Prevalence of Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) in Nigeria

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ABSTRACT

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) remains one of the most challenging pandemics in the world with fewer casualties in Nigeria despite minimal vaccine uptake. This study examines the prevalence of Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) in subjects attending Federal Medical Center, Owo, Ondo State. A questionnaire based descriptive cross-sectional was conducted in 2022 among 100 patients from Federal Medical Centre in Owo, Ondo State. 50 of whom had received the COIVD-19 vaccine and 50 of whom had not. For this study, men and women between the ages of 18 and 55 who appeared to be in good health were included. According to the study's findings, the prevalence of SARS-CoV-2 was detected in 5% of the population while it was absent in 95% of the rest. Two (20.00%) men and three (30.00%) women out of the five who confirmed positive for SARS CoV 2. The findings also revealed that, of the 5 participants who were tested positive for SARS CoV 2, 4 (80.00%) had not had a vaccination, while 1 (20.00%) had. Adult Nigerians who have never received the COVID-19 vaccine have a high SARS-CoV-2 antibody sero-prevalence rate. Age and gender do not appear to significantly correlate with sero-positivity (p>0.05). Therefore, anti-SARS-CoV-2 antibody testing is required after vaccination since it may be necessary to achieve herd immunity.

Keywords: antibody; SARS-CoV-2; Sero-prevalence; vaccine; Covid-19

INTRODUCTION

The infection that caused the pulmonary illness that sparked the COVID-19 pandemic is known as the severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) [1]. The virus may have originated from a bat given its zoonotic origins and genetically resemblance to bat coronaviruses [2]. Since the Middle East respiratory syndrome coronavirus (MERS-CoV) and the severe acute respiratory syndrome coronavirus (SARS-CoV), two extremely transmissible coronaviruses with zoonotic origin, first appeared in humans in 2002 and 2012, respectively, and both of which caused fatal respiratory conditions, emerging coronaviruses have become a new public health concern [2]. Recently, a novel coronavirus illness known as COVID-19, also known as coronavirus disease 2019, spread quickly throughout the entire world [3]. The angiotensin-converting enzyme 2, or ACE2, receptor allows SARS-CoV-2 to attach to and enter cells in humans [4]. The greater prevalence of SARS-CoV-2 infections compared to SRAS-CoV infections may be due to a DNA recombination process at the S protein in the RBD region of the virus [5]. While the S, E, and M proteins collaborate to create the viral envelope, the N protein, which is found in SARS-CoV-2 encodes the RNA genome [6]. The four structural proteins, which are S (spike), E (envelope), M (membrane), and N (nucleocapsid) make up SARS-CoV-2. They are divided into two functional groups (S1 and S2) [7]. The SARS-CoV-2 spike protein, in particular, the S1 subunit, which induces bonding, and the S2 subunit, which induces fusion, enable the infectious agent to bind as well as fuse with the membrane of the host cell [8].

Nigeria had improved its diagnostic capability as of the second of February, 2022, with an average screening rate of 6.4% [9]. World Health Organization (WHO) figures indicate that COVID-19 is responsible for a total of 6.6 million fatalities

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as well as more than 651 million diseases globally [10]. In Nigeria, there were a total of 266,057 cases and 3,155 fatalities, according to 10. Since the beginning of the pandemic, Ondo state had recorded 5,173 COVID-19 cases as of the 16th of February, 2022 [9]. Due to the broad distribution of COVID-19 vaccines, the risk is now being reversed. To reduce the danger of COVID-19-related mortality, researchers and a number of pharmaceutical firms have created and launched COVID-19 vaccinations [10]. Vaccination has been proven to be an effective public health approach for reducing the burden of infectious illnesses globally [10]. There were claims that the

immunizations are safe and effective at preventing life-threatening COVID19 infections [10]. Nigeria and other African nations have published very few publications despite the rising body of research on COVID-19 [11-12]. Another prerequisite for managing the COVID-19 pandemic in nations with middle or low incomes is understanding the medical indicators, laboratory features, and other aspects connected with negative outcomes in COVID-19 patients. Therefore, the purpose of this study was to determine the prevalence of SARS CoV-2 in patients attending Federal Medical Centre, Owo, Ondo State.

MATERIALS AND METHODS

Research Area

This investigation was conducted in Owo, Ondo State, Nigeria. Owo was at the seat of a Yoruba city-state between 1400 and 1600 AD. Federal Medical Centre is the only functional federal government owned hospital in the local government. Owo has a land area of 735 square kilometers and it lies between 7°11’N and 5° 35’E of the Greenwich Meridian. Majority of people in this area are civil servants, traders, business men and women, transporters, farmers, teachers and students by occupation.

Study Design

The investigation employed a descriptive cross-sectional study design. The only thing that is known about a health outcome's prevalence in a particular population is from descriptive cross-sectional research. This study was conducted between March and June of 2022.

Subjects

Recruitment for this study involved gathering 100 subjects from the Federal Medical Centre in Owo, Ondo State, 50 of whom had received the COVID-19 vaccine and 50 of whom had not. For this study, men and women between the ages of 18 and 55 who appeared to be in good health were included.

Sample Size

The sample size was calculated using the Cochrane formula for sample size determination [13]

\[ n = \frac{z^2pq}{d^2} \]

\[ n = \frac{1.96^2 \times 0.04 \times 0.96}{0.04^2} \]

n = 88.47

Minimum sample size = 88

Allowance for Non-response rate = 10% of 88 = 8.8

Sample size = minimum sample size + No response rate

88 + 9 = 97

To make up for the sampling error or drop outs, one hundred (100) samples were collected and used for the research at 95% confident interval.

Ethical Approval and Informed Consent

The Federal Medical Centre in Owo, Ondo State's health ethics and review Committee gave its ethical permission for the collecting of samples. Prior to the collection of samples, each participant in the study gave their informed consent.
Inclusion Criteria and Exclusion Criteria.

Individuals that attended the Federal Medical Centre in Owo, Ondo State at the time of this study and gave their consent were included in this study. The study excluded people with underlying medical issues and anyone who did not give their consent.

Analytical Technique

- SARS-CoV-2 Rapid Antigen Test

Procedure

The posterior nasopharynx surface was examined by inserting a sterile swab into the patient's nostril. After rotating three to four times, the swab was removed from the nasal passages. An extraction buffer tube was used to contain the swab. The swab was swirled at least five times when the buffer tube was squeezed. After removing the swab, the liquid was extracted from it by squeezing the tube's sides, and the nozzle cap was then firmly put onto the tube. Three drops of the extracted material were introduced to the test device's specimen well, and the test results were then awaited. The test result was read after 15 minutes.

Statistical Analysis

Results were presented in tables and figures as simple frequency and percentage. Statistical comparison between groups was done using student T-test computed with SPSS software version 21.

RESULTS

Socio-demographic characteristics of the Respondents

Table 1 revealed the socio-demographic characteristics of study participants. One hundred subjects comprising of forty-six (46) male and fifty-four (54) females were recruited for this study. The subjects were grouped into different age groups; 18 – 30 years (49%), 31 – 50 years (39%) and age 51 years and above (12%) respectively. Among the subjects studied, 50 were vaccinated against COVID-19, while 50 were not vaccinated. The clinical characteristics of the participants examined are shown in Table 2. According to the data, 52% of the subjects did not have a cough, compared to 48% of the subjects. Thirty (30%) of the subjects had fever, compared to 70% who did not; 23% of the subjects lost their sense of smell, compared to 77% who did not; 22% of the subjects lost their sense of nasal congestion, compared to 78% who did not; and 29% of the subjects had trouble breathing, compared to 70% who did not. In addition, 53% of the individuals had a history of using antibiotics, compared to 47% who had none. 22% of respondents took antibiotics, 16% used herbs, 32% used antimalarial, and 30% utilized other medicines as part of their treatment regimen. The prevalence of the SARS-CoV-2 coronavirus (severe acute respiratory syndrome coronavirus) among the study individuals was depicted in Figure 1. As a result of this investigation, 5% of the study participants had SARS-CoV-2 positive tests whereas 95% had negative tests. According to gender, Table 3 provided data on the prevalence of the SARS CoV 2 coronavirus among the subjects. According to the results, out of the 5 people who confirmed positive for SARS CoV 2, two (40%) were men and three (60%) were women. Similar to this, 44 (46%) of the 95 people who tested negative were men and 51 (54%) were women. Regarding gender, there was no discernible difference in SARS-CoV-2 prevalence (p>0.05). According to subject age, Figure 2 depicted the prevalence of the SARS CoV 2 coronavirus among the subjects. Age groups 18 to 30 years had 2%, 31 to 50 years had 2%, and 50 years and above had 1% of those who tested positive for SARS CoV 2. On the other hand, the percentages of people who tested negative for SARS CoV 2 in the age groups of 18 to 30 years, 31 to 50 years, and 50 and older, respectively, were 47%, 39%, and 9%. Regarding age, there was no discernible variation in SARS-CoV-2 prevalence (p>0.05).

DISCUSSION

In different regions of the world, the SARS-CoV-2 virus outbreak has been associated with diverse types of morbidity and mortality. In comparison to many developed nations and even some African nations, Nigeria's infection and mortality rates have been considerably lower [14]. A total of 3,143 deaths were reported in July 2022, while there were 256,004 confirmed cases overall². There have been a few explanations given for these variations, but none of them include a functioning health system [15]. The demographic and clinical details of the study participants were reported in Tables 1 and Table 2, which were conducted as a part of the prevalence study of the infection in Nigeria. The study participants presented with varying clinical symptoms like loss of nasal congestion, difficulty breathing, and fever [16]. On the general prevalence, the study found a 5% incident rate of SARS-CoV-2 among the study participants, which was consistent with the study conducted [17]. Less than 5% of the nation's population has been tested, and [9] claimed that only 5,160,280 out of more than 200 million people have been tested, which was cited as the reason for the low prevalence rate. Limited testing capacity was caused by a number of elements, including a lack of genetic testing resources, the expensive nature of molecular diagnostics, and a lack of enthusiasm in voluntary
testing in patients with no symptoms. Based on age and gender representation, as seen in Table 2 and Figure 1, respectively, out of the 5% prevalent rate among the study participants, 2% were male and 3% were female. The findings of this study disagreed with those found by [18]. However, the higher rate in female can be attributed to their lower ability to access healthcare due to cultural customs, monetary, and non-monetary barriers that limit their capacity for testing and prevent them from receiving adequate care, which results in underestimated female cases and deaths from SARS-CoV-2 [19]. As regards age, 2% of the study participants within the age range of 18–30 years and 31–50 years were positive for SARS-CoV-2, while 1% of the study participants above 50 years of age tested positive. The findings are consistent with a study conducted by [20] which suggest that people between the ages of 21 and 50 in Nigeria were most affected, with people between the ages of 31 and 40 seeing the highest infection rates. According to UN statistics, Africa, including Nigeria, has the world’s youngest population, with a median age of 19 years, rendering this group vulnerable to a high prevalence of infection [21]. A high seroprevalence of SARS-CoV-2 infection was witnessed in this study, as seen in Table 4, 4% of the study participants who were not vaccinated were positive, while 1% of those who were vaccinated were positive for the infection. The findings of this study were similar to those reported by [22] who had a similar high seroprevalence among non-vaccinated individuals. This is because, as of May 29, 2022, around 30,680,510 Nigerians (14.90% of the population) had received at least one dosage, while 20,096,868 (9.70% of the population) had received two doses and were thus fully immunized. As a result, Nigerian vaccination rates against COVID-19 are still low [22].

Our finding, along with the earlier results, demonstrated that sero epidemiological research could provide a more accurate assessment of the true scope of SARS-CoV-2 infection. Additionally, the results of this study’s observations point to the necessity of screening for SARS-CoV-2-specific antibodies prior to vaccination in order to maximize the number of vaccine doses that may be administered, particularly in low-resource nations that heavily rely on vaccine contributions. In order to support immunization strategies against diseases that can be prevented by vaccination, the use of serology tests and sero epidemiological reports is well established [23]. Considering the nature of the research, it is important to point out that the strength of the study lies in the use of a cost-effective, non-invasive, and easy-to-access technique that would help early detection of infection in low-resource communities like the study population, so that it can help guide early decisions about vaccination, prevention, and control of disease outbreaks. However, this method limits the depth of the seroprevalence analysis due to its inability to quantify the level of antibody. As a result, it encourages further research to consider a real-time reverse-transcriptase polymerase chain reaction (RT-PCR) assay for a more quantitative, sensitive, and effective representation of the seroprevalence analysis [24–44].

In conclusion, there is a lack of knowledge regarding the antibody titer threshold that might be deemed sufficient to protect a person against SARS-CoV-2 infection, whether it be caused by vaccination or natural infection. According to this study, adults in Nigeria who have never received the COVID-19 vaccine had a significant seroprevalence of SARS-CoV-2 antibodies. This supports the earlier hypothesis that there is widespread, undiscovered community transmission. Despite the recommendation for longitudinal-scale studies to check for the presence of neutralizing antibodies in vaccine recipients, age and gender do not appear to significantly correlate with seropositivity. Additionally, screening for anti-SARS-CoV-2 antibodies after vaccination is crucial for clinical purposes because it may be necessary to achieve herd immunity.

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Conflicting Interest
The authors declared no conflict of interest whatsoever.

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