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► To cite this version:

Almoustapha Maiga, Mahamadou Saliou, Amadou Kodio, Abdoulaye Traore, Garan Dabo, et al.. High SARS-CoV-2 seroprevalence among health care workers in Bamako referral hospitals: a prospective multisite cross-sectional study (ANRS COV11). *Clinical Microbiology and Infection*, 2022, 28 (6), pp.900-902. <10.1016/j.cmi.2022.02.019>. <hal-03780525>

HAL Id: hal-03780525

<https://hal.science/hal-03780525v1>

Submitted on 17 Oct 2022

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1 **High SARS-CoV-2 Seroprevalence among Healthcare Workers in**
2 **Bamako Referral Hospitals: A Prospective Multi-Site Cross-**
3 **sectional Study (ANRS COV11)**

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27 **RUNNING TITLE: SARS-CoV-2 among caregivers of Bamako**

28 **Text word count: 840**

29

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35 **KEYWORDS**

36 SARS-CoV-2; Africa; Seroprevalence; Anti-nucleocapsid antibodies; Healthcare workers.

37 **To the Editor,**

38

39 The COVID-19 outbreak has affected some parts of the globe more than others. Mali, like
40 the majority of African countries, has reported much fewer deaths and cases related to
41 COVID-19 when compared to more affected states. As of December 2nd, 2021, there have
42 been 17339 confirmed cases from a population of more than 20 million people. These
43 figures may be underestimated due to weak organization of the health system and low
44 screening capacity.

45 Serological rapid diagnostic tests could be used as tools to inform public health authorities
46 on the development of herd immunity and spread within a population. A particularly affected
47 population group is that of healthcare workers (HCW), representing up to 14% of those
48 infected with COVID-19. In Mali, there is currently no official data on the number of
49 caregivers infected with COVID-19. Therefore, the aim of this study was to determine the
50 seroprevalence of SARS-CoV-2 among HCW in Bamako hospitals and to determine
51 predictive factors associated with positive serology.

52 We conducted a prospective study among HCW older than 18 years working in three referral
53 hospitals with a center for COVID-19 patient management in Bamako (Gabriel Toure
54 University Hospital, Dermatology Hospital of Bamako, and Mali Hospital). Clinical and socio-
55 demographic data were obtained from participants' records or collected after inclusion. The
56 Panbio™ IgG/IgM COVID-19 Rapid Test Device (Abbott Diagnostics, North Chicago, IL,
57 USA; specificities $\geq 94\%$ for IgG and IgM (1)) was performed according to the manufacturer's
58 instructions for qualitative detection of IgG and IgM directed against SARS-CoV-2
59 nucleocapsid. Wilcoxon and Chi-Square statistics were used to assess statistical
60 significance between groups for continuous and categorical variables, respectively. All
61 variables providing a p-value ≤ 0.1 in the univariate analysis were retained for building the
62 final multivariate model.

63 From 16th March 2021 to 15th July 2021, 200 HCW were consecutively included in our study.

64 The enrollment period coincided with the second wave of the COVID-19 epidemic in Mali.

65 Socio-demographic characteristics of the participants are presented in Table 1. Only 1% of
66 HCW reported being a smoker. Median BMI was 24.2 kg/m² (IQR: 21.1-27.3) overall.
67 Symptoms reported at the time of screening were: rhinitis (3.5%), headache (3.0%), cough
68 (2.5%), fever (1.5%), and thoracic pain (1.5%). Three percent of participants mentioned
69 previous medical history of sinusitis/rhinitis. None reported symptoms of severe COVID-19.
70 Twenty-one HCW reported having been in contact with a confirmed case of COVID-19
71 (10.5%). Finally, 29.2% of the participants were vaccinated for COVID-19 with Vaxzevria®
72 by the time of the screening.

73 After inclusion, five participants refused the blood sample. Anti-nucleocapsid SARS-CoV-2
74 IgG were detected for 51.8% (101/195) of HCW. Only 2 of the 195 samples were positive for
75 IgM (1.0%; one IgG positive and one IgG negative with IgG remaining negative one month
76 later). In univariate analysis, it was determined that there were two predictive factors for
77 positive serology: to be a paramedical staff (n=53, 42/53 nurses; Odds Ratio=2.4, 95%CI
78 1.1-4.9, $p=0.020$) and having ≥ 8 individuals living in the household (OR=2.4, 95%CI 1.3-4.3,
79 $p=0.003$). Considering these two variables, only the number of people living in the household
80 (≥ 8 versus < 8) was an independent predictive factor of a positive serology.

81

82 In this study, we report a high seroprevalence of 51.8% among HCW in Bamako referral
83 hospitals. These results are notably higher to what has been observed among the general
84 population in Democratic Republic of Congo and Cameroon (2,3), but are in line with a
85 recent work revealing a SARS-CoV-2 exposure rate of around 58% among three Malian
86 communities after the first wave (4). Anti-nucleocapsid antibodies allow an estimation of viral
87 spread by seroprevalence in the context of spike-based vaccination but vanish within several
88 months. Then, our results could have been slightly underestimated, also because of non-
89 detection of very recent infections. Moreover, only 16.6% of the staff of the three hospitals
90 were screened. In any case, it suggests a dramatic SARS-CoV-2 spread among HCW in a
91 West African country, supporting what has been shown in Nigeria (5). Characteristics such
92 as the median age of the population (29 years) could explain the majority of asymptomatic

93 cases reported in this study. However, the spread of COVID-19 is an important concern as
94 high viral circulation may lead to the selection of problematic SARS-CoV-2 variants.
95 Living in a household of >8 individuals was the only independent risk factor predictive of a
96 positive serology, reflecting that the concentration of people is a key factor in this outbreak.
97 In Mali, vaccination was initiated at the peak of the second wave, concomitantly to this study,
98 and only 29.2% of study participants were vaccinated. This possibly explains why the
99 seroprevalence did not differ according to vaccination status ($p=0.834$).

100 In conclusions, our study showed a high seroprevalence among HCW in Bamako and
101 confirmed a large spread of SARS-CoV-2 virus in the region despite of a previously under-
102 reported circulation in Africa. In this context, screening and molecular surveillance capacities
103 should be enhanced. HCW are on the frontline of the epidemic and should be considered for
104 priority vaccination as much for their own protection as for the collective protection of public
105 health.

106 **Transparency declaration**

107 **Conflict of Interest**

108 None.

109 **Funding**

110 This study is part of clinical trial ANRS COV11 (BamaCoV) funded by the Agence Nationale
111 de Recherches sur le SIDA et les hépatites virales ANRS| Emerging Infectious diseases and
112 sponsored by the French National Institute for Health and Medical Research (INSERM;
113 reference C20-41).

114 **Ethics**

115 The study was approved by the Ethics Committee of the Faculty of Medicine, Dentistry and
116 Pharmacy of Bamako (opinion number 2021/13/CE/USTTB) and by the Institutional Review
117 Board "CEEI" Committee of INSERM (opinion number 20-743). It was authorized by the
118 Commission nationale de l'informatique et des libertés (CNIL, France; N°921130) and
119 registered in a public trial registry (<https://ClinicalTrials.gov> NCT04710316). Written informed
120 consent was obtained from the participants, and confidentiality of the data was ensured.

121 **Acknowledgments**

122 We thank Abbott Diagnostics (North Chicago, IL, USA) for Panbio™ IgG/IgM COVID-19
123 Rapid Test Device donation.

124 **Contribution**

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138 . Participant socio-demographic characteristics.

Significative	Overall N=200	Positive serology N=101	Negative serology N=94	p-value (univariate analysis)
Age, years, median (IQR)	29.0 (25.0-35.0)	29.0 (25.0-35.0)	29.0 (25.0-35.0)	0.897
Male gender, n/N (%)	114/200 (57.0)	59/101 (58.4)	53/94 (56.4)	0.774
Marital status married, n/N (%)	110/200 (55.0)	57/101 (56.4)	51/94 (54.3)	0.568
Household people number, median (IQR)	7.0 (5.0-11.0)	8.5 (6.0-12.0)	6.0 (4.0-10.8)	0.013
Public transport use (bus), n/N (%)	38/198 (19.2)	75/99 (75.8)	80/94 (85.1)	0.103
Commutation time, min, median (IQR)	30.0 (15.0-45.0)	30.0 (15.0-45.0)	30.0 (15.0-36.3)	0.290
Urban residence, n/N (%)	123/198 (62.1)	61/101 (60.4)	59/92 (64.1)	0.593
Profession				
Medical staff, n/N (%)	74/200 (37.0)	33/101 (32.7)	36/94 (38.3)	0.754
Paramedical staff, n/N (%)	53/200 (26.5)	35/101 (34.7)	18/94 (19.1)	0.021
Administrative and service staff, n/N (%)	73/200 (36.5)	33/101 (32.7)	40/94 (42.5)	0.154
Level of Education				
Elementary, n (%)	41/200 (20.5)	19/101 (18.8)	22/94 (23.4)	0.432
Secondary, n (%)	33/200 (16.5)	22/101 (21.8)	11/94 (11.7)	0.113
University/doctorate, n (%)	118/200 (59.0)	55/101 (54.5)	58/94 (61.7)	0.971
Vaccinated participants, n/N (%)	52/178 (29.2)	27/91 (29.7)	24/83 (28.9)	0.834
COVID-19 confirmed case contact, n/N (%)	21/194 (10.5)	15/100 (15)	6/94 (6.4)	0.053

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Significative p-value (univariate analysis) in bold.
IQR: interquartile range (25th and 75th percentile).

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