Letter to the Editor

Healthcare-associated transmission of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) among Thai healthcare personnel who receive 2 doses of a coronavirus disease 2019 (COVID-19) vaccine: A call for considering a booster dose

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To the Editor—There have been consistent reports of healthcare personnel (HCP) acquiring COVID-19 as a result of workplace exposure, either directly or indirectly.1,2 In Thailand, the emerging alpha variant of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) replaced the original strain in February 2021, followed by the emergence of the delta variant of SARS-CoV-2 in April 2021.3 Immunization of HCP was the first priority of the coronavirus disease 2019 (COVID-19) vaccination campaign, and most HCP received vaccine, based on the government vaccine allocation. As of July 19, 2021, CoronaVac (Sinovac-Biotech) and ChAdOx-1 (AstraZeneca) are the only 2 COVID-19 vaccines available in Thailand. Despite 2 doses of vaccine, the number of HCP who were infected with SARS-CoV-2 in Thailand is continuously increasing. To better understand the epidemiology of healthcare-associated SARS-CoV-2 transmission among HCP, we performed a retrospective review of HCP who received 2 doses of COVID-19 vaccine.

At Thammasat University Hospital a 650-bed, academic medical center in Pratum Thani, Thailand, a COVID-19 vaccination campaign for HCP (n = 890) was initiated on February 1, 2021. Of 890 HCP, 860 (96.6%) were vaccinated and were invited to participate in a vaccination serological study after vaccination. In total, 767 HCP (89.2%) received CoronaVac and 93 (10.8%) received ChAdOx-1. Occupational health records from February 1, 2021, to July 16, 2021, were reviewed to evaluate the incidence of healthcare-associated SARS-CoV-2 transmission among HCP. Healthcare-associated SARS-CoV-2 transmission among HCP was defined as HCP who developed COVID-19 with a clear contact history to confirmed COVID-19 case(s) during patient care without using appropriate personal protective equipment (PPE) and without an epidemiology link to possible community or home transmission. Definitions of exposure risk and severity of symptoms are summarized in the Supplementary Material (online).4,5 Data collected included HCP demographics, underlying diseases, occupation, risk of exposures, severity of symptoms and serology after 2 doses of vaccinations (if available). Anti-spike receptor-binding domain antibody (anti-S-RBD-Ab) was measured using quantitative anti-SRBD IgG enzyme-linked immunosorbent assay (ELISA) in house to detect presumptive immunity to SARS-CoV-2 among vaccinated HCP who participated in the serology study, according to previously described techniques.6 The World Health Organization (WHO) standard for anti-SARS-CoV-2 antibody (NIBSC code 20/136) was included in the assay as a reference standard curve. The optical density (OD) values from each serum sample were translated into anti-SRB-D IgG levels (in BAU/mL) using the standard curve in the assay. Descriptive analysis was used to describe the characteristics of HCP who developed healthcare-associated COVID-19.

In total, 62 vaccinated HCP met the criteria for healthcare-associated COVID-19. Among 62 HCP 54 (87%) were female; 38 (62%) were nurses or nurse assistants; 16 (25.8%) worked in the medicine department; and 42 (68%) were categorized as having “high-risk” exposure (Table 1). Notably, 24 HCP (38.7%) acquired COVID-19 via exposure to asymptomatic cases (Table 1). Furthermore, all infected HCP who had received 2 doses of COVID-19 vaccine developed mild COVID-19 symptoms that requiring admission by Thai law. Despite the vaccination campaign, a higher frequency of healthcare-associated SARS-CoV-2 transmission in our hospital was seen after the emergency of the alpha variants and was accelerated after the emergence of the delta variant of SARS-CoV-2 in Thailand (Supplement 1 online). Data showed that 8 HCP had anti-S-RBD-Ab IgG prior to infection with COVID-19. The median anti-S-RBD-Ab IgG level for these 8 HCP after vaccination was 112.5 BAU/mL (range, 25–355). The median anti-S-RBD-Ab IgG levels at day 60 after vaccination among HCP were 108.9 BAU/mL for CoronaVac (n = 7) versus 355 BAU/mL for ChAdOx-1 (n = 1). The 7 HCP who received CoronaVac were infected at a median of 67 days (range, 55–115) after the second vaccine dose, and 1 HCP who received 2 doses of ChAdOx-1 was infected 44 days after the second vaccine dose.
This study has some important implications. First, HCP were at extremely high risk for healthcare-associated SARS-CoV-2 transmission despite receiving 2 doses of COVID-19 vaccine. This risk may be explained by the suboptimal immune response following CoronaVac, particularly after day 60. Based on our hospital serological study, HCP who received CoronaVac, tested after 60 days, had significantly lower antibody levels compared to those who were tested within 60 days of receiving CoronaVac (111.1 ± 62.63 vs 237.4 ± 160.4 BAU/mL; P < .001) (unpublished data). Antibody levels of HCP who completed 2 doses of ChAdOx-1 (12 weeks apart) at day 14 were measured at 401.8 ± 289.1 BAU/mL (unpublished data). Together, these data suggest the need for a booster dose of COVID-19 vaccine among HCP, particularly those who received CoronaVac. Second, most HCP were categorized as having a high-risk exposure to the index case without using appropriate PPE. Third, we also noticed that a substantial proportion of HCP acquired SARS-CoV-2 from asymptomatic index cases. These data emphasize the need for continuous education to focus on the stringent use of PPE to enhance HCP safety, despite being fully vaccinated. Lastly, the fact that all HCP who were infected developed only mild COVID-19 symptoms confirmed the effectiveness of both vaccines to prevent severe disease and mortality.7,8

Our study had some limitations including the small sample size, the limited number of HCP who participated in a vaccination serological study after vaccination, and the possibility of misclassification bias from using epidemiology data to classified healthcare-associated SARS-CoV-2 transmission.

Additional studies to evaluate the viral transmission dynamic for the delta variant and its impact on healthcare-associated transmission among HCP who have completed different types of COVID-19 vaccine, as well as a longitudinal data regarding anti-S-RBD-Ab IgG among HCP, will provide insight into better protection of healthcare-associated transmission of COVID-19 among HCP.

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References