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.

Public Health 203 (2022) 19–22

Contents lists available at ScienceDirect

Public Health

journal homepage: www.elsevier.com/locate/puhe

Short Communication

SARS-CoV-2 serosurvey among adults involved in healthcare and health research in Guinea-Bissau, West Africa

C.S. Benn [a, b, c, *], A. Salinha [c], S. Mendes [c], C. Cabral [c], C. Martins [c], S. Nielsen [a, c], A.B. Fisker [a, c], F. Schaltz-Buchholzer [a, c], C.S. Jørgensen [d], P. Aaby [a, c]

[a] Bandim Health Project, OPEN, Department of Clinical Research, Odense University Hospital, University of Southern Denmark, Denmark
[b] Danish Institute of Advanced Science, University of Southern Denmark, Denmark
[c] Bandim Health Project, Indepth Network, Apartado 861, Bissau, Guinea-Bissau
[d] Statens Serum Institut, Artillerivej 5, 2300 Copenhagen S, Denmark

ARTICLE INFO

Article history:
Received 5 July 2021
Received in revised form
22 October 2021
Accepted 12 November 2021
Available online 3 December 2021

Keywords:
Public health
COVID-19 prevalence
Sub-Saharan Africa
Asymptomatic COVID-19 infection
COVID-19 among health professionals

ABSTRACT

Objectives: Many African countries have reported fewer COVID-19 cases than countries elsewhere. By the end of 2020, Guinea-Bissau, West Africa, had <2500 PCR-confirmed cases corresponding to 0.1% of the ~1.8 million national population. We assessed the prevalence of SARS-CoV-2 antibodies in urban Guinea-Bissau to help guide the pandemic response in Guinea-Bissau.

Study design: Cross-sectional assessment of SARS-CoV-2 antibody in a cohort of staff at the Bandim Health Project.

Methods: We measured IgG antibodies using point-of-care rapid tests among 140 staff and associates at a biometric research field station in Bissau, the capital of Guinea-Bissau, during November 2020.

Results: Of 140 participants, 25 (18%) were IgG-positive. Among IgG-positives, 12 (48%) reported an episode of illness since the onset of the pandemic. Twenty-five (18%) participants had been PCR-tested between May and September; 7 (28%) had been PCR-positive. Four of these seven tested IgG-negative in the present study. Five participants reported that somebody had died in their house, corresponding crudely to an annual death rate of 4.5/1000 people; no death was attributed to COVID-19. Outdoor workers had a lower prevalence of IgG-positivity.

Conclusions: In spite of the low official number of COVID-19 cases, our serosurvey found a high prevalence of IgG-positivity. Most IgG-positives had not been ill. The official number of PCR-confirmed COVID-19 cases has thus grossly underestimated the prevalence of COVID-19 during the pandemic. The observed overall mortality rate in households of Bandim Health Project employees was not higher than the official Guinean mortality rate of 9.6/1000 people.

Background

In Guinea-Bissau, a low-income country with a population of 1.9 million inhabitants, the first case of COVID-19 was registered on March 25, 2020, and quickly followed by a lockdown that lasted several months. Per December 20, of 35,644 people tested by PCR, 2447 (6.9%) tested positive for SARS-CoV-2 (0.1% of the national population) with 45 deaths (1.8% of positive cases) (Supplementary Fig. 1).

The Bandim Health Project (BHP, www.bandim.org) employs ~180 staff members in a Health and Demographic Surveillance System that covers the urban suburbs of Bandim, Belém, Mindará and Cuntum in Guinea-Bissau's capital, Bissau. Most staff and associates had been working throughout the epidemic, and we aimed to study the prevalence of SARS-CoV-2 antibodies by conducting a serosurvey among our local staff and associates.

Methods

We performed a serosurvey among field assistants who conducted house visits to collect demographic and health information, office staff members, and staff placed at three health centers in the study area and the nearby national hospital. From November 9 to

* Corresponding author. Bandim Health Project, OPEN, Department of Clinical Research, University of Southern Denmark, Studiestræde 6, 1455 Copenhagen C, Denmark.
E-mail address: cbenn@health.sdu.dk (C.S. Benn).

https://doi.org/10.1016/j.puhe.2021.11.013

November 24, 2020, after informed oral and written consent, we interviewed participants about background factors and about illness and mortality in their homes since March 25, 2020. For assessing SARS-CoV-2 antibody among participants, two drops of blood obtained by finger prick were applied to a point-of-care antibody test (OnSite COVID-19 IgG/IgM Rapid Test, CTK Biotech).

The study was approved by the Guinean National Ethics Committee (Ref 116/CNES/INASA/2020).

Results

A total of 146 staff and associates were present to be tested during the survey. Of these, 6 declined participation. Of 140 tested, 25 (18%) were IgG-positive. One participant who was IgM-positive and had a slight fever was referred for PCR testing, which was negative; all symptoms waned after a day.

The average age of IgG-positives tended to be higher than among IgG-negatives (mean 46 years (range 26–70) vs 41 years (range 19–63), $P = 0.05$). There tended to be more infected females than males (24% vs 13%, $P = 0.10$) (Table 1). The ethnicities that traditionally populated the study area had a higher risk of being IgG-positive than other ethnicities. All participants reported using masks.

The highest proportion of IgG-positives (42%) was found among laboratory staff, followed by frontline healthcare workers (HCWs) (doctors, nurses, or midwives) (24%) and office personnel (17%). In the combined group of frontline HCWs and laboratory technicians, 28% tested positive (P for the same risk as others = 0.01). The lowest proportions were among field assistants (8%) and other staff (mechanics, guards, cleaners) (9%).

The area of residence was associated with the risk of being IgG-positive, the proportion varying from 9% to 37% ($P = 0.02$ for the same risk across areas), the proportion being highest for those coming from outside the study area.

In a multivariable analysis retaining age and sex and the three variables (ethnicity, type of work, and area of residence) that were significant in univariate analysis, all three variables remained independently associated with the risk of being IgG-positive.

In urban Guinea-Bissau, most people live in multifamily houses. There was no association between being IgG-positive and the number of household inhabitants or the total number of people in the multifamily house (Table 1). Five people reported that somebody in their house had died during the past 8 months of the pandemic. With a mean of 12 people per house, this translates to a crude yearly mortality rate of 4.5/1000 people (5 deaths in 140 BHP staff houses * 12 persons/house * (8/12) years of observation). No death was attributed to COVID-19.

Table 1
Characteristics of individuals testing IgG positive or IgG negative for SARS-CoV2 in Guinea-Bissau, Nov 2020.

		IgG positive (% of group) N = 25	IgG negative $N = 115$	Relative risk (95% CI)	P-value*	Multivariable model[c]
Mean age in years (range)		46 (26–70)	41 (19–63)	1.03 (1.00–1.07)	0.05	1.02 (0.98–1.05)
Sex	Male	10 (13%)	67	Ref	0.10	Ref
	Female	15 (24%)	48	1.83 (0.88–3.81)		1.21 (0.57–2.60)
Ethnicity[a]	Pepel/Manjaco/Mancanha	20 (27%)	54	3.57 (1.41–9.00)	0.003	3.19 (1.23–8.27)
	Other	5 (8%)	61	Ref		Ref
Type of work	Field assistants	2 (8%)	24	Ref	0.05	
	Office staff	6 (17%)	30	2.17 (0.47–9.95)		
	Doctors/nurses/midwifes	10 (24%)	31	3.17 (0.75–13.4)		
	Lab technicians	5 (42%)	7	5.41 (1.21–24)		
	Other staff	2 (8%)	23	1.04 (0.16–6.87)		
Healthcare worker	Yes	15 (28%)	38	2.46 (1.19–5.09)	0.01	2.22 (1.06–4.67)
	No	10 (11%)	77	Ref		Ref
Area of residence[b]	Bandim/Belém/Mindera/Cuntum	5 (9%)	50	Ref	0.02	Ref
	Praça/Antula	4 (15%)	23	1.62 (0.47–5.61)		1.63 (0.50–5.66)
	Missira/Militar/Aeroporto	5 (18%)	23	1.96 (0.62–6.25)		2.23 (0.80–6.19)
	Bor/Quelélé/Enterramento	11 (37%)	19	4.03 (1.54–10.6)		3.17 (1.22–8.22)
Median number of people in household		5 (1–9)	5 (1–21)		0.77	
Median number of people in house		10 (3–26)	12 (1–30)		0.43	
Ill during the pandemic	Yes	12 (21%)	45	1.34 (0.66–2.74)	0.42	
	No	13 (16%)	70	Ref		
Among the ill		$N = 12$	$N = 45$			
Loss of taste/smell	Yes	7 (28%)	18	1.79 (0.64–5.02)	0.27	
	No	5 (16%)	27	Ref		
Fever	Yes	8 (23%)	27	1.26 (0.42–3.72)	0.68	
	No	4 (18%)	18	Ref		
Cough	Yes	3 (16%)	16	0.67 (0.20–2.20)	0.61	
	No	9 (24%)	29	Ref		
Runny nose	Yes	8 (17%)	40	0.38 (0.14–0.99)	0.05	
	No	4 (44%)	5	Ref		
Difficulties breathing	Yes	2 (33%)	4	1.70 (0.48–6.06)	0.41	
	No	10 (20%)	41	Ref		
Fatigue	Yes	4 (29%)	16	0.90 (0.31–2.65)	0.85	
	No	8 (20%)	29	Ref		

*By rank-sum test (number of people in household/house) or Poisson test with robust variance estimation (rest).
[a] Grouped into traditional ethnicities in the study area, with related languages and social structures vs others.
[b] Grouped by geographical vicinity: the Bandim Health Project study area (Bandim/Belém/Cuntum); areas closer to city (Praça/Antula); areas further from the city on the northern side (Missira/Militar/Aeroporto); areas further out of the city on the southern side (Bor/Quelélé/Enterramento).
[c] Retaining age, sex, and variables that were significant in univariate analysis.

The risk of being IgG-positive did not correlate with self-reported illness (Table 1). Among the IgG-positives, 12 (48%) reported having been ill since the onset of the pandemic, vs. 45 (40%) of IgG negative ($P = 0.41$). Of the 57 persons reporting being ill, 25 reported loss of smell or taste: 7 of these were IgG-positive (58% of IgG-positives), while 18 were IgG-negative (40% of IgG-negatives) ($P = 0.27$). One person was hospitalized during the pandemic; this person was not PCR-positive and tested IgG negative here.

Interestingly, 25 (18%) participants had been PCR-tested between March and September; 7 reported having been previously tested positive. Among these 7, 6 reported being ill during the pandemic, all reported loss of taste/smell and runny nose, approximately half reported fever and/or cough; only one reported difficulty breathing and one reported fatigue. Four of the 7 PCR-positives tested IgG-negative.

Discussion

COVID-19 infections appeared to have been widely transmitted in Bissau in November 2020, with the apparent decline of the first wave coinciding with the start of the rainy season in June 2020. In this serosurvey from November 2020, 18% (25/140) had IgG antibodies.

Only 3 of 7 past PCR-positive also tested IgG-positive. Given that the first pandemic wave might have peaked in weeks 17–23 (Supplementary Fig. 1), most may have been infected more than 5 months before our survey. It has previously been shown that negative SARS-CoV-2 serology does not exclude previous infection.[1] Point-of-care rapid tests are not as precise or sensitive as laboratory antibody tests. The CTK test used for the present study was, however, among the best in a comparison of nine SARS-CoV-2 immunoassays, with a sensitivity of 90% and a specificity of 100%.[2]

The point-of-care test is not a quantitative test, but we noted that many positives exhibited a quite weak, lighter colored IgG band than we have seen for people recently infected in Denmark. Only 12 of the 25 IgG-positive individuals reported being ill during the pandemic. Loss of smell/taste is a common symptom of COVID-19 and was reported by all who had been ill *and* had a positive PCR test but was also reported by many IgG-negative individuals. Hence, the true prevalence of past infection might be underestimated by IgG-positivity. On the other hand, HCWs were overrepresented in our study population, which could overestimate the seroprevalence compared to the general population.

A meta-analysis of serosurveys conducted in Africa identified 23 studies (including the present study) conducted between April 2020 and April 2021 and reported an overall seroprevalence of 22% (95% Confidence Interval: 14%–31%); the estimate for West Africa was 25% (13%–39%).[3] In a systematic review and meta-analysis of the global seroprevalence in 2020 involving 968 seroprevalence studies and 9.3 million participants from 74 countries, the median global seroprevalence was 4.5% (Interquartile Range (IQR), 2.4%–8.4%), but in Sub-Saharan Africa, the seroprevalence was 5.01 (2.89–8.69) times higher than in high-income countries, being 19.5% (IQR, 9.0%–26.0%).[4]

We did not find indications of a higher than anticipated overall mortality, but the households of Bandim Health Project employees, although diverse, might not be representative for the background population due to differences in educational level, household income, and access to healthcare. However, official figures also suggest that the mortality rate of COVID-19 per million in Africa is lower than in other regions.[5] It has been speculated that this could be due to swift and effective government response to the COVID-19 threat and high adherence to preventative strategies.[5] However, the seroprevalence rates[3,4] suggest that the continent has had a high burden of COVID-19 infections. Our study indicates that many of them could have gone unnoticed, which could indicate that the low mortality is due to lower disease severity. It has been hypothesized that this could involve factors such as demographics and cross-protection from other pathogens.[5] Another explanation for the low observed mortality rate of COVID-19 is the under-registration of infections and deaths. Future studies, unfortunately, are unlikely to throw much light on this, since the low testing rates makes it difficult to disentangle deaths from COVID-19 from deaths caused by lockdowns and other pandemic-related causes.

Our numbers were small, but laboratory workers had the highest risk of all and may be a subgroup that deserves special attention as they collect and process patient samples, but perhaps without the same level of protection as frontline HCWs. Our data suggest that persons working outside may have a lower risk.

The highest risk was noted for participants residing outside the BHP's study area. This may suggest that infection was more present in some areas and that people were infected, to a large extent, at home. However, there was no association with the number of people in the household or the house, as would be anticipated if infection at home was prevalent. Alternatively, since the prevalence was highest in the most distant suburbs, shared transport, which often consists of crowded minibuses, could be a risk factor.

In conclusion, our survey found a high prevalence of IgG-positive individuals in an urban African setting. COVID-19 was certainly here. The official numbers grossly underestimate the true number of COVID-19 cases. More than half of the IgG-positives had not been ill. Studies are ongoing to assess the overall mortality impact of the pandemic. Despite low official numbers, the toll might have been high and undetected among the elderly.

What is already known on this subject

- Many African countries have experienced far fewer COVID-19 cases than countries in Europe, Asia, or the Americas.
- By the end of 2020, Guinea-Bissau had <2500 PCR-confirmed cases corresponding to 0.1% of the national population.

What this study adds

- Among 140 field station staff members, the proportion being SARS-CoV-2 IgG-positive was 18%.
- Less than half of the IgG-positive individuals reported being ill during the pandemic.
- The official number of PCR-confirmed COVID-19 cases grossly underestimates the prevalence during the pandemic.

Author statements

Ethical approval

National Committee of Ethics in Health (CNES – Guinea-Bissau), approval number 116/CNES/INASA/2020.

Funding

EDCTP funded a study of BCG vaccine to healthcare workers, including part of the staff involved in the present survey (RIA2020EF-3049). Statens Serum Institut, Denmark, donated the test kits used while other expenses were covered by in-kind funding. The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Competing interests

None declared.

Author contributions

All authors had had full access to all the data in the study. Benn takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Benn, Cabral, Martins, Schaltz-Buchholzer, Aaby.

Acquisition of data: Benn, Salinha, Fernandes.

Analysis or interpretation of data: All authors.

Drafting of the manuscript: Benn, Nielsen, Fisker, Schaltz-Buchholzer, Jørgensen, Aaby.

Critical revision of the manuscript for important intellectual content: All authors.

Statistical analysis: Benn.

Obtained funding: NA.

Administrative, technical, or material support: Cabral, Jørgensen.

Disclaimer

The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of any funder or sponsor.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2021.11.013.

References

1. Self WH. Decline in SARS-CoV-2 antibodies after mild infection among frontline health care personnel in a multistate hospital network — 12 states, april–august 2020. *MMWR Morb Mortal Wkly Rep* [Internet] 2020;**69** [cited 2021 Jul 2]. Available from: https://www.cdc.gov/mmwr/volumes/69/wr/mm6947a2.htm.
2. Lassaunière R, Frische A, Harboe ZB, Nielsen ACY, Fomsgaard A, Krogfelt KA, et al. Evaluation of nine commercial SARS-CoV-2 immunoassays. *medRxiv* 2020 Apr 10. https://doi.org/10.1101/2020.04.09.20056325.
3. Chisale MRO, Ramazanu S, Mwale SE, Kumwenda 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 Jul 6:e2271.
4. Bobrovitz N, Arora RK, Cao C, Boucher E, Liu M, Donnici C, et al. Global seroprevalence of SARS-CoV-2 antibodies: a systematic review and meta-analysis. *PLoS One* 2021 Jun 23;**16**(6):e0252617.
5. Adams J, MacKenzie MJ, Amegah AK, Ezeh A, Gadanya MA, Omigbodun A, et al. The conundrum of low COVID-19 mortality burden in sub-saharan Africa: myth or reality? *Glob Health: Sci Pract* 2021 Sep 30;**9**(3):433–43.