# Knowledge, Atitude and Uptake of COVID-19 Vaccine among Undergradute Students in Southern 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

**Aim:** The study was carried out to assess the knowledge, attitude, and uptake of the COVID-19 vaccine among undergraduate students in a tertiary institution in Southern Nigeria.
**Study Design:** Cross-sectional study
**Place and Duration of Study:** Rivers State University, June, 2022
**Method:** A validated self-administered questionnaire was used to obtain information on the knowledge, attitude, and uptake of the COVID-19 vaccine among 410 undergraduate students. The data collected was analyzed with the statistical package for social sciences (SPSS) v25 software at a 95% confidence interval.
**Results:** The study showed that only 16.5% of the students indicated willingness to take the COVID-19 vaccine, while 95.1% had a good knowledge of COVID-19. It was also observed that 75.1% of the students had good knowledge of the COVID-19 vaccine, while only 50.7% of the

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students had good/positive attitude to the COVID-19 vaccine and 49.3% of the students had a poor attitude to the COVID-19 vaccine. Regression analysis showed that Male gender was 1.5 times (95% C.I; 0.8 – 2.6) more likely to take the vaccine, while persons that had a comfortable income level were 1.6 times (95% C.I; 0.9 – 2.7) more likely to take the vaccine. It was also observed that good knowledge of COVID-19 was significantly associated with the willingness to take the vaccine (Chi-square = 6.80, p = 0.009). The findings of the study showed that the high level of good knowledge of COVID-19 did not correspond with the willingness to take the vaccine among the students.

**Conclusion:** The poor attitude towards the vaccine is relatively high among the students, making it imperative for an improved awareness on the vaccine safety and efficacy among undergraduate students to improve vaccine coverage and reach some sort of herd immunity for the COVID-19 viral infection in the country

## 1. INTRODUCTION

"Severe Acute Respiratory Syndrome Corona virus 2 (SARSCoV-2) is the causative agent for COVID-19" [1]. "First identified in Wuhan China in December 2019, over 102 million cases and 2.2 million deaths have been reported from 222 countries and territories as of 3rd February 2021 and in Nigeria, over 133,552 cases and 1,613 deaths have been documented across 36 States and the Federal Capital Territory, with 5,483 cases and 84 deaths recorded in Rivers as of 3rd February 2021" [2]. "The infection had no immediate treatment and vaccine, and according to World Health Organization (WHO) became a worldwide pandemic causing significant morbidity and mortality with 1,603,428 confirmed cases, 356,440 recoveries from the illness and 95,714 deaths worldwide as of April 9, 2020" [1]. "On February 27, 2020, an Italian citizen became the index case for COVID-19 in Nigeria and as of April 9, 2020, there were 288 laboratory-confirmed cases of COVID-19 in Nigeria with 51 discharges and 7 deaths" [1,3]. "Despite scientific evidence indicating that the vaccines are safe and effective, and health message dissemination efforts to the public about the vaccines' development, safety, and efficiency, doubt continues to be embedded in people's minds which hinders the continued effort to control the spread of the virus and the goal of herd immunity due to vaccine hesitancy" [4,5]. "The development of highly efficacious COVID-19 vaccines in less than one year is a major medical accomplishment of the last century. However, vaccine hesitancy (i.e., a refusal or reluctance to be vaccinated) has slowed projected uptake and remains a barrier COVID-19 pandemic control" [6,7]. "Myths impede vaccine uptake in this part of the globe. Adopting these myths leads to sharing and spreading, which negatively impacts the prevention of COVID 19 and vaccine uptake"

[8,9]. Vaccine hesitancy has become a stumbling block for achieving herd immunity globally. Only concerted efforts to education the public on the safety, efficacy and critical need to vaccinate a vast majority of the population eligible to receive the vaccine can earn us the freedom to triumph over the fast-mutating Coronavirus that has become a focus of all developed and developing countries. The study was carried out to assess the knowledge, attitude and uptake willingness of COVID-19 vaccine among students at Rivers State University, Port Harcourt.

## 2. METHODS

### 2.1 Study Design

This was a cross-sectional study carried out at the Rivers State University in June, 2022.

### 2.2 Study Population

The study population consisted of undergraduate students attending the Rivers State University, Port Harcourt, Rivers State University.

### 2.3 Study Sample

The sample size was determined using the sample size for proportions formula as below;

$$n = (z^2 \times p \times q)/d^2$$

Where;

z = 1.96, standard derivate at 95% confidence interval (1.96)
p = 60%, proportion of attribute of interest in vaccination uptake reported in a previous study q = 1 - P
d = degree of accuracy (d = 0.05).
n = {[1.96 × 1.96] × 0.60(1 - 0.60)}/ 0.05 × 0.05
n = 368.8

Taking into consideration that there could be non-response, an estimated 10% of the sample size (36.8) will be added to the figure computed.

Thus, the total sample size was:

Minimum sample size n = 368.8 + 36.8 = 405.68 ~ 410

Probability sampling (simple random sampling) was used to select the study participants by generating a random number between 1 and 410 using the RAN function whenever data collectors visited a gathering of students on the University campus at hostels or large classrooms.

## 2.4 Data Collection

A semi-structured and self-administered questionnaire was used for this study. Socio-demographic data was obtained from the respondents on variables such as gender, age, ethnicity, level of study, religion, and present location. Knowledge and attitude about COVID-19, and COVID-19 vaccine was assessed with validated questions adapted from a previous study [7]. The uptake and willingness to take the COVID-19 vaccine was also obtained from the study participants. All responses were collated, with the correct/appropriate response scored as "1" and wrong responses scored as "0". Knowledge of COVID-19 were graded as good (16-31), and poor (≤15), while knowledge of COVID-19 vaccine was graded as good (6-11), and poor (≤5). The attitude to COVID-19 vaccine were graded as good (4-6), and poor (≤3) also.

## 2.5 Data Analysis

The data was presented in frequencies, percentages, mean and standard deviation as appropriate. The association of the uptake of COVID-19 vaccine with demographic variables, knowledge of COVID-19, knowledge of COVID-19 vaccine and the attitude to COVID-19 vaccine was assessed using the Chi-square and Bivariate regression analysis. All analysis was done at a 95% confidence interval and a p-value less than 0.05 was considered statistically significant.

## 3. RESULTS

Table 1 shows the demographic distribution of the respondents. The mean age was *23.30±5.66* years while there were 132 (32.20%) male and 278 (67.80%) female respondents.

Fig. 1 shows the willingness and uptake of COVID-19 vaccine among the study participants.

**Table 1. Demographic distribution of respondents**

| Characteristics | Frequency (n=410) | Percentage (%) |
|---|---|---|
| **Age** | | |
| 18-24 | 316 | 77.07 |
| 25-29 | 32 | 7.80 |
| 30-34 | 38 | 9.27 |
| 35-39 | 17 | 4.15 |
| 40-44 | 7 | 1.71 |
| **Mean Age ±SD** | 23.30±5.66 years | |
| **Gender** | | |
| Male | 132 | 32.20 |
| Female | 278 | 67.80 |
| **Relationship status** | | |
| Single/Not dating | 224 | 54.63 |
| Single/but seriously dating | 186 | 45.37 |
| **Level** | | |
| 100 | 141 | 34.39 |
| 200 | 21 | 5.12 |
| 300 | 166 | 40.49 |
| 400 | 21 | 5.12 |
| 500 | 61 | 14.88 |
| **Income** | | |
| Little | 42 | 10.24 |
| Basic | 184 | 44.88 |
| Comfortable | 184 | 44.88 |

It was observed that 60 (14.6%) of the respondents indicated their willingness to take the vaccine while 350 (85.4%) were hesitant in taking the COVID-19 vaccine.

Table 2 shows the distribution of the responses to the different questions on the knowledge of COVID-19 among the respondents.

Fig. 2 shows the distribution of good and poor knowledge of COVID-19 among the respondents. The figure indicated that 5% (20/410) of the respondents had poor knowledge of COVID-19, while 95% (390/410) had good knowledge of COVID-19.

Table 3 shows the responses of the respondents to questions on the knowledge of COVID-19 vaccine.

Fig. 3 shows the distribution of good knowledge and poor knowledge of the COVID-19 vaccine among the respondents. The data showed that 75.1% of the respondents had a good knowledge of COVID-19 vaccine, while 24.9% of the respondents had poor knowledge of the COVID-19 vaccine.
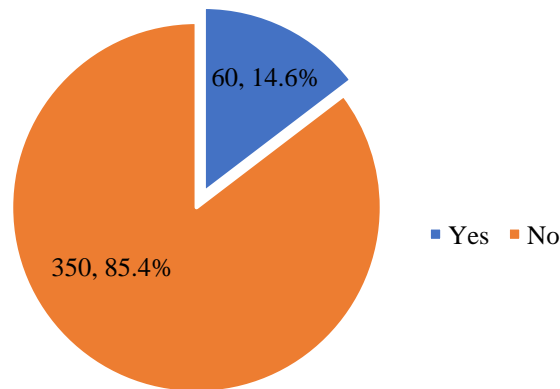
60, 14.6%

350, 85.4%

■ Yes ■ No

**Fig. 1. Distribution of COVID-19 vaccine uptake/willingness**

**Table 2. Reponses on knowledge of COVID-19**

| Questions | Frequency (n=410) | Percentage (%) |
|---|---|---|
| **To the best of your knowledge, the novel Coronavirus is** | | |
| A severe illness transmitted to people from wild animals | 144 | 35.12 |
| Biological weapon designed by the government of China | 122 | 29.76 |
| Designed to reduce or control the population | 101 | 24.63 |
| A virus designed by pharmaceutical industry to sell their drugs | 81 | 19.76 |
| An exaggeration by news media to cause fear and panic | 61 | 14.88 |
| A plague caused by sins and unbelief of human being | 61 | 14.88 |
| A biological weapon designed by the USA government | 20 | 4.88 |
| **The Coronavirus is typically spread (i.e., passed from person-to-person) by which means** | | |
| Contact with airborne droplets via breathing, sneezing, or coughing | 390 | 95.12 |
| Touching contaminated objects or surfaces | 370 | 90.24 |
| Kissing, hugging, sex, or other sexual contact | 226 | 55.12 |
| Eating of contaminated water or food | 163 | 39.76 |
| **Coronavirus can be prevented by** | | |
| Disinfecting contaminated surfaces | 348 | 84.88 |
| Regular hand washing and social distancing | 348 | 84.88 |
| Closing schools and cancelling mass gathering events | 286 | 69.76 |
| Fumigation and spraying bus stops and other public places | 164 | 40 |
| The hot weather of Africa | 143 | 34.88 |
| Taking chloroquine capsules and antibiotics | 121 | 29.51 |
| Consuming gin, garlic, ginger, herbal mixtures and traditional food and soup. | 20 | 4.88 |
| anointing oil and prayers | 20 | 4.88 |
| **The most important symptoms of COVID19/Coronavirus are** | | |
| Cough | 328 | 80.00 |
| Shortness of breath | 307 | 74.88 |
| Fever | 288 | 70.24 |
| Sore throat | 203 | 49.51 |
| Fatigue | 165 | 40.24 |
| Sneezing | 143 | 34.88 |
| Muscle pain | 62 | 15.12 |
| I do not know any symptoms of COVID19/Coronavirus | 21 | 5.12 |
| **Do you think it is possible to die from the Coronavirus** | | |
| Yes | 348 | 84.88 |
| No | 62 | 15.12 |

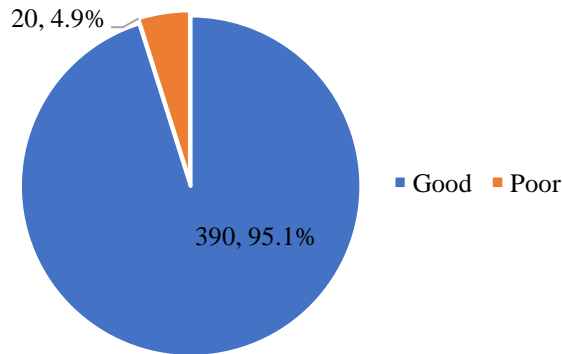*Note: Multiple responses are applicable*

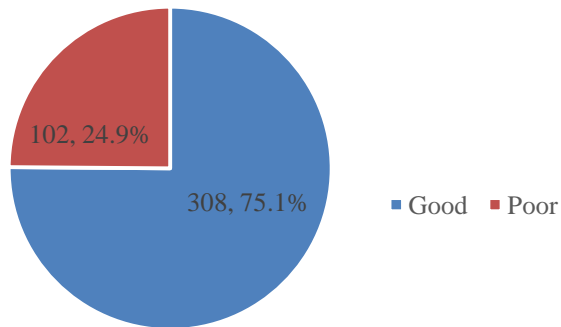**Fig. 2. Distribution of knowledge of COVID-19**



**Fig. 3. Distribution of knowledge of COVID-19 Vaccine**

**Table 3. Knowledge of coronavirus (COVID-19) vaccine**

| Characteristics | Frequency (n=410) | Percentage (%) |
|---|---|---|
| **Which of the following are approved COVID-19 vaccines** | | |
| Johnson & Johnson's Janseen COVID-19 vaccine | 207 | 50.49 |
| Moderna COVID-19 vaccine. | 166 | 40.49 |
| Pfizer-BioNTech | 142 | 34.63 |
| Astrazeneca – Oxford COVID-19 vaccine | 122 | 29.76 |
| K-BCG COVID-19 vaccine | 0 | 0.0 |
| K-Anthrax COVID-19 vaccine | 0 | 0.0 |
| **COVID-19 can alter my DNA.** | | |
| Yes | 40 | 9.76 |
| No | 370 | 90.24 |
| **COVID-19 can prevent me from getting sick with COVID-19** | | |
| Yes | 104 | 25.37 |
| No | 306 | 74.63 |
| **After getting a COVID-19 vaccine, I can still test positive for COVID-19 on a viral test** | | |
| Yes | 83 | 20.24 |
| No | 327 | 79.76 |
| **COVID-19 vaccine can make me sick with COVID-19** | | |
| Yes | 267 | 65.12 |
| No | 143 | 34.88 |

Table 4 showed the responses to questions on attitude to the COVID-19 vaccine.

Fig. 4 shows the distribution of good and poor attitude to the COVID-19 vaccine among the respondents. The data showed that 50.7% of the participants had a good attitude, while 49.3% had a poor attitude to the COVID-19 vaccine.

Table 5 shows the association of demographic characteristics and the uptake of the COVID-19 vaccine among the respondents. The table showed that there was no statistically significant association between any demographic variable and the uptake of the vaccine. However, Regression analysis showed that Male gender was 1.5 times (95% C.I; 0.8 – 2.6) more likely to take the vaccine, while persons that had a comfortable income level were 1.6 times (95% C.I; 0.9 – 2.7) more likely to take the vaccine.

Table 6 shows the association of knowledge and attitude of COVID-19 and the COVID-19 vaccine with the uptake of the vaccine among the participants. The data shows there was no statistically significant association between the knowledge of COVID-19 and the attitude to the COVID-19 vaccine with the uptake of the COVID-19 vaccine. However, there was a statistically significant association between the knowledge of the COVID-19 vaccine and the uptake of the vaccine among the respondents (Chi-square = 6.80, p= 0.009).

**Table 4. Attitude towards COVID-19 vaccine**

| Characteristics | Frequency (n=410) | Percentage (%) |
|---|---|---|
| **COVID-19 vaccines are safe** | | |
| Strongly Disagree | 20 | 4.88 |
| Disagree | 21 | 5.12 |
| Neither | 40 | 9.76 |
| Agree | 123 | 30.00 |
| Strongly Agree | 206 | 50.24 |
| **COVID-19 vaccines are effective** | | |
| Strongly Disagree | 21 | 5.12 |
| Disagree | 0 | 0.0 |
| Neither | 41 | 10.00 |
| Agree | 265 | 64.63 |
| Strongly Agree | 83 | 20.24 |
| **I have trust issues with the vaccine** | | |
| Strongly Disagree | 40 | 9.76 |
| Disagree | 143 | 34.88 |
| Neither | 0 | 0.0 |
| Agree | 166 | 40.49 |
| Strongly Agree | 61 | 14.88 |
| **I am worried there could be unforeseen effects** | | |
| Strongly Disagree | 20 | 4.88 |
| Disagree | 42 | 10.24 |
| Neither | 0 | 0.0 |
| Agree | 308 | 75.12 |
| Strongly Agree | 40 | 9.76 |
| **COVID-19 vaccines may just be for commercial profiteering** | | |
| Strongly Disagree | 81 | 19.76 |
| Disagree | 228 | 55.61 |
| Neither | 0 | 0.0 |
| Agree | 81 | 19.76 |
| Strongly Agree | 20 | 4.88 |
| **I prefer natural immunity** | | |
| Strongly Disagree | 40 | 9.76 |
| Disagree | 125 | 30.49 |
| Neither | 0 | 0.0 |
| Agree | 165 | 40.24 |
| Strongly Agree | 80 | 19.51 |
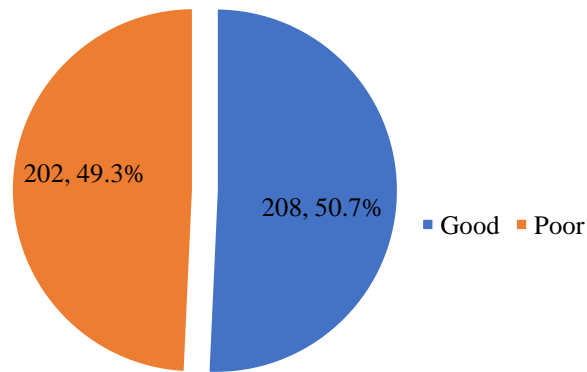
**Fig. 4. Distribution of Attitude to COVID-19 Vaccine**

**Table 5. Association of sociodemographic characteristics and uptake of Covid-19 vaccine**

| Socio-demographic characteristics | Uptake of COVID-19 vaccine | | Total n=410 (%) | Chi-square (p-value) | OR (95% C I) |
|---|---|---|---|---|---|
| | Yes n=60, (%) | No n=350, (%) | | | |
| **Age group (years)** | | | | | |
| 18-29 | 51 (14.66) | 297 (83.34) | 348 (100.0) | 0.028 | 1.0 |
| ≥30 | 9 (14.52) | 53 (85.48) | 62 (100.0) | (0.867) | (0.5-2.2) |
| **Gender** | | | | | |
| Male | 24 (18.18) | 108 (81.82) | 132 (100.0) | 1.56 | 1.5 |
| Female | 36 (12.95) | 242 (87.05) | 278 (100.0) | (0.210) | (0.9-2.6) |
| **Relationship status** | | | | | |
| Single | 31 (13.84) | 193 (86.16) | 224 (100.0) | 0.24 | 0.86 |
| In a relationship | 29 (15.59) | 157 (84.41) | 186 (100.0) | (0.617) | (0.5-1.5) |
| **Level of Education** | | | | | |
| 100-300 | 45 (13.72) | 283 (86.28) | 328 (100.0) | 1.09 | 0.7 |
| 400-500 | 15 (18.29) | 67 (81.71) | 82 (100.0) | (0.295) | (0.3-1.4) |
| **Income** | | | | | |
| Comfortable | 33 (17.93) | 151 (82.07) | 184 (100.0) | 2.91 | 1.6 |
| Basic/little | 27 (11.95) | 199 (88.05) | 226 (100.0) | (0.088) | (0.9 – 2.7) |

**Table 6. Association of knowledge and attitude of COVID-19 vaccine with uptake of COVID-19 vaccine**

| Variables | Uptake of COVID-19 vaccine | | Total n=410 (%) | Chi-square (p-value) | OR (95% C I) |
|---|---|---|---|---|---|
| | Yes n=60, (%) | No n=350, (%) | | | |
| **Knowledge of COVID-19** | | | | | |
| Good | 57 (14.62) | 333 (85.38) | 390 (100.0) | 0.97 | 0.97 |
| Poor | 3 (15.0) | 17 (85.0) | 20 (100.0) | (0.27-3.41) | (0.3-3.4) |
| **Knowledge of COVID-19 vaccine** | | | | | |
| Good | 37 (12.01) | 271 (87.99) | 308 (100.0) | 6.80 | 0.46 |
| Poor | 23 (22.55) | 79 (77.45) | 102 (100.0) | (0.009)* | (0.3-0.8) |
| **Attitude of COVID-19 vaccine** | | | | | |
| Good attitude (4-6) | 25 (12.02) | 183 (87.98) | 208 (100.0) | 2.31 | 0.65 |
| Poor attitude (≤3) | 35 (17.33) | 167 (82.67) | 202 (100.0) | (0.128) | (0.4-1.1) |

*statistically significant (p < 0.05)*

## 4. DISCUSSION

"Achieving a high rate of vaccination is deemed a key to successfully combat the COVID-19 pandemic" [10]. "Efforts have been made in many countries to distribute vaccines against the virus to people at high risk of a severe or fatal course of the disease as well as to the rest of the population" [11–13]. "However, high vaccination rates are not solely the result of availability, effectiveness, and safety of vaccines, but also of people's willingness to get vaccinated" [10,11].

The current study showed that only 14.6% of the students indicated their willingness/uptake of the COVID-19 vaccine. This finding is lower than the reported 47.6% willingness of COVID-19 vaccine uptake among students in the University of Maiduguri Teaching Hospital [14]. The observed difference could be due to a variance in the study population of the current study compared to the study in Maiduguri. The Maiduguri study was carried out among students in a tertiary teaching hospital, compared to the current study which was carried out among students in a tertiary institution where students from all other disciplines apart from medical sciences were involved. The findings of the current study is also in contrast with reports of a similar study in Anambra state, where 35% of the students in a tertiary institution indicated there willingness for the COVID-19 vaccine [2]. Similarly, a study among University students in Ethiopia reported that 50% of the students indicated their willingness to take the COVID-19 vaccine [8]. This disparities in willingness to take the vaccine among the university students is indicative of a lower willingness to take the vaccine among students in the study area, in comparison to students in other parts of Nigeria. Vaccination intentions were assumed to be a function of people's attitudes toward the vaccine, perceived social pressures to get vaccinated, and perceived barriers to vaccination [15]. "Moreover, background factors such as institutional trust, fear of COVID-19, conspiracy beliefs, denial of COVID-19, skepticism toward vaccines, religiosity, and socioeconomic and demographic characteristics" [10,15,16].

The current study showed that 95% of the participants had a good knowledge of COVID-19. This is consistent with the reports of similar studies that showed a good knowledge of COVID-19 among undergraduate students with about 85 – 98% of undergraduate students interviewed having a good knowledge of COVID-19 causes, prevention and mode of transmission [15,17–19]. This finding indicates that majority of the undergraduates sampled in the study had good knowledge and reliable sources on the information about COVID-19. The relatively high proportion of persons with good knowledge of COVID-19 could be attributed to the efficacy and consistency of awareness campaigns carried out during the early stages of the pandemic in Nigeria and other parts of the world as well [2,13,15].

Although more than 80% of the undergraduates had a good knowledge of COVID-19, only 75% of the students had good knowledge of the COVID-19 vaccine. This is consistent with the findings of similar studies reporting that between 60 – 80% of undergraduate students had a good knowledge of the COVID-19 vaccine [20–22]. However, the current study showed that 49% of the students had a poor/negative attitude to the COVID-19 vaccine. This findings are consistent with reports of similar studies which indicated the between 25% - 60% of young adults in sub-Saharan Africa tend to have a negative or poor attitude towards the COVID-19 vaccine [2,14,22,23].

The findings of the current study showed no significant associations between demographic variables and the willingness to take the COVID-19 vaccine among the students. However, logistic regression showed that Male students were 1.5 times more likely to take the vaccine, while, persons with comfortable levels of income (average of ₦128,000 per month ~ $200 per month) were reported to be 1.6 times more likely to take the COVID-19. This findings are in agreement with the reports of other studies indicating that male students and persons that had a mid-high level income range were most likely to take the vaccine [8,9,20,24]. This phenomenon could also be attributed to the relatively higher trust of medical reports that persons with comfortable income levels tend to have in different parts of the globe [3].

The current study also showed that good knowledge of COVID-19 vaccine was significantly associated with the uptake/ willingness to take the COVID-19 vaccine among the undergraduate students. This is consistent with reports of similar studies that concluded that people who are more trusting in science and fear suffering from COVID-19 are in favour of getting the vaccination [2,14,21,25]. "People with a higher level of education are more inclined to

believe in science because of their educational experience" [13,22,26].

## 5. CONCLUSION

According to the findings of the study, students' knowledge of COVID-19 vaccines is significantly associated with their intent to vaccinate, whereas negative attitudes toward COVID-19 vaccines are inversely associated with their intent to vaccinate. Students were discovered to know about some types of approved vaccines while being totally ignorant of others. Despite following COVID-19 national prevention guidelines, they had an overwhelmingly negative attitude toward vaccination. With only a few students already vaccinated, students' intent to vaccinate was higher than average. The study suggests that increasing students' vaccine knowledge and changing their attitudes toward vaccination may increase vaccine acceptability.

## CONSENT AND ETHICAL APPOVAL

A willing informed consent was obtained from each study participant prior to their inclusion into the study. Ethical approval to carry out the study was obtained from the research and ethics committee of the rivers state university before commencement of the study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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