Relationship between SARS-CoV-2 Antibody Positivity and Sociodemographic Characteristics of Health Care Workers in the University of Uyo Teaching Hospital

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ABSTRACT

The COVID-19 pandemic is primarily an acute respiratory infection. While polymerase chain reaction (PCR) remains the gold standard for diagnosis, antibody assays have also been deployed as a useful screening tool for COVID-19. This study aimed to determine the pattern of COVID-19 immunoglobulin seropositivity among healthcare workers in a tertiary hospital. The study was a cross sectional sero-epidemiological survey of different healthcare workers within the University of Uyo Teaching hospital community. There was a single sampling of volunteer's blood using finger prick to obtain 5 microlitres (μl) of blood, which was tested immediately for the presence of COVID-19 antibodies (IgM or IgG or both). There were 166 healthcare workers who participated in the study. The mean age of the participants was 38.81 ± 7.99 years and ranged from 25-59 years. Positive IgG antibody was found in 47(28.3%) of the study participants. There was no significant difference in IgG positivity between males (27.1%) and females (29%). On univariate analysis, participants that were administrative staff and those that were 30-39 years of age were significantly associated with IgG seropositivity. On multivariate analysis, being an administrative staff, participants having an age range of 30-39 years and those of 40-49 years were significantly associated with IgG seropositivity. Among the various professional cadres, being an administrative staff was significantly associated with having IgG sero-positivity. There is need to strengthen infection prevention and control measures among all healthcare workers.

Keywords: COVID-19, Healthcare workers, Antibodies

INTRODUCTION

The COVID-19 pandemic is primarily an acute respiratory infection that started in Wuhan, China in December 2019 before spreading to most countries of the world including Nigeria.[1] It is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and has clinical features ranging from asymptomatic to critical illness following an incubation period of 2-14 days.[2] While polymerase chain reaction (PCR) remains the gold standard for diagnosis, antibody assays have also been deployed as a useful screening tool for COVID-19 both clinically and for research purposes, with Immunoglobin M (IgM) and IgG antibodies signifying recent and past infections respectively.[3]

Healthcare workers (HCWs) are a high risk group for exposure to the COVID-19 virus by having to maintain interpersonal interactions with sick individuals even when staff of most other professions had to stay at home during the lockdown measures instituted by various countries to stem the spread of the infection.[4] Male gender has been associated with an increased risk of having the SARS-CoV-2 infection with androgens being postulated to suppress immune responses to the virus in contrast to estrogens generating immune responses and attendant antibodies against it.[5] Older age groups, living in urban areas and having comorbid medical illnesses like chronic kidney disease are other sociodemographic factors that have also been linked with an increased risk of having SARS-CoV-2 positivity.[6] The aim of this study was to determine the pattern of COVID-19 immunoglobulin seropositivity among healthcare workers in a tertiary hospital.

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MATERIALS AND METHODS

This study was conducted at the University of Uyo Teaching Hospital (UUTH), Uyo after obtaining ethical approval. It was a cross sectional sero-epidemiological survey of different healthcare workers (doctors, nurses, laboratory scientists, pharmacists, community health extension workers, radiographers, physiotherapists, administrative staff and cleaners) within the hospital community. Informed consent was obtained from asymptomatic adult health workers who were willing to participate in the study. A structured questionnaire to capture personal data, demographic information, and past records (if any) of COVID-19 symptoms was administered to the participants by trained research assistants. There was a single sampling of volunteer's blood using finger prick to get about 5 microlitres (l) of blood. The samples collected were tested immediately for the presence of COVID-19 antibodies (IgM or IgG or both), using an immunochromatographic assay, with the trained research assistants wearing appropriate personal protective equipment. Data was entered into Microsoft Excel and transferred to SPSS version 20 (IBM, USA) for further analysis. Data was summarized using descriptive statistics.

RESULTS

There were 166 healthcare workers who partook in the study. The mean age of the participants was 38.81 ± 7.99 years and ranged from 25-59 years. There were 107(64.5%) females. Most of the study participants comprised Doctors and Nurses/Community health officers which were 54(32.5%) and 53(31.9%) respectively.

Their sociodemographic characteristics are summarized in Table 1.

Table 2 summarizes the possible COVID-19 risk factors of the participants. Of the healthcare workers involved in the study, only 33 of them comprising 19(57.6%) Doctors and 14(42.4%) Nurses/Community health officers had come in contact with a known COVID-19 patient (p <0.05). Most of the study participants (54%) had an average routine daily exposure of 20-39 patients. Hypertension (14.5%), Asthma (4.8%) and Diabetes (2.4%) were the main comorbidities of the participants. A history of overseas travel was present in 44(26.5%) of the study participants, while 24(14.5%) of them had contact with an oversea returnee.

Positive IgG antibody was found in 47(28.3%) of the study participants. The presence of IgG was used as an index of SARS-CoV-2 sero-positivity in analyzing the data as it was present in all the participants who had a positive antibody test and there was no isolated IgM sero-positivity. There was no significant difference in IgG positivity between males (27.1%) and females (29%) with a p-value of 0.80. On univariate analysis, being an administrative staff and study participants that were 30-39 years of age were significantly associated with IgG seropositivity with both parameters having a p-value of 0.03. On multivariate analysis, being an administrative staff, participants having an age range of 30   39 years and those that were 40-49 years were significantly associated with IgG seropositivity with p-values of 0.04, 0.01 and 0.02 respectively. The odds of having positive IgG antibody by an administrative staff was 7.82 and 8.64 respectively when compared to Doctors (Table 3).

Table 1: Sociodemographic characteristics of the study participants

Characteristic		Frequency	Percent (%)
Gender	Female	107	64.5
	Male	59	35.5
	Total	166	100.0
Age category (years)	<30	15	9.0
	30-39	89	53.6
	40-49	42	25.3
	50-59	20	12.0
	Total	166	100.0
Marital status	Married	122	73.5
	Single	41	24.7
	Separated	3	1.8
	Total	166	100.0
Staff cadre	Doctors	54	32.5
	Nurse/Community Health Officers	53	31.9
	Laboratory scientist	18	10.8
	Pharmacists	4	2.4
	Cleaners	4	2.4
	Radiographers/Health information managers	20	12.0
	Administrative staff	6	3.6
	Physiotherapists	7	4.2
	Total	166	100.0

Table 2: Risk of exposure to COVID-19

Risk		Frequency	Percent
● Daily patient exposure	<10	17	10.2
	10-19	37	22.3
	20-39	54	32.5
	40-59	23	13.9
	60-79	14	8.4
	80-100	12	7.2
	>100	9	5.4
● Comorbidities			
Hypertension	Present	24	14.5
	Absent	142	85.5
Diabetes	Present	4	2.4
	Absent	162	97.6
Asthma	Present	8	4.8
	Absent	158	95.2
Chronic obstructive pulmonary disease	Present	2	1.2
	Absent	164	98.8
Obesity	Present	2	1.2
	Absent	164	98.8
● Overseas travel	Yes	44	26.5
	No	121	72.9
	Missing	1	0.6
● Contact with overseas returnee	Yes	24	14.5
	No	142	85.5
● Contact with COVID-19 patient	Yes	33	19.9
	No	133	80.1

Table 3: Univariate and Multivariate logistic regression models for factors independently associated with IgG seropositivity

Variable	Univariate Odds ratio (95% CI) p-value	Multivariate Odds ratio (95%CI) p-value
Cadre		
Doctors	1	1
Nurses/ Communityhealth officers	2.18(0.92 - 5.21) 0.08	2.20(0.78 - 6.24) 0.14
Laboratory scientists	1.96(0.60 - 6.34) 0.28	1.80(0.46 - 7.08) 0.40
Pharmacists	0.00(0.00) 1.00	0.00(0.00) 1.00
Cleaners	0.00(0.00) 1.00	0.00(0.00) 1.00
Radiographers/Health Information managers	0.98(0.27 - 3.52) 0.97	0.98(0.22 - 4.33) 0.98
Administrative staff	7.82(1.26 - 48.35) 0.03	8.64(1.10 - 68.22) 0.04
Physiotherapists	2.93(0.57 - 15.07) 0.20	3.28(0.50 - 21.35) 0.22
Daily patient exposure	0.92(0.74 - 1.15) 0.47	0.92(0.71 - 1.18) 0.50
Overseas travel	0.41(0.17 - 1.01) 0.05	0.51(0.18 - 1.44) 0.20
Contact with overseas travelers	0.82(0.30 - 2.22) 0.70	1.14(0.36 - 3.55) 0.83
Contact with COVID-19 patient	1.13(0.49 - 2.60) 0.78	1.06(0.39 - 2.92) 0.91
Age group		
<30	1	1
30-39	0.29(0.09 - 0.88) 0.03	0.20(0.05 - 0.72) 0.01
40-49	0.31(0.09 - 1.06) 0.06	0.18(0.04 - 0.78) 0.02
50-59	0.38(0.09 - 1.51) 0.17	0.29(0.06 - 1.46) 0.13

DISCUSSION

The sero-prevalence of SARS-COV-2 antibodies among the asymptomatic health-care workers is 28.3%. This is similar to 26% and 24.4% in a study in Calabar, Nigeria and Birmingham, United Kingdom respectively.[7,8] In a systematic review and meta-analysis of SARS- COV-2 screening carried out in 7 studies of defined populations, 31% (95% CI 26% - 37%) remained asymptomatic.[9] Though male gender has been associated with a higher risk of COVID-19 infection than females,[5] there was no significant difference in both sexes in our study.

Clinical staff have more direct interaction with patients and have been associated with a higher risk of COVID-19 than non-clinical staff.[10] Administrative staff are non-clinical staff and were found to have a significantly higher odds of having SARS-CoV-2 seropositivity in our study in both univariate and multivariate analysis. These may have been due to the administrative staff having less tendency to observe infection prevention and control practices like use of facemask in the hospital environment with the possibility of contracting the infection from asymptomatic carriers.[11] The possible exposure from community transmission of the infection may also be responsible for this outcome.[12] There is need for other studies to corroborate this finding.

Older age group have been associated with higher risk of COVID-19 infection unlike the findings in our study.[6] Younger age range may have been associated with increased risk of having IgG antibodies because of the likelihood of younger staff to be in closer interaction with patients receiving care and there were no elderly

persons involved in our studies as the retirement age for most staff working in the government service in Nigeria is 60 years.[13] Other risk factors for exposure to COVID-19 infection such as daily patient exposure, overseas travel, contact with overseas travelers and contact with a known COVID-19 patient was not significantly associated with IgG sero-positivity. The impact of these parameters may be better elucidated in a study with a larger sample size.

CONCLUSION

The sero-prevalence of COVID-19 IgG antibody in asymptomatic health-care workers in our hospital is over a quarter. Among the various professional cadre, being an administrative staff was significantly associated with having IgG sero-positivity. There is need to strengthen infection prevention and control measures among all healthcare workers.

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