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Seroprevalence of anti-SARS-CoV-2 antibodies in blood donors at the Yaoundé University Teaching Hospital, Cameroon

Séroprévalence des anticorps anti-SARS-CoV-2 chez les donneurs de sang au CHU de Yaoundé, Cameroun

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Article original

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RESUME

Introduction: Blood donors in apparently good health may have been in contact with the SARS-CoV 2 without developing symptoms. The Objective of this study was to determine the seroprevalence of anti-SARS-CoV-2 antibodies in blood donors at the Yaoundé University Teaching Hospital.
Methodology: A four-week cross-sectional study was conducted from April to May, 2021. All persons fulfilling the required criteria for blood donation were consecutively included in the study, and their serological status was assessed using the STANDARD TM Q COVID-19 IgM/IgG Duo immunochromatographic test. Statistical analysis was performed using SPSS version 23.0 software with a significance level p<0.05.
Results: Of the 232 donors in our study, 55 (23.7%) had anti-SARS-CoV-2 Ig M/Ig G antibodies. Among these, 41 were males (74.5%) with 39 aged under 35 years (70.9%). Blood group O was found in 37 donors (67.3%). Co-infections with HIV, HBV, HCV and syphilis were found in 7 donors (12.7%). Multivariate analysis showed that anti-SARS-CoV-2 Ab was 2.27 times greater in blood donors aged 35 to 44 years (p=0.039).
Conclusion: These results suggest that a significant proportion of SARS-CoV-2 infection occurs in our population, even if these were persons in apparently good health and age between 35 and 44 years seems to be an associated factor. Sensitization campaigns targeting specific populations may limit the spread of the virus.

ABSTRACT

Introduction : des donneurs de sang en bonne santé apparente peuvent avoir été en contact avec le SARS-CoV-2 sans développer de symptômes. L'objectif de cette étude était de déterminer la séroprévalence des anticorps anti-SARS-CoV-2 chez les donneurs de sang au CHU de Yaoundé.
Méthodologie : une étude transversale de quatre semaines a été menée d'avril à mai 2021. Toutes les personnes remplissant les critères requis pour le don de sang ont été consécutivement incluses dans l'étude, et leur statut sérologique a été évalué à l'aide du test immuno-chromatographique STANDARD TM Q COVID-19 IgM/IgG Duo. L'analyse statistique a été réalisée à l'aide du logiciel SPSS version 23.0 avec un niveau de signification p<0,05.
Résultats : sur les 232 donneurs de notre étude, 55 (23,7%) avaient des anticorps anti-SARS-CoV-2 Ig M/Ig G. Parmi ceux-ci, 41 étaient des hommes (74,5 %) dont 39 avaient moins de 35 ans (70,9 %). Le groupe sanguin O a été retrouvé chez 37 donneurs (67,3%). Des co-infections VIH, VHB, VHC et syphilis ont été retrouvées chez 7 donneurs (12,7%). L'analyse multivariée a montré que les Ac anti-SARS-CoV-2 étaient 2,27 fois plus élevés chez les donneurs de sang âgés de 35 à 44 ans (p=0,039).
Conclusion : ces résultats suggèrent qu'une proportion importante d'infection par le SRAS-CoV-2 survient dans notre population, même s'il s'agissait de personnes en bonne santé apparente et l'âge compris entre 35 et 44 ans semble être un facteur associé. Des campagnes de sensibilisation ciblant des populations spécifiques peuvent limiter la propagation du virus.

Introduction

Coronavirus disease 2019 (COVID-19) discovered in Wuhan, China in December 2019 has caused more than 450 million cumulative cases worldwide with about 6 million deaths today [1]. Since the first confirmed case of COVID 19 on March 06, 2020, Cameroon has recorded more than 120,000 infected cases with 1,931 deaths [2] reported to the World Health Organisation (WHO). The new coronavirus which has been named SARS-CoV-2 (for severe acute respiratory syndrome-Coronavirus 2), responsible for COVID-19, is transmitted from one individual to another through close contact [3, 4]. It is transmitted from human to human mainly through respiratory droplets and has been found in stool, urine and conjunctival secretions of infected cases [5, 6] especially in the early stage of COVID-19. Currently, blood transmission has been refuted by several studies [7-9]. As SARS-CoV-2 can be spread from asymptomatic, pauci-symptomatic and symptomatic subjects, one of the key measures to limit its spread, apart from vaccination, is to carry out screening by molecular, antigenic and/or viral tests. Serological antibody detection has been considered central in epidemiological studies to assess program control at the population level [10]. The seroprevalence of SARS-CoV-2 can be 23 times greater than the prevalence of COVID-19 [11]. A meta-analysis revealed that the detection of anti-SARS-CoV-2 IgG and IgM had high diagnostic efficiency to help in the diagnosis of SARS-CoV-2 infection [12]. Carrying out seroprevalence studies in the general population during a global pandemic such as COVID-19 is particularly difficult not only because of the fear of stigmatization but also because of the constraints linked to containment measures. Despite the extraordinary universal attempt to limit the spread of this virus, many cases have been diagnosed across the world significantly affecting several healthcare disciplines such as blood banking and transfusion medicine. The blood donors are individuals in apparent good health, but may have been in contact with the SARS-CoV 2 without developing symptoms. To identify such, serological screening is the gold standard. Thus, this study aimed to determine the seroprevalence of anti-SARS-CoV-2 antibodies in blood donors at the Yaoundé University Teaching Hospital (YUTH).

Material and methods

We conducted a descriptive, cross-sectional study over a period of 4 weeks from April 05 to May 02, 2021, at the YUTH blood bank. The latter, located in Yaoundé, is a reference establishment in Cameroon specialized in the care of patients and the training of medical personnel.

After a pre-donation medical interview, candidates for blood donation of all genders and nationalities registered during the study period were included after obtaining their informed consent. All those who were excluded from donation after the medical interview were not included in our study. The mode of recruitment was consecutive non-probabilistic. We performed donor screening according to routine procedures that included a medical interview and a physical examination. Apparently healthy people between the ages of 18 and 60, weighing a minimum of 50 kg and with a haemoglobin level of at least 12 g/dl, were eligible for blood donation.

For each one, venous blood was collected in bags containing citrate–phosphate–dextrose and adenine (CPD-A, Hindustan Latex Ltd, Kerala, India), as well as 10 mL collected into a dry tube. The samples were taken in strict compliance with the measures imposed by the COVID-19 pandemic. The sera obtained after centrifugation of the tubes were kept in aliquots at -20°C for a maximum of 2 weeks, for serological analysis. Relevant information was collected from each participant using a previously tested and validated questionnaire with coding to guarantee confidentiality.

Socio-demographic characteristics including sex and age, profession, type of donation (voluntary or family/replacement) were noted on each questionnaire. An immunochromatographic technique was used for screening for SARS-CoV2 antibodies (STANDARD TM Q COVID-19 IgM/IgG Duo from the SD BIOSENSOR laboratory). ABO and Rhesus D blood groups were determined as well as serologies for human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and *Treponema pallidum*. Finally, the results were dispensed after counselling that mainly advised on attitudes to adopt, both for people who tested COVID-negative and COVID-positive.

The data collected was entered using Microsoft Excel version 2020 software, then imported by Windows version 21 SPSS (Statistical Package for the Social Sciences) software for analysis. The comparison of categorical variables was made by the Chi square test and a difference was considered statistically significant at the 5% level ($p<0.05$). The strength of association was measured by the odds ratio (OR) with 95% confidence interval (95% CI).

We obtained a research authorization from the YUTH, an ethical clearance from the Institutional Ethics and Research Committee of the Faculty of Medicine and Biomedical Sciences of Yaoundé (FMBS) and an informed consent from each donor who participated in the study. The information collected was used exclusively within the framework of this study and in strict compliance with medical secrecy.

Results

Of the 232 blood donors received during the study period, the majority 179 (77.2%) were male and single 31 (96.9%). There were 182 donors (78.5%) aged under 35 years and most donors were students (51.3%). There were voluntary 132 donors (56.9%), and the O rhesus positive group was noted in 124 donations (53.4%). A total of 32 donors (13.8%) had at least one transfusion-transmissible infection. The overall prevalences were 7.8%, 5.6%, 0.9% and 0.9% respectively for anti-HIV, Ag/Ab, HBs Ag, anti-HCV Ab and anti-*T pallidum* Ab (Table I).

A total of 55 (23.7%) donors were positive for anti-SARS-CoV-2 antibodies either Ig M or Ig G. Among them, 41 (74.5%) were male, 23 (41.8%) students, 48 (87.3%) singles and 31 (36.4%) were voluntary non-remunerated donors.

Table I: Socio-demographic characteristics and infectious profile among 232 blood donors at the Yaoundé University Teaching Hospital in 2021

Variables	Number (n)	Percentage (%)
Sex		
Male	179	**77.2**
Female	53	22.8
Age group (years)		
< 25	96	41.4
25-34	86	37.1
35-44	37	15.9
45-54	13	5.6
Profession		
Public sector employee	36	15.5
Private sector employee	77	33.2
Pupil/Student	119	51.3
Matrimonial status		
Single	200	86.2
Married	32	13.8
Type of donation		
Voluntary	132	56.9
Family	100	43.1
Blood group		
A Negative	1	0.4
A Positive	54	23.3
B Negative	1	0.4
B Positive	43	18.5
O Negative	5	2.2
O Positive	124	53.4
AB Negative	1	0.4
AB Positive	3	1.3
Transfusion-transmissible infections		
Presence	32	13.8
Absence	200	86.2
HBs Ag		
Non reactive	219	94.4
Reactive	13	5.6
anti-HCV Ab		
Non reactive	230	99.1
Reactive	2	0.9
HIV Ag/Ab		
Non reactive	214	92.2
Reactive	18	7.8
anti-*Treponema pallidum* Ab		
Non reactive	230	99.1
Reactive	2	0.9

HBs: Hepatitis B surface; HCV: Hepatitis C Virus; HIV: Human Immunodeficiency Virus; Ag: antigen; Ab: antibody

Table II: Factors associated with anti-SARS COV-2 positive serology (univariate analysis) among 232 blood donors at The Yaoundé University Teaching Hospital in 2021

	Covid-19			
	Non-reactive N= 177	Reactive N= 55	OR [CI 95%]	p
Sex				
Male	138 (78)	41 (74.5)	1.21 [0.60-2.44]	0.586
Female	39 (22.0)	14 (25.5)		
Age group (years)				
< 25	78 (44.1)	18 (32.7)	1.62 [0.86-3.06]	0.159
25-34	65 (36.7)	21 (38.2)	0.94 [0.50-1.75]	0.874
35-44	22 (12.4)	15 (27.3)	**0.38 [0.18-0.80]**	**0.012**
45 et plus	13 (7.3)	2 (3.6)	2.10 [0.46-9.61]	0.531
Profession				
Public sector	24 (13.6)	12 (21.8)	0.56 [0.26-1.22]	0.142
Private sector	57 (32.20)	20 (36.4)	0.83 [0.44-1.57]	0.624
Pupil/Student	96 (54.2)	23 (41.8)	1.65 [0.89-3.04]	0.124
Matrimonial status				
Single	152 (85.9)	48 (87.3)	0.89 [0.36-2.18]	1
Type of donation				
Voluntary	101 (57.1)	31 (56.4)	1.03 [0.56-1.89]	1
ABO system				
O	92 (52)	37 (67.3)	0.53 [0.28-0.99]	0.062
A	45 (25.4)	10 (18.2)	1.53 [0.71-3.29]	0.364
B	37 (20.9)	7 (12.7)	1.81 [0.76-4.33]	0.237
AB	3 (1.7)	1 (1.8)	0.93 [0.10-9.14]	1
Rhesus system				
Positive	172 (97.2)	52 (94.5)	1.99 [0.46-8.59]	0.398
Transfusion-transmitted infections				
Presence	25 (14.1)	7 (12.7)	1.13 [0.46-2.77]	1
Infection				
HBV	12 (6.8)	1 (1.8)	3.92[0.50-31.25]	0.311
HCV	1 (0.6)	1 (1.8)	0.31 [0.02-5.00]	0.419
VIH	12 (6.8)	6 (10,9)	0.59 [0.21-1.66]	0.385
Syphilis	2 (1.1)	0 (0)		1

HBV: Hepatitis B Virus; HCV: Hepatitis C Virus; HIV: Human Immunodeficiency Virus

Most (39) were aged below 35 years (70.9%). Blood group O was dominant among them; 67.3% (37). Regarding transfusion-transmissible infections, co-infections were found in 7 cases (12.7%).

012The most common infection associated with anti-SARS-CoV2 antibodies was HIV infection, noted in 6 cases (10.9%). The prevalence of COVID-19 was significantly high (p = 0.) in donors aged 35 to 44 years (27.3%), see Table II.

After multivariate analysis, the presence of anti-SARS-CoV2 Ab was 2.27 times greater in the group of donors aged 35 to 44 (p=0.039) (Table III). There were no other statistically significant differences between the other variables and the seroprevalence of COVID-19.

Table III: Factors associated with SARS COV-2 – positive serology (multivariate analysis) among 232 blood donors at the Yaoundé University Teaching Hospital in 2021

	Covid-19			
	Non-reactive N= 177	Reactive N= 55	OR [CI 95%]	P
Age group (years)				
35-44	22 (12.4)	15 (27.3)	**0.44 [0.21-0.96]**	**0.039**
Profession				
Public sector	24 (13.6)	12 (21.8)	0.61 [0.27-1.33]	0.211
ABO system				
O	92 (52)	37 (67.3)	0.61 [0.32-1.19]	0.147

Discussion

Since the outbreak of the COVID-19 pandemic, the means and methods of evaluating the control of this disease have been challenging for governments, and studies of seroprevalence in the population have been useful. Our study aimed to determine the seroprevalence of anti-SARS-CoV-2 antibodies in blood donors from the Yaoundé University Teaching Hospital (YUTH). Despite the lack of evidence that SARS-CoV-2 is transmissible by blood transfusion [13, 14], this point seemed important to assess the seroprevalence in a population with apparently good health. A total of 55 (23.7%) donors were reactive to the screening test for anti-SARS-CoV-2 antibodies. This seroprevalence is similar to that obtained in the United States by Jones et al. in May 2021, also among blood donors. Indeed, they had obtained a seroprevalence of SARS-CoV-2 of 20.2%. On the other hand, in the same study, in July 2020, the overall estimate of the seroprevalence of SARS-CoV-2 induced by the infection was 3.5% [14]. In Africa, these same variations in seroprevalence among blood donors have been noted. In particular, in a study conducted in Angola, an estimate of the exposure of healthy blood donors in Luanda from July to September 2020 revealed an anti-SARS-CoV-2 seroprevalence of 4.7% [15]. Crude and weighted seroprevalences of anti-SARS-CoV-2 antibodies in Madagascan blood donors rapidly increased to more than 40% positivity from May to August 2020 [16]. In a study conducted in Malawi, seropositivity peaked in October 2020 (18.5%) and May 2021 (64.9%) [17]. These changes in seropositivity among blood donors demonstrate the importance of implementing sero-surveillance in controlling the pandemic. After multivariate analysis, the presence of anti-SARS-CoV2 Ab was 2.27 times greater in the group of donors aged 35 to 44 (p=0.039), whereas other studies show no evidence of age and sex dependence of prevalence [18].

In our study, most of the COVID-19 seropositive donors were male. This observation was also found by Elnasser et al in 2021 in Jordan, who found a male predominance of 96.7% among donors seropositive for COVID-19 [19]. This distribution could be related to that of the general population of blood donors. A study by Mayomo et al in Cameroon in 2016 revealed a predominance of men among blood donors at the Central Hospital of Yaounde [20]. The most common age group among our SARS-CoV 2 seropositive donors was under 35 years old. Elnasser et al reported a median age of 29 years among blood donors [19]. The young age of blood donors has already been noted in several studies [19-21]. This would explain that our donors were mostly students and single people. In our study, blood group O was the majority, noted in 67.3% of donors seropositive for COVID-19. This differs from the observations of Dodd et al which found that SARS-CoV2 infection was higher in blood group A and lower in blood group O [21]. It seems important to continue to question the impact of blood group in coronavirus disease 2019. Concerning transfusion-transmitted infections, HIV, HBV, HCV and/or syphilis coinfections with anti-SARS-CoV 2 antibodies were found in 12.7% of cases. This trend is similar to that of the general population of our study where 13.8% blood units were contaminated by at least one of the 4 infections routinely screened for in blood banks in Cameroon. Compared to the work of Mayomo et al in 2016 in Yaoundé [20], we observe about a 50% reduction in the prevalence of TTIs in our study. This decrease could be correlated with that observed in the general population. For example, the prevalence of HIV in Cameroon dropped from 5.5% in 2004 to 4.3% in 2011 and 2.7% in 2018 [22, 23]. The voluntary nature of the donation was found in 56.9% of blood donors. This result differs from that observed by Mayomo et al who found that only 1.3% had made a voluntary blood donation [20]. This difference suggests progressive increased awareness of the population of the importance of blood donation. One could wonder if this awakening of consciousness would be linked to the media coverage of health thanks to COVID-19. This epidemiological data could help in targeting priorities in terms of vaccination in our context.

As a main limitation, the recruitment was done in a single site. Thus, conducting studies in other blood banks may provide more informations on factors related to the presence of anti-SARS-CoV 2 Ab in blood donors.

Conclusion

These results show that the seroprevalence of SARS-CoV 2 in blood donors was about 23.7%, suggesting that a significant proportion of SARS-CoV-2 infections may occur in our population, given that these were persons in apparently good health. It appears important to determine the kinetics of its antibodies and the epidemiological profile to better understand and develop the control mechanisms of this pandemic. Sensibilisation campaigns on a target population can be of benefit to limit the propagation of the virus.

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Authors' contributions: Ndoumba Mintya Annick and Boum II Yap **designed the study**. Dimegni Emmeran and Kouongni Yves **collected the data**. Boum II Yap and Voundi Voundi Esther **carried out the statistical analysis**. Bouopda Rodrigue, Ndoumba Mintya Annick and Voundi Voundi Esther **wrote the manuscript.** Tayou Tagny Claude and Mbanya Dora **critically read the manuscript.**
All the authors gave their approval for publication.

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