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Evaluasi Antibodi Netralisasi terhadap Berbagai Varian SARS-CoV-2 Setelah 3 Bulan Vaksinasi Dosis Lengkap pada Populasi Umum di Jakarta = Evaluation of Neutralizing Antibody against Various Variants of SARS-CoV-2 After 3 Months of Complete Dose Vaccination in the General Population in Jakarta

Ronaa Fadhila Emelda, author

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Abstrak

COVID-19 merupakan penyakit yang disebabkan oleh virus SARS-CoV-2 yang mengakibatkan pandemi global. Jakarta adalah salah satu kota di Indonesia dengan angka kasus dan kematian tertinggi akibat COVID-19. Salah satu cara paling efektif untuk mengurangi keparahan dan resiko penularan COVID-19 adalah dengan vaksinasi. Vaksin dapat merangsang respons imunitas humoral tubuh yang menghasilkan antibodi netralisasi. Selain vaksin, antibodi netralisasi dapat diinduksi secara natural oleh imunitas tubuh. Hybrid immunity merupakan gabungan antara antibodi netralisasi yang diinduksi secara natural dan yang diinduksi oleh vaksin. SARS-CoV-2 terus bermutasi memunculkan berbagai varian yang menyebabkan peningkatan jumlah kasus dan munculnya gelombang COVID-19 baru di Indonesia, yaitu gelombang Delta pada Juni 2021 dan gelombang Omicron pada Januari 2022. Penelitian ini bertujuan untuk mengevaluasi perubahan antibodi netralisasi 3 bulan setelah vaksinasi dosis lengkap dari beberapa jenis vaksin, yaitu vaksin virus inaktivasi (CoronaVac), vaksin viral vektor (ChAdOx1 nCoV-19), dan vaksin mRNA (BNT162b2) serta pengaruh riwayat infeksi SARS-CoV-2 pada penerima vaksin terhadap berbagai varian SARS-CoV-2 (Wuhan, Delta, Omicron B.1.1.529 dan BA.2). Penelitian dilakukan dengan menggunakan uji Surrogate Virus Neutralization Test (sVNT) yang memiliki prinsip kerja seperti enzyme-linked immunosorbent assay (ELISA) dan meniru interaksi antara receptor binding domain (RBD) dan angiotensin-converting enzyme 2 (ACE2) dalam pelat ELISA dengan RBD dan ACE2 yang telah mengalami pemurnian dengan sampel serum partisipan populasi umum (n = 76). Hasil penelitian menunjukkan adanya perbedaan signifikan antara antibodi netralisasi sebelum dan 3 bulan setelah vaksinasi dosis lengkap, tetapi tidak terdapat perbedaan signifikan pada antibodi netralisasi yang dihasilkan dari masing-masing jenis vaksin. Hal tersebut kemungkinan disebabkan oleh waktu pengambilan sampel setelah terjadi gelombang Omicron COVID-19 sehingga terjadi hybrid immunity yang menyebabkan tingginya kadar antibodi netralisasi yang merata pada setiap jenis vaksin. Partisipan dengan riwayat infeksi SARS-CoV-2 memiliki kadar antibodi netralisasi yang lebih tinggi. Terdapat perbedaan antibodi netralisasi yang signifikan terhadap berbagai varian SARS-CoV-2 dengan penurunan kadar antibodi netralisasi yang signifikan terhadap varian Omicron B.1.1.529 dan BA.2. Kesimpulan dari penelitian ini adalah vaksinasi dosis lengkap berhasil meningkatkan kadar antibodi netralisasi hingga 3 bulan pascavaksinasi yang dipengaruhi oleh riwayat infeksi SARS-CoV-2.

.....COVID-19 is a disease caused by the SARS-CoV-2 virus which has resulted in a global pandemic. Jakarta is one of the cities in Indonesia with the highest number of COVID-19 cases and deaths. One of the most effective ways to reduce the severity and transmission risk of COVID-19 is by getting vaccinated. Vaccines can stimulate the body's humoral immune response to produce neutralizing antibodies. Apart from vaccines, neutralizing antibodies can be induced naturally by the body's immunity. Hybrid immunity is a

combination of naturally induced neutralizing antibodies and those induced by vaccines. The continuously mutating SARS-CoV-2 has led to the emergence of various variants which have resulted in an increase in the number of cases and the emergence of new COVID-19 waves in Indonesia, namely the Delta variant which appeared in June 2021 and the Omicron variant in January 2022. This study aims to evaluate changes in neutralizing antibodies 3 months after complete doses of several types of vaccines, namely inactivated virus vaccine (CoronaVac), viral vector vaccine (ChAdOx1 nCoV-19), and mRNA vaccine (BNT162b2) and the effect of a history of SARS-CoV-2 infection in vaccine recipients against various variants SARS-CoV-2 (Wuhan, Delta, Omicron B.1.1.529 and BA.2). The study was conducted using the Surrogate Virus Neutralization Test (sVNT) test which has a working principle like the enzyme-linked immunosorbent assay (ELISA) and mimics the interaction between the receptor binding domain (RBD) and angiotensin-converting enzyme 2 (ACE2) in ELISA plates using RBD and ACE2 that had undergone purification with sera samples of general population participants (n = 76). The results showed that there were significant differences between the neutralizing antibodies before and 3 months after the full dose of vaccination, but there were no significant differences in the neutralizing antibodies produced from each type of vaccine. This was probably caused by the sampling time after the Omicron COVID-19 wave occurred, resulting in hybrid immunity which resulted in high levels of neutralizing antibodies that were evenly distributed in each type of vaccine. Participants with a history of SARS-CoV-2 infection had higher levels of neutralizing antibodies. There were significant differences in neutralizing antibodies against various variants of SARS-CoV-2 with a significant decrease in levels of neutralizing antibodies against Omicron B.1.1.529 and BA.2 variants. The conclusion of this study is that full dose vaccination has succeeded in increasing neutralizing antibody levels for up to 3 months after vaccination which are affected by a history of SARS-CoV-2 infection.