

## CORONAVIRUS DISEASE 2019 IN NEWBORNS AND VERY YOUNG INFANTS

A SERIES OF SIX PATIENTS IN FRANCE

Pauline Meslin, MD, Clara Guiomard, MD, Mouna Chouakria, MD, Julie Porcher, MD, Frédérique Duquesne, MD, Catherine Tiprez, MD, and Neila Zemouri, MD

**Abstract:** We present here a series of 6 infants hospitalized for coronavirus disease 2019 infection from March 14 to March 30, 5 of them are newborns. All 6 patients presented with fever, it was the main symptom for all of them. Only one of them needed oxygen; the others were hospitalized for surveillance but did not need specific care. In our series, coronavirus disease 2019 infection is mostly mild in neonates.

**Key Words:** coronavirus disease 2019, fever, newborn

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From the Pediatric Department, Perpignan Hospital, Perpignan, France.

Address for correspondence: Pauline Meslin, MD, Pediatric Department, Perpignan Hospital, 20 Avenue du Languedoc, 66046 Perpignan, France. E-mail: pauline.meslin@ch-perpignan.fr.

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Coronavirus disease 2019 (COVID-19) clinical features have been described in adults, but much less in children. Indeed, pediatric cases are less frequent or severe.<sup>1</sup> Children show different clinical features to adults, and limited number of COVID-19 cases has been reported concerning infants and neonates. We present here a clinical review of 6 cases of COVID-19 in infants: 5 neonates and an infant 2 months of age at the time of diagnosis.

### METHODS

This is a clinical description of all children (0–18 years of age) hospitalized in Perpignan Public Hospital, France, from March 6, 2020, to March 31, 2020, with a confirmed laboratory COVID-19 diagnosis: 5 neonates (under 1 month of age) and a 2-month-old infant. They were brought to the Pediatric Emergency ward for fever and were hospitalized for medical supervision because of their age. The hospital's protocol is to keep under medical supervision all infants under 3 months of age presenting with fever. They all tested positive for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) after nasopharyngeal swab examination. Other general infections were excluded.

In the following study, the 6 patients will be referred to as "patient 1" to "patient 6." Clinical, epidemiological and biological data were collected during hospitalization. After discharge, the patient's families were called on a daily basis until day 14 from the beginning of the symptoms. All of them have agreed to this review of their children's clinical cases.

### CASE DESCRIPTION

The characteristics of the patients (3 boys and 3 girls) are summarized in Table 1. Their age at diagnosis ranged from 11 days (patients 2 and 3) to 2 months (patient 1). Patient 4 was 27 days old, patient 5 was 26 and patient 6, 30 days old. Four of them had no specific underlying medical condition. Patient 2 had a patent ductus arteriosus, without cardiac function consequences. Patient 6

needed phototherapy at birth to treat a mild jaundice. None of them had any risk factor for mother-to-child infection.

Four of the babies had been in contact with a confirmed or suspected case of COVID-19. The parents of patient 6 presented with fever, intense asthenia, diarrhea and cough, following contact with a confirmed case in their professional entourage. These parents were not tested for SARS-CoV-2. The father developed symptoms 7 days before his child, and the mother 5 days before her. Concerning the 3 other patients, they had been in contact with confirmed cases, whom were not their parents but family friends (patients 1 and 4) or a grandmother (patient 3), whom the babies had been in contact with. The mother of patient 1 developed symptoms a few days after him. The other mothers did not develop any symptoms. None of the parents were tested for SARS-CoV-2.

They were all brought to the Pediatric Emergency ward for a fever that started a few hours to 24 hours earlier.

Fever went up to 39.6°C for patient 1 and was under 39°C for all other patients. In patients 2 and 3, the youngest ones, 11 days of age, fever was associated with grunting. In the others, fever was well tolerated. Two of them had rhinitis and one had a cough, but those were not the reasons for consulting. Patient 1 had vomited once and had reduced his food intake. None had respiratory distress at admission. They all had laboratory tests, and C-reactive protein test and procalcitonin test were normal for all of them. Leukocytes were within normal range for all of them; lymphocytes were low only for patients 1 and 3. Liver enzymes were tested in 4 of them and were normal or subnormal. Urinary tract infection was investigated because of their age and was excluded. Meningitis was excluded in the 3 youngest patients (Table 1). Blood culture was negative for all of them. SARS-CoV-2 polymerase chain reaction on nasopharyngeal swab was positive for all of them.

They were all hospitalized in the Pediatric ward for medical supervision.

Patient 1 was fever free on day 7 since the onset of symptoms. His body temperature was initially between 39°C and 39.6°C the first 2 days, under 38°C on the third day and around 38°C the following days. He reduced his food intake on day 7 for 3 days but did not need enteral feeding or intravenous hydration. He totally recovered within 10 days. Patient 3 developed polypnea on the second day of hospitalization. On day 7, the patient's respiratory rate increased to 66/min and she required oxygen therapy for 2 days (maximum 0.5 L/min), even though the body temperature returned to normal on day 5. The pulmonary auscultation was normal, and the chest radiograph showed alveolar interstitial syndrome. During hospitalization, patient 6 developed diarrhea for 2 days but fed well.

The condition of the others patients improved within 1–2 days, and their general state of health was preserved. None of them needed enteral feeding or intravenous hydration. They were kept under medical supervision in the hospital for 4–10 days maximum, following COVID-19 diagnosis, even if their symptoms had improved, to ensure they did not worsen.

### DISCUSSION

We are reporting here 6 cases of COVID-19 in infants. Among them, 5 were neonates. One patient only presented with severe symptoms according to the World Health Organization criteria: hypoxia with saturation under 90%, on the seventh day of the disease. In adults, the median time between first symptoms and hospital admission for respiratory distress also ranges from 4 to 8 days.<sup>2</sup> Patient had no other complications or signs of gravity, and so no other specific treatment was required. No severe symptoms were reported in the other patients. This is consistent with a Chinese

**TABLE 1.** Characteristics and Clinical Features of the Patients Hospitalized for COVID-19 Infection in Perpignan Hospital, March 2020

Normal Range	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6
Age at diagnosis	2 months	11 days	11 days	27 days	26 days	30 days
Gender	Male	Female	Female	Male	Male	Female
Direct contact with infected person	Yes (family friend)	Not found	Yes (grandmother)	Yes (family friend)	Not found	2 parents
Maternal symptoms (COVID)	Yes, after her baby	No	No	No	No	Yes, 5 days before her baby
COVID test done (mother)	No					No
Previous history	None	Patent ductus arteriosus	None	None	None	Jaundice
Fever (Y/N, duration, intensity)	Born at 38 weeks Yes: 7 days Except for the third day (no fever) Max 39.6°C	Born at 38 weeks Yes: 24 hours Max 38.7°C	Born at 38 weeks Yes: 5 days Max 38.7°C	Born at 40 weeks Yes: 24 hours Max: 38.4°C	Born at 37 weeks Yes: 2 days Max: 38.9°C	Born at 39 weeks Yes: 1 hour Max: 38°C
Respiratory symptoms	Rhinitis	Rhinitis	None	None	None	Cough
Other symptoms	Vomiting Reduced food intake	Grunting during fever	Grunting during fever	None	None	None
CRP (N < 5), mg/L	1	0.7	1.9	1.7	1.3	1.6
PCT (N < 0.5), ng/mL	0.14	0.14	0.41	0.13	0.16	0.09
Leukoc., G/L	4.45	11	5.11	10.04	8.5	8.2
Lymphoc. (N > 2,2), G/L	1.8	5.01	1.62	4.05	3.66	6
ALT (N < 33), IU/L		13	24		29	13
AST (N < 32), IU/L		47	59		40	29
Blood culture	Negative	Negative	Negative	Negative	Negative	Negative
CBEU	Negative	Negative		Negative	Negative	Negative
CSF		Negative	Negative		Negative	
Radiograph	No radio	No radio	Alveolar interstitial syndrome	No radio	No radio	No radio
Evolution	Cough (no respiratory distress) Discharged day 12	Favorable after 24 hours Discharged day 9	O <sub>2</sub> therapy, polypnea, discharged day 9	Discharged day 4	Discharged day 7	Diarrhea Discharged day 7

ALT indicates alanine aminotransferase; AST, aspartate aminotransferase; CBEU, cytobacteriological examination of urines; CRP, C-reactive protein; CSF, cerebrospinal fluid; Leukoc., leukocytes; lymphoc., lymphocytes; PCT, procalcitonin.

series of 36 older children (mean age: 8 years old) in which 17% (6/36) needed oxygen.<sup>3</sup>

All infants had fever (a body temperature above 38°C) on admission, and in 3 of them, it was the only symptom at first. In the other patients, fever was associated with a cough or a runny nose, which proved consistent with studies in older children. One infant presented with fever, vomiting and feeding refusal without respiratory symptoms.

Few studies in children and infants are currently available, and those available suggest that they develop a mild or moderate form of the disease<sup>4</sup> which was consistent with our findings. Yet, little is known about the clinical characteristics and level of severity in young infants and especially in newborns.

In the study of Dong et al<sup>5</sup> in 2143 pediatric patients, the few cases that were severe (2.5%) or critical (0.5%) involved mostly children under 1 year old, suggesting that infants may be more susceptible to severe symptoms.

In another study in China,<sup>6</sup> none of the 9 infants from 1 to 11 months of age infected with COVID-19 presented severe symptoms.

Concerning neonatal manifestation, in a study of 33 newborns from mothers with COVID-19,<sup>7</sup> 2 of them developed mild symptoms, and 1 required respiratory support, but it was certainly due to his prematurity (31 weeks of gestation). We found 2 other case studies in literature: one<sup>8</sup> referring to a newborn from a COVID-19 laboratory-confirmed mother, diagnosed with SARS-CoV-2 infection in his first day of life, even though he was separated from his mother immediately after birth. His symptoms were mild. Another study reports of a neonate<sup>9</sup> who developed gastrointestinal symptoms only (refusal to feed and vomiting).

The laboratory results in most cases were normal. In our series of patients, only 2 presented with lymphopenia, which is

consistent with laboratory findings in older children.<sup>5</sup> None of them suffered from liver damage.

In most of our patients, the route of transmission of COVID-19 was close contact with an infected family member or friend in most cases. Four of the 6 children were living in a neighborhood with a high prevalence of the disease. The latter may explain the relatively high number of cases observed in our pediatric unit, compared with other pediatric wards in the same region.

There are no indications of vertical mother-to-child transmission as all mothers were asymptomatic during pregnancy. Two of the mothers developed symptoms of COVID-19 over 2 weeks after giving birth, one of them showed symptoms 7 days after her baby was affected by the virus. None of the children was breast-fed, which rules out transmission of the virus through breast milk in our patients.

## CONCLUSION

Our study suggests that infants, and newborns especially, present, as older children do, mostly with mild or moderate form of COVID-19. In our observation, all patients suffered from fever alone or in association with other mild symptoms such as rhinitis, diarrhea and reduced food intake. COVID-19 must be considered as a differential diagnosis in a newborn with fever. Most of them will recover quickly without any other complications, but medical supervision in hospital seems justified in newborns.

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