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SEROPREVALENCE OF ANTI-SARS-COV-2 ANTIBODIES AMONG FIRST-LINE MEDICAL AND NON-MEDICAL STAFF AT THE JOURDAN MEDICAL CENTER, YAOUNDE-CAMEROON: A DESCRIPTIVE CROSS-SECTIONAL STUDY

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Abstract: -

Background: *Health personnel on the front line of the COVID-19 pandemic are at major risk of contamination by this virus and therefore represent a potential source of transmission. The aim of our study was to assess the seroprevalence of anti-SARS-Cov-2 antibodies among nursing and non-clinical staff at Jordan Medical Services (JMS).*

Method*: We conducted a descriptive cross-sectional study in April 2021 among JMS staff from whom blood samples were taken after obtaining their consent. Immunoglobulins G and M were screened for using the Panbio TM COVID-19 IgG/IgM immunochromatographic kit. The data thus collected were analyzed using SPSS version 21 software, a Chi square test was used with a statistical significance of $p<0.05$.*

Results*: Among the 170 participants, the most represented age group was [30-40[(86, 50.6%); Women (95, 55.9%) and paramedical staff (90, 52.9%) were also the most represented. The seroprevalence of anti-SARS-CoV2 antibodies was 6.5% (11) for IgM and 44.7% (76) for IgG. The proportion of paramedical staff who were IgG positive for COVID-19 was statistically significantly higher than that of medical and administrative staff ($p = 0.037$). Similarly, the proportion of IgG-positive participants with a history of COVID-19 was statistically higher than that of the others ($p = 0.016$).*

Conclusion*: The seroprevalence of COVID-19 is high among healthcare workers and among other categories; with paramedics and history of COVID-19 as associated factors.*

Keywords: - *Seroprevalence, healthcare workers, non-healthcare workers, SARS-CoV 2, Cameroon*

INTRODUCTION

The coronavirus disease (COVID-19) causing severe acute respiratory syndrome (SARS-CoV- 2) is a global public health emergency of international concern that has spread to many countries around the world, including African countries [1]. Since the start of the pandemic, the world has recorded 499,189,439 cases of COVID-19, including 6,159,474 deaths, representing a mortality rate of 1.2%. Cameroon, on in own, has recorded approximately 119,544 cases of COVID-19, including 1,927 deaths, i.e. a mortality rate of 1.6% [2]. This COVID-19 pandemic has strained health systems and disrupted essential health services in Africa, exposing health workers on the front line of the pandemic [3]. The contamination of health workers during an epidemic has important consequences, both at individual and community level, because it can represent a serious way of spreading the infectious agent in a context of weakening of the health system. [4]. Healthcare workers are a high-risk group for infection. A recent meta-analysis with 11 studies found that the proportion of HCWs who were SARS-CoV-2 positive among all patients with COVID-19 was 10.1%, but severity and mortality among HCWs were lower than among all patients with COVID-19 [5]. In addition, high infection rates among health workers increase absenteeism in the workplace, overburdening the already strained health system and creating stigma phobia and mental disorders such as anxiety and depression [6]. The *Jourdan Medical Center*, like the vast majority of hospital structures in the city of Yaoundé, was very busy during this period and had to deal with the influx of patients with COVID-19, thus exposing its staff to a potential contamination. Monitoring the seroprevalence of infection among healthcare workers based on the detection of specific immunoglobulin type G (IgG) and type M (IgM) is of great importance to know the proportion of people who have already been exposed to SARS-CoV 2 and thus to identify the hospital departments at risk in this structure. Although the kinetics of anti-SARS-CoV-2 antibodies are still under investigation, it is clear that most infected individuals develop antibodies to the SARS-CoV-2 nucleoprotein and spike protein within three weeks of the onset of symptoms [7, 8]. In addition, antibody carriage is a marker of active virus circulation in a community and thus of increased transmission in that population [9]. Several reports show that a large majority of infected individuals are asymptomatic or pauci-symptomatic carriers of the virus [10]; thus, the exact number of people who have been infected with SARS-CoV-2 is currently unknown. A seroprevalence study in New York, USA, estimated SARS-CoV-2 IgG seropositivity rates among health care workers at 27% [8]. In Africa, studies in Kenya [9] and Nigeria [11] show IgG prevalences of 20.8% and 45.1% respectively. In Cameroon, another study on the seroprevalence of health personnel made in three health facilities showed IgM carriage rates of 6.79% and IgG carriage rates of 17.93% [12]. The objective of our study was to assess the seroprevalence of anti-SARS-Cov-2 antibodies in medical and non-healthcare staff at the *Jordan Medical Services* (JMS).

Methodology

Study location

Our study was conducted at *Jordan Medical Services*, located in the Center Region of Cameroon, in Yaoundé. it is a private hospital which has been designated by the Ministry of Public Health as an approved screening center and to date receives several patients infected with SARS-CoV 2 for care.

Type and population of study

We conducted a descriptive cross-sectional study during the month of April 2021 and our target population consisted of both medical and non-medical staff of the JMS.

Data and sample collection

Staff were informed of the study by email and through team supervisors. After obtaining written consent from the participants, a standardized questionnaire was administered to them to obtain sociodemographic data, assess working conditions, potential comorbidities and their history with COVID-19. Then, after recording, a blood sample was taken by finger prick, in search of anti-SARS-CoV 2 antibodies by immunochromatographic technique. Blood samples were analyzed anonymously.

SARS-CoV 2 Antibodies serology

IgG and IgM immunoglobulins were detected using the rapid diagnostic kit (Panbio TM COVID-19 IgG/IgM, Reference ICO-T40203, Lot number COV0052131, Expiry date 2021-04-30). It is a solid phase immuno-chromatographic test used for the qualitative detection of IgG and IgM antibodies to SARS-CoV-2 with a sensitivity and specificity of 96.2% and 100% respectively. The test is interpreted 10-20 minutes after sample application. A positive result for IgM is reported when two separate red lines appear (one line in the control area "C" and one in the test area "M"). For a positive result for IgG, two separate red lines appear (one line in control area "C" and another in test area "G"). A negative result shows a single red line in control area "C" and no red line in test areas "M" and "G".

Statistical analysis

The data collected was entered using Microsoft Excel version 2010 and then imported by the Statistical Package for the Social Sciences (SPSS) Windows version 21 for statistical analyses. Categorical variables were presented as frequency and percentage. Comparisons between groups were made using the chi-square test. Continuous variables were presented as mean and 95% CI. A p-value of <0.05 was considered significant.

Ethical considerations

Testing for COVID-19 was free and consented. Administrative approval was obtained for the study and informed consent was obtained from the participants after assurance of confidentiality of results and free care in case of IgM seropositivity.

Results

Over the 250 *Jordan Medical Services* staff, 170 (68%) participants were tested for antibodies (Figure 1). Among the 170 participants, the most represented age group was [30-40[years (n=86, 50.6%); women (n=95, 55.9%), single people (n=115, 66.5%) and paramedical personnel (n=90, 52.9%) are also the most represented socio-demographic groups. As for medical history, asthma, diabetes and arterial hypertension were found in 0.6%, 1.2% and 2.4% of cases respectively. Of the 22.9% (n=39) of participants with a history of COVID-19, 94.9% received the protocol validated by the Ministry of Public Health while 5.1% (n=2) opted for the traditional pharmacopoeia (Table I).

11 participants were tested positive for COVID-19 IgM antibodies for a seroprevalence of 6.5%, while 76 tested positive for COVID-19 IgG antibodies for a seroprevalence of 44.7% (Figure 2).

The proportion of COVID-19 IgG-positive for paramedical staff was statistically higher than that of medical and administrative staff, at 52.2% ($p = 0.037$). On the other hand, the proportion of COVID-19 IgG positive participants with a history of COVID-19 was statistically higher than that of participants without a history of COVID-19, at 61.5% ($p = 0.016$) (Table II).

Only the proportion of staff with a history of COVID-19 with probable immunization to SARS-CoV 2 was statistically higher than others ($p = 0.005$) (Table III).

Discussion

Since the first cases of COVID-19 appeared in China, the first line of control for SARS-CoV-2 is the health care workers. They are therefore exposed not only to stress and stigma [1] but also to a high risk of infection [8]. Our study focused on the staff of the JMS, which is one of the screening and management center for COVID-19 in Cameroon, to estimate the rate of exposure to this new coronavirus. This private centre located in Yaoundé has a total of 250 staff who did not all participate in the study, with an abstention rate of 32%. This could be explained by the fear of the stigma attached to this result in the population since the beginning of the pandemic [13].

The prevalence of IgG and IgM anti-COVID-19 antibodies of the staff involved in our study was 44.7% and 6.5% respectively. This observation is in line with the work of Olatunde and *al*; who also demonstrated a prevalence of IgG anti-COVID-19 antibodies of 45.1% [11] and the work of Nguwoh and *al*; who demonstrated a prevalence of IgM anti-COVID-19 antibodies of 6.79% [12]. This rather high prevalence could be explained by the influx of COVID-19 patients to the JMS which is located in the city of Yaoundé considered as the epicentre of the pandemic [12] with a very high risk of community transmission. In a study carried out in Yaoundé, the adjusted seroprevalence of IgG SARS-CoV-2 antibodies in the general population was 29.2%, i.e. about two times lower than that obtained in our study. This highlights the vulnerability of health care personnel to this pandemic [7].

Most of the staff at the centre were found to be HIV-positive. However, the proportion of paramedical staff positive for IgG anti-COVID-19 was statistically higher than that of medical and administrative staff, at 52.2% ($p = 0.037$). This could be due to the fact that paramedical staff, especially nurses, are the ones who are in continuous contact with SARS-CoV-2 patients. This result differed from that obtained by Olatunde and *al*, who showed a higher seroprevalence among medical staff (45%) [11], and corroborated that of Cherif and *al*, who found that paramedical staff represented the category of staff most at risk of SARS-Cov-2 infection (54.4%) [14]. According to the interpretation of anti-COVID-19 antibodies, only the proportion of staff with a history of COVID-19 with probable immunization to SARS-CoV 2 was statistically higher than the others ($p = 0.005$). Natural immunity confers high levels of protection against reinfection ranging from about 81% to nearly 100% in health workers for a period of at least five to seven months [15], hence the World Health Organization's recommendation to vaccinate health workers as a priority [16].

Limitations of this study

Our study had limitations. A larger sample size, involving all hospital departments, would have been more representative of seroprevalence. However, the main clinical departments with a high patient flow were included in this study. In addition, a quantitative SARS-CoV-2 IgG and IgM assay would have been more informative and would have provided an important basis for comparison. A SARS-CoV-2 antigen test would also have been more informative and would have provided a basis for comparison with the detection of anti-IgM antibodies, which indicates probable acute infection.

Conclusion

The seroprevalence of SARS-CoV-2 was high among nursing and non-healthcare staff, although all were asymptomatic. Slightly more than 4/10 staff had probable immunity to SARS-CoV-2. Factors associated with seropositivity were paramedical staff and a history of Covid-19.

What is known about this topic

- Infection of health care workers during an outbreak has important consequences as they can be a source of transmission in a hospital setting and elsewhere.

- Most infected individuals develop antibodies to the SARS-CoV-2 nucleoprotein and spike protein within three weeks of the onset of symptoms.

What the study provides

Factors associated with SARS-CoV-2 seropositivity in the hospital setting were paramedical staff and a history of COVID-19.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Contribution of the authors

Doumou A Mvomo Lylian designed the study and drafted the manuscript. Sam Yimga Blessing and Tassonwa Tchida Herman carried out the data collection. Voundi Voundi Esther carried out the statistical analysis. Assam Assam Jean Paul, Voundi Voundi Esther, Ngongang Ruth, Eric Etouckey, Haamit Kabir Abba, Chokote Tollo Eric, Simeni Tchouassi Gilles critically read the manuscript. All the authors gave their approval for publication.

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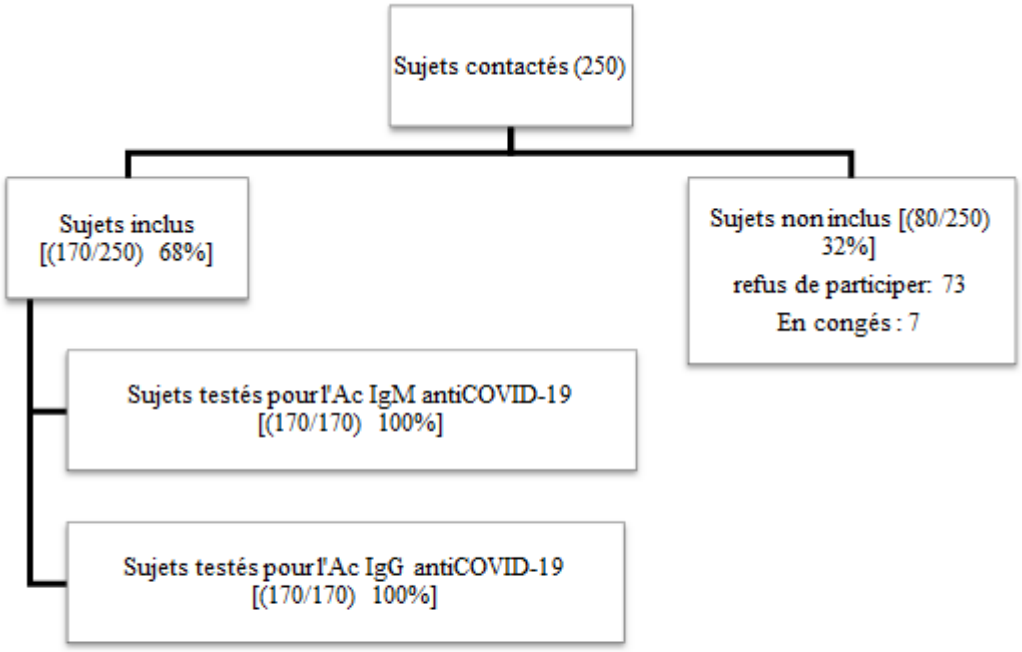

Figure 1 : Diagramme de flux de l'étude

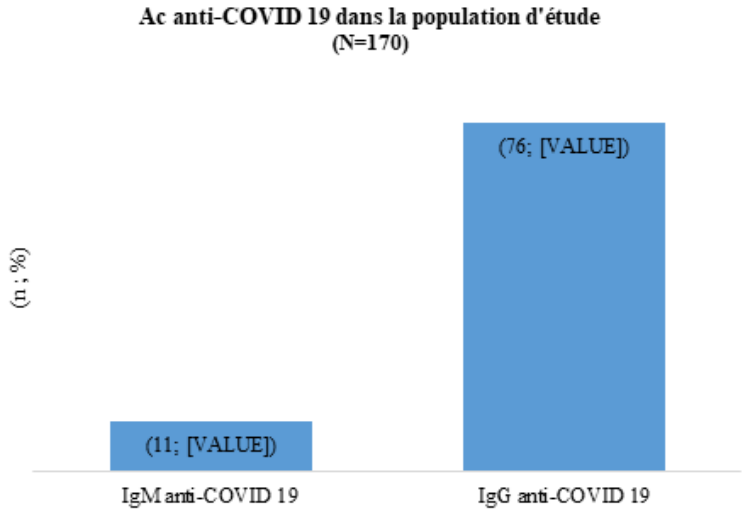

Figure 2 : Répartition de la population d'étude selon le type d'anticorps anti-COVID 19

Tableau II : Association entre les types d'anticorps anti-COVID 19 et les caractéristiques de la population d'étude

Variables		IgM anti-COVID 19			IgG anti-COVID 19		
		Négatif n (%)	Positif n (%)	p	Négatif n (%)	Positif n (%)	p
Tranches d'âge (ans)							
	< 30	53 (91,4)	5 (8,6)	0,590	34 (58,6)	24 (41,4)	0,317
	[30-40[	82 (95,3)	4 (4,7)		44 (51,2)	42 (48,8)	
	[40-50[	17 (89,5)	2 (10,5)		10 (52,6)	9 (47,4)	
	≥ 50	7 (100)	0 (0)		6 (85,7)	1(14,3)	
Sexe							
	Féminin	91 (95,8)	4 (4,2)	0,178	50 (52,6)	45 (47,4)	0,432
	Masculin	68 (90,7)	7 (9,3)		44 (58,7)	31 (41,3)	
Situation matrimoniale							
	Célibataire	105 (92,9)	8 (7,1)	0,881	67 (59,3)	46 (40,7)	0,190
	Divorcé(e)	1 (100)	0 (0)		1 (100)	0 (0)	
	Marié(e)	53 (94,6)	3 (5,4)		26 (46,4)	30 (53,6)	
Personnel médical							
	Non	135 (93,8)	9 (6,2)	0,783	78 (54,2)	66 (45,8)	0,487
	Oui	24 (92,3)	2 (7,7)		16 (61,5)	10 (38,5)	
Personnel paramédical							
	Non	76 (95,0)	4 (5,0)	0,462	51 (63,7)	29 (36,2)	**0,037**
	Oui	83 (92,2)	7 (7,8)		43 (47,8)	**47 (52,2)**	
Personnel administratif							
	Non	124 (91,9)	11 (8,1)	0,081	73 (54,1)	62 (45,9)	0,530
	Oui	35 (100)	0 (0)		21 (60,0)	14 (40,0)	
Diabète							
	Non	157 (93,5)	11 (6,5)	0,708	94 (56,0)	74 (44,0)	0,114
	Oui	2 (100)	0 (0)		0 (0)	2 (100)	
Hypertension artérielle							
	Non	155 (93,4)	11 (6,6)	0,594	93 (56,0)	73 (44,0)	0,217
	Oui	4 (100)	0 (0)		1 (25,0)	3 (75,0)	
Antécédent COVID 19							
	Non	120 (91,6)	11 (8,4)	0,061	79 (60,3)	52 (39,7)	**0,016**
	Oui	39 (100)	0 (0)		15 (38,5)	**24 (61,5)**	

Tableau III : Interprétation des anticorps anti-COVID 19 selon les caractéristiques de la population d'étude

		Interprétation des anticorps anti-COVID 19			
		Probable immunisation à SARS-Co-V-2	Probable infection aigüe à SARS-Co-V-2	Sérologie négative ou fenêtre sérologique	p
Tranches d'âge (ans)					
	< 30	21 (36,2)	5 (8,6)	32 (55,2)	0,484
	[30-40[	39 (45,3)	4 (4,7)	43 (50,0)	
	[40-50[	8 (42,1)	2 (10,5)	9 (47,4)	
	≥ 50	1 (14,3)	0 (0)	6 (85,7)	
Sexe					
	Féminin	42 (44,2)	4 (4,2)	49 (51,6)	0,291
	Masculin	27 (36,0)	7 (9,3)	41 (54,7)	
Situation matrimoniale					
	Célibataire	41 (36,3)	8 (7,1)	64 (56,60)	0,431
	Divorcé(e)	0 (0)	0 (0)	1 (100)	
	Marié(e)	28 (50,0)	3 (5,4)	25 (44,6)	
Personnel médical					
	Non	60 (41,7)	9 (6,2)	75 (52,1)	0,79
	Oui	9 (34,6)	2 (7,7)	15 (57,7)	
Personnel paramédical					
	Non	27 (33,8)	4 (5,0)	49 (61,3)	0,121
	Oui	42 (46,7)	7 (7,8)	41 (45,5)	
Personnel administratif					
	Non	55 (40,7)	11 (8,1)	69 (51,2)	0,195
	Oui	14 (40,0)	0 (0)	21 (60,0)	
Diabète					
	Non	67 (39,9)	11 (6,5)	90 (53,6)	0,227
	Oui	2 (100)	0 (0)	0 (0)	
Hypertension artérielle					
	Non	66 (39,8)	11 (6,6)	89 (53,6)	0,356
	Oui	3 (75,0)	0 (0)	1 (25,0)	
Antécédent COVID 19					
	Non	45 (34,3)	**11 (8,4)**	**75 (57,3)**	**0,005**
	Oui	**24 (61,5)**	0 (0)	15 (38,5)	

Tableau I : Distribution des caractéristiques sociodémographiques et des antécédents de la population d'étude

Variables		N	%
Tranches d'âge (N=170)			
	< 30	58	34,1
	[30-40[	**86**	**50,6**
	[40-50[	19	11,2
	>50	7	4,1
Sexe (N=170)			
	Féminin	**95**	**55,9**
	Masculin	75	44,1
Situation matrimoniale (N=170)			
	Célibataire	**113**	**66,5**
	Divorcé(e)	1	0,6
	Marié(e)	56	32,9
Type de personnel (N=170)			
	Personnel administratif	35	20,6
	Personnel médical	26	15,3
	Personnel paramédical	**90**	**52,9**
	Autre personnel	19	11,2
Asthme (N=170)			
	Oui	1	0,6
	Non	169	99,4
Diabète (N=170)			
	Oui	2	1,2
	Non	168	98,8
Hypertension artérielle (N=170)			
	Oui	4	2,4
	Non	166	97,6
Antécédent COVID 19 (N=170)			
	Oui	39	22,9
	Non	131	77,1
Traitement (N=39)			
	Protocole validé	**37**	**94,9**
	Pharmacopée traditionnelle	2	5,1