2 weeks</td>
<td>cough/jaundice 2 weeks</td>
<td>39w</td>
<td>32</td>
<td>21</td>
<td>Invasive ventila tion</td>
<td>9</td>
</tr>
<tr>
<td>dyspnea</td>
<td>29w+ 6d</td>
<td>27</td>
<td>-</td>
<td>O2 with mask</td>
<td>31</td>
<td>H.Chl /betamethasone/ MgSO4/ Indomethacin / Digoxin/ Isordil/ hydralazine</td>
</tr>
<tr>
<td>Cough, dyspnea, diarrhea</td>
<td>17w+ 1d</td>
<td>35</td>
<td>-</td>
<td>O2 with mask</td>
<td>4</td>
<td>H.Chl / Azithromycin/ ceftriaxone/ DiPhen</td>
</tr>
<tr>
<td>labor pain</td>
<td>36w+ 6d</td>
<td>35</td>
<td>0</td>
<td>Room air</td>
<td>1</td>
<td>No treatment</td>
</tr>
<tr>
<td>FOF, chills, dry cough</td>
<td>19w+ 3d</td>
<td>31</td>
<td>5</td>
<td>O2 with mask</td>
<td>9</td>
<td>H.Chl/ Azithromycin/ ceftriaxone/ kaletra/ oseltamivir/ salbutamol</td>
</tr>
<tr>
<td>Cough, dyspnea</td>
<td>26w</td>
<td>35</td>
<td>9</td>
<td>O2 with mask</td>
<td>5</td>
<td>H.Chl/ Azithromycin</td>
</tr>
<tr>
<td>vaginal leak</td>
<td>38w+ 1d</td>
<td>21</td>
<td>-</td>
<td>O2 with mask</td>
<td>5</td>
<td>H.Chl/ kaletra</td>
</tr>
<tr>
<td>FOP/ labor pain</td>
<td>40w+ 2d</td>
<td>29</td>
<td>-</td>
<td>Room air</td>
<td>1</td>
<td>Azithromycin/ kaletra</td>
</tr>
<tr>
<td>FOF, cough</td>
<td>34w+ 6d</td>
<td>35</td>
<td>5</td>
<td>O2 with mask</td>
<td>10</td>
<td>H.Chl/ Azithromycin/ ceftriaxone/ oseltamivir</td>
</tr>
<tr>
<td>Diarrhea, FOF, cough</td>
<td>22w</td>
<td>31</td>
<td>10</td>
<td>O2 with mask</td>
<td>9</td>
<td>H.Chl/ Azithromycin/ kaletra/ ceftriaxone/ oseltamivir/ DiPhen</td>
</tr>
<tr>
<td>labor pain</td>
<td>39w</td>
<td>36</td>
<td>3</td>
<td>O2 with mask</td>
<td>4</td>
<td>H.Chl/ Azithromycin</td>
</tr>
<tr>
<td>FOF, cough</td>
<td>38w+ 1d</td>
<td>35</td>
<td>-</td>
<td>O2 with mask</td>
<td>4</td>
<td>H.Chl/ Azithromycin</td>
</tr>
<tr>
<td>Itching</td>
<td>37w+ 4d</td>
<td>23</td>
<td>5</td>
<td>Room air</td>
<td>3</td>
<td>H.Chl/ Azithromycin/ ceftriaxone</td>
</tr>
<tr>
<td>FOF, cough, dyspnea</td>
<td>32w+ 4d</td>
<td>22</td>
<td>8</td>
<td>O2 with mask</td>
<td>8</td>
<td>H.Chl/ Azithromycin/ ceftriaxone/ dextromethorphan</td>
</tr>
<tr>
<td>FOP/ ROM</td>
<td>39w+ 6d</td>
<td>26</td>
<td>-</td>
<td>O2 with mask</td>
<td>1</td>
<td>Azithromycin</td>
</tr>
<tr>
<td>Fever chills, cough, dyspnea, fatigue</td>
<td>19w+ 4d</td>
<td>41</td>
<td>10</td>
<td>O2 with mask</td>
<td>5</td>
<td>H.Chl/ ose ltimivir</td>
</tr>
<tr>
<td>FOF chills, headache, myalgia</td>
<td>37w+ 1d</td>
<td>42</td>
<td>-</td>
<td>O2 with mask</td>
<td>4</td>
<td>H.Chl/ Kaletra/ Azithromycin/ ceftriaxone/ vancomycin/ plasmapheresis/Tocoliz omab/ Ribavirin</td>
</tr>
</tbody>
</table>
In 12 out of 20 admitted cases (44%), pregnancy terminated during hospitalization; 7 (58%) term pregnancies and 5 for obstetrical complications including fetal distress (28 W), IUFD (28 W), cholestasis (27 W), heart disease (34 W), and preterm labor (37 W). In this study, there were three maternal mortalities (12%) and overall low morbidity. Two patients died during the acute infection (in the C-ICU); both had twin pregnancies, a history of infertility, and died from cardiac arrest (one due to myocarditis). The third patient died due to hepatic failure five months after delivery.

Totally, there was 24 live birth from 23 mothers (1twin) and only two IUFD (twin). Thirteen neonates (from 12 mothers) were born during hospitalization. Three out of 13 neonates (23%) expired, who were all preterm (27-28 W). PCR was taken from all the rest neonates with only one positive result. The infected neonate was isolated and showed no symptoms of COVID-19 infection after birth.

In the 6-month follow-up of women discharged from the hospital, there was no readmission due to COVID-19 infection. Nearly all signs and symptoms ameliorated during the first 2 weeks after discharge; however, the dyspnea in three patients and cardiac status in one patient improved more slowly. The pregnancy and disease outcomes are summarized in Table 3.

### Table 3. The pregnancy and disease outcome in 25 pregnant women diagnosed with COVID-19 infection

<table>
<thead>
<tr>
<th>C-ICU Admission</th>
<th>C-Ward admission**</th>
<th>Outpatient ***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dx: diagnosis</td>
<td>MR: Maternal request</td>
<td>FOF: Feeling of fever</td>
</tr>
<tr>
<td>Azi: Azithromycin</td>
<td>DiPhen: Diphenhydramine</td>
<td>NL: Normal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term</th>
<th>Preterm</th>
<th>Active phase</th>
<th>After remission</th>
<th>mother</th>
<th>neonate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out patients (N=5)</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>All OK</td>
</tr>
<tr>
<td>C-Ward (N=15)</td>
<td>13</td>
<td>2</td>
<td>8</td>
<td>7</td>
<td>All OK</td>
</tr>
<tr>
<td>C-ICU (N=5)</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>0</td>
<td>3 dead</td>
</tr>
</tbody>
</table>

In the following section, the obstetric care and outcomes of the 5 pregnant women admitted to C-ICU are described in detail.

**Case 1:**
A 35-year-old patient G2P0Ab1 with twin pregnancy conceived through ICSI procedure at a gestational age of 23w+3d. She complained of coughing, dyspnea, and feverishness. She had no past medical history. Her vital signs were normal. O2 saturation=91%, and reached 94% with nasal flow O2. Fetal well-being was assessed by NST and ultrasound. COVID-19 PCR was positive. Spiral lung and mediastinal CT scans showed patchy consolidation in both lungs, especially the left lower
lobe (LLL) (Figure 2). She was first admitted to C-Ward and treated by Oseltamivir, Ceftriaxone, Hydroxychloroquine, Kaletra, and oxygen therapy. After 24 hours, the patient's condition worsened, and her O₂ saturation dropped to 84%. She was admitted to the C-ICU. After 36 hours, she was intubated due to deterioration of her respiratory status (RR= 40 breaths/min, O₂ saturation = 65%).

The COVID-19 multidisciplinary team (including an anesthesiologist, perinatologist, infectious disease, C-ICU, and forensic medicine specialists) decided that termination of pregnancy would not improve the maternal condition. During C-ICU admission, she received 2 packed cells and a 3 day-trial of 20 mg/day intravenous immunoglobulin (IVIG). She was suspected of having hospital-acquired pneumonia; a combination of intravenous (IV) vancomycin and meropenem were started, while azithromycin and ceftriaxone were tapered and then discontinued. The patient's general condition improved, and on the 13th day of hospitalization, she was extubated using a high-flow nasal cannula (HFNC). However, five days after extubation, the patient's condition deteriorated, resulting in reintubation and mechanical ventilation. Echocardiography and chest X-ray demonstrated cardiomegaly and a modest decline in left ventricular ejection fraction (about 35%). Further imaging demonstrated an extensive involvement of the lung tissues with possible cardiogenic pulmonary edema. The laboratory tests deteriorated, especially hepatic tests and coagulation profiles. She received two units of fresh frozen plasma. Her pregnancy terminated spontaneously through vaginal delivery. Meanwhile, she developed episodes of refractory hypotension, and her ejection fraction declined to 10-15%. Unfortunately, the patient's general and hemodynamic status deteriorated, and she died of cardiac arrest.

Figure 2. Patient no.1 CT scan images

Noncontrast chest CT scan showed diffuse alveolar opacities with consolidation and ground glass patterns in posterior aspects of lower lobes of both lungs, mostly compatible with viral pneumonia.

Case 2

A 48-year-old woman, G2P1 (previous vaginal live/delivery), with GA= 28w+2d, twin pregnancy (conceived through IVF procedure with donated egg) was referred to hospital. She complained of fever, chills, cough, and dyspnea, which started 3 days before her referral. She had no past medical history but had 3 previous surgeries, including appendectomy, abdominoplasty, and rhinoplasty. On admission, her vital signs were PR=110 bpm/min, T=38.8, RR=24, O₂ Sat=87% in room air, and 95% on supplemental oxygen. Laboratory findings were: AST=66 U/L, ALT=38U/L, LDH=908 U/L, ESR=60mm/hr, CRP=81.9mg/L. Her COVID-19 PCR test was positive. Initial treatment was with kaletra, hydroxychloroquine, tocilizumab, oseltamivir, prednisolone, vancomycin, meropenem, IVIG and oxygen. Unfortunately, after 2 days the patient's clinical condition worsened. Her RR=30 breath/min, T=39.5°C, and O₂ sat=60%, with associated fetal distress. The pregnancy terminated by emergency cesarean section and delivery of a live female infant (weighing 1210 grams), and a live male infant weighing 1300 grams. Both babies admitted in neonatal C-ICU, and both babies tested negative for COVID-19. The mother was transported to C-ICU and extubated. Laboratory data improved: LFT = normal, LDH - 538 U/L, ESR = 6 mm/h and CRP =15mg/L. Unfortunately, severe respiratory distress occurred de novo and O₂ saturation decreased from 82% to 30-46%, requiring re-intubation. The platelet count decreased to 93,000. Liver and renal tests increased again (AST=291 U/L, ALT=75 U/L, Cr=1.67mg/dL, BUN=41mg/dL, INR>6, PTT>120sec, PT>60sec). Plasmapheresis was performed and finally, after 16 days of hospitalization the patient died of cardiac arrest. Both infants also died due to extensive DIC.

Case 3

A 25-year-old G1P0 with GA: 27w+6d and no past medical history presented dry cough, dyspnea, anorexia, and diarrhea that started 2 weeks before her referral. She also reported jaundice during the last few months. At the first visit, her vital signs were stable and O₂ saturation was 96% in room air, Hb=9.8g/dL, AST=37 U/L, ALT=30 U/L, Bili T=25 mg/dL, Bili D=15mg/dL, ALP=650U/L, LDH=750U/L, ESR=49-
mm/h, CRP=39mg/L, INR=2.4. In her last laboratory data (3 days before the referral), Bili T=20mg/dL, Bili D=13 mg/dL, ALP= 970U/L and ESR=55mm/h with normal LFT had been reported. The liver ultrasound was normal. She was treated with Azithromycin and Ursodeoxycholic acid (UDCA) and admitted to the C-ICU. Her COVID-19 PCR test was positive. Chest CT scan showed bilateral patchy ground-glass appearance, with more prominent consolidation in the lower and peripheral zones. An emergency C/S was performed due to cholestasis. A live female infant with an Apgar score of 8/10, weighing 1070 grams, was born and admitted to neonatal C-ICU due to prematurity and respiratory distress. The mother was treated with FFP, hydrocortisone, hydroxyzine, cefazolin, ceftriaxone, Kaletra, oseltamivir, hydroxychloroquine, N-acetyl cysteine (NAC), and metronidazole. The first day after C/S, the lab data showed: AST=37 U/L, ALT=63 U/L, ALP=619 U/L, LDH=1256 U/L, ESR=85 mm/hr, INR=2.93, Bili T=39.5 mg/dL, Bili D=18.9 mg/dL), with O₂ saturation declining to 80%. The liver increased in size, measured by ultrasound (130 mm). Liver biopsy showed parenchyma with prominent sinusoidal dilation, canicular and centrilobular cholestasis (liver injury with predominantly cholestatic pattern), mild lobular inflammation, and hepatocytes anisonecrosis with ballooning degeneration (drug induced liver disease). As treatment continued, the patient's clinical condition and chest CT scan gradually improved. She was discharged from C-ICU after 10 days. She received azithromycin, hydroxychloroquine, ceftriaxone and meropenem in the C-Ward. After 8 days, she was discharged from the hospital with stable vital signs (O₂ saturation =93%, INR=1, ESR =26 mm/h, CRP=17 mg/L) and a prescription of rifampin, prednisolone, and hydroxychloroquine. This patient did not come back to the clinic for follow-up, and after contacting her family by telephone, it was discovered that the patient had been admitted to another center and subsequently died 5 months after delivery due to hepatic failure.

**Case 4**

A 32-year-old lady G2P1 (previous live birth by cesarean section) with GA= 39w+1d presented dyspnea (which started one week previously), nasal congestion, sweating, cough, chest pain, sleep disorder, and otalgia. She had a past medical history of hypothyroidism (diagnosed 4 years ago), congenital achalasia (treated surgically), and ITP (from 13 years of age, requiring hydrocortisone injections 100 mg 3 times a day from 3 weeks before hospitalization). Her vital signs were: T=39.4°C, PR=104 bpm/min, RR=36 breath/min, O₂ saturation = 89% in room air and 91% with O₂ mask. Initial laboratory tests showed: WBC=10700, (Lymph=6%), PLT=58000, AST=70 U/L, ALT=91 U/L, ESR=18 mm/h and CRP=38.5 mg/L. She was the only patient amongst these 25 women whose COVID-19 PCR testing was negative, but her clinical presentation and chest CT scan findings supported a diagnosis of COVID-19 (Figure 3). Before her admission to C-ICU, her pregnancy was terminated by an emergency CS. A live female infant weighing 3800g with an Apgar score of 9/10 was born and her COVID-19 PCR testing was also negative. In C-ICU, she received hydroxychloroquine, Kaletra, ceftriaxone, and levothroixine, 5 doses of interferon beta, 60 g IVIG, and prednisolone. Although ESR and CRP increased to 56 mm/h and 69 mg/L, respectively, the LFT decreased. After 9 days of hospitalization, the patient was discharged in a very good condition and ordered to self-quarantine at home for a further 5 days while receiving hydroxychloroquine. Most of her symptoms were resolved 10 days after the discharge. Both mother and baby are healthy after six months of follow-up.

**Case 5**

A 27-year-old woman, G1P0, with GA= 29w+6d, with a history of hypothyroidism during pregnancy, treated with levothyroxine, was referred to hospital. She complained of feeling feverish, rigors, sweating, myalgia, productive cough, fatigue, conjunctivitis, dry mouth, sore throat, sneezing, nasal and throat itching, dyspnea, palpitations, anorexia, headache, dizziness, depression, nervousness, vomiting, flank pain, sleep dyspnea, nasal and throat itching, dyspnea, palpitations, anorexia, headache, dizziness, depression, nervousness, vomiting, flank pain, sleep

---

**Figure 3. Patient no.4 CT scan images.**

Noncontrast CT scan images revealed peripheral ground-glass opacities and crazy paving patterns associated with mosaic attenuation of lungs secondary to air trapping. These findings are highly suggestive of viral pneumonia.
disorder and pruritus. Her COVID-19 PCR test was positive. Her vital signs were stable and laboratory tests were: WBC=7900, Lymph%=15%, Hb= 9.8 g/dL, PLT=214000, AST=15 U/L, ALT=20 U/L, ALP=575 U/L, LDH=634 U/L, Urea=18mg/dL, Cr=0.9 mg/dL, ESR=47 mm/h, CRP=16.3 mg/L. During her admission, she also had mild uterine contractions. Hydroxychloroquine, betamethasone, magnesium sulfate, and Indomethacin were commenced. After 6 days, she was transferred to the C-ICU due to severe dyspnea. Her contractions stopped after 1 day. Proteinuria (1386 grams) was detected in the 24-hour urine sample, and echocardiography showed severe eccentric mitral regurgitation (MR) to lateral wall, pulmonary artery pressure (PAP)= 58mmHg, mild left ventricle (LV) dilatation with dysfunction, raised LV filling, and pressure, with an ejection fraction (EF) of =25%. The patient was then admitted to the C-ICU. Due to severe dyspnea, the MDT suggested postponing delivery until 34 weeks of gestational age. Treatment for possible viral myocarditis (due to COVID-19 or peripartum cardiomyopathy) was initiated. She received digoxin, Isordil, and hydralazine. Finally, at 34 weeks of gestational age, CS was performed (due to maternal condition, threatened preterm labor, and breech presentation). A live male infant weighing 2410 grams was delivered, with an Apgar score of 9/10, and he was admitted to NICU. After delivery, the mother's respiratory function improved, and her cough stopped. She was transferred to C-Ward and then discharged from the hospital. The infant was also intubated due to respiratory distress, and after extubation, he had one seizure episode treated with phenobarbital. The baby had no further seizures after discontinuation of treatment and was ultimately discharged in a good general condition. After 6 months of follow-up, the ejection fraction showed a modest improvement to just 40%. The echocardiography (at 6 months) was as follows: Moderate LV systolic dysfunction, Apico-septal hypokinesia, NL left atrium (LA) and right atrium (RA) size, NL right ventricle (RV) function, mild to moderate MR, mild tricuspid regurgitation (TR), NL LAP at rest systolic pulmonary artery pressure SPAP= 30mmHg, EF=40%). Clinically, the mother and baby remain in good condition.

Discussion

In this case series, we reported 25 COVID-19 infected pregnant women with positive signs, symptoms, and positive PCR testing in 24 out of 25.

In our report, the symptoms, signs, lab data of infected pregnant women were similar to the other reports. Fever, cough, dyspnea as the predominant symptoms (11, 16, 17), the decreased oxygen saturation <95%, tachycardia, fever (45%) (16-19) as the most significant signs, and high CRP level as the most common abnormal laboratory data are revealed (2, 18). The most common finding on the Chest CT scan of 13 patients was a ground-glass appearance, which was similar to other data (8-10, 19). As expected, the trend of CT severity score was associated with disease severity, C-ICU hospitalization, and intubation.

Among these 25 pregnant women, the vertical transmission was very low (one out of 23 live neonates). Some other studies confirmed the rare vertical transmission (11-12, 20).

Similar to some other published articles (21-23), the maternal mortality rate in our report was 12% (3out of 25), all preterm (23-28weeks). Two of the expired mothers had twin pregnancies. This could be explained by the fact that all possible effects of the virus on host cells and vice versa, which deteriorate normal organ function, could get worst in pregnant women and that the immunological changes during pregnancy increase susceptibility to viral infections, in particular respiratory pathogens (24-26). Consequently, pregnant women are more intolerant to hypoxia, especially in twin pregnancy and in early third trimester when maximum cardiac output happens and make the mother more prone to develop severe pneumonia, which is predisposing to hypoxemic respiratory failure due to COVID-19 pneumonia.

Conclusion

In this case series, among 25 women with confirmed COVID-19, maternal, fetal, and neonatal mortality happened mostly in the early third trimester and in twin pregnancy.

Acknowledgments

This study was funded and supported by the Preventative Gynecology Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Author’s Contributions

MS: supervision, collected the data. FF: Conceived and designed the analysis, drafting and revising the manuscripts in English. MM: wrote the paper contributed data or analysis tools. SMA, LA, SS, TJ, PP, SA, MY, BN, SZ, SH, MH, MMM, SPS, AM, DA: collected the data. TV: TV: Contributed data or analysis tools; performed the analysis.

Conflict of Interest

The authors declared no conflict of interest.

Availability of Data and Materials

The data set collected and analyzed during the current study is available from the corresponding author on reasonable request.
Ethics Approval

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (IR.SBMU.RESEARCH.REC.1399.766).

Consent to Participate

Informed consent was obtained from all individual participants included in the study.

Consent for Publication

Not applicable.

References


Volume 7, July – August 2022

Journal of Obstetrics, Gynecology and Cancer Research


How to Cite This Article: