

Letter to the Editor

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in vaccinated and unvaccinated healthcare personnel in a Veterans' Affairs healthcare system

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To the Editor—Coronavirus disease 2019 (COVID-19) mRNA vaccines substantially reduce but do not eliminate the risk for symptomatic and asymptomatic severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infections in healthcare personnel.^{1–5} In a recent report, 5 (12%) of 43 fully vaccinated personnel acquired mildly symptomatic or asymptomatic SARS-CoV-2 infection after higher-risk household exposures.⁶ Ongoing surveillance studies are needed to determine whether such postvaccination “breakthrough” infections are caused by variants of concern with reduced in vitro susceptibility to neutralization by vaccine-induced antibodies.⁷ Surveillance studies can also provide comparative data on COVID-19 in unvaccinated personnel.

The study protocol was approved by the Cleveland Veterans' Affairs Medical Center's institutional review board. We examined the incidence and clinical characteristics of COVID-19 in fully vaccinated versus unvaccinated personnel at the Cleveland VA Medical Center from February 1, 2021, through May 15, 2021. Personnel were considered fully vaccinated if >2 weeks had passed since their second dose of the BNT162b2 vaccine. Partially vaccinated personnel with COVID-19 were excluded. Personnel health and infection control databases were reviewed to obtain information on exposure history, symptoms, and suspected transmission clusters based on contact tracing investigations. We used the Fisher exact test to compare the percentage of vaccinated versus unvaccinated employees developing COVID-19.

Nasopharyngeal respiratory samples were tested by reverse transcriptase polymerase chain reaction (RT-qPCR) for SARS-CoV-2 RNA using a TaqPath COVID-19 CE-IVD RT-PCR Kit (ThermoFisher, Waltham, MA). Positive samples were further screened by multiplex qPCR for the presence of S gene L452R, E484K, N501Y mutations, S gene 69/70 deletion, and ORF1a 3675/3677 deletion to identify potential variants of concern or interest. Samples with cycle threshold <30 were subjected to an

additional multiplex RT-qPCR for a deletion in the ORF1a gene (ORF1a Δ3675–3677)⁸ and an N501Y spike mutation.^{8,9} Any samples containing any of these alterations were then subjected to whole-genome sequencing for lineage identification using the SARS-CoV-2 Research Panel and Ion Gene Studio S5 system (ThermoFisher).

Figure 1 shows the cumulative incidence of SARS-CoV-2 infections in fully vaccinated versus unvaccinated personnel. During 14 weeks of follow-up, 80 (5.7%) of 1,408 unvaccinated employees were diagnosed with COVID-19 versus 12 (0.3%) of 4,222 vaccinated employees ($P < .0001$). Of the 12 vaccinated employees with COVID-19, 8 (67%) reported prior higher-risk exposures, including 5 exposed to family members with SARS-CoV-2 infection, 2 exposed in the community, and 1 exposed to an unvaccinated coworker with COVID-19. All of the vaccinated employees with COVID-19 had mild symptoms and none required hospitalization. We identified 4 clusters of SARS-CoV-2 infections of 17 employees that involved suspected transmission among unvaccinated employees. No transmission clusters were linked to vaccinated personnel with COVID-19.

The mean cycle threshold values for the vaccinated employees with COVID-19 was 20 (range, 14–28). S gene dropout suggestive of the B.1.1.7 variant was detected in 7 (58.3%) of the 12 vaccinated employees with COVID-19; the overall percentage of positive SARS-CoV-2 positive samples in the facility with S gene dropout during the study period was 49% (107 of 217 positive tests). Whole-genome sequencing confirmed that the S gene dropout specimens were lineage B.1.1.7. No other variants of concern or interest were identified.

In summary, in our facility fully vaccinated personnel were 19 times less likely than unvaccinated personnel to be diagnosed with COVID-19. The percentage of infections with the B.1.1.7 variant among vaccinated personnel was equivalent to the overall percentage of B.1.1.7 infections in our facility. No other currently classified variants of concern or interest were detected among the breakthrough infections. Most SARS-CoV-2 infections in vaccinated personnel occurred after higher-risk exposures to family members. As noted previously, Selby et al⁶ reported that such exposures may present a substantial risk to vaccinated

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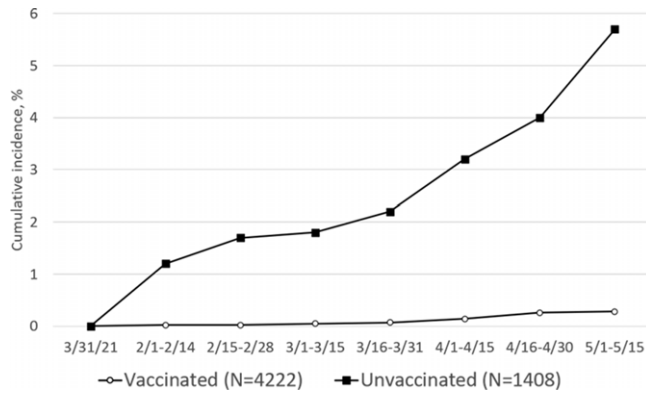


Fig. 1. Cumulative incidence of symptomatic SARS-CoV-2 infection in vaccinated versus unvaccinated healthcare personnel.

individuals. Our findings provide support for recommendations that vaccinated individuals continue to take measures to avoid SARS-CoV-2 exposure.

Our findings also highlight the potential for adverse consequences when personnel decline SARS-CoV-2 vaccination. Unvaccinated personnel have a substantial ongoing risk for COVID-19. Infected personnel can transmit SARS-CoV-2 to their patients and coworkers.¹⁰ During the 14-week study period, our healthcare system investigated 4 clusters of SARS-CoV-2 infections that involved suspected transmission by unvaccinated employees. In a long-term care facility in Kentucky, an unvaccinated employee was implicated as the source of an outbreak that resulted in infections in 20 healthcare personnel and 26 residents with 3 resident deaths.¹ There are also potential adverse effects for individuals who do not develop COVID-19. In our facility, several unvaccinated individuals missed work due to quarantine after higher-risk COVID-19 exposures. Such quarantine is not required for vaccinated individuals. Facility-specific data highlighting the incidence of infections and days of work missed due to quarantine for vaccinated versus unvaccinated employees might serve as a useful reminder of the benefits of vaccination for hesitant individuals.

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