

SHORT REPORT

The latent period of coronavirus disease 2019 with SARS-CoV-2 B.1.617.2 Delta variant of concern in the postvaccination era

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Abstract

Introduction: Emerging variants of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have resulted in new challenges for epidemic prevention and control worldwide. However, little is known about the latent period of coronavirus disease by the SARS-CoV-2 Delta variant of concern (VOC) in the postvaccination era.

Methods: The epidemiology and clinical data of cases with confirmed SARS-CoV-2 Delta VOC infection were retrospective collected. Dates of the first positive PCR test were collected to estimate the distribution of latent period.

Results: Of the 40 patients, 16 were male (40%). The median age of patients was 47.5 years. The median latent period of patients was 6.0 days (interquartile range [IQR], 4.0–9.0 days) and the longest latent period was 13.0 days after exposure. The latent periods were longer in male patients compared to female patients (median, 8.5 days vs. 5.0 days, $p = .041$). The median latent period was comparable among fully vaccinated cases (6.5 days), no vaccinated cases (7.5 days), and partially vaccinated cases (5.5 days).

Conclusions: The median latent period of SARS-CoV-2 Delta VOC infection was 6.0 days. The latent period between vaccinated and non-vaccinated patients was not significantly different. The 14-day quarantine program is

Tao Ma, Songning Ding, and Rui Huang contributed equally to this study.

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sufficient to prevent the transmission of COVID-19 by Delta VOC in the postvaccination era.

KEYWORDS

latent period, severe acute respiratory syndrome coronavirus 2, vaccine, variant of concern

1 | INTRODUCTION

Emerging variants of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have resulted in new challenges for epidemic prevention and control worldwide. The SARS-CoV-2 lineage B.1.617.2 (Delta) variant of concern (VOC) was a variant with faster spread compared to other variants.¹

A number of studies have estimated the incubation period of wild-type.^{2,3} However, contrasted with the incubation period, the latent period is the time interval between infection and onset of infectiousness which is important for the control of infectious disease transmission.⁴ Xin et al.⁵ had estimated the latent period of SARS-CoV-2 infection, while little is known about the latent period of coronavirus disease by the SARS-CoV-2 Delta VOC in the postvaccination era.

2 | METHODS

The time of exposure to SARS-CoV-2 Delta VOC, any symptom onset, SARS-CoV-2 vaccination information, and case detection of each patient with confirmed SARS-CoV-2 Delta VOC infection were retrospectively collected. Data on the exposure to infection were collected to estimation of the latent period distribution. Repeated testing results and sampling dates of each PCR test were collected. Dates of the first positive PCR test were collected to estimate the latent period distribution. Vaccination status of patients with COVID-19 was categorized into three groups according to the immunization history of SARS-CoV-2 vaccine, which included fully vaccinated (two doses of SARS-CoV-2 vaccines), partially vaccinated (single dose of SARS-CoV-2 vaccine) and no vaccinated (no SARS-CoV-2 vaccine doses). This study was approved by the Institutional Review Board at Nanjing Municipal Center for Disease Control and Prevention with a waiver of informed consent.

3 | RESULTS

Forty cases with confirmed SARS-CoV-2 Delta VOC infection were collected (Table 1). Of these, 16 were male (40%). The median age was 47.5 years (interquartile

range (IQR), 32.3–55.0 years). All cases had a known history of single confirmed exposure. The timelines of disease onset in confirmed COVID-19 patients were presented in Figure 1A. The median times of

TABLE 1 Characteristics of patients with SARS-CoV-2 Delta VOC infection

Characteristics	Median (IQR) or n (%)
Age	
≤18	6 (15)
19–60	26 (65)
≥61	8 (20)
Gender	
Male	16 (40)
Female	24 (60)
Comorbidities	
Type 2 diabetes	3 (7.5)
Cardiovascular diseases	9 (22.5)
Chronic liver diseases	1 (2.5)
Onset symptoms	
Fever	11 (27.5)
Cough	21 (52.5)
Fatigue	4 (10.0)
Sore throat	6 (15.0)
Diarrhea	2 (5.0)
Headache	1 (2.5)
Vomit	2 (5.0)
Muscle ache	4 (10.0)
Severity of illness	
Non-severe illness	37 (92.5)
Severe illness	3 (7.5)
Vaccination status	
No vaccinated	12 (30)
Partially vaccinated	14 (35)
Fully vaccinated	14 (35)

Abbreviations: IQR, interquartile range; VOC, variant of concern.

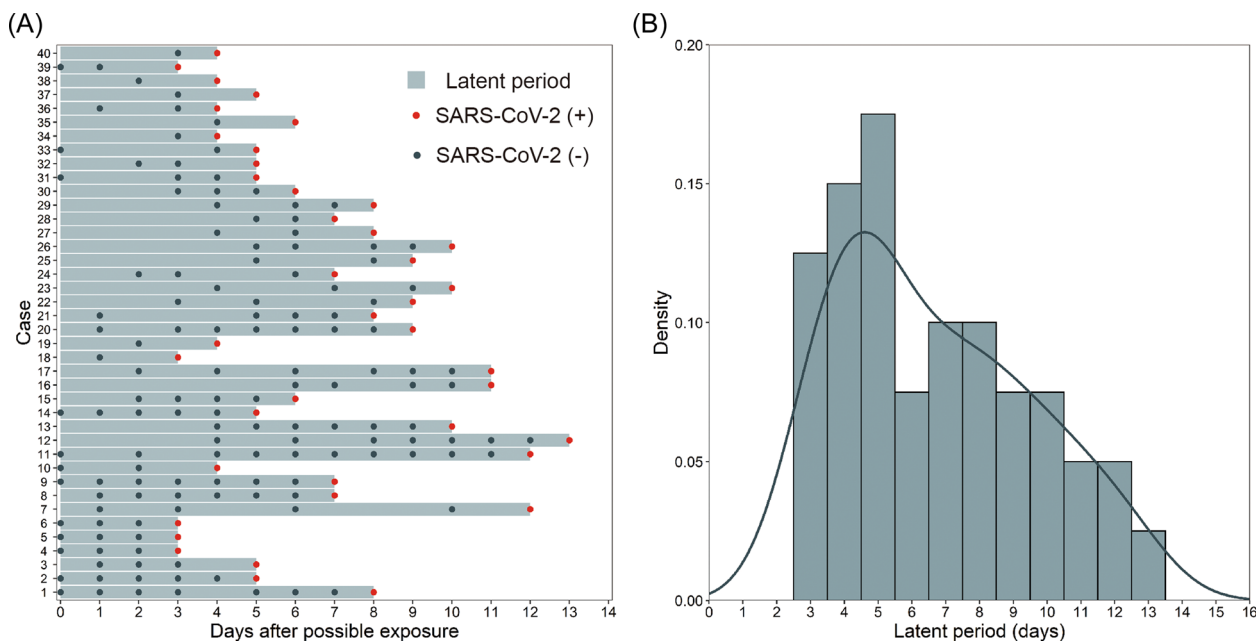


FIGURE 1 Latent period of coronavirus disease 2019 with SARS-CoV-2 B.1.617.2 Delta variant of concern. SARS-CoV-2 Delta VOC exposure and case detection times (A) and latent period distribution (B).

SARS-CoV-2 RNA screening before the first positive test result was three times. The median latent period was 6.0 days (IQR, 4.0–9.0 days) after exposure. The longest latent period was 13.0 days (Figure 1B) after exposure.

The latent periods were longer in male patients compared to female patients (median, 8.5 vs. 5.0 days, $p = .041$; Figure 2A,B). The latent periods were comparable between different age groups (Figure 2C). Fourteen patients had received full vaccination. The median latent period among fully vaccinated cases was 6.5 days (IQR, 4.8–9.3 days) which was similar to the no vaccinated cases and partially vaccinated cases with the median latent periods of 7.5 days (IQR, 4.3–9.8 days, $p = .697$) or 5.5 days (IQR, 4.0–8.3 days, $p = .701$), respectively (Figure 2D).

4 | DISCUSSION

Comprehensive large-scale SARS-CoV-2 RNA testing strategies have been widely used in mainland China to control outbreaks of COVID-19.⁶ Close contacts of confirmed cases were required to be quarantined for 14 days and samples were repeatedly collected to screen for SARS-CoV-2 RNA regardless of whether any symptoms were reported, providing a possibility for the calculation of latent period.⁵ Xin et al.⁵ estimated the mean latent period of COVID-19 to be

5.5 days (95% confidence interval: 5.1–5.9 days). However, the presence of variants of SARS-CoV-2 in the study was not described.

To the best of our knowledge, our study is the first study that estimated the latent period of COVID-19 with Delta VOC of 6 days. Only patients with single exposure were included. Moreover, patients were repeatedly tested every day or every other day for SARS-CoV-2 RNA before confirmed COVID-19. Thus, we considered that the latent period is accurate. We found that the latent period was shorter in female patients compared to male patients. However, the latent period was comparable between vaccinated patients and no vaccinated patients.

This study presents some limitations. First, the sample size used to estimate the latent period was small since we only included cases with single possible exposure. Patients with multiple exposures, continued exposure, or no known exposure were excluded from the analysis. Second, we did not consider the demographic characteristics of the patients, which may have affected the latent period.

In conclusion, the median latent period of SARS-CoV-2 Delta VOC infection was 6.0 days. No significant difference in the latent period between vaccinated and non-vaccinated patients was found. Our study support that the 14-day quarantine program is sufficient to prevent the transmission of COVID-19 by Delta VOC in the postvaccination era.

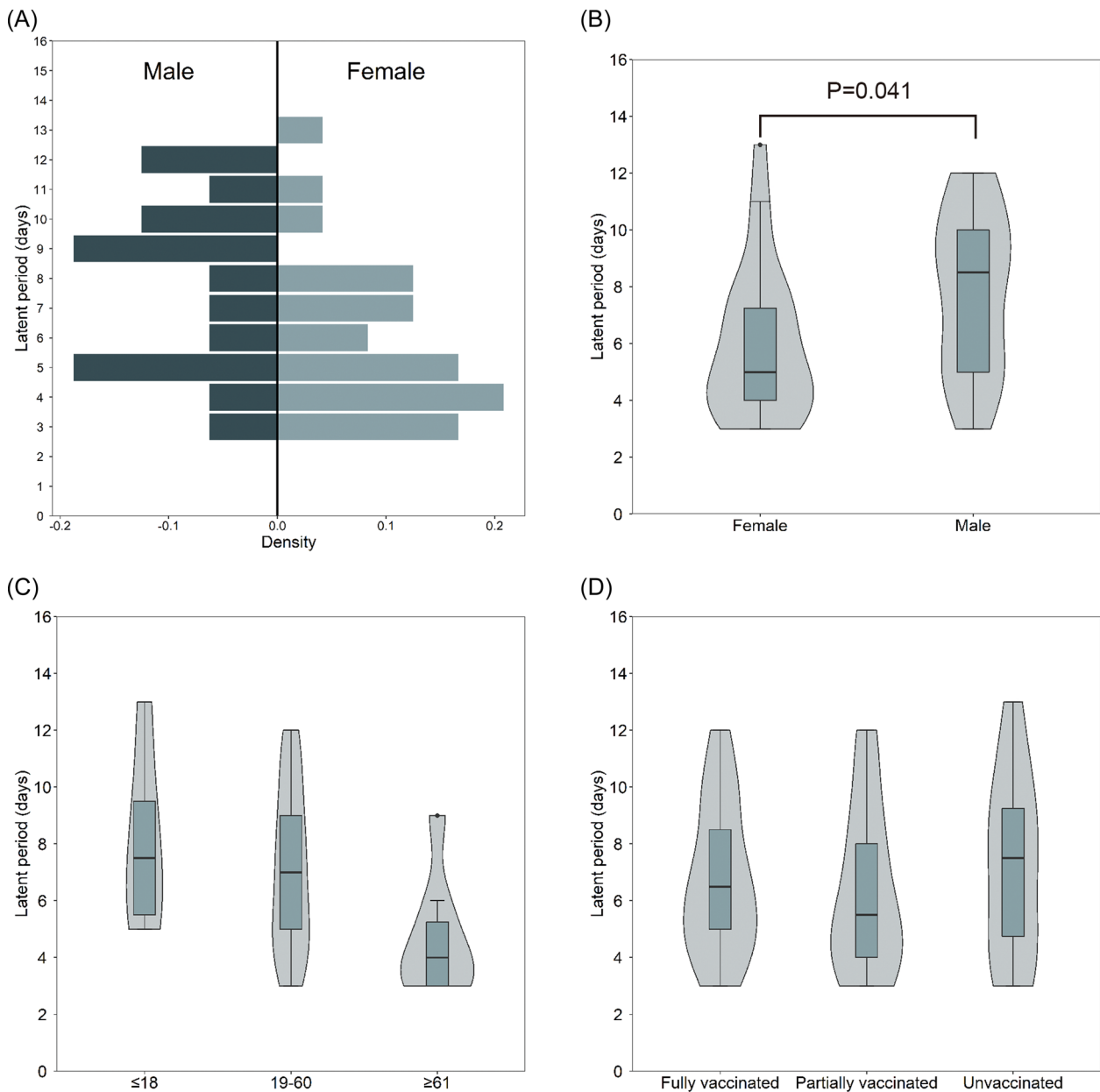


FIGURE 2 Comparisons of the latent period distribution in COVID-19 patients with different gender (A,B), age (C), and vaccination status (D)

AUTHOR CONTRIBUTIONS

All authors contributed to this study at different levels. *Study concept and design:* Nan Zhou, Huafeng Fan, and Rui Huang. *Acquisition of data:* Hengxue Wang, Junjun Wang, Jiacheng Liu, Jian Wang, Jie Li, and Chao Wu. *Statistical analysis and interpretation of data:* Rui Huang and Hengxue Wang. *Drafting of the manuscript:* Tao Ma, Songning Ding, and Rui Huang. *Critical revision of the manuscript for important intellectual content:* Nan Zhou, Huafeng Fan, and Rui Huang.

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