Failure to seroconvert after two doses of BNT162b2 SARS-CoV-2 vaccine in a patient with uncontrolled HIV

SARS-CoV-2 infection elicits similar antibody responses in HIV-negative individuals and people living with HIV that is well controlled by antiretroviral therapy (ART).[1] SARS-CoV-2 vaccines, including the mRNA vaccine BNT162b2, are efficacious in clinical trials, inducing antibodies and T cells specific to the spike protein.[2–4] However, vaccine responses in people living with HIV have been assessed only in those stable on ART.[5] Immune function in people with HIV and uncontrolled HIV replication is impaired due to destruction of the CD4 T cells that help B cells during an antibody response. Immune responses to vaccines (eg, against influenza and hepatitis B) in people living with HIV are inferior to those in the general population.[6] We present a case of one individual with uncontrolled HIV replication who did not respond to two doses of the BNT162b2 SARS-CoV-2 vaccine.

The index patient, with advanced HIV, was recruited to a cohort study, along with 13 people living with HIV suppressed on ART (median CD4 count 590 cells per µL [SD 202; range 310–940]) and 43 HIV-negative controls, all of whom had received one or two doses of BNT162b2.[1] The index patient had no history of SARS-CoV-2 infection or AIDS-defining conditions and had already received two doses of BNT162b2 24 days apart. Blood samples were obtained 16 days and 44 days after the second dose (appendix p 2). At day 16, the patient's HIV viral load was 831 764 copies per mL and CD4 count was 20 cells per µL (CD4% 4·6%; CD4/CD8 0·05). ART with bictegravir, emtricitabine, and tenofovir alafenamide and prophylaxis for opportunistic infections were initiated at day 16. At day 44 (29 days after ART initiation), HIV viral load was undetectable and CD4 count was 70 cells per µL.

Post-vaccine samples from the index patient showed no IgG reactivity against the S1 subunit of the spike protein by an in-house ELISA (appendix pp 1–2).[7] By contrast, an HIV-negative, SARS-CoV-2-naive participant had an S1-specific IgG titre of 43·4 µg/mL 44 days after the second dose of BNT162b2, consistent with the binding titres across the wider cohort, in which all participants produced S1-specific IgG, even after only one dose (appendix pp 1–2). No SARS-CoV-2-specific neutralisation was observed at either timepoint for the index patient. By contrast, the HIV-negative, SARS-CoV-2-naive vaccine recipient had a neutralisation titre of 1/656 after the second dose. No quantifiable spike protein-specific T cells, evaluated via ELISpot (MAIPN4550; Merck Millipore, Darmstadt, Germany), were observed in the index patient compared with the HIV-negative control participant, sampled 44 days after the second dose, and a subsample of people living with well controlled, stable HIV after one dose of BNT162b2 (appendix p 2). Although no spike protein-specific T cells were detected via intracellular cytokine staining in the index patient, responses against cytomegalovirus pp65 were dominated by CD8 T cells, strikingly so after ART (appendix p 2). The profound peripheral immune cell perturbations in the index patient were accompanied by increased frequencies of CD8 T cells with a terminally differentiated effector memory phenotype (CCR-7^{-} and CD45RA^{+}) and an inverted CD4/CD8 ratio, which could influence the size of T-cell responses to SARS-CoV-2.[1]

In conclusion, an individual with profound HIV-related immune dysfunction did not seroconvert to a SARS-CoV-2 vaccine. We suggest monitoring SARS-CoV-2 seroconversion in people with advanced HIV and considering repeat vaccination upon HIV suppression and CD4 count improvement with ART. This case highlights an urgent need to establish correlates of vaccine efficacy in people living with HIV, particularly in those with suboptimal viral suppression or ongoing perturbed immune function, to better inform clinical management and guidelines.

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See Online for appendix

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Need for transgender-specific data from Asia

In *The Lancet HIV*, Venkatesan Chakrapani[1] commented on the study by Adrian D Smith and colleagues[2] and suggested transgender-specific data collection to inform the redress of health inequalities. We believe heeding this call for transgender-specific data could benefit efforts in Asia to identify gaps in HIV response for transgender people.

First, transgender-specific HIV care cascade data are scarce. This scarcity could be because the data are usually merged with data from men who have sex with men (MSM) or not reported due to negligence or not enough attention being paid to this group of people.[3] Among the countries where data were available, HIV prevalence among transgender people reached 24·8% in 2019 in Indonesia, and increased in countries that used integrated biological and behavioural surveillance (eg, Cambodia, Malaysia, and Thailand).[3,4] The percentage of transgender people reporting HIV testing in the past year ranged from 15% (Philippines) to 89% (Nepal). However, the percentage of transgender people with HIV receiving antiretroviral therapy was not reported, or low if available.[4] Hence, Asian countries need to include transgender people as a separate group in HIV surveillance programmes and expand current programmes to include smaller cities and rural areas.

Second, use of HIV prevention services is low among transgender people in Asia. As of 2019, less than 50% of transgender people reportedly received a combined set of HIV prevention interventions in Bangladesh, Nepal, Pakistan, Philippines, and Sri Lanka.[4] Data on the use of pre-exposure prophylaxis (PrEP) were consistently included with data from MSM in Asia.[3] Our cross-sectional study reported in 2020 also showed a low PrEP uptake among transfeminine people in China (24 [8·7%] of 277 people).[5] Additionally, societal stigma and discrimination consistently hindered transgender people's access to PrEP and other HIV services in Asia.[3,6] Therefore, it is crucial to consider the socioecological systems that dictate access to HIV care and to plan data collection strategies accordingly. We suggest researchers collect interpersonal and structural-level data through both quantitative and qualitative methods when considering health inequalities in transgender people.

Third, few data exist on mental health and gender-affirming interventions among transgender people in Asia.[7] Using the gender minority stress framework, our study in China found that gender-identity-related stress can effect transgender people's engagement with gender-affirming interventions and HIV prevention services.[5] As access to HIV care services is interconnected with mental health and gender affirmation,[8] we recommend collecting data related to these area to address health inequalities.

Now is the time to tackle health inequalities for transgender people.

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