



Research Article

COVID-19 Vaccine Knowledge, Attitude, and Acceptance among Students in Selected Universities in Nigeria

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ABSTRACT

This study sought to examine the relationship between knowledge, attitude, and acceptance of Coronavirus Disease 2019 (COVID-19) vaccine among students in selected universities in Nigeria. An anonymous survey was conducted online among Nigeria students. The questionnaire collected demographic characteristics, knowledge, attitudes, and acceptance of vaccines among respondents during the COVID-19 pandemic. Data were analyzed using descriptive and inferential statistic. Of the 521 participants surveyed, 74 (14.2) stated that they have already received COVID-19 vaccination, whereas 286 (54.9%) intend to be vaccinated as soon as the vaccine becomes available. Negative attitude toward COVID-19 vaccination has an inverse, very weak, and significant relationship with intent to vaccinate ($r = -0.125$, $N = 521$, $p < 0.01$). However, knowledge of COVID-19 vaccines was significantly related with intent to vaccinate ($r = 0.130$, $N = 521$, $p < 0.01$). The study concluded that knowledge and attitude of students toward vaccines are highly essential for their acceptance. Results suggest that vaccine acceptability may be increased if students' knowledge of vaccines is increased, and attitudes toward vaccination are improved by addressing the respondents' worries about vaccines' unforeseen effects, and changing their general mistrust of the benefits of vaccines.

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1. INTRODUCTION

On March 11, 2020, the World Health Organization announced Coronavirus Disease 2019 (COVID-19) to be a pandemic [1]. COVID-19 is caused by the severe acute respiratory syndrome coronavirus-2 and can range from asymptomatic to severe respiratory illness, pneumonia, and death [2]. As of April 2021, the COVID-19 pandemic had caused almost unthinkable damage to many nations' health and economy. According to an early COVID-19 modeling report, Nigeria has a high coronavirus importation risk, high susceptibility, and moderate capacity to contain the outbreak [3]. Overall, more than 132 million COVID cases and 2,875,672 deaths have been recorded worldwide [4]. Nigeria has experienced the highest COVID-19 burden of any country in Africa to date, with 163,498 cases and 2058 deaths [4]. Universities have certain characteristics that can increase the risk of COVID-19 spread throughout campuses, such as a large population, high population density, and regular interactions between students. This risky combination calls for protective measures to curb the spread of the virus on campuses.

Protective measures are essential in pandemic management [5], and vaccination is one of the most successful and cost-effective

COVID-19 protective measures [6,7]. Several prophylactic vaccines against COVID-19 have already been developed in various countries, including vaccines produced by AstraZeneca, Pfizer-BioNTech, Moderna, and Johnson & Johnson (Janssen). These vaccines have been distributed to various countries. In Nigeria, however, only the AstraZeneca COVID-19 vaccine has been rolled out for public use. With this vaccination underway, it is critical to investigate the acceptability of a COVID-19 vaccine, particularly given people's varying perception of vaccines worldwide. Moreover, the best vaccine would be ineffective if it is not used. Although little progress has been made in vaccination among the general public in Nigeria, there are still important challenges about complete immunization against COVID-19 in universities, one of which is the uncertainty about the students' acceptance of COVID-19 vaccination amidst the many fake news and conflicting information on social media that could deter acceptance [8].

Vaccine acceptance reflects the overall perception of disease risk and vaccine demand within communities, which is critical for the success of immunization programs in achieving high vaccination coverage rates, particularly for newly emerging infectious diseases [9-11]. Such information helps proper authorities make informed predictions about vaccine adoption and develop strategies for improving acceptability as vaccine refusal would expose more students to the disease.

Vaccine refusal is a global problem with several contributing factors [12,13]. The World Health Organization advises a proactive

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approach to resolve vaccine hesitancy and create confidence in a vaccine to maximize effectiveness [14,15]. Control or eradication of the pandemic via a vaccination program necessitates an understanding of the reasons for Nigerians' resistance to COVID-19 vaccines and the methods to resolve this resistance. Understanding various vaccine attitudes and knowledge is critical because a heterogeneous approach to vaccine refusal that deals with the concerns of different groups is more effective than a homogenous strategy [5,16]. A qualitative and quantitative understanding of vaccine knowledge is especially urgent in Nigeria, given its recent vaccine rollout. Therefore, the current study examined the relationship between knowledge, attitude, and acceptance of COVID-19 vaccine among students in selected universities in Nigeria.

2. MATERIALS AND METHODS

2.1. Settings

Adeleke University is a private, faith-based learning school located on 520 acres of property in Ede, Osun State, in Nigeria's southwestern area. Dr Adedeji Adeleke established the University in 2011 through the Springtime Development Foundation, a charitable, nonprofit organization dedicated to providing poor students with access to high-quality higher education. Scholarship possibilities, fee flexibility, the development of entrepreneurial skills, high-quality teaching, research, and creative learning are some of Adeleke University's distinctive qualities.

Babcock University is a Seventh-Day Adventist institution that practices holistic education based on the harmonious development of our students' intellectual, physical, social, and spiritual potentials, instilling the stable and noble character required for effective leadership and service in society. It is one of Nigeria's first private universities and officially inaugurated on April 20, 1999. The university is located in Ilishan-Remo, Ogun State, Nigeria.

2.2. Study Design

The descriptive survey design was adopted. This approach allows researchers to describe a population's characteristics or the differences between two or more populations, and researchers can make predictions based on the correlation survey data. This design was adequate for this study because of its dependability in terms of ensuring the respondents' anonymity, which encourages them to give accurate answers.

2.3. Study Population

The survey was conducted in two universities in Nigeria: Adeleke University and Babcock University. The population comprised all students from the two universities.

2.4. Instrument

A structured questionnaire titled "Knowledge, attitude and acceptance" was adopted for the study. Furthermore, even as some

items in the questionnaire were adapted as they have been used in other nations and contexts, certain instrument sections were self-developed. The knowledge scale was adapted from the Centers for Disease Control and Prevention [17], whereas the attitude scale was adapted from Paul et al. [18] with Cronbach's alpha values of 0.91–0.94.

2.5. Data Collection

A structured, self-administered questionnaire was used to obtain data with Google Form from students in the two universities. The survey link was sent through WhatsApp, as it is the major social media platform used by lecturers to communicate with students. Students in both universities responded to the survey.

2.6. Data Analysis

Data were analyzed using frequency counts, percentages, mean, and standard deviation, whereas the hypothesis was analyzed using Pearson's product moment correlation, tested at the 0.01 level of significance.

3. RESULTS

The questionnaire was circulated among students at Adeleke University and Babcock University. A total of 521 responses were collected and subsequently used in the analysis.

Findings shown in Table 1 show that majority of the respondents were male (54.1%). Most are Christians (84.3%) within the Faculty of Science (41.8%).

Findings shown in Table 2 indicate that majority of the respondents are knowledgeable about the approved COVID-19 vaccines such as Johnson & Johnson's Janssen (70.8), Moderna (61.4), AstraZeneca-Oxford (57.2), and Pfizer-BioNTech (51.8). However, only a few were able to correctly identify that some vaccines are not meant

Table 1 Demographic information of respondents

	<i>n</i>	Percentage (%)
Sex		
Female	239	45.9
Male	282	54.1
Total	521	100.0
Religion		
Christian	439	84.3
Islam	78	15.0
Traditionalist	4	0.8
Total	521	100.0
Faculty		
Science	218	41.8
Law	6	1.2
Engineering	77	14.8
Art	32	6.1
Business and Social Science	60	11.5
Basic and Medical Science	128	24.6
Total	521	100.0

for COVID-19, such as K-BCG (44.9) and K-Anthrax (42.0). The study also revealed that majority of respondents were aware that COVID-19 vaccination could protect them from getting sick with COVID-19 (77.4), and after getting a COVID-19 vaccine, they can still test positive for COVID-19 on a viral test (58.0). Meanwhile, a smaller percentage of students believed that the COVID-19 vaccine could alter their DNA (29.0), they do not need to get vaccinated if they already had COVID-19 (36.7), and the vaccine can make them sick with COVID-19 (31.1).

Findings shown in Table 3 indicate that majority of the students' have a positive behavior toward the COVID-19 national prevention guideline. The majority of students wear facemasks at school (mean = 4.77); wear a facemask while using public transport (mean = 4.74); use alcohol-based hand sanitizers (mean = 4.62); cover their mouth and nose with a tissue or use their elbows when coughing/sneezing (mean = 4.59); avoid close contact with people

who are sick (mean = 4.53); wash their hands often, with soap and water for at least 20 s (mean = 4.45); clean and disinfect their room (mean = 4.44); wear a facemask whenever they have visitors (mean = 4.39); clean and disinfect frequently touched surfaces daily (mean = 4.34); avoid eating or gathering at bars, restaurants, and food courts (mean = 4.33); avoid social gatherings, no matter its purpose (mean = 4.31); avoid discretionary travel, shopping trips, and social visits (mean = 4.22); refrain from touching their eyes, nose, and mouth with unwashed hands (mean = 4.15); avoid physical touch when greeting other people (mean = 4.10); and put 6 ft of physical distance between themselves and other people (mean = 4.01).

Findings presented in Table 4 indicate that the attitudes of the majority of the respondents' toward COVID-19 vaccine include worries about the unforeseen effect (mean = 3.29), preference for natural immunity (mean = 3.20), general mistrust of vaccine

Table 2 Knowledge of COVID-19 vaccination

S/N	Knowledge of COVID-19 vaccine	Yes	No
1	Approved COVID-19 vaccines		
	AstraZeneca-Oxford COVID-19 vaccine	298 (57.2)	223 (42.8)
	Pfizer-BioNTech COVID-19 vaccine	270 (51.8)	251 (48.2)
	Johnson & Johnson's Janssen COVID-19 vaccine	369 (70.8)	152 (29.2)
	Moderna COVID-19 vaccine	320 (61.4)	201 (38.6)
	K-BCG COVID-19 vaccine	287 (55.1)	234 (44.9)
	K-ANthrax COVID-19 vaccine	302 (58.0)	219 (42.0)
2	COVID-19 vaccine can alter my DNA	151 (29.0)	370 (71.0)
3	COVID-19 vaccination can protect me from getting sick with COVID-19	403 (77.4)	118 (22.6)
4	I do not need to get vaccinated if I already had COVID-19	191 (36.7)	330 (63.3)
5	After getting a COVID-19 vaccine, I can still test positive for COVID-19 on a viral test	302 (58.0)	219 (42.0)
6	COVID-19 vaccine can make me sick with COVID-19	162 (31.1)	359 (68.9)

Table 3 Behavior toward COVID-19 national prevention guidelines

S/N	National prevention guidelines	Always	Often	Sometimes	Hardly	Never	Mean	Std. D
1	I avoid social gatherings, no matter its purpose	280 (53.7)	139 (26.7)	89 (17.1)	12 (2.3)	1 (0.2)	4.31	0.849
2	Avoid eating or gathering at bars, restaurants and food courts, pickup, or delivery options instead	292 (56.0)	141 (27.1)	62 (11.9)	21 (4.0)	5 (1.0)	4.33	0.905
3	Avoid discretionary travel, shopping trips and social visitations	273 (52.4)	135 (25.9)	77 (14.8)	26 (5.0)	10 (1.9)	4.22	0.999
4	Put 6 ft of physical distance between myself and other people	247 (47.4)	128 (24.6)	76 (14.6)	45 (8.6)	25 (4.8)	4.01	1.183
5	Avoid physical touch when greeting other people (i.e., handshakes, hugs)	267 (51.2)	121 (23.2)	75 (14.4)	35 (6.7)	23 (4.4)	4.10	1.147
6	I do not touch my eyes, nose and mouth with unwashed hands	249 (47.8)	149 (28.6)	83 (15.9)	32 (6.1)	8 (1.5)	4.15	1.000
7	Avoid close contact with people who are sick	357 (68.5)	110 (21.1)	34 (6.5)	13 (2.5)	7 (1.3)	4.53	0.832
8	I cover my mouth and nose with a tissue or my elbow when coughing/sneezing	376 (72.2)	99 (19.0)	30 (5.8)	10 (1.9)	6 (1.2)	4.59	0.782
9	I clean and disinfect frequently touched surfaces daily	310 (59.5)	121 (23.2)	57 (10.9)	21 (4.0)	12 (2.3)	4.34	0.981
10	I clean and disinfect my room	316 (60.7)	140 (26.9)	49 (9.4)	12 (2.3)	4 (0.8)	4.44	0.816
11	Wash your hands often, with soap and water for at least 20 s	325 (62.4)	121 (23.2)	60 (11.5)	14 (2.7)	1 (0.2)	4.45	0.814
12	I use an alcohol-based hand sanitizer	388 (74.5)	85 (16.3)	36 (6.9)	9 (1.7)	3 (0.6)	4.62	0.739
13	I wear a facemask at school	436 (83.7)	59 (11.3)	20 (3.8)	5 (1.0)	1 (0.2)	4.77	0.577
14	I wear a facemask whenever I have visitors	341 (65.5)	96 (18.4)	45 (8.6)	24 (4.6)	15 (2.9)	4.39	1.017
15	I wear a facemask while using public transport	425 (81.6)	64 (12.3)	23 (4.4)	8 (1.5)	1 (0.2)	4.74	0.632

Std. D, standard deviation.

Table 4 | Attitudes toward COVID-19 vaccine

S/N		SA	A	D	SD	M	Std. D
1	General mistrust of vaccine benefit	195 (37.4)	210 (40.3)	105 (20.2)	11 (2.1)	3.13	0.803
2	Worries about unforeseen effect	237 (45.5)	207 (39.7)	70 (13.4)	7 (1.3)	3.29	0.747
3	Concern about commercial profiteering	184 (35.3)	218 (41.8)	107 (20.5)	12 (2.3)	3.10	0.801
4	Preference for natural immunity	208 (39.9)	232 (44.5)	59 (11.3)	22 (4.2)	3.20	0.801

A, agree; D, disagree; M, mean; SD, strongly disagree; SA, strongly agree; Std. D, standard deviation.

benefit (mean = 3.13), and concerns about commercial profiteering (3.10). The respondents overall had a negative attitude toward COVID-19 vaccines.

Table 5 shows the acceptance and intention to accept an approved vaccine by students in the selected universities. Results indicate that 14.2% have already received the vaccine. This could be because of the slow distribution of the vaccine in the country. However, the study also revealed that 54.9% of students intend to accept the vaccine.

A summary of data analysis on the test of the significance of the relationship between attitude toward COVID-19 vaccination and COVID-19 vaccination acceptance is presented in Table 6. As shown in the table, attitude toward COVID-19 vaccination has a negative, very weak, and significant relationship with intent to vaccinate ($r = -0.125$, $N = 521$, $p < 0.01$). Therefore, the alternate hypothesis is accepted, and the null hypothesis is rejected. This implies that the attitude toward COVID-19 vaccine will associate with the intent to vaccinate among students in selected universities in Nigeria.

A summary of data analysis on the test of the significance of the relationship between knowledge on COVID-19 vaccine and COVID-19 vaccination acceptance is presented in Table 7. As shown in the table, knowledge on COVID-19 vaccine has a positive, very weak, and significant relationship with intent to get vaccinated ($r = 0.130$, $N = 521$, $p < 0.01$). Therefore, the null hypothesis is rejected, and the alternate hypothesis is accepted. This implies that the knowledge on COVID-19 vaccine will associate with the intent to vaccinate among students in selected universities in Nigeria.

4. DISCUSSION

The present study reports low acceptance of COVID-19 vaccination among the respondents. However, most (54.9%) of the participants stated that they intend to receive an approved COVID-19 vaccine in the future. This corroborates the findings of Bhartiya et al. [19], who noted that most are willing to receive a COVID-19 vaccine. Furthermore, Sharun et al. [20] reported that in a similar study via a self-administered questionnaire online, nearly 85% of the 351 participants were planning to get the COVID-19 vaccine once it is available. Our finding represents one of the first estimates of acceptability of COVID-19 vaccines among students in Nigeria and can guide projections of future vaccine uptake. Moving forward, it will be essential to monitor temporal changes in acceptability as more vaccines become available.

Findings revealed that respondents' are knowledgeable about COVID-19 vaccines that have already been approved for use, but

Table 5 | COVID-19 vaccination acceptance

S/N	COVID-19 vaccination acceptance	Yes	No
1	I already received an approved vaccination	74 (14.2%)	447 (85.8%)
2	I intend to accept the approved vaccination	286 (54.9%)	235 (45.1%)

Table 6 | Relationship between attitude toward vaccine and vaccine acceptance

		Correlations	
		Attitude	I plan to receive the approved vaccination
Attitude	Pearson correlation	1	-0.125
	Sig. (two-tailed)	-	0.004
	N	521	521
I plan to receive the approved vaccination	Pearson correlation	-0.125	1
	Sig. (two-tailed)	0.004	-
	N	521	521

Table 7 | Relationship between knowledge toward vaccine and vaccine acceptance

		Knowledge	I plan to receive the approved vaccination
Knowledge	Pearson correlation	1	0.130
	Sig. (two-tailed)	-	0.003
	N	521	521
I plan to receive the approved vaccination	Pearson correlation	0.130	1
	Sig. (two-tailed)	0.003	-
	N	521	521

their knowledge on vaccines that are not meant for COVID-19 is inconsistent. This is in contrast to the findings of Rhodes et al. [21], who reported a weak knowledge about COVID-19 vaccines among Australians. Furthermore, most students had an inconsistent knowledge about what COVID-19 vaccines can achieve. This implies that more efforts are needed in Nigeria to ensure that students acquire a deeper knowledge about the effects of vaccines on health. Various myths regarding the vaccines should also be addressed.

The findings also revealed that students have a positive behavior toward COVID-19 national prevention guidelines, and that they

complied with these guidelines. This is in contrast to the results obtained by Nivette et al. [22], who found that noncompliance with COVID-19 measures in Switzerland was more prevalent in individuals with higher education. This also contradicts the findings of Sherman et al. [23], who discovered poor compliance with COVID-19 government guidelines. The reason for the compliance of students in these universities could be attributable to the measures taken by these institutions to enhance compliance.

Our findings suggest that the major attitudinal barriers to receiving a COVID-19 vaccine among the respondents are worries about the unforeseen effect, preference for natural immunity, general mistrust of vaccine benefit, and concerns about commercial profiteering. This corroborates the findings of previous work showing that general mistrust in the benefits and safety of vaccines and concerns about their unforeseen effects are the key barriers to vaccine acceptance [18].

We had also predicted that specific knowledge of vaccines would affect the intent to vaccinate, which was supported by the survey findings. These findings were in contrast with those of Pogue et al. [24], who revealed that knowledge score did not significantly correlate with intent to vaccinate. However, the study supports the findings of Gallè et al. [25], who found a significant relationship between knowledge and vaccine acceptance. Moreover, there was an inverse relationship found between negative attitudes toward COVID-19 vaccines and intent to vaccinate. This implies that more focus should be directed toward changing the attitudes of students toward the vaccines.

There are drawbacks to our study. Because an offline survey was not feasible during the social distancing mandate, the use of an online survey could restrict the representativeness of the current study's sample. To address this problem, we enrolled a broad sample size and used a simple random sampling approach across multiple faculties to improve sample diversity and representativeness. Second, because the study is hypothetical, the findings may vary from real-world experience, and certain self-reported responses may contribute to information bias.

5. CONCLUSION

The study concludes that students' knowledge of COVID-19 vaccines is positively associated with intent to vaccinate whereas negative attitudes toward COVID-19 vaccines are inversely associated with their intent to vaccinate. Students were found to be knowledgeable about several types of approved vaccines while being ignorant about others. Despite adhering to COVID-19 national prevention guidelines, their attitude toward vaccination was overwhelmingly negative. Students' intent to vaccinate was higher than average, with just a few already vaccinated. The study suggests that vaccine acceptability may be increased if students' knowledge about the vaccine is increased, and attitudes toward vaccination are modified. The attitudinal reformation can be achieved by addressing worries about the vaccines' unforeseen effect, thereby tackling the general mistrust of vaccine benefit. Furthermore, the government must assure students that big pharma is not trying to make profits by selling their vaccines but rather is trying to save lives.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

AUTHORS' CONTRIBUTION

AJA contributed to the conceptualization and drafting (review and editing) of the manuscript. BAS and MOA handled the data analysis and final draft of the research.

ETHICAL APPROVAL

The study was carried out during the pandemic and participant wilfully responded to the online survey.

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