

Respons imun humoral dan seluler pada lansia pasca vaksinasi COVID-19 Platform Virus Utuh Inaktif = Humoral and Cellular Immune Responses in the Elderly After COVID-19 Vaccination Inactivated Whole Virus Platform

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Abstrak

Latar Belakang: Pandemi COVID-19 telah mempercepat pengembangan vaksin secara global, namun efektivitas vaksin pada populasi lansia masih menjadi perhatian utama karena adanya fenomena immunosenescens. Penelitian ini bertujuan membandingkan respons imun humoral dan seluler terhadap vaksin COVID-19 platform virus utuh inaktif antara kelompok lansia dan dewasa muda.

Metode: Studi prospektif dilakukan di wilayah Jakarta-Bogor Indonesia selama Januari hingga Desember 2023, melibatkan 74 subjek yang dibagi menjadi dua kelompok: lansia (60-85 tahun, n=37) dan dewasa muda (30-40 tahun, n=37). Sampel darah dikumpulkan pasca vaksinasi booster-1 dan 4 minggu pasca vaksinasi booster-2. Parameter imun humoral yang dianalisis meliputi subkelas IgG dan sVNT, sedangkan respons imun seluler mencakup populasi sel T (naif, memori, senescens) serta mediator sitokin TNF-, IL-2, IL-6, IL-10, dan IFN-. Analisis perbandingan dilakukan menggunakan uji-t berpasangan dan uji Mann-Whitney.

Hasil: Pada respons humoral, lansia menunjukkan perbedaan pola subkelas IgG dengan peningkatan IgG4 dan penurunan IgG3 pasca booster, namun tidak terdapat perbedaan kemampuan netralisasi antibodi antara kedua kelompok. Secara seluler, populasi CD8+ senescens dan memori lebih tinggi pada lansia sesudah booster-2 ($p<0,001$), sementara CD8+ naif lebih rendah ($p<0,001$). Tidak terdapat perbedaan bermakna CD4+ pada lansia dan dewasa muda kecuali CD4+ memori pada pasca booster-1 pada lansia lebih tinggi dibandingkan dewasa muda ($P<0,002$). Mediator sitokin menunjukkan pola berbeda dimana TNF- meningkat signifikan pada dewasa muda pasca booster-2 ($p=0,004$), IL-2 meningkat pada lansia dan IFN- menunjukkan peningkatan lebih signifikan pada lansia.

Kesimpulan: respons imun humoral pada lansia relatif setara dengan dewasa muda, namun terdapat perbedaan signifikan dalam respons imun seluler, terutama pada populasi CD8+ dan mediator sitokin. Temuan ini menekankan pentingnya strategi vaksinasi yang disesuaikan bagi populasi lansia dengan mempertimbangkan aspek immunosenescens.

.....Background: The COVID-19 pandemic has accelerated vaccine development, but effectiveness in the elderly remains a concern due to immunosenescence. This study compares humoral and cellular immune responses to an inactivated COVID-19 vaccine between elderly and young adults.

Methods: A prospective study was conducted in the Jakarta-Bogor region of Indonesia from January to December 2023, involving 74 subjects divided into two groups: elderly (60–85 years, n=37) and young adults (30–40 years, n=37). Blood samples were collected after the first booster vaccination and 4 weeks

after the second booster vaccination. Humoral immune parameters analyzed included IgG subclasses and sVNT, while cellular immune responses included T cell populations (naive, memory, senescent) and cytokines mediators TNF-, IL-2, IL-6, IL-10, and IFN-. Comparative analysis was performed using paired t-tests and the Mann-Whitney test.

Results: In terms of humoral response, the elderly showed a different IgG subclass pattern with an increase in IgG4 and a decrease in IgG3 post-booster, but there was no difference in antibody neutralization capacity between the two groups. At the cellular level, CD8+ senescent and memory populations were significantly higher in the elderly after the second booster ($p < 0.001$). There was no significant difference in CD4+ cells between the elderly and young adults, except for memory CD4+ cells, which were higher in the elderly post-first booster ($p < 0.002$). Cytokines mediators showed differing patterns: TNF- significantly increased in young adults after the second booster ($p = 0.004$), IL-2 increased in the elderly, and IFN- showed a more significant increase in young elderly

Conclusion: The humoral immune response in the elderly is relatively comparable to that in young adults; however, there are significant differences in the cellular immune response, particularly in CD8+ populations and cellular immunity mediators. These findings highlight the need for age-specific vaccination strategies.