A familial cluster of COVID-19 indicating virus can be transmitted by asymptomatic carriers

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DISCLAIMER
This paper was submitted to the Bulletin of the World Health Organization and was posted to the COVID-19 open site, according to the protocol for public health emergencies for international concern as described in Vasee Moorthy et al. (http://dx.doi.org/10.2471/BLT.20.251561).

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RECOMMENDED CITATION
The novel coronavirus (2019 nCoV) has resulted in an ongoing outbreak of Coronavirus Disease 2019 (COVID-19) in China and is now spreading worldwide\(^1\). Person-to-person transmission has been demonstrated. It is not clear whether asymptomatic infected person is the source of transmission. From January 22 to February 21, 71 cases were confirmed in Ningxia Hui Autonomous Region, China. A case of asymptomatic infection with normal chest high-resolution computed tomography (HRCT) findings caused family aggregation in her early and middle latent period.

**Methods** A familial cluster of COVID-19, 2 with symptoms and 1 without symptom, were diagnosed in the General Hospital of Ningxia Medical University. A detailed analysis of patient records was performed. The study was approved by the local institutional review board, and written informed consent was obtained from all patients.

All patients underwent complete blood count, C-reactive protein (CRP) and chest HRCT. Real-time reverse transcriptase polymerase chain reaction (RT-PCR) tests for virus nucleic acid was performed using nasopharyngeal swabs (Novel Coronavirus PCR Fluorescence Diagnostic Kit, Shanghai Jienuo Biotechnology Co., Ltd).

**Results**

**Patient 1.** Yuan XX, female, 50 years old, visited the febrile clinic on January 29. The patient had fever, dry cough and weakness for 3 days, with a temperature of 39.2 °C. Complete blood count: WBC 3.64 × 10\(^9\) / L, lymphocyte 16.8%, CRP 44.67 mg / L, HRCT showed multifocal infiltration lesions. RT-PCR testing were positive on January 30 and 31. The antiviral treatments were given (interferon 5 million unit with saline 2ml, inhalation, twice daily. Lopinavir and Ritonavir 200mg/50mg, 2 tables, twice daily). Her temperature was normal on February 3 and other symptoms relieved. But CT showed that exudative shadows in both lungs increased. The virus nucleic acid turned negative on February 12 and 13. The HRCT showed lesions was absorbed compared with the second times (Fig2A).
**Patient 2.** Cao XX, male, 51 years old, was the husband of patient 1. He and his wife visited the febrile clinic together on January 29. The patient had fever and pharyngeal discomfort just for one day, with a temperature of 37.6°C. Complete blood count: WBC $9.54 \times 10^9$ / L, lymphocyte 15.0%. CRP 4.12 mg / L, HRCT showed no abnormalities. RT-PCR testing were positive on January 30 and 31. He was given the same antiviral treatments. His body temperature was normal on February 1. The virus nucleic acid turned negative on February 14 and 15. The HRCT was normal.

**Patient 3.** Cao XX, female, 22 years old, was the daughter of patient 1 and 2. She settled down in Wuhan, epidemic center of COVID-19, and engaged in clothing sales. She left Wuhan on January 21 by train and arrived in Yinchuan next day. She lived together with her parents and younger brother. She had no elevated temperature measured or self-reported fever and no gastrointestinal or respiratory symptoms. RT-PCR testing were negative on January 30. Complete blood count: WBC $9.9 \times 10^9$ / L, lymphocyte 25.7%. CRP 4.93 mg / L and HRCT images showed no abnormalities (Fig2B). The second and third RT-PCR tests were positive on February 1 and 2. The patient had light diarrhea and headache on February 1 and was given the same antiviral treatments. The symptoms were improved the next day. The virus nucleic acid turned negative on February 11 and 12 and the HRCT was normal. The timeline of exposure to the asymptomatic COVID-19 in a familial cluster was showed in Figure1.

**Discussion**

Except the daughter, the couple had no contact with other people from Wuhan within 14 days before the onset of the disease. The patient 3’s younger brother and all close contacts with the couple (48 people) were fine in the medical observation for 14 days.

The Novel Coronavirus Pneumonia Diagnosis and Treatment Plan (The fourth pilot version) of China issued on January 27 indicates that the main source of transmission is pneumonia patients caused by 2019 nCoV infection. Both the fifth and sixth pilot version issued on February 3 and 12 indicate that asymptomatic carrier
is likely to be the source of transmission. A paper published on NEJM about the first four people in Germany infected with 2019 nCoV found asymptomatic persons can still transmit the virus to others⁳. That might warrant a reassessment of transmission dynamics and make controlling the virus much harder. But soon the German government’s public health agency announced that the information was wrong. The “asymptomatic” patient actually had some symptoms and the researchers didn’t actually speak to the patient directly⁴. Yan Bai’s study presumed that asymptomatic 2019 nCoV carrier could be a transmitter⁵. We met the same event during this outbreak of 2019 nCoV. A couple with COVID-19 were transmitted by their asymptomatic daughter who had traveled from the epidemic center of Wuhan. The sequence suggests that the coronavirus can be transmitted by the asymptomatic carriers in their early and middle latent period. A symptomatic virus carriers should be monitored and isolated as early as possible to facilitate the control of epidemic situation.

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References


Figure 1. Timeline of Exposure to index patient with Asymptomatic 2019-nCoV in a Familial cluster of Ningxia

Figure 2: Chest HRCT images of Patient1 and patient 3.