Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Short Communication

SARS-CoV-2 seroprevalence among people living with HIV in Guinea-Bissau

A. Dutschkea, a, b, *, C. Wejsea, a, b, e, J.P. Nanque, a, d, C. Medina, d, B.L. Hønge, a, b, c, S. Jespersena, b, the Bissau HIV cohort study group

a Bandim Health Project, Indepth Network, Bissau, Guinea-Bissau
b Department of Infectious Diseases, Aarhus University Hospital, Denmark
c Department of Clinical Immunology, Aarhus University Hospital, Denmark
d National HIV Programme, Ministry of Health, Bissau, Guinea-Bissau
e GloHAU, Center for Global Health, School of Public Health, Aarhus University, Denmark

Article history:
Received 19 January 2022
Received in revised form 3 May 2022
Accepted 20 May 2022
Available online 1 June 2022

Keywords:
COVID-19
SARS-CoV-2
Low-income country
Guinea–Bissau
HIV
Prevalence

Introduction

The first case of coronavirus disease of 2019 (COVID-19) in Guinea–Bissau was registered on March 25, 2020.1 The epidemic has continually been monitored with a low testing capacity. By November 1, 2021, 103,820 people (5.5% of a total population of 1.9 million) had been tested by PCR with 6150 (5.9% of tested people) positive for SARS-CoV-2 and 143 deaths.2 A recent study from Bissau found SARS-CoV-2 seroprevalence of 18% in healthcare workers.3 A meta-analysis found a pooled African seroprevalence of SARS-CoV-2 of 22%.4 Vaccination in Guinea–Bissau started April 2, 2021, prioritizing at-risk groups like people living with HIV (PLWH) using the AstraZeneca vaccine. On August 25, Sinopharm and Johnson vaccines were added to the program and the three vaccines were all administered afterwards. Guinea–Bissau has a high HIV prevalence of 3% nationally5 and 6.7%6 in the capital of Bissau. The prevalence of SARS-CoV-2 infection in PLWH in Guinea–Bissau is unknown and we aimed to assess it in this study.

Methods

Participants of the study were PLWH attending follow-up at the HIV clinic at Hospital National Simão Mendes (HNSM) who agreed to participate on the day of follow-up. Initially, an equal amount of HIV-1, HIV-2 and HIV-1/2 dually infected patients was planned to be
including, but rarity of the two latter led to more HIV-1 inclusions. All participants were aged 18 years or older. Participants were interviewed about demography, lifestyle and COVID-19–related symptoms (fever, cough/sore throat, muscle/joint pain, loss of taste/smell and difficulties breathing), and a drop of blood from the finger was applied to a 2019-nCoV IgG/IgM Rapid Test Cassette (Hangzhou Alltest Biotech Co, Ltd, Hangzhou, China), detecting antibodies to the nucleocapsid protein, to determine SARS-CoV-2 antibody status. Testing and interviews were conducted by local assistants at the clinic. Data collection on SARS-CoV-2 antibody status started June 1, 2021, and ended October 1, 2021.

**Results**

Sixty-six percent of participants (n = 195) were not vaccinated. Among unvaccinated participants, SARS-CoV-2 seroprevalence was 27.7% (see Table 1). Among vaccinated participants (n = 98), 73.5% were seropositive (P = <0.001).

**Analysis of unvaccinated participants**

Fifty-four participants (27.7%) tested positive for SARS-CoV-2 antibodies. Among positives, 48 (88.9%) were IgG-positive, 3 (5.5%) were IgM positive and 3 (5.5%) were IgG + IgM positive. No significant difference in HIV-SARS-CoV-2 seroprevalence was found between any of the HIV serotypes, different sex, education status or whether people lived inside or outside the capital. Age among seropositives tended to be higher than among seronegatives (49.7% vs 46.4%, P = 0.07). A large part of SARS-CoV-2 seropositive participants (71.2%) never experienced any symptoms of COVID-19 from the arrival of the pandemic in Guinea—Bissau on March 25, 2020, up to their day of inclusion between June 1, 2021, and October 1, 2021. For SARS-CoV-2 seropositive patients, 73.3% never experienced any symptoms with no statistically significant difference between the two groups (P = 0.76).

Six people reported death in their household during 17 pandemic months with an average reported household size of 6.7, giving a crude annual death rate of 3.3 per 1000 people.

Of unvaccinated patients, 176 (91.2%, n = 193) had never received a test for SARS-CoV-2 of any kind. Among all participants, both vaccinated and unvaccinated, 90.1% reported never having been tested for SARS-CoV-2 by any test (n = 292).

**Discussion**

In this serosurvey, 27.7% of unvaccinated PLWH in HNSM Guinea—Bissau tested positive for SARS-CoV-2 antibodies. In comparison, the official number of PCR-confirmed positives (5.9% positivity rate of general population tested) is likely underestimating the magnitude of the epidemic. PLWH in Guinea—Bissau are generally advanced in their disease with low CD4 cell counts when presenting themselves at the clinic and have a high risk of being lost to follow-up. Vaccines for COVID-19 are prioritized for this group, but two-thirds of participants had not received a single dose, indicating problems in vaccination efforts. Their advanced status and the low vaccine coverage mean that they could be more at risk of SARS-CoV-2 infection and higher mortality. Unvaccinated seropositive patients reported few symptoms of disease, which could indicate underestimation of SARS-CoV-2 seroprevalence due to survival bias in this group. The low number of reported symptoms and the low crude annual mortality rate (compared to the official Guinean 2018 yearly mortality rate of 9.6/1000 people) could also indicate that PLWH, even those who are generally advanced in their HIV disease, are not necessarily at increased risk of more severe disease, symptomatology or death, or that for now some degree of herd immunity is in effect. The study population consisted only of patients on follow-up, which could underestimate reported symptoms, disease severity and mortality rate due to higher degree of immunosuppression among patients lost to follow-up. Of all participants, very few had ever received a test of any kind to detect SARS-CoV-2. This underlines the general problem of COVID-19 monitoring in the country and for this potential at-risk group specifically.

We found limits in the use of our rapid tests to detect SARS-CoV-2 antibodies because, for instance, Sinopharm will test

| HIV-type               | SARS-CoV-2 seropositive n = 54 (27.7%) | SARS-CoV-2 seronegative n = 141 (72.3%) | P-value |
|------------------------|----------------------------------------|----------------------------------------|---------|
| n = 195                |                                        |                                        | 0.53    |
| HIV-1                  | 19 (35.2%)                             | 62 (43.9%)                             |         |
| HIV-2                  | 19 (35.2%)                             | 44 (31.2%)                             |         |
| HIV-dually infected    | 16 (29.6%)                             | 35 (24.8%)                             |         |
| Sex                    |                                        |                                        | 0.39    |
| n = 195                |                                        |                                        |         |
| Male                   | 12 (22.2%)                             | 40 (28.4%)                             |         |
| Female                 | 42 (77.8%)                             | 101 (71.6%)                            |         |
| Age, mean in years     | 49.7                                   | 46.4                                   | 0.07    |
| n = 192                |                                        |                                        |         |
| Area of residence      |                                        |                                        | 0.49    |
| n = 195                |                                        |                                        |         |
| Bissau                 | 48 (88.9%)                             | 120 (85.1%)                            |         |
| Other                  | 6 (11.1%)                              | 21 (14.9%)                             |         |
| Any level of education |                                        |                                        | 0.31    |
| n = 195                |                                        |                                        |         |
| Yes                    | 33 (61.1%)                             | 97 (68.8%)                             |         |
| No                     | 21 (38.9%)                             | 44 (31.2%)                             |         |
| Previous COVID-19 test |                                         |                                        | 0.69    |
| n = 193                |                                        |                                        |         |
| Previous positive test | 1 (25.0%)                              | 1 (7.7%)                               | 0.42    |
| No symptoms of COVID-19| 37 (71.2%)                             | 99 (73.3%)                             | 0.76    |
| n = 187                |                                        |                                        |         |
positive on a vaccinated participant and AstraZeneca will not. This is because Sinopharm, in contrast to AstraZeneca, generates an antibody response to the nucleocapsid protein, which is what our rapid tests detected. Most vaccinated patients had a positive rapid test, but because of the lack of vaccination data, it is difficult to evaluate if positivity is due to the vaccine or due to endogenous infection, because of the possibility of patients with low CD4 cell count not responding well to the vaccines. Therefore, the analysis focused on unvaccinated patients. Excluding vaccinated patients may underestimate the number of patients tested for SARS-CoV-2 by any test, due to vaccinated patients potentially being more generally informed on health issues and seeking testing when having symptoms. Excluding vaccinated patients benefitting from vaccine-mediated immunity likely increases the seroprevalence of SARS-CoV-2 antibodies derived from infection. However, 66% of the total study population was unvaccinated and the prevalence of SARS-CoV-2 antibodies derived from infection. However, 66% of the total study population was unvaccinated and the prevalence of SARS-CoV-2 in this group specifically is interesting to help assess the impact of the pandemic on the many who have no vaccine immunity.

In conclusion, our survey found a high seroprevalence of SARS-CoV-2 antibodies in PLWH in an urban African setting. More studies are recommended to understand the impact of SARS-CoV-2 in PLWH in low-income settings, both with regards to the prevalence and overall mortality of PLWH with SARS-CoV-2 compared to the general population. Studies on policymaking on how to best monitor and prevent SARS-CoV-2 in PLWH in similar settings are also recommended, as the epidemic is clearly present and sufficient monitoring and diagnostic efforts are challenged.

**Author statements**

**Authors contributions**

AD, CW, JP, CM, BLH and SJ conceived the study; AD, JP and CM carried out data collection; AD, BLH and SJ carried out analysis and interpretation of data. AD and BLH drafted the manuscript; all authors critically revised the manuscript for intellectual content. All authors read and approved the final manuscript of the paper. CW, BLH and SJ are guarantors of the paper.

**Ethical approval**

This study was approved by the Guinean Ethical Committee (NoRef019/CNES/INASA/2021).

**Funding**

This study was funded by Aarhus University paying the salary of 120.000 dkk for 1 year to the principal researcher.

**Competing interests**

None declared.

**Acknowledgements**

The authors are grateful to the staff working in the HIV clinic at HNSM and the National Public Health Laboratory for their work effort and their professionalism. We are furthermore grateful to the staff at the Bandim Health Project, for making this study possible.

The Bissau HIV cohort study group consists of Amabelia Rodrigues, David da Silva, Zacarias da Silva, Candida Medina, Ines Oliveira-Souto, Lars Østergaard, Alex Laursen, Peter Aaby, Anders Fomsgaard, Christian Erikstrup, Christian Wejse, Bo Langhoff Hange and Sanne Jespersen (chair).

**References**

1. Reuter, March 25, https://www.reuters.com/article/us-health-coronavirus-bissau-idUSKBN21C2EA.
2. Alto Comissario Do Para A COVID-19, BOLETIM INFORMATIVO SEMANAL Nr. vol. 62.
3. Beno CS, Salinha A, Mendes S, Cabral C, Martins C, Nielsen S, et al. SARS-CoV2 sero-survey among adults involved in health care and health research in Guinea-Bissau, West Africa. Public Health; 2021.
4. Chisale MRO, Ramazanu S, Mwale SE, Kuumwenda P, Chipeta M, Kaminga AC, et al. Seroprevalence of anti-SARS-CoV-2 antibodies in Africa: a systematic review and meta-analysis. Rev Med Virol 2021:e2271.
5. UN AIDS 2019, Guinea-Bissau, https://www.unaids.org/en/regionscountries/countries/guinea-bissau.
6. Olesen JS, Jespersen S, da Silva ZJ, Rodrigues A, Erikstrup C, Aaby P, et al. HIV-2 continues to decrease, whereas HIV-1 is stabilizing in Guinea-Bissau. AIDS 2018;32(9):1193–8.
7. Jespersen S, Hange BL, Oliveira J, Medina C, da Silva Té D, Correia FG, et al. Cohort profile: the Bissau HIV cohort-a cohort of HIV-1, HIV-2 and co-infected patients. Int J Epidemiol 2015;44(3):756–63.
8. Hange BL, Jespersen S, Nordenfelt PB, Medina C, da Silva D, da Silva ZJ, et al. Loss to follow-up occurs at all stages in the diagnostic and follow-up period among HIV-infected patients in Guinea-Bissau: a 7-year retrospective cohort study. BMJ Open 2013;3(10):e003499.
9. Ssentongo P, Heilbrunn ES, Ssentongo AE, Advani S, Chinchilli VM, Nunez JJ, et al. Epidemiology and outcomes of COVID-19 in HIV-infected individuals: a systematic review and meta-analysis. Sci Rep 2021;11(1):6283.
10. World Bank. Death rate, crude - (per 1000 people) - Guinea-Bissau. 2018. https://data.worldbank.org/indicator/SP.DYN.CDRT.IN?end=2018&locations=GW&start=2018&view=chart.