Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

MAYO CLINIC

EDITORIAL

Lessons From India's Second Wave: Real World Effectiveness of Health Care Worker Vaccination

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Until the middle of March 2021, there was a sense that India had somehow miraculously averted the coronavirus disease 2019 (COVID-19) pandemic. The first wave had almost fully abated by the end of 2020, and life was returning to normal. Then came the ferocious second wave, which at its peak in early May was marked by 400,000 confirmed daily new cases, and more than 400 daily deaths by official counts.[1] India's deadly second wave had many lessons for the world. First, it demonstrated that abandoning protective measures like masks and distancing before achieving herd immunity can have devastating consequences. At the time of the second wave less than 10% of India had received even one dose of COVID-19 vaccination. Second, it brought into question the reliability of seroprevalence studies. Big cities in India that had reported seroprevalence rates of 40% to 50% by the end of 2020 were nevertheless severely affected in the second wave.[2-5] Third, it highlighted (again) the consequences of an overwhelmed health care system. New York and Lombardy had shown us that mortality increases when cases rise to the point where the health care system is strained. In many parts of India, demand for life-saving resources from hospital beds to oxygen to medications rapidly outstripped supply. Many lives were lost due to this, something that could have easily been avoided if cases did not all occur at the same time. Fourth, was the identification that a new more transmissible and possibly more serious variant, B1.617.2 (later named the Delta variant), was probably driving the crisis in India.[6] During the peak of the crisis, concerning reports of COVID-19 infections, hospitalizations, and even deaths in people who had already been vaccinated were appearing in the media and on social media.[7] This raised an urgent question about whether COVID-19 vaccines were as effective in the real world as they had been in randomized trials, and whether the variants driving the crisis in India were able to evade the protection offered by vaccines. At the time, it was hard to estimate the extent of the problem and to be able to determine if these were anecdotal rare events or more serious and widespread.

In this issue of *Mayo Clinic Proceedings*, a study on vaccinated health care workers from Christian Medical College, Vellore, India, provides important and reassuring data that vaccines do offer significant protection from COVID-19 infection.[8] This health care facility in Southern India had vaccinated 85% of their 10,600 health care workers. Almost all received (93.4%) Covishiel, the Oxford–Astra Zeneca vaccine manufactured by Serum Institute of India. The others received Covaxin, an inactivated virus vaccine developed by Bharath Biotech, India. Six hundred seventy of 7080 (9.5%) fully vaccinated health care workers developed COVID-19 compared with 438 of 1609 (27.2%) unvaccinated health care workers (relative risk, 0.35; 95% CI, 0.32 to 0.39). More importantly, there was a 92% reduction in need for oxygen therapy, and a 94% reduction in intensive care unit admissions in vaccinated persons. The only death in the study occurred in an individual who was unvaccinated. Overall, the study provides the first published data that vaccines are highly effective in a real-world setting in India.

Health care workers are at increased risk for COVID-19 infection and therefore have

been prioritized for vaccination. A vaccine effectiveness study in US health care personnel estimated that 2 doses of the mRNA vaccines were 94% effective against symptomatic COVID-19.[9] The mRNA vaccines are not available in most low- and middle-income countries, and other types of vaccine including the viral vector vaccines form the backbone of national vaccination programs in many parts of the world. This study provides reassurance that the Astra-Zeneca vaccine produced in India provides high levels of protection, comparable to that afforded by the mRNA vaccines. A few caveats remain. In the study from Christian Medical College Vellore, we do not know what proportion of infections was caused by the Delta variant. In this regard, studies in the United Kingdom provide reassurance on the effectiveness of vaccines against two of the most common variants of concern, the Alpha and Delta variants. Second, it is likely that health care workers are younger and not fully representative of the elderly population that is most at risk from COVID-19; moreover, health care workers are also likely to adhere to other nonpharmacologic interventions to reduce probability of infection such as masks and distancing. Finally, more real-world data is needed on Covaxin, especially against the Delta variant. After a long delay, a preprint with results of the randomized trial of Covaxin has been published, and it shows excellent efficacy of this vaccine.[10] Efficacy was slightly reduced against the Delta variant (65%), and there were insufficient data to determine efficacy to prevent severe COVID-19.

This report adds to the growing body of evidence that vaccine breakthrough infections and deaths are rare. Early reports of vaccine failure appeared higher due to the large population size in India, and the tendency of social media to amplify adverse outcomes. Vaccines are the single best way to reduce COVID-19 infections and transmission. Current vaccines are highly effective in preventing severe disease, and dramatically reduce the risk of hospitalizations, intensive care unit admissions, and deaths. Increasing the pace of vaccination is key to reducing the numbers of infection and stopping the pandemic. The authors are also to be commended for implementing a highly effective COVID-19 vaccination campaign that achieved a high rate of health care worker vaccination.

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