Humoral immune response of patients living with HIV (PLWH) after 3 doses of m-RNA BNT162b2 SARS-CoV-2 vaccine: a prospective cohort study

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Background

Recent studies had shown good serological and cellular immune responses after vaccination with 2 doses of mRNA SARS-CoV2 vaccines among PLWH. However, data is missing regarding the vaccine response after 3 doses.

Materials and Methods

We followed prospectively a group of PLWH in Crusaid Kobbler AIDS Center, Tel-Aviv, that received 3 doses of mRNA BNT162b2 vaccine and for whom data of humoral immune response 4-6 months after two vaccine doses was available from our previous study. Patients provided an additional blood sample in a time frame of 4-6 months after the 3rd vaccine dose. The aim of the study was to evaluate the difference of serological response after 2nd and 3rd doses and to investigate the factors that could influence the vaccine response. Humoral response was evaluated by measuring IgG titers of anti spike receptor-biding domain antibodies (anti-RBD IgG). The level of anti-nucleocapsid IgG (anti N-IgG) was measured as well.

Results

- **Of 136 patients for whom serological data after 2 doses was previously available , 50 have provided a serum sample for serological evaluation after booster dose. Of them 5 patients were excluded due to positive anti-N-IgG, suggesting previous SARS-CoV2 infection (Figure 1). Mean age was 47 and majority were male (82%). Median time between 2nd to 3rd vaccine doses was 6.87 months and a median time between the 3rd vaccine dose and serological test was 5.37 months. The titers of anti-RBD IgG were higher after 3rd vaccine dose with a median delta (difference between the antibody level after dose 2 and dose 3) of 3240 AU/ml (Table 1).**
- **Mean CD4 count was 731 (±303) and had no influence on the antibody level.Factors that were associated with lower delta were lower anti-RBD IgG level after 2nd vaccine (p=0.03), higher CD8 count (p=0.018), longer time between the vaccine doses (p=0.031) and longer time between the 3rd vaccine dose and a blood test (p=0.011) (Table 2).**

Table 1. Baseline characteristics of patients with HIV Receiving 3 doses of the BNT162b2 mRNA COVID-19 vaccine

Characteristic	Value
Age, years, mean (SD)	**47 (±10)**
Male sex, N (%)	**37 (82)**
Female, N (%)	**8 (18)**
Smoking, N (%)	**11 (24)**
Diabetes, N (%)	**0 (0)**
Hypertension, N (%)	**1 (2)**
Ischemic heart disease, N (%)	**1 (2)**
Obesity, N (%)	**1 (2)**
MSM, N (%)	**30 (67)**
Heterosexuals, N (%)	**8 (18)**
IVDU, N (%)	**2 (4)**
INSTI-based regimen, N (%)	**43 (96)**
CD4, cells/mm^3, mean (SD)	**731(±303)**
Time from HIV diagnosis, years, median (IQR)	**10 (5-13)**
Time from third vaccine dose, months, median (IQR)	**5.3 (4.73-5.96)**
Time between 2nd and 3rd vaccine doses, months, median (IQR)	**6.87 (6.3-7.3)**
HIV viral load, copies/ml, N (%) <40 >40	 **43 (96)** **2 (4)**
Anti-RBD IgG, AU/ml,after 2 doses, median (IQR)	**995 (604-1452)**
Anti-RBD IgG, AU/ml,after 3 doses, median (IQR)	**5818 (2339-10727)**
Anti-RBD IgG delta, AU/ml, median (IQR)	**3240 (1606.5-9407)**

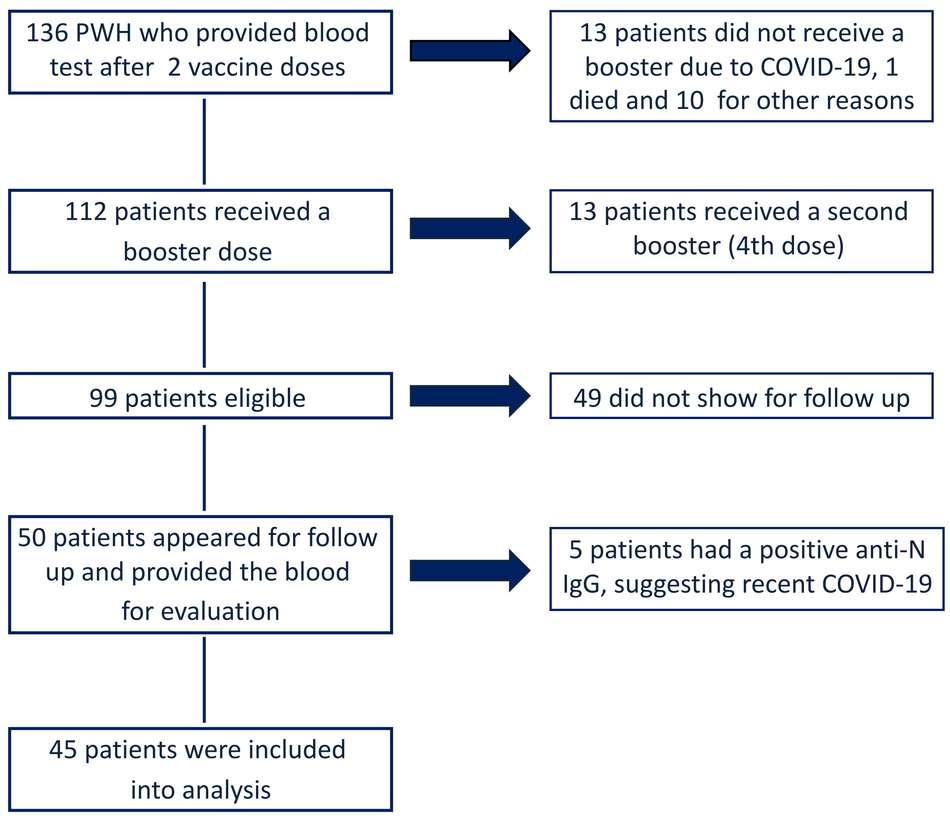
MSM - Men who have sex with men;
IVDU – Intravenous drug user,
INSTI – Integrase inhibitor; IQR – interquartile ranges;
SD – standard deviation,
delta – difference between antibody levels after 3 and 2 vaccine doses

Table 2. Association between patients characteristics and anti RBD-IgG delta

Characteristic	Correlation coefficient, rs	P-value
CD4, absolute	.066	**0.666**
CD4, %	.125	**0.413**
CD8, absolute	-.350	**0.018**
CD4/CD8 ratio	.270	**0.072**
Age, years	-.121	**0.429**
Anti-RBD IgG level after 2 vaccine doses	.324	**0.030**
Years since HIV diagnosis	-.011	**0.940**
Time from third vaccine dose	-.375	**0.011**
Time between second and third vaccine doses	**.325**	**0.031**

rs - Spearman's rank correlation coefficient
Bold indicates significant

Figure 1. Patients' cohort



Conclusions

The anti-RBD IgG level after 3 doses of mRNA BNT162b2 vaccine was higher when compared to the level after 2 doses, suggesting additional value of the booster dose.