Clinical characteristics and outcome of SARS-CoV-2 infection during pregnancy

Yangli Liu#, Haihong Chen#, Weiping Tan, Yukun Kuang, Kejing Tang, Yifeng Luo*,
Yubiao Guo*

Division of Pulmonary and Critical Care Medicine, the First Affiliated Hospital of
Sun Yat-sen University, Institute of Pulmonary Diseases, Sun Yat-sen University,
Guangzhou 510080, Province Guangdong, P.R. China.

#: These authors contributed equally to this work.

*Correspondence: Prof. Yubiao Guo, Email: guoyb@mail.sysu.edu.cn
Yifeng Luo, Email: lyif@mail.sysu.edu.cn

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Dear editors,

Tang and colleagues, in this Journal, drew readers attention to emerging COVID-19[1]. We focused on the pregnant COVID-19 patients. Given the maternal physiologic and immune function changes in pregnancy[2], pregnant individuals might face greater risk of getting infected by SARS-CoV-2 and might have more complicated clinical events. We described epidemiological, clinical characteristics, pregnancy and perinatal outcomes of 13 hospitalized pregnant patients diagnosed with COVID-19 in China.

We searched the China National Knowledge Infrastructure (CNKI), the China Science and Technology Journal database (VIP) and Wanfang Database for case reports on pregnant patients with COVID-19 infection and identified 13 hospitalized pregnant patients in areas outside of Wuhan, China, with laboratory-confirmed SARS-CoV-2 infection between January 15, 2020, and February 29, 2020. Information including age, geographic location, epidemiological history, prenatal course, maternal and newborn hospital course, discharge data and outcome were obtained. This investigation was approved by the institutional review board of the First Affiliated Hospital of Sun Yat-sen University.

A total of 13 Chinese patients with SARS-CoV-2 admitted to hospitals outside of Wuhan were included (Table). There were 3 patients from other cities of Hubei, 2 patients from Zhejiang, and 1 each from Henan, Jiangsu, Shandong, Beijing, Guangdong, Shanxi, Jiangxi and Anhui. The maternal age ranged between 22 to 38
Two women were less than 28 weeks of gestation and the other 11 patients were in their third trimesters at presentation. None of the patients had underlying medical disease.

Ten patients (77%) presented with fever (range 37.3–38.9°C), mostly accompanied with fatigue. Three (23%) pregnant patients complained with dyspnea. One patient complained with only gastrointestinal symptoms such as nausea and diarrhea, without obvious respiratory symptoms. One had no symptoms but got a positive RNA test result of oropharyngeal swabs after close contact to a diagnosed family member. All the patients had a clear epidemiologic history, either with other family members affected or with linkage to Wuhan (residing in or visiting Wuhan or contact with visitors from Wuhan ≤ 2 weeks before the onset of infection).

Four of the patients (31%) improved after hospitalization and got discharged with an uncomplicated ongoing pregnancy. The other 9 patients (69%) all underwent caesarean section. Six of the 9 patients were delivered by emergency cesarean section because of pregnancy complications including maternal hypoxemia (in 2/9 patients) fetal distress (in 3/9 patients), severe preeclampsia (in 1/9) and stillbirth (in 1/9). Seven patients had preterm labor between 28-36 weeks of gestation.

Patient 8's condition deteriorated during hospitalization, prompting intensive care unit (ICU) admission with multiple organ dysfunction syndrome (MODS) including acute respiratory distress syndrome (ARDS), acute hepatic failure, acute renal failure and septic shock requiring intubation, mechanical ventilation and Extracorporeal
Membrane Oxygenation (ECMO). As of March 8th, patient 8 recovered well and was transferred out of ICU to the designated hospital for further treatment. The other 12 pregnant patients were all discharged with no obvious complication. Except for 1 stillbirth, 8 newborn infants and 3 fetus were survived. There was no clinical or serologic evidence suggestive of vertical transmission of SARS-CoV-2.

Previous studies suggested that COVID-19 is more likely to affect older males with comorbidities[3]. We reported 13 pregnant COVID-19 patients in China, indicating pregnant women also susceptible to SARS-CoV-2. Clinical manifestations of the pregnant COVID-19 patients in this study varied widely from asymptomatic to very severe, similar to previous report in non-pregnant patients [4]. Most of the pregnant patients had mild to moderate symptoms. Fever and fatigue were the principal symptoms, and less common symptoms were sore throat and shortness of breath. All the patients had a clear epidemiologic history.

One of the 13 patients (7.6%) developed severe pneumonia requiring ICU care with multiple organ dysfunction syndrome in the third trimester in our study, similarity with the general population reported to be with critical rate of 5% [5]. Cytokine storm might be the reason for very severe cases since Chaolin Huang et al[6] found that compared with non-ICU patients, ICU patients had higher plasma levels of various cytokines.

Six patients of thirteen (46%) were delivered by emergency cesarean section because of pregnancy complications including maternal hypoxemia, severe
preeclampsia, fetal distress and stillbirth. Seven patients (54%) had preterm labor. These perinatal complications could be ascribed to the virus infection as well as the physiologic changes that reducing the woman intolerant to hypoxia during late pregnancy[7]. Fortunately, no severe neonatal asphyxia was observed in the eight livebirths and no vertical transmission was found.

In conclusion, our report showed pregnant women are also susceptible to SARS-CoV-2 infection. SARS-CoV-2 may increase health risks to both mothers and infants during pregnancy. Efforts should be taken to reduce the infection rate of SARS-CoV-2 both in pregnant and perinatal period, and more intensive attention should be paid to pregnant patients.

Conflict of interest

All authors declare that they have no competing interests.
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Table. Characteristics of 13 hospitalized pregnant patients infected with SARS-CoV-2

| Characteristics                  | Patient 1 | Patient 2 | Patient 3 | Patient 4 | Patient 5 | Patient 6 | Patient 7 | Patient 8 | Patient 9 | Patient 10 | Patient 11 | Patient 12 | Patient 13 |
|----------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Location                         | Henan     | Zhejiang  | Hubei     | Jiangsu   | Shandong  | Beijing   | Hubei     | Guangdong | Zhejiang  | Hubei     | Shanxi    | Jiangxi   | Anhui     |
| Patient age, y                   | Unknown   | 38        | 32        | 28        | 38        | 25        | 27        | 32        | 30        | 33        | 33        | 30        | 22        |
| Gestational age at illness onset, wk | 16w       | 25w+5     | 28w+1     | 30w       | 30w+2     | 33w+1     | 33w+6     | 35w+2     | 35w+2     | 36w+3     | 36w+5     | 37w+3     | 38w       |
| Symptoms at onset                | Fever, fatigue | Fever, cough | Fever, dyspnea | Fever, dyspnea | Fever, fatigue | Fever, dyspnea | Fever, fatigue | Fever, dyspnea | Fever, fatigue | Fever, dyspnea | Fever, fatigue | Fever, fatigue |
| Epidemiologic history            | Yes       | Yes       | No        | Yes       | No        | No        | No        | Yes       | Yes       | Yes       | Yes       | No        | Yes       |
| Other family members affected    | No        | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | No        | No        | Yes       | No        | No        |
| Linkage to Wuhan                 | No        | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | No        | No        | No        | No        | No        |
| Complications                    | No        | No        | Maternal hypoxemia | Maternal hypoxemia | No        | No        | severe preeclampsia | MODS Stillbirth | No        | No        | No        | Fetal distress | No        |
| Method of delivery               | NA        | NA        | C-section | C-section | NA        | NA        | C-section | C-section | C-section | C-section | C-section | C-section | C-section |
| Maternal outcome                 | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  |
| Premature delivery               | NA        | NA        | Yes       | Yes       | NA        | Yes       | Yes       | Yes       | Yes       | Yes       | Yes       | No        | No        |
| Fetal outcome                    | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  | Died      | Survived  | Survived  | Survived  | Survived  | Survived  | Survived  |
| Vertical transmission            | NA        | NA        | No        | No        | NA        | No        | No        | No        | No        | No        | No        | No        | No        |

Abbreviation: SARS-CoV-2=severe acute respiratory syndrome corona virus 2; MODS=multiple organ dysfunction syndrome; C-section=caesarean section