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

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coronavirus disease; Clinical manifestations ;Pregnancy outcome**

Dear editors,

Tang and colleagues, in this Journal, drew readers attention to emerging COVID19[1].

We focused on the pregnant COVID19 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 all hospitalized pregnant patients diagnosed with COVID-19 in China.

We identified all hospitalized pregnant patients with laboratory-confirmed SARS-CoV-2 infection between December 8, 2019, and February 25, 2020 officially reported by the central government, in areas outside Wuhan, China. Information including age, geographic location, epidemiological history, prenatal course, maternal and newborn hospital course, discharge data and outcome were obtained by Centers for Disease Control and Prevention and Local Health Commission. When necessary, we attempted to contact local hospital or patients by telephone to supply missing information. This investigation was part of an emergency public health outbreak investigation and therefore not subject to institutional review board.

There were a total of 13 Chinese patients with SARS-CoV-2 admitted to hospitals outside of Wuhan (Table). There were 3 patients from Zhejiang, 3 from other cities of Hubei and 1 each from Fujian, Shanxi, Beijing, Guangdong, Jiangxi, Heilongjiang and Anhui. The maternal age ranged between 22 to 36 years. 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 37.3–39.0°C), mostly accompanied with fatigue. Only 3 (23%) pregnant patients complained with dyspnea. 1 had no symptoms but got a positive RNA test result of oropharyngeal swabs after close contact to a diagnosed family member. 12 patients (92%) 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).

Three of the patients (23%) improved after hospitalization and got discharged with an uncomplicated ongoing pregnancy. The other 10 patients (77%) all underwent caesarean section. Five of the 10 patients were delivered by emergency cesarean section because of pregnancy complications including fetal distress (in three of ten patients), premature rupture of the membrane (in one of ten) and stillbirth (in one of ten). Six patients (46%) had preterm labour between 32- 36 weeks of gestation.

Patient 6's condition deteriorated during hospitalization, prompting intensive care unit (ICU) admission with multiple organ dysfunction syndrome (MODS) including acute respiratory distress syndrome (ARDS) requiring intubation and mechanical ventilation, acute hepatic failure, acute renal failure and septic shock. As of February 25th, Patient 6 was still in the support of Extracorporeal Membrane Oxygenation (ECMO). The other 12 pregnant patients were all discharged with no obvious complication. Except for 1 stillbirth, nine newborn infants got a 1-min Apgar score of 10. 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. Almost 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.

Five patients of thirteen (38%) were delivered by emergency cesarean section because of pregnancy complications including fetal distress, premature rupture of the membrane and stillbirth. Six patients (46%) had preterm labour. 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 nine 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

| charac | Pati | Pati | Pati | Pati | Pati | Pati | Pati | Pati | Pati | Pati | Pati | Pati | Pati |
|----------------|------------------|------|-------|-----------------------|------|------|------|------|-------|-------|-------|------|------|
| teristic | ent | ent | ent | ent | ent | ent | ent | ent | ent | ent | ent | ent | ent |
| s | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | Second trimester | | | > 28 wks of gestation | | | | | | | | | |
| Patient | 28 | 24 | 33 | 29 | 35 | 31 | 30 | 36 | 26 | 32 | 30 | 22 | 30 |
| age,y | | | | | | | | | | | | | |
| Gestati | 25w | 27w | 32w | 33w | 34w | 34w | 35w | 35+ | 36w | 36+ | 37 | 38w | 38+ |
| onal | | | | | | + | | 5 | | 4 | | | 3 |
| age at | | | | | | | | | | | | | |
| illness | | | | | | | | | | | | | |
| onset, | | | | | | | | | | | | | |
| wk | | | | | | | | | | | | | |
| Sympt | Fev | Fev | Pers | Fev | Fev | Fev | Dys | Fev | Fev | Fev | Fev | No | Fev |
| oms at | er, | er, | isten | er, | er | er, | pne | er, | er, | er, | er, | | er, |
| onset | fatig | pea | t | pea | | sore | a | cou | fatig | pea | fatig | | pea |
| | ue | king | coug | king | | thor | | gh, | ue | king | ue | | king |
| | | at | h | at | | at | | dysp | | at | | | at |
| | | 38.5 | | 38 | | | | nea | | 39°C | | | 37.3 |
| | | °C | | °C | | | | | | | | | °C |
| | | dys | | | | | | | | | | | |
| | | pne | | | | | | | | fatig | | | |

| | a | | | | ue | | | | | | | | | |
|---|-----|-----|-------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Epidemiologic history | Yes | No | Yes | No | No | No | No | No | No | Yes | Yes | No | Yes | Yes |
| Other family members affected and Linkage to Wuhan | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Unk | No | No |
| Compliance | No | No | No | No | PR | MO | Feta | No | No | Feta | Feta | No | No | |
| Method of | NA | NA | C-se | NA | OM | DS | I | | | I | I | | | |
| | | | | | | Still | distr | | | distr | distr | | | |
| | | | | | | birth | ess | | | ess | ess | | | |
| Method of | NA | NA | C-se | NA | C-se | C-se | C-se | C-se | C-se | C-se | C-se | C-se | C-se | C-se |
| Method of | | | ction | | ction | ction | ction | ction | ction | ction | ction | ction | ction | ction |

deliver

y

| | | | | | | | | | | | | | |
|-----------------|---------|---------|----------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Maternal | Survive | Survive | Survived | Survive | Survived | Survived | Survived | Survived | Survived | Survived | Survived | Survived | Survived |
| Outcome | d | d | | d | | | | | | | | | |

me

| | | | | | | | | | | | | | |
|------------------|----|----|-----|----|-----|-----|-----|-----|-----|----|----|----|----|
| Premature | NA | NA | Yes | NA | Yes | Yes | Yes | Yes | Yes | No | No | No | No |
|------------------|----|----|-----|----|-----|-----|-----|-----|-----|----|----|----|----|

ture

deliver

y

| | | | | | | | | | | | | | |
|--------------|----|----|----|----|----|---|----|----|----|----|----|----|----|
| Fetal | NA | NA | 10 | NA | 10 | 0 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
|--------------|----|----|----|----|----|---|----|----|----|----|----|----|----|

Apgar

score

| | | | | | | | | | | | | | |
|----------------|---------|---------|----------|---------|----------|------|----------|----------|----------|----------|----------|----------|----------|
| Fetal | Survive | Survive | Survived | Survive | Survived | Died | Survived | Survived | Survived | Survived | Survived | Survived | Survived |
| Outcome | vive | vive | ived | vive | ived | | ived | ived | ived | ived | ived | ived | ived |
| me | d | d | | d | | | | | | | | | |

| | | | | | | | | | | | | | |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Vertical | NA | NA | No | NA | No | No | No | No | No | No | No | No | No |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|

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transmission

ission

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