



Prevalence and Associated Factors of Sars-COV-2 among Students in Private Universities in Rivers State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: COVID-19 prompted an early and sustained worldwide public health response. Its proclivity for rapid transmission and relatively high fatality rate across global regions prompted the World Health Organization (WHO) to proclaim it a global pandemic. This study is aimed at determining the prevalence, and factors associated with Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) infection among students in private universities in Rivers State.

Design: This was a descriptive cross-sectional study

Aims: To determine the prevalence of SARS-CoV-2 and its associated factors among private university students.

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Materials and Methods: 431 participants were tested for SARS CoV-2 using GeneXpert Dx System's reverse transcription-polymerase chain reaction (RT-PCR). Self-administered questionnaires were also distributed to elicit responses from these participants. Descriptive statistics (percentages and proportions) were used to report findings.

Results: A response rate of 96% was recorded (431 correctly completed questionnaires retrieved). Out of the 431 participants tested, 425(98.6%) were negative while 6(1.4%) were positive bringing the prevalence rate to 1.4%. The majority (90.3%) don't use facemasks when a lecturer is not in class, and 60.6% of the participants indicated inadequate provision for hand washing equipment, and sanitizers in the laboratories for students.

Conclusion: This study showed a low prevalence of SARS-CoV-2 among private university students and poor compliance with COVID-19 protocols.

Keywords: Prevalence; COVID-19 prevalence; SARS CoV-2; COVID-19; associated factors.

1. INTRODUCTION

In late December 2019, multiple cases of pneumonia of unknown origin were reported in Wuhan, China, which was later identified as the result of a novel coronavirus in early January 2020. The virus was eventually dubbed SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and was identified as the cause of coronavirus disease in 2019 (COVID-19) [1]. An initial relationship with a seafood market that sold live animals, where most patients had worked or visited, was discovered during an epidemiologic examination in Wuhan, China, at the start of the COVID-19 outbreak.

As the outbreak advanced, however, person-to-person transmission became the primary mechanism of infection. COVID-19 mostly spreads via the person-to-person route, which is also known as direct person-to-person transmission [2]. It is thought to spread through close contact, primarily through respiratory droplets; the virus released in respiratory secretions when a person with infection coughs, sneezes, or talks can infect another person if it comes into direct contact with the mucous membranes; infection may also occur if a person's hands are contaminated by droplets or by touching contaminated surfaces and then they touch another person; infection may also occur if a person's hands are contaminated by droplets or by touching [3,4]. The World Health Organization (WHO) lists fever, cough, shortness of breath, weakness, exhaustion, nausea, vomiting, diarrhoea, and changes in taste and smell as common COVID-19 symptoms [5].

Due to its propensity for quick transmission and relatively high death rate across global regions, COVID-19 sparked a sustained global public health response from the first to the last quarter of 2020, leading the World Health Organization

(WHO) to declare it a global pandemic. As of June 2, 2023, there were a total of 767,364,883 confirmed cases of COVID-19 worldwide, including 6,938,353 deaths, as reported by WHO [6]. Africa has recorded a total number of 9,532,788 cases, the lowest among the six continents [6].

Nigeria, Africa's most populous country recorded its index case on 27th February 2020 [7]. As of 19th May 2023, 266,675 cases and 3,155 deaths have been recorded in Nigeria. Rivers State of Nigeria ranks third in the number of cases and mortality (18,112 cases, 155 deaths) [8].

With the first case recorded in Nigeria on February 27, 2020 [7], the exponential rise in case number and death rates made her one of the worst-hit countries in Africa. This led the Federal Ministry of Education to order the closure of all schools as part of the country's wider attempt to stop the virus from spreading [9,10]. However, as the infection curve flattened, it became vital to reopen the economy and schools for on-campus physical learning, in accordance with the Presidential Task Force (PTF) rigorous guidelines for institutions to follow. The aim of these guidelines is to ensure that the success already recorded will not be ruined. However, with the consistent poor compliance towards the protective measures instituted against the spread of the disease as well as the poor attitude and knowledge towards the disease especially among young people, these measures may not be effective.

Prevalence is a metric used in epidemiology to show how common a condition is in a community [11]. Examples of how these estimates are put to use include determining the burden of various conditions and establishing priorities for interventions, creation of guidelines, and research. Because they demonstrate changes

and trends over time in the conditions of interest, they are also helpful in assessing the effectiveness of health interventions [12]. There is a paucity of information on the prevalence of COVID-19 in Rivers State's higher institutions as well as the country as a whole. Hence, this study is pivotal as it estimates COVID-19 prevalence and its associated factors among students in private institutions in Rivers State, Nigeria. Understanding the prevalence of diseases is essential for efficient healthcare provision [13]. Determining COVID-19 prevalence can help to ascertain its burden on the population and to determine at-risk populations. In addition, it can help the authorities formulate better policies and target interventions to appropriate populations. Risk factors are important elements which make being sick or getting infected more likely. Some of them may include age, gender, chronic conditions, environmental risk factors and so on. Identifying the associated factors can also help target strategies for rapid interventions.

This study aimed to determine the prevalence of COVID-19 as well as its associated factors among students attending private institutions in Rivers State, Nigeria. Lastly, the degree to which university students comply with Infection, Prevention and Control (IPC) measures on COVID-19 is uncertain. However, the existence of some factors that could contribute to greater COVID-19 infection among Nigerian students has not been investigated.

2. MATERIALS AND METHODS

The study was a descriptive cross-sectional study on the prevalence and associated factors of SARS CoV-2 among students attending private Universities in Rivers State.

The study population comprises Undergraduate students attending private universities in Rivers State.

2.1 Inclusion and Exclusion Criteria

Inclusion Criteria:

- I. Student of a private university in Rivers State who is enrolled in an undergraduate programme and currently in any 100-600L year of study, aged 18 years and above.

Exclusion criteria:

- I. Students who were ill or unavailable at the period of the study

3. SAMPLING

The required minimum sample size (n) will be determined by considering the Cochran formulae [14]:

$$N = \frac{pq * (z^2)}{(d^2)}$$

Where n = minimum sample size, p = the proportion of undergraduate students who had good knowledge of COVID-19 65.4% [15], d = error margin tolerated (d = 0.05), z = the standard level of deviate corresponding to the level of significance (z = 1.96), and q = (1-p).

Therefore, $n = 0.654 (1 - 0.654) * (1.96^2)/(0.05^2)$
 $n = 347.7$

Considering a non-response rate of 20%, total sample size is $347.7 + 69.5 = 417$

Thus, the required minimum sample size for this study was 417. However, 431 students were present and met the eligibility criteria.

The sampling technique used was cluster sampling. Three private universities were taken as homogeneous groups (clusters) of eligible study populations. From these three clusters, one cluster was selected using simple random sampling by balloting. After selecting the study site, a sampling frame (a comprehensive list of all students) was obtained from the Registrar following the necessary preliminary sensitization and permissions. Out of the total 620 who were present, 450 students met the inclusion criteria. From the 450 students, a simple random sampling of 431 students from the comprehensive list was conducted by generating random numbers using an online random number generator. Questionnaires were also used to collect demographic data about the participants and gather information regarding their knowledge, perception, and preventive practices of COVID-19. Questionnaire administration and sample collection (throat and nasopharyngeal swabs) were carried out from the 2nd to the 13th of March 2020.

Face validity was carried out by engaging experts in the subject matter to ensure the reliability and validity of the study instrument. A pre-test was carried also out, and Cronbach's alpha for internal consistency was computed, giving a good reliability score of 0.70. Statistical analysis was done using IBM SPSS v25.

Descriptive statistics were used for the socio-demographics and to determine prevalence.

Study participation was voluntary, and collected data and laboratory results were treated as confidential, as participants were not permitted to submit their names. Each participant was allocated a unique code to enable the questionnaire to be linked to the biological sample taken, to avoid inaccurate data entry and misinterpretation.

Because the study entailed the collection of biological samples from humans, ethical clearance and approval were obtained from the University of Port Harcourt Research Ethics Committee (UPH/CEREMAD/REC/MM74/048) and the Rivers State Ministry of Health.

4. COVID TESTING OF PARTICIPANTS

GeneXpert Dx System's reverse transcription-polymerase chain reaction (RT-PCR) was employed for the sample testing of the students. The SARS-CoV-2 Xpert Xpress kit contains enough reagents to process ten specimens or quality control samples. The package includes cartridges with integrated reaction tubes, lysis reagent, binding reagent, elution reagent, single-use transfer pipettes, CD (per kit), assay definition file (ADF), and importation instructions for the ADF into the GeneXpert software. The materials used for sample collection include; a viral transport medium (VTM), falcon tube, Ziploc packs, ice packs, and geostyle container.

5. SAMPLE COLLECTION PROCEDURE

The procedure employed during the sample collection process is as follows;

A comfortable seat was provided to a participant who was present for sample collection. The participant was then informed of the technique

and, instructed to slant the head backwards. A swab stick was placed semi-vertically into each nostril of the nasopharynx, swabbing epithelial cells in each case. Another swab stick was used to gather swabs from the same person's oropharynx.

Sample packing and storage: The sample was packaged using the triple approach. When a swab is collected, it is immediately placed in a VTM, which preserves the sample and promotes viral development. Following that, the VTM was wrapped in cotton wool and put into a falcon tube. In a Ziploc bag, the falcon tube was inserted. The triple-packed sample was then inserted into a Geostyle box lined with ice packs to protect it from contamination during transportation to the laboratory for testing.

This included the proper donning and doffing of personal protective equipment (N95 face masks were used because they provide the highest level of protection against COVID-19), maintaining a safe distance of at least one meter from participants, proper hand washing hygiene, proper donning and donning of hand gloves, and an adequate decontamination process.

6. RESULTS

The socio-demographic characteristics of the patients are shown in Table 1. The majority of the study respondents, 284(65.9%) were females while 147(34.1%) were males. More than half of the respondents, 280 (65%) were aged between 16 – 20 years, while 23.4% and 11.6% were aged 26 – 30 and 31 – 35 years respectively. Almost all, 421(97.7%) were single, while 10(2.3%) were married. Furthermore, the majority of the respondents, 425(98.6%) practised Christianity while 6(1.4%) practised Islam. 140(32.5%) of respondents were in their third year of study, 100(23.2%) were in their first year, and 12(2.8%) were in their sixth year.

Table 1. Socio-demographic characteristics of study participants

Variable (N = 431)	Frequency	Percentage (%)
Gender:		
Male	147	34.1
Female	284	65.9
Age range:		
16-20 years	280	65
26-30 years	101	23.4
31-35 years	50	11.6
Marital status:		
Single	421	97.7
Married	10	2.3

Variable (N = 431)	Frequency	Percentage (%)
Religion:		
Christianity	425	98.6
Islam	6	1.4
Level of study:		
100	100	23.2
200	60	13.9
300	140	32.5
400	53	12.3
500	66	15.3
600	12	2.8

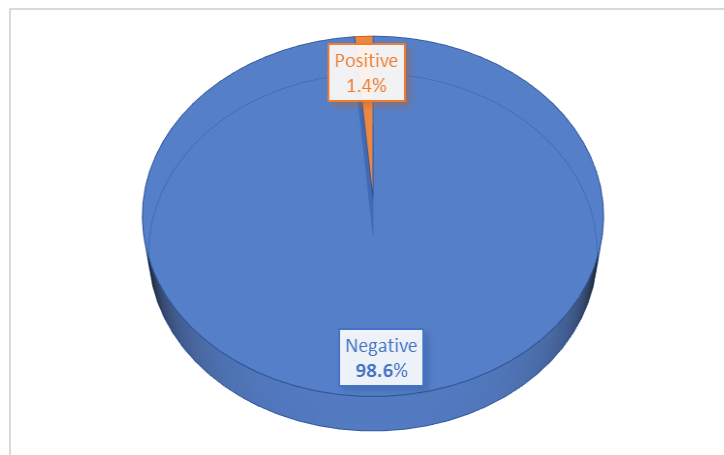


Fig. 1. Prevalence of SARS CoV-2 virus among private University Students in Rivers, Nigeria

Table 2. Associated factors of SARS-CoV-2 among private University Students in Rivers, Nigeria

Variable	Strongly Agree	Agree	Disagree	Strongly disagree
	n (%)	n (%)	n (%)	n (%)
The sitting arrangement in class does not provide for proper spacing in my lecture hall.	85 (19.72)	58 (13.5)	203 (47.1)	85 (19.7)
Some of my classmates do not wear face mask in class when the lecturers are not in the class.	389 (90.3)	31 (7.2)	8 (1.90)	3 (0.70)
There are no adequate provisions for hand washing and sanitizers in the laboratories, hostels and lecture halls for students.	30 (7.0)	261 (60.60)	37 (8.60)	103 (23.9)
The lecture halls are usually overcrowded.	8 (1.9)	14 (3.20)	250 (58.0)	159 (36.9)
Students generally believed that COVID-19 is not real	119 (27.6)	109 (25.3)	130 (30.2)	73 (16.9)

98.60% of study participants tested negative for COVID-19, while 1.40% tested positive (Fig. 1). Thus, the COVID-19 prevalence among the study participants was 1.40%.

The prevalence of associated factors of COVID-19 is shown in (Table 2). 47.1% of study

participants disagreed that sitting arrangement in class does not provide for proper spacing in lecture halls. The majority (90.3%) of the participants agreed that some of their classmates do not wear face masks in class when the lecturers are not in the class. 60.6% of study participants agreed with the statement 'there are

no adequate provisions for hand washing and sanitizers in the laboratories, hostels and lecture halls for students' (Table 2). Table 2 further shows that 58.0% disagreed that lecture halls are usually overcrowded, while 30.2% of study participants disagreed that students generally believed that COVID-19 is not real.

7. DISCUSSION

The study findings on the prevalence of SARS-CoV-2 infection among students in private universities in Rivers State revealed that of the 431 participants tested, 425 (98.60%) tested negative for COVID-19, whereas 6 (1.40%) tested positive, giving COVID-19 prevalence rate among study participants as 1.40% (Fig. 1). The prevalence of SARS-CoV-2 among the students in this study was low (1.4%). This is consistent with other studies on the incidence of the infection among students. 9 students in Australia (New South Wales) tested positive to COVID-19 [16], while 3 students in Ireland tested positive during the first wave of the pandemic [17]. In England, active prospective surveillance following the full reopening of schools identified acute SARS-CoV-2 infection in 0.38% and 0.93% of participants at the start and end of the autumn term of the 2020/21 academic year respectively [17]. Videla et al. [18] in a cross-sectional study, determined the impact of the SARS-CoV-2 pandemic at the University of Barcelona among 2784 students who provided a nasal swab for reverse transcription polymerase chain reaction (RT-PCR) SARS-CoV-2 analysis and a venous blood sample for SARS-CoV-2 IgG antibody assay. The result showed that the total prevalence of SARS-CoV-2 infection (positive RT-PCR or positive IgG) was 14.9% as 40 participants were positive for SARS-CoV-2 RT-PCR while IgG against SARS-CoV-2 was observed in 12.8% of participants [18].

There is a paucity of research that has been done on the prevalence of COVID-19 in Rivers State's higher institutions. However, Alasia and Maduka [19] looked at the incidence of COVID-19 cases among healthcare workers in Rivers State. In this study, there was a significant difference in gender distribution between healthcare and non-healthcare workers, with a higher female prevalence among healthcare workers compared to non-healthcare workers, which reflects the high prevalence of females in healthcare occupations in Nigeria, particularly nursing, which accounted for over 30% of health care workers and doctors. According to Alasia

and Maduka [19], case fatality among healthcare employees in Rivers State was 1%, compared to 1.9% for non-healthcare workers. They reported that the prevalence of COVID-19 among healthcare workers in the state was high. Though the COVID-19 prevalence seen in this study could be related to low compliance with NCDC-recommended non-pharmaceutical interventions, an important factor to consider is whether the infections occur within or outside the school premises. Additionally, a recent report by the European Centre for Disease Control (ECDC) concluded that the prevalence of COVID-19 within schools is influenced by community prevalence especially when community transmission is sustained [20]. However, these data suggest that the spread of COVID-19 within school settings may still be limited due to the low incidence. In contrast to this study, Nwosu et al. [21] reported that men, obese individuals and those living in large households were significantly more likely to be seropositive. Also, Gudbjartsson et al. [22] and Fischer [23] have suggested that being older increases the likelihood to be infected with SARS-CoV-2 while there are slightly raised viral attack rates in men [24,25]. Furthermore, Liu et al. [26] reported that Children, old people, females, and family members are more susceptible to COVID-19 infection. The differences in these factors could be related to the differences in the sample size and the prevalence of the infection in the different study areas.

Findings from this study showed that non-use of face masks when a lecturer is not in class, (57.0%), inadequate provision for hand washing equipment, and sanitizers in the laboratories for students (47.1%) were some factors driving the infection, in agreement with Ong et al. [27] in their study which found out that compliance to infection control measures remains poor in schools. This could increase the number of cases in schools if urgent steps are not immediately taken to address these identified factors. Additionally, it highlights the need to increase public health literacy and COVID-19 awareness. However, overcrowding in lecture halls was not part of the factors identified as more than half (47.1%) of study participants disagreed that lecture halls were usually overcrowded. This could be attributed to low intake by these private universities compared to their public counterparts where students learn in crowded classrooms with no regard to physical distancing.

8. CONCLUSION

This study shows a low prevalence of COVID-19 (1.4%) among Private University students and also highlights the need for compliance with COVID-19 infection prevention protocols. Findings from this study have shown that private University students have very good knowledge and perception of COVID-19 infection, and route of transmission, but demonstrated poor preventive practices in some areas such as strict adherence to the use of face masks, hand washing, use of hand sanitizers etc. In order to initiate effective control measures for Covid-19, having good knowledge about basic hygiene guidelines and modes of disease transmission, and preventive measures in such an environment is, therefore, of significant importance to public health.

9. STUDY LIMITATION

This study was a descriptive study and in hindsight, it could have been more analytical and would have better enhanced the contribution of this paper to the existing knowledge base.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical clearance and approval were obtained from the University of Port Harcourt Research Ethics Committee (UPH/CEREMAD/ REC/MM74 /048) and the Rivers State Ministry of Health.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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