

THE EXPECTED SEROPROTECTION RATE AFTER THE SIXTH DOSE OF THE COVID-19 VACCINE: A NOTE FROM A CLINICAL MODEL ON KIDNEY TRANSPLANT RECIPIENTS

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There is still no cure for COVID-19, making it a global emergency (1). The best, greatest choice for management is vaccination (2). Traditionally, a complete vaccination requires two doses of the vaccine. Several experts advise taking an additional booster dose of the COVID-19 vaccine when there is a novel variant and a probable drop in antibodies after routine immunization (3, 4). The Australian Technical Advisory Group on Immunization (ATAGI) recommends a single booster dose for adults aged 16 and older, three months after the initial course (<https://www.health.gov.au/initiatives-and-programs/covid-19-vaccines/advice-for-providers/clinical-guidance/clinical-recommendations>). A second booster dose is advised four months following the first for patients who are at high risk of developing severe COVID-19.

For instance, the additional third and fourth doses of COVID-19 are already in use in Southeast Asia, where the background two dosage immunization has shown to be ineffective for immunocompromised groups (5, 6). The fifth dosage of the COVID vaccination is currently being administered with good results (7, 8). The local public health plan in some places, like Thailand, is to immunize people with a sixth dose that serves as a booster shot. The general indication for the sixth dose is usually for the immunocompromised cases such as renal transplant recipient.

The objective of the current study is to estimate the immunoprotection rate among a renal transplant recipient group following the sixth dose of a COVID-19 vaccination. Basic data on the protective effectiveness rates of various vaccine kinds are referred to as "primary data" (9). To create the model, the previously reported data on immunoprotection following five vaccinations is employed (9).

The basic concept is that different vaccinations have distinct immunogenicity mechanisms. The highest level of protective efficacy or effective immunity will be obtained once routine immunization is completed. The extra sixth dose will be employed to improve the performance of the immune system. The modeling approach employed in this research is the same as that used in a previous study to investigate the effect of a booster dose (10). After the sixth dose, the protective efficacy is likely to be treated as background protective efficacy for modeling. If delivered as a boosting dose, the sixth dose can increase the protected efficacy rate. However, it will not exceed the baseline protective effectiveness rate. The predicted protective efficacy rate after the sixth dose will be calculated as "background protective effect after the fifth dose + extra protection from the sixth dose."

Table 1 illustrates the estimated efficiency of the fifth vaccination dosage. The expected protective efficacy rates

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Table 1: Expected immunoprotection for renal transplant recipients after the sixth dose of the COVID-19 vaccine

Type	The sixth dose vaccine		Protective efficacy rate (%)	
	Specific boosting* activity (%)	Background protective effect before the new additional dose** (%)	Expected protective efficacy rate after the sixth dose (%)	
Inactivated	27	88.7	88.7	
Viral vector	37	88.7	89	
mRNA	24	88.7	94	

*: Specific boosting activity refers to the ability to raise the protective efficacy rate of the first dose of vaccination when given as the second dose. **: Background protective effect prior to the new additional dose refers to the documented immunoprotection for renal transplant recipients after completing the fifth dose vaccination of that vaccine, and the statistics are based on publicly accessible data (8).

for the sixth dose vaccination using inactivated, viral vector, and mRNA type COVID-19 vaccine are 88.7%, 89.9%, and 94%, respectively, compared to the baseline protective level of 88.7%.

According to this study, the sixth dosage of vaccination still has a function in improving immunity, and all types of vaccines play a role, but an mRNA vaccine is the best vaccine for enhancing immunity. As a result, the sixth dosage of boosting immunization may be recommended for transplant recipients.

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