

LETTER TO THE EDITOR

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A super-spreader of SARS-CoV-2 in incubation period among health-care workers

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Abstract

Since the coronavirus disease 2019 (COVID-19) identified in Wuhan, Hubei, China in December 2019, it has been characterized as a pandemic by World Health Organization (WHO). It was reported that asymptomatic persons are potential sources of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. We present an outbreak among health-care workers incited by a doctor who cared a patient with COVID-19 in a Hospital in Wuhan, Hubei, China, which indicates existence of super-spreader even during incubation period.

Keywords: Coronavirus disease 2019, Health-care workers, Super-spreader

To the editor:

Since the coronavirus disease 2019 (COVID-19) identified in Wuhan, Hubei, China in December 2019, it has been characterized as a pandemic by World Health Organization (WHO). Person-to-person transmission pattern of COVID-19 is obvious [1, 2]. Moreover, it was reported that asymptomatic persons are potential sources of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection [3]. Here, we present an outbreak among health-care workers incited by a doctor who cared a patient with COVID-19 in Hospital A, in Wuhan, Hubei, China, which indicates existence of super-spreader during incubation period and sustained human-to-human transmission of COVID-19.

A 66-year-old woman (patient A₁) with a history of cholecystolithiasis presenting right epigastric pain, fever, and tenderness in the right upper abdomen was admitted by doctor B to department A for consideration of acute cholecystitis. During preoperative preparation, patient A₁

presented progressive dyspnea. Chest computed tomography (CT) scan showed bilateral wide spread ground-glass opacity at day 6 after admission. Then, real-time reverse transcription-polymerase chain reaction (RT-PCR) of a throat swabs has been done and confirmed SARS-CoV-2 infection. Patient A₁ was transferred immediately to isolation ward. Without realization of infectious disease, doctor B didn't use any personal protectives when provided health care for patient A₁.

The exposure history was shown in Fig. 1. A multiple disciplinary team meeting (MDT) was hold by department A on the third day after doctor B first exposure to patient A₁. About 40 health-care workers (including doctor B–Q and nurse R) attended the MDT. The MDT lasted for about several hours in a closed meeting room. After the MDT, doctor F conducted a consultation for his patient. Doctor S and T from other two departments communicated with doctor F during the consultation for less than half an hour.

Within 10 days, 14 health care workers presented symptoms, such as fever, cough, fatigue, myalgia, etc. (Additional file 1: Table S1). Doctor H even felt unwell on the day after the MDT. Doctor B presented symptoms 3 days after the MDT. All 19 health-care workers had abnormal chest CT scan with ground-glass opacity and/

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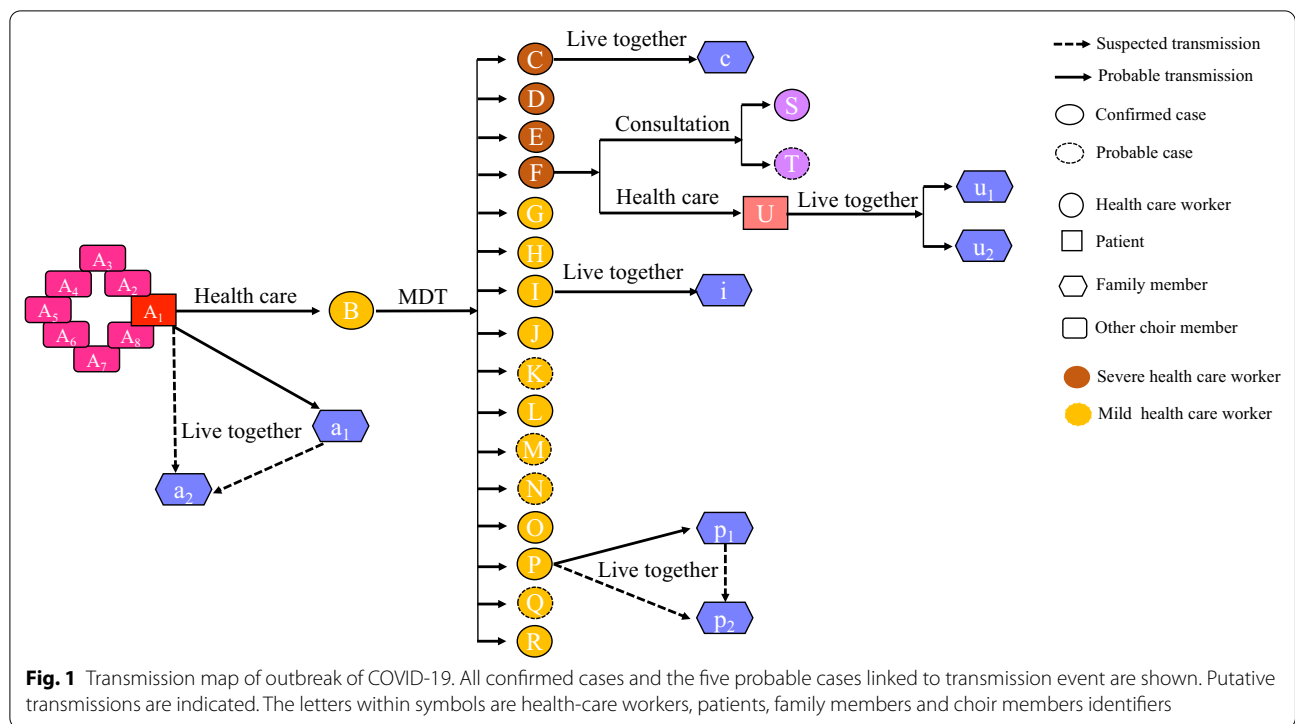


Fig. 1 Transmission map of outbreak of COVID-19. All confirmed cases and the five probable cases linked to transmission event are shown. Putative transmissions are indicated. The letters within symbols are health-care workers, patients, family members and choir members identifiers

or subsegmental areas of consolidation, but normal white blood cell counts and procalcitonin (PCT) values. Assays of SARS-CoV-2 by real-time RT-PCR from throat swabs samples were positive in 14 of 19 health-care workers (Additional file 1: Table S1). The 5 with negative nucleic acid test of SARS-CoV-2 all had abnormal chest CT scan with unilateral ground-glass opacity. The negative result of SARS-CoV-2 test may be explained by low viral load and only once nucleic acid test.

Afterwards, as shown in Fig. 1, the wife (c, i, p₁) of doctor C, I, and P respectively, the mother-in-law (p₂) of doctor P and a patient (U) of doctor F were confirmed COVID-19. The wife (u₁) and mother (u₂) of patient U were also confirmed as COVID-19 later. In addition, patient A₁ was a member of a chorus in which they often sang together. Seven members (A₂–A₈) of his choir were confirmed or suspected COVID-19 and two were died. The son (a₁) of patient A₁ was also confirmed COVID-19 as well as his cousin (a₂).

After inquiry of all the health-care workers attended the MDT, we learnt that doctor B was the only person who was definitely exposed to the person with confirmed COVID-19 before the MDT. Therefore, doctor B was the most possible source of SARS-CoV-2 in the health-care workers attended the MDT. The possibility that some health-care workers in the same department as doctor B may be infected by doctor B during daily work cannot

be precluded. It was reported that asymptomatic persons are potential sources of SARS-CoV-2 infection [3]. The MDT was held 3 days before symptoms onset of doctor B. Whereas, doctor B was yet induced transmission of SARS-CoV-2 to 16 health-care workers. Thus, a person infected SARS-CoV-2 may be a ‘super-spreader’ even during incubation period. Indeed, the presence of ‘super-spreaders’ of COVID-19 cannot be precluded in the large clinical research of Dr. Zhong’s group [4]. Phenomenon of super-spreading was observed in SARS and MERS [5]. In addition, the third and fourth generation of COVID-19 was detected in this case, which indicated possible sustained human-to-human transmission of COVID-19.

Among the 14 health-care workers who presented symptoms, the median incubation time was 4.0 days (IQR 2.0–6.0). However, the shortest incubation time observed in this case was less than 1 day, which is consistent to the recent large clinical research of Dr. Zhong’s group [4].

Supplementary information

Supplementary information accompanies this paper at <https://doi.org/10.1186/s12931-020-01592-w>.

Additional file 1: Table S1. Characteristics of patient A₁ and health care workers with confirmed or suspected COVID-19.

Abbreviations

COVID-19: Coronavirus disease 2019; SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2; WHO: World Health Organization; CT: Computed tomography; RT-PCR: Reverse transcription-polymerase chain reaction; MDT: Multiple disciplinary team meeting; PCT: Procalcitonin; IQR: Interquartile range.

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None reported.

Authors' contributions

YY and ZC had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. CW is the first author. ZC and YY contributed equally to this article. Concept and design: ZC, CW. Acquisition, analysis, or interpretation of data: CW, ZC. Statistical analysis: CW. Drafting of the manuscript: CW. Critical revision of the manuscript for important intellectual content: ZC, YY. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was approved by the institutional ethics board of Zhongnan Hospital of Wuhan University (No. 2020013). Oral consent was obtained from patients or their health care proxy.

Consent for publication

A consent form will be made available to the Editor if requested.

Competing interests

The authors declare that they have no competing interests.

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