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Short Communication

A survey of a COVID-19 cluster of charter flight importation

Y. Yue ^{a, b, d}, Y. Chen ^{a, b, d}, X. Du ^{a, b}, Y. Jin ^{a, c}, M. Hu ^{a, b}, X. Jiang ^{a, b}, C. Wang ^{a, b}, Z. Chen ^{a, b}, L. Su ^{a, b}, C. Chen ^{a, b}, S. Jiang ^{a, b}, X. Tuo ^{a, b, *}

^a Chengdu Workstation for Emerging Infectious Disease Control and Prevention, Chinese Academy of Medical Sciences, Chengdu, Sichuan, 610000, PR China

^b Chengdu Center for Disease Control and Prevention, Chengdu, Sichuan, 610000, PR China

^c Dayi County Center for Disease Control and Prevention, Chengdu, Sichuan, 610000, PR China



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ABSTRACT

Objectives: Although a number of cases of importation with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection have been reported, there are still no data available concerning the characteristics in the coronavirus disease 2019 (COVID-19) cluster of charter flight importation. Here, we provide an analysis of COVID-19 cases and their close contacts who worked for the same company on a project in Karbala, Iraq, and returned back to Chengdu, China, by a charter flight.

Methods: The data of imported COVID-19 cases and their close contacts were obtained from National Notifiable Disease Report System of Chinese Center for Disease Control and Prevention and field epidemiological investigation reports by Centers for Disease Control and Prevention (CDCs) in Chengdu. The information of general characteristics and laboratory findings of this cluster were collected and summarized.

Results: One hundred and six (66.67%) of 159 charter flight passengers tested positive for COVID-19 before entry. Through treatment, all 159 people tested negative and meet the requirements of taking flights bound for China before boarding. However, there has been still 36 (22.64%) of them tested positive after entry. The median time from entry to confirmation was 1.0 day (Interquartile Range (IQR): 0–4.3). The Cycle threshold value (Ct value) of 36 patients' positive samples are all above 30 and most values are above 35.

Conclusions: In conclusion, there is still a risk that a number of COVID-19 cases can be imported through charter flight. However, the infectivity of confirmed patients of the charter flight was considered to be low. © 2021 The Authors. Published by Elsevier Ltd on behalf of The Royal Society for Public Health. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

In late December 2019, several pneumonia cases of unknown cause in Wuhan, China, were reported and subsequently confirmed to be caused by a novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).^{1,2} The coronavirus disease 2019 (COVID-19) spread rapidly to all the provinces throughout China and then burst out all over the world. With rapid response and implementation of drastic measures, the government of China contained the disease effectively and the number of domestic cases dropped to zero for the first time on 18 March 2020, while this epidemic was continuously on the rise globally. With the normalization of international air routes to China, the number of incoming flights increase incrementally. Therefore, China is facing a serious situation of imported cases with the arrival of autumn and winter

which are the perfect time for the spread of respiratory infectious disease.

In early October 2020, a charter flight landed in Chengdu, and 36 passengers of this charter flight were confirmed with SARS-CoV-2 infection later on, which is the highest number of one flight to date. We analyzed the epidemiologic characteristics of the cluster of this charter flight importation in an attempt to provide evidence for the prevention and control of imported epidemic.

Apart from the crew and the medical team, there are 159 male passengers who worked for a certain company in the Middle East and returned back to China through this charter flight. The average age of all passengers was 39.65 years old with the standard derivation (SD) of 8.71 years. One hundred and five (66.04%) of them have a habit of smoking. Of all the 159 inbound passengers, 22 (13.84%) are outsourced workers, 85 (53.46%) are independent contractors, and 52 (32.70%) are regular employees. Notably, there were no significant difference between the age group, employment type, and habit in passengers who had been RT-PCR-confirmed since entry or not ($P > 0.05$, respectively).

* Corresponding author. Chengdu Center for Disease Control and Prevention, No.4, Longxiang Road, Chengdu, Sichuan, China.

E-mail address: 3439682@qq.com (X. Tuo).

^d Yong Yue and Yuezhu Chen contributed equally to this article.

One hundred and six (66.67%) of the cluster tested positive for COVID-19 in nucleic acid tests at least once before returning back to China. Through treatment, all 159 people tested negative for COVID-19 in the last four nucleic acid tests successively before the day of entry. However, there has been still 36 (22.64%) of them tested positive in the screening by customs or in later regular tests during quarantine since entry. Fig. 1 shows the timeline of nucleic acid tests, onset of symptoms, admission, and discharge for 159 passengers.

Of all the 36 patients, there were 23 (63.89%) asymptomatic individuals and 13 (36.11%) symptomatic individuals. The median time from entry to confirmation was 1.0 day (IQR 0–4.3). Seventeen (17/36, 47.22%) of the patients tested positive on the day of entry, and the longest period of time was up to 14 days. The median duration of admission of all the patients was 14.0 days (IQR: 10.0–18.0), with 12.0 days (IQR: 11.0–15.0) for symptomatic cases and 14.0 days (IQR: 10.0–18.5) for asymptomatic cases ($P > 0.05$).

This case reflected some problems of health management of overseas employees. On the positive side, immediate measures were taken by the company despite the limited medical conditions. Under the circumstances that the number of dormitories were in acute shortage, the company tried its best to create acceptable quarantine conditions by making flexible use of office space. All people took eight nucleic acid tests and five antibody tests under the unified organization of the company during quarantine. Everyone's temperature was taken and recorded every morning, noon, and evening. In the respect of case monitoring, the company developed a good pattern. However, in the respect of quarantine, accommodation isolation was limited by insufficient rooms and high moving frequency. In the respect of medical treatment for confirmed cases, drug therapy was the sole treatment the patients got before entry. There is a lack of data about blood tests, urine tests, and thoracic imaging results of patients because of

insufficient medical resources locally. No confirmed cases of the company got adequate medical treatment in qualified hospitals before returning back to China. How to make sure that Chinese citizens who are confirmed with SARS-CoV-2 infection receive good treatment overseas is a question remaining to be solved. Not only the detection of COVID-19, but also the follow-up treatment needs more improvements. Even though multiple tests were performed for COVID-19 detection before entry, the number of people of the company who were confirmed with SARS-CoV-2 infection still reached an all-time record of 36 after entry. The whole personnel tested negative for the last antibody test and the last four nucleic acid tests before boarding, thus meeting the requirements of taking flights bound for China.³ However, in all 36 confirmed patients, 17 (47.22%) of them tested positive in COVID-19 screening performed by the customs as soon as their flight landed and were confirmed within just two days after entry. By this token, the quality control of these tests for COVID-19 seemed to us to be rather dubious. Thus, to mitigate the risks of cross-border transmission of COVID-19, examining the qualifications of testing institutions overseas is essential.

From the Ct values of 36 patients, we can see that all Ct values are above 30 and most values are above 35. In a study of viral load among hospitalized patients in New York, a sample with a Ct value above 30 was defined as a low viral load sample.⁴ As shown in a study in England, the percentage of positive viral culture of SARS-CoV-2 PCR-positive upper respiratory tract (URT) samples from symptomatic cases from January to May 2020 was under 20% if the Ct value reached 35.⁵ In addition, a research in France showed that the percentage of positive viral culture of SARS-CoV-2 PCR-positive nasopharyngeal samples from COVID-19 patients dropped to 0% if the Ct value reached 34.⁶ Thus, we can infer that the positive results were more likely caused by virus fragments and

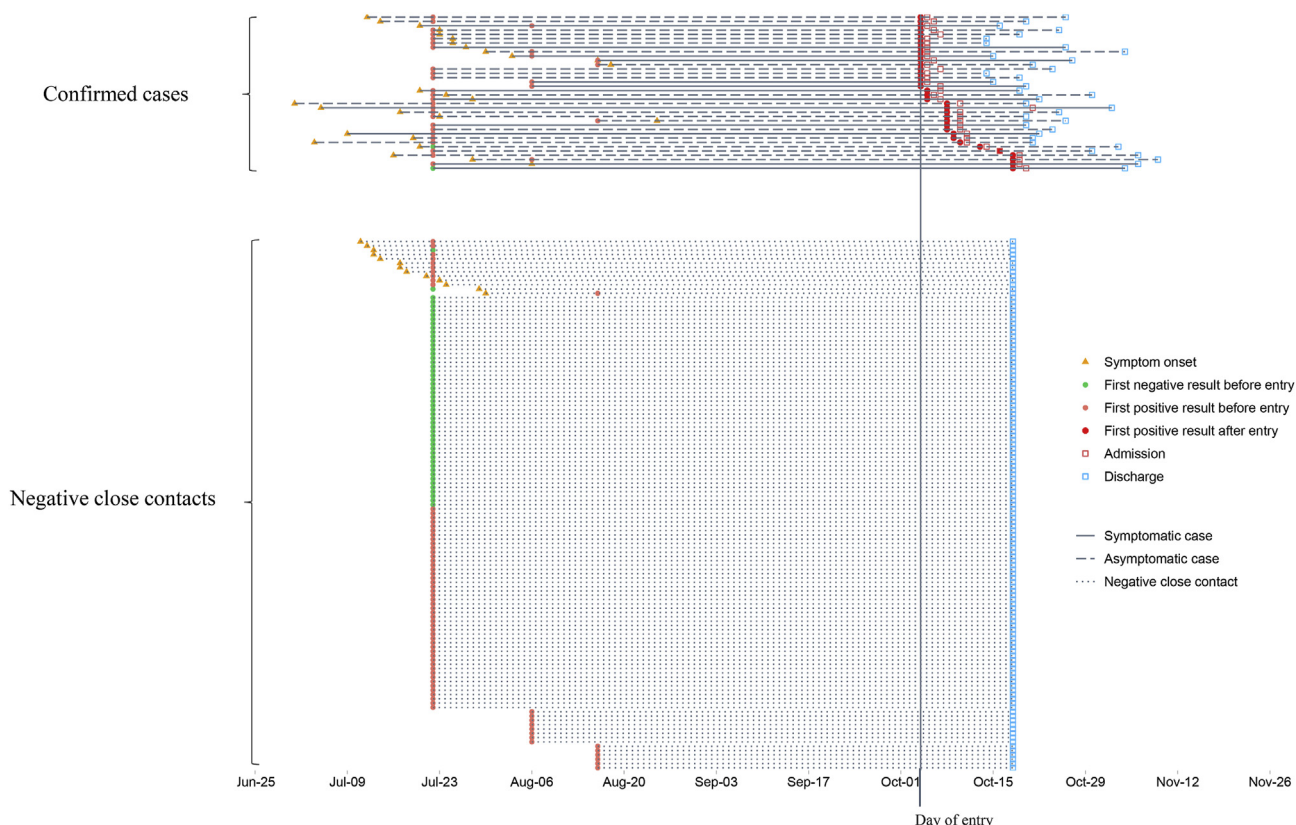


Fig. 1. Timeline of nucleic acid tests, onset of symptoms, admission, and discharge for 159 passengers.

the possibility of positive viral culture of samples from patients in our case can be rather small. Based on the aforementioned conclusions, it can be considered that the infectivity of confirmed patients of the charter flight is rather low. With closed-loop management of quarantine and regular detection, the risk of transmission can be controlled.

In conclusion, under the high pressure of imported cases, such a high percentage of passengers who were confirmed with SAR-CoV-2 infection after entry can be a big concern for the government departments and medical institutions. For further control of cross-boundary transmission, the examination of the qualifications of testing institutions overseas is a big subject to discuss. It is just as important that we strengthen the monitoring mechanism to minimize the risk of undetected cases.

Author statements

Ethical approval

Ethical approval was not required.

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Competing interests

The authors have no conflicts of interest to declare.

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