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## Short Communication

## Post-vaccination cases of COVID-19 among healthcare workers at Siloam Teaching Hospital, Indonesia

Cucunawangsih Cucunawangsih<sup>a,\*</sup>, Ratna Sari Wijaya<sup>a</sup>, Nata Pratama Hardjo Lugito<sup>b</sup>, Ivet Suriapranata<sup>c</sup><sup>a</sup> Department of Microbiology, Faculty of Medicine, Pelita Harapan University, Tangerang, Indonesia<sup>b</sup> Department of Internal Medicine, Faculty of Medicine, Pelita Harapan University, Tangerang, Indonesia<sup>c</sup> Division of Immunology, Mochtar Riady Institute for Nanotechnology and Medical Science Group, Pelita Harapan University, Tangerang, Indonesia

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## ABSTRACT

**Background:** Healthcare workers (HCWs) are at increased risk of exposure to severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the cause of coronavirus disease 2019 (COVID-19), compared with the general population. Therefore, they are given priority for the COVID-19 vaccine in the national COVID-19 vaccination campaign in Indonesia. However, while the daily number of new COVID-19 cases remains high, and data regarding the efficacy of the vaccine in healthcare settings remain unavailable, vaccinated HCWs remain at risk of COVID-19 infection and further transmission.

**Objective:** To identify cases of COVID-19 among vaccinated HCWs at Siloam Teaching Hospital, Indonesia via active and passive surveillance conducted by the hospital's COVID-19 infection prevention and control unit.

**Results:** Of 1040 HCWs who had received two doses of the COVID-19 vaccine, 13 (1.25%) tested positive for SARS-CoV-2 RNA on reverse transcriptase polymerase chain reaction between 2 and 11 days (median 5 days) after the second vaccination.

**Conclusion:** Laboratory-confirmed COVID-19 among vaccinated HCWs soon after the second vaccination indicates that HCWs remain at risk of COVID-19. Therefore, the presence of symptoms soon after full vaccination cannot be considered as vaccine-related symptoms, and regular COVID-19 testing should be conducted among HCWs.

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Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), has rapidly spread worldwide. Indonesia reported its first case of COVID-19 on 2 March 2020, and reached more than 1 million cases by February 2021 ([World Health Organization, 2021](#)). Among the countries in south-east Asia, Indonesia has the most active COVID-19 cases ([Dong et al., 2020](#)), and the nation's case fatality rate was higher than the global average (2.7% vs 2.2%) at the end of February 2021 ([Kementerian Kesehatan Republik Indonesia, 2021](#)). The number of daily confirmed cases of COVID-19 remains high in Indonesia, with more than 1000 new cases per day.

On 11 January 2021, CoronaVac (Sinovac Biotech, Beijing, China) was approved by the Indonesian Food and Drugs Agency for emergency use, and the national COVID-19 vaccination programme commenced on 13 January 2021. Healthcare workers (HCWs) are at increased risk of COVID-19 compared with the general population. Therefore, the Indonesian Ministry of Health has prioritized HCWs for vaccination in Indonesia's initial COVID-19 vaccination programme. At Siloam Teaching Hospital, Indonesia, vaccination of HCWs commenced on 26 January 2021, and excluded HCWs with a history of COVID-19. CoronaVac is given in two doses administered intramuscularly with a 14-day interval. Each dose consists of 3 µg CoronaVac in 0.5 mL of aluminium hydroxide diluent.

Active and passive surveillance of vaccinated HCWs conducted by the hospital's COVID-19 infection prevention and control unit showed that among 1040 HCWs who had received both vaccinations, 13 (1.25%) tested positive for COVID-19 on reverse

\* Corresponding author at: Faculty of Medicine, University of Pelita Harapan, MH Thamrin Boulevard 1100, Banten, Indonesia.

E-mail address: [cucunawangsih.fk@uph.edu](mailto:cucunawangsih.fk@uph.edu) (C. Cucunawangsih).

**Table 1**  
Cases of coronavirus disease 2019 among healthcare workers (HCWs) after full vaccination, Siloam Teaching Hospital, Indonesia, 11–19 February 2021.

No.	Age (years)	Sex	Unit	Healthcare sector	Indication of RT-PCR testing	Date of first vaccination	Date of second vaccination	Day of symptom onset <sup>a</sup>	Day tested	Number of days from symptom onset to RT-PCR testing	Ct values target 1 (N)	Ct values target (ORF1ab)	Serology test after full vaccination <sup>b</sup>
1	32	M	Admission department	Admission clerk	Symptoms	01/02/2021	15/02/2021	+7	+8	+1	24.6	24.3	Non-reactive
2	34	F	Admission department	Admission clerk	Symptoms	02/02/2021	17/02/2021	+3	+5	+2	26	25.2	Non-reactive
3	39	M	Hospital security	Staff	Exposure	05/02/2021	19/02/2021	Asymptomatic	+3	NA	34.2	-	Non-reactive
4	32	M	General	Housekeeper	Exposure	04/02/2021	19/02/2021	Asymptomatic	+3	NA	16.4	16.3	Non-reactive
5	25	F	ICU	Staff	Symptoms	30/01/2021	13/02/2021	0	+3	+3	22.9	23.8	Non-reactive
6	34	M	ED	Nurse	Symptoms	31/01/2021	13/02/2021	+3	+5	+2	16.3	16.4	Non-reactive
7	26	M	Medical treatment centre	Staff	Symptoms	01/02/2021	16/02/2021	+1	+4	+3	18.6	19.9	Non-reactive
8	43	F	Internal medicine	Nurse	Symptoms	29/01/2021	12/02/2021	0	+4	+4	19.3	20.6	Non-reactive
9	25	F	ED	Nurse	Symptoms	01/02/2021	15/02/2021	+1	+2	+1	25.4	24.7	Reactive
10	28	F	Internal medicine	Nurse	Symptoms	02/02/2021	16/02/2021	+2	+5	+3	14.4	15.4	Non-reactive
11	41	F	Internal medicine	Nurse	Symptoms	29/01/2021	13/02/2021	+4	+8	+4	18	18.1	Reactive
12	35	F	Laboratory	Staff	Symptoms	28/01/2021	11/02/2021	+10	+11	+1	21.6	20.3	Non-reactive
13	29	F	Finance	Staff	Symptoms	01/02/2021	15/02/2021	+7	+9	+2	32.7	32	Reactive

NA, not applicable; ICU, intensive care unit; ED, emergency department; Ct, cycle threshold; RT-PCR, reverse transcriptase polymerase chain reaction.

<sup>a</sup> Considering the day of second vaccination as day 0.

<sup>b</sup> Serological testing was performed within the first 2 weeks of vaccination.

transcriptase polymerase chain reaction (RT-PCR) after the second vaccination (Table 1). The mean age of vaccinated HCWs with COVID-19 was 32.5 years (standard deviation 5.9 years), and they worked in different units and healthcare sectors in the hospital.

Among the 13 HCWs who tested positive for COVID-19, 11 were tested because they had symptoms of influenza-like illness, such as fever, cough, headache, chills, sore throat and myalgia. Two asymptomatic HCWs with COVID-19 were identified as part of postexposure screening. The median time between the second vaccination and the onset of symptoms was 3 days (range 0–10 days). None of the HCWs with COVID-19 in this study required hospitalization. Recent studies have indicated that people aged >60 years with pre-existing comorbidities are more likely to have unfavourable clinical outcomes of COVID-19 (Bonanad et al., 2020; Luo et al., 2020). A previous report has shown that the distribution of angiotensin-converting enzyme, an entry receptor of SARS-CoV-2, was mainly detected in the lower pulmonary tract of older patients. Additionally, the lung progenitor cells that play an important role in lung repair were found in lower frequency, potentially contributing to the poor prognosis of older patients with COVID-19 (Zhang et al., 2021b). However, in the present study, all HCWs were aged <60 years, which is potentially the main factor determining the favourable clinical outcomes among these patients.

The median time between the onset of symptoms and positive RT-PCR testing was 5 days (range 2–11 days). The gene targets for RT-PCR assay were the N gene and ORF1ab gene. Samples with a single target gene and a cycle threshold (Ct) value <40 were interpreted as a positive result, in line with the manufacturer's guidance (Bioacumen, Singapore). The median Ct values of the N gene and ORF1ab gene were 21.6 (range 14.4–34.2) and 20.5 (range 15.4–32), respectively, indicating the high level of possibility of COVID-19 acquisition during the vaccination programme. Moreover, this range of Ct values may suggest that vaccinated HCWs pose a high risk for viral transmission due to the significant viral load (Perera et al., 2020).

Regular qualitative serological screening using the Elecsys anti-SARS-CoV-2 assay (Roche Diagnostics, Basel, Switzerland) that detects antibodies to nucleocapsid (anti-N) was conducted by the COVID-19 infection prevention and control unit. Serological testing showed that no antibody response was detected in 10 HCWs (HCW1, HCW2, HCW3, HCW4, HCW5, HCW6, HCW7, HCW8, HCW10, HCW12), whereas three HCWs (HCW9, HCW11, HCW13) showed an antibody response.

The CoronaVac vaccine is an inactivated vaccine that uses a whole virus structure consisting of spike (S), nucleocapsid (N), membrane (M) and envelope (E) proteins as vaccine targets (Dai and Gao, 2021). As a result, the antibody response elicited by CoronaVac is directed not only against the S protein but also against many other SARS-CoV-2 antigens. In the current observation, the antibody response against the N protein detected by electrochemiluminescence immunoassay was only observed in three HCWs after the second vaccination. Previous studies have shown that antibodies against the N protein following SARS-CoV-2 infection can be detected at approximately the same time as antibodies against the S protein, and there is a positive correlation between these two antibodies (Burbelo et al., 2020; McAndrews et al., 2020; To et al., 2020). Although no data were available regarding the N-specific antibody titre or the efficacy of CoronaVac after the first vaccination, early studies had reported that antibody levels against SARS-CoV-2 antigen did not increase significantly until 14 days after the second vaccination (Xia et al., 2020; Zhang et al., 2021a). Thus, this indicates that HCWs remain at risk of acquiring COVID-19 in the initial phase after receiving two vaccine doses.

In conclusion, vaccinated HCWs remain at risk of acquiring SARS-CoV-2 infection, especially in Indonesia where the number of COVID-19 cases remains high. Therefore, any COVID-19 symptoms found among vaccinated HCWs should not be considered as vaccine-related systemic events, and these HCWs should be considered as suspected COVID-19 cases until COVID-19 infection can be ruled out. Furthermore, active and passive surveillance and routine laboratory testing are essential to identify COVID-19 among HCWs and prevent secondary SARS-CoV-2 transmission to patients, other HCWs and throughout healthcare settings. These measurements have to be implemented strictly until systematic and comprehensive data regarding the effectiveness of CoronaVac in healthcare settings are available.

#### Author contributions

Design of research study (CC, RW, NL), data acquisition (CC), data analysis (CC, RW, NL, IS), interpretation of results (CC, RW, NL, IS) and writing the manuscript (CC, RW, NL, IS).

#### Ethical approval

This study was approved by the Research Ethics Committee at the Faculty of Medicine, Pelita Harapan University.

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#### Conflicts of interest

None declared.

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