
**Asymptomatic and symptomatic SARS-CoV-2 infections in close contacts of
COVID-19 patients: a seroepidemiological study**

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To the Editor

The recent article by Wang et al [1] reported that the proportion of asymptomatic infection was 23%. However, this study depended on nucleic acids detection to define an infection, thus might underestimate the proportion due to the virus shedding window and the sensitivity of testing. Previously studies had demonstrated that almost all COVID-19 patients could raise antibodies. [2, 3] Therefore, the serology screening for infections might give a more clear profile of the spectrum of infection. Here we reported a seroepidemiological study in close contacts of COVID-19 patients in Yancheng, a low epidemic area of China.

A total of 284 close contacts of 14 indicated COVID-19 patients were traced and were quarantined for 14 days (Figure 1A). All close contacts were tested by RT-PCR using throat swab samples collected before de-isolation. The total antibodies against SARS-CoV-2 were tested using a well-validated enzyme linked immunosorbent assay (ELISA) kit (Beijing Wantai Co.,Ltd, China)[2] with a specificity of 99.6% [4], which allows detection of any types of antibody such as IgM, IgG and IgA. Ten close contacts were positive for RT-PCR (2 were asymptomatic cases); seven among them were tested for antibody and all were positive.

Among 274 PCR negative close contacts, 113 (41%), including all four who reported symptoms during the quarantine period, donated plasma samples during isolation for testing total antibodies. Additional 10 (8.8%, 10/113) infected close contacts were identified by positive findings of antibody, including all 4 contacts who reported transient flu-like symptoms and 6 asymptomatic contacts. Therefore, a total of 20

infections were identified in close contactors, 40% (8/20) were asymptomatic.

It should be noted that only 41% of PCR negative close contacts were tested for antibody, which might miss some asymptomatic infections and underestimate the proportion of asymptomatic infection. If the untested asymptomatic contacts had the same infection ratio as that of tested contacts (6/109), then there might have additional 9 infections ($161 \times 6/109 = 9$) among the 161 untested contacts. Therefore, there might be 17 asymptomatic and 12 symptomatic infections among the 284 close contacts; the proportion of asymptomatic infection might be 59% (17/29). The infectivity of asymptomatic infections was only proved in one cluster of the transmission chains (Figure 1B). Based on this finding, all the total 36 COVID-19 patients identified in the area could be linked to close contact with a confirmed infection or a travel history of highly epidemic area.

The present data showed that at least 40% of the SARS-CoV-2 infections might be asymptomatic and some of them are infectious. [5, 6] Nevertheless, under current close contacts tracing and quarantine approach initiated from each indicator patient, the transmission role of asymptomatic infection is limited, as evidenced by: 1) only 2.7% (1/36) of COVID-19 patients identified in the area was caused by close contact with asymptomatic infection; 2) 10 PCR negative infectors among the close contacts did not lead to noted secondary transmission after their de-isolation; and 3) the new diagnosis of local COVID-19 case had remained zero for more than 3 months in the area.

Conflicts of interest

We declare no competing interests.

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Figure 1. Study flow chart and a transmission chain caused by asymptomatic infection. (A) The study flow chart. Ten close contacts were positive for RT-PCR then transferred to hospital; among them 2 were asymptomatic cases and the other 8 cases showed mild symptoms before admission (6) or after admission (2). *The 161 close contacts who had not tested for Ab did not reported any symptom during the quarantine period. *The 103 close contacts who were negative for Ab did not reported any symptom during the quarantine period. (B) A transmission chain caused by asymptomatic infection. Green, orange and red oval were representative of asymptomatic, mild and severe case. Case 2 was a close contact with Case 1 (male, 70 years old, worked in Wuhan and backed to the area on January 20, and then had fever on January 28), since they stood nearby in one bus for 26 minutes on January 23. Case 2 had no any symptom and remained RT-PCR negative in several times' testing, but was found to be antibody positive. Case 2 was the son (56 years old) of Case 3 (female, 74 years old, had headache on January 30 and respiratory symptom on February 6) and lived in one apartment.

Figure 1

