

## Coronavirus Pandemic

### Different outcome of COVID-19 in members of a family

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#### Abstract

We report a family cluster of cases of coronavirus disease 2019 (COVID-19), in which three members of the family were exposed to SARS-CoV-2 at the same time, but the disease manifested differently among the three family members. We describe the clinical manifestations, disease progression, and treatment of wife and husband. We also analyze the daughter who was in close contact with patients with COVID-19 but was not infected.

**Key words:** COVID-19; SARS-CoV-2; coronavirus; disease progression; treatment.

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#### Introduction

The ongoing outbreak of coronavirus disease 2019 (COVID-19) in Wuhan, China, began in December 2019 and spread rapidly across the world in only two months [1]. It has constituted a public health emergency of international concern [2]. COVID-19 coronavirus (SARS-CoV-2) is thought to spread mainly from person-to-person through close contact and through respiratory droplets [3,4]. The fecal-oral routes and aerosols may also be potential transmission routes [5]. Clinical features of COVID-19 include fever, dry cough, vomiting, diarrhoea, and myalgia. Some patients develop acute respiratory failure and other serious complications [6]. Here we report a family cluster of cases who were exposed to SAR-CoV-2 at the same time, but in which the disease manifested differently among the family members.

#### Case Report

On January 31, 2020, a 34-year-old woman, wife in this family cluster of cases, presented to our hospital with a 3-day history of cough and fever. In the government report, there was a confirmed patient with COVID-19 on the plane she took on January 21, 2020.

On admission, her body temperature was elevated to 37.6°C without shortness of breath or chest pain. Laboratory examination results showed decreased levels of lymphocytes ( $0.89 \times 10^9/L$  (normal range  $1.10-3.2 \times 10^9/L$ ), but white blood cells and C-reactive protein were within normal ranges. Chest CT showed gross glass-like manifestations in the upper lobes of both lungs (Figure 1A and 1B). Finally, the patient's oropharyngeal swab was tested for SAR-CoV-2 by qualitative real-time reverse-transcriptase–polymerase-chain-reaction (RT-PCR) assay and was positive, and she was diagnosed with COVID-19. The patient had been diagnosed with Tolosa-Hunt syndrome (THS) in 2015 which recurred in 2019. She has been taking azathioprine since 2019.

After admission, the patient received antiviral treatment, including lopinavir (Kaletra®, 400 mg, q12h, po), Arbidol (Manuosu®, 0.2 g, tid, po) and Lianhua Qingwen capsule (Chinese medicine, 6g, tid, po) and recombinant human interferon (5 million iu Bid nebulization). On day 5 of her hospital stay, the patient's body temperature returned to within normal range, but she reported that she had shortness of breath and chest depression. All laboratory examination

results were normal. However, chest CT on that same day showed multiple patchy ground-glass opacities in the upper and lower lobes of both lungs (Figures 1C and 1D). On day 6, the patient was started on supplemental oxygen, delivered by nasal cannula at 2 liters per minute. Oseltamivir (kewei®75mg, bid, po) and Yinlianjiedutang (Chinese medicine) were added to her antiviral treatment. On hospital day 16, the patient's symptoms improved and supplemental oxygen was discontinued. The previously-observed patchy ground-glass opacities in the chest CT were no longer present (Figures 1E and 1F). All laboratory examination results were normal. However, the patient's oropharyngeal swab test for SAR-CoV-2 was still positive. On hospital day 23, the patient's body temperature elevated to 37.7°C. The therapeutic scheme was changed to ribavirin, hydroxychloroquine sulfate tablets and Qingfeipaidutang (Chinese medicine). After 3 more days, on hospital day 27, her body temperature returned to normal. On hospital day 30, the patient once again had a fever, with cough, sore throat and tonsil enlargement. Apart from increased C-reactive protein (5.91 mg/L, normal range 0.00-4.00mg/L), the patient had no other abnormalities in laboratory examination and chest CT (Figure 1G and 1H). She was diagnosed with tonsillitis and treated with Aztreonam (Shenghuaxi®, 2.0g, q12h, ivgtt). On hospital day 35, the patient's symptoms improved, and she maintained normal body temperature. The patient's oropharyngeal swab test for SAR-CoV-2 became negative.

The husband in this family, a 35-year-old non-smoker, was in good health and denied any history of chronic disease. He and his wife, the above-described patient had had contact with the patient with COVID-19 at the same time. He had no fever or cough during hospitalization. On admission, the results of the

laboratory examination showed decreased levels of lymphocytes ( $0.69 \times 10^9/L$ ), and chest CT examination revealed no lesions in both lungs. The result of an oropharyngeal swab test for SAR-CoV-2 on January 31<sup>st</sup> was positive. After admission, he received antiviral treatment, including lopinavir, abidor and interferon. On February 15<sup>th</sup> and 17<sup>th</sup>, the patient's oropharyngeal swab test of SAR-CoV-2 remained negative.

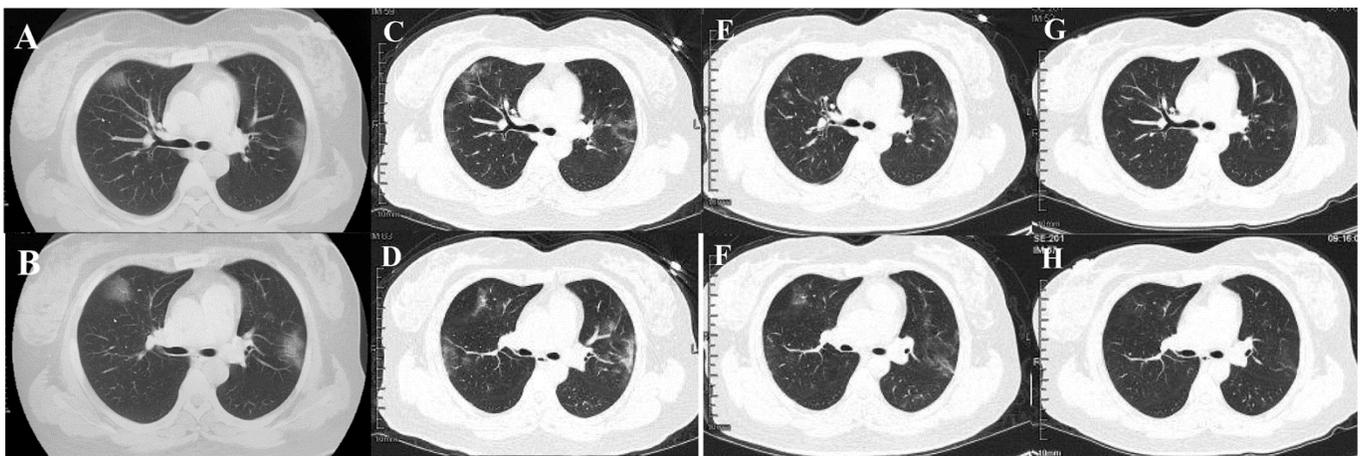
This family also has a daughter, a 6-year-old girl. She also had contacted with the patient on the plane on January 21<sup>st</sup> and she stayed with her parents until January 31<sup>st</sup>. She had no symptoms, and her chest CT was normal. Her oropharyngeal swab test of SAR-CoV-2 remained negative on January 31<sup>st</sup>.

## Discussion

Although COVID-19 is highly contagious and the population is generally susceptible, not everyone who is exposed to the coronavirus becomes infected [7]. In addition, each infected person may have different incubations, different symptoms, and different disease processes [8,9]. In one family who were exposed to SAR-CoV-2 at the same time, the disease manifested differently among the three family members.

At the time of contact with the virus, the wife had been a patient with THS, the underlying cause of which is immune-mediated inflammation, and had been immunosuppressants including prednisone and azathioprine for a long time., This treatment can effectively antagonize the purine analog, thereby inhibiting the synthesis of purines and reducing the proliferation of white blood cells including the immunoactive T and B lymphocytes. This results in fewer autoantibodies, reduced inflammatory responses, while also reducing immune response capacity in general [10]. Therefore, she had an earlier onset of

**Figure 1.** Chest Computed Tomography; A-B, At time of admission (before treatment); C-D, 5 days after treatment; E-F, 16 days after treatment; G-H, 30 days after treatment.



infection with obvious symptoms and imaging findings. She also required a longer period of treatment and complicated treatment regimen.

The husband in this family was also confirmed as infected, but he was asymptomatic. After 14 days of anti-viral treatment, his oropharyngeal swab test for SAR-CoV-2 became negative. The difference in responses to infection between the wife and the husband indicates that in the early stage of infection, the good health of the host plays an important role in the adaptive immune response, which can eliminate the virus and prevent the progression of disease [7].

The daughter in this family, who was exposed to COVID-19 patient at the same time as her parents, and stayed with her parents for ten days after that, did not show evidence of infection. Among the total of 58 patients with COVID-19 who were treated in our hospital, there was only one child. It has been reported that the infection rate in children is relatively low and that their symptoms are milder [11,12]. That may be related to children having had fewer basic diseases, not smoking and having strong self-healing capabilities. Or it may be because of different immune responses between children and adults. There is a hypothesis about innate immune response, important for an early response to pathogens, being more active in children [13]. The interesting observations from this one family need further study with more examples to explain the differences with more confidence about the underlying mechanisms.

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