Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Letter to the Editor

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

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 (CSTJ) 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 1). 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 and 38 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 37.3–38.9 °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 ≤2weeks 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 caesarian 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 and 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 (7.7%) 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.

Declaration of Competing Interest

All authors declare that they have no competing interests.

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Table 1
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	36 w+5	37w+3	38w
Symptoms at onset	Fever, fatigue	Fever, cough	Fever, peaking at 38.9 °C dyspnea	Fever, dyspnea	Nausea, diarrhea, fatigue	Fever, peaking at 38 °C	Fever, fatigue	Fever, sore thorat	Dyspnea	Fever, peaking at 38 °C, fatigue	Fever, sore throat, cough	Fever, fatigue	No
Epidemiologic history													
Other family members affected	Yes	Yes	No	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes
Linkage to Wuhan	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Complications	No	No	Maternal hypoxemia	Maternal hypoxemia, Fetal distress	No	No	severe preeclampsia	MODS Stillbirth	Fetal distress	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	NA	Yes	Yes	Yes	Yes	Yes	No	No
Fetal outcome	Survived	Survived	Survived	Survived	Survived	Survived	Survived	Died	Survived	Survived	Survived	Survived	Survived
Vertical transmission	NA	NA	No	No	NA	NA	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=caesarian section.

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