

Knowledge, perceptions, and uptake of covid-19 vaccine by medical & pharmacy students of a tertiary institution in southwest Nigeria: a cross-sectional study

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ABSTRACT

Background: During the covid-19 pandemic, vaccination program commenced in most countries, including Nigeria. Uptake of the vaccine was essential to improve herd immunity.

Objectives: This study assessed the knowledge, perception, and uptake of the covid-19 vaccine among medical and pharmacy students.

Methods: A cross-sectional survey was conducted among medical and pharmacy students of a tertiary institution. Data were collected with an online semi-structured questionnaire using a non-probability sampling method. Descriptive and inferential statistical analyses were undertaken using Statistical Package for Social Sciences version 25. The confidence interval was set at 95% while a P- value of less than 0.05 was considered statistically significant.

Results: Of the 300 students that completed the questionnaire, more than three quarters (78.7%) were between ages 20 to 29 years, with a mean age of 23.6 ± 2.6 (years). More than half (63.3%) were females and mostly from monogamous families (84.7%). Almost half of the students (43.3%) have not taken the covid-19 vaccine. More than three-quarters (77%) had good knowledge, while the majority had a positive attitude (99 %) toward covid-19 vaccines. About 88% of the students perceive the covid-19 vaccine as a strategy to reduce incidence, hospitalization, and death. Year of study ($p = 0.014$), course of the study ($P = 0.024$), and having received any vaccine previously ($p = 0.003$) were associated with the uptake of the COVID-19 vaccine.

Conclusion: The students had good knowledge, a positive attitude, and a good perception of the covid-19 vaccine, but the uptake of the vaccine was low. The inclusion of communicable diseases such as covid-19 infection in the curriculum of Medical and Pharmacy students is recommended

Keywords: covid-19 vaccine, knowledge, perception, students, uptake.

Connaissances, perceptions et adoption du vaccin contre le covid-19 par les étudiants en médecine et en pharmacie d'un établissement d'enseignement supérieur du sud-ouest du Nigeria : une étude transversale

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RÉSUMÉ

Contexte : Le programme de vaccination contre la covid-19 a commencé dans la plupart des pays, y compris le Nigeria. La prise du vaccin est essentielle pour améliorer l'immunité collective.

Objectifs : Cette étude a évalué les connaissances, la perception et l'adoption du vaccin contre le covid-19 chez les étudiants en médecine et en pharmacie.

Méthodes : Une enquête transversale a été menée auprès d'étudiants en médecine et en pharmacie d'un établissement d'enseignement supérieur. Les données ont été recueillies à l'aide d'un questionnaire semi-structuré en ligne utilisant une méthode d'échantillonnage non probabiliste. Des analyses statistiques descriptives et inférentielles ont été entreprises à l'aide de la version 25 du logiciel de statistique pour les sciences sociales. L'intervalle de confiance a été fixé à 95 % tandis que la valeur P- inférieure à 0,05 a été considérée comme statistiquement significative.

Résultats : Sur les 300 étudiants qui ont rempli le questionnaire, plus des trois quarts (78,7%) étaient âgés de 20 à 29 ans, avec un âge moyen de $23,6 \pm 2,6$ (ans). Plus de la moitié (63,3%) étaient des femmes et majoritairement issues de familles monogames (84,7 %). Près de la moitié des étudiants (43,3%) n'ont pas pris le vaccin covid-19. Plus des trois quarts (77 %) avaient une bonne connaissance, tandis que la majorité avait une attitude positive (99 %) envers les vaccins covid-19. Environ 88% des étudiants perçoivent le vaccin covid-19 comme une stratégie permettant de réduire l'incidence, l'hospitalisation et la mortalité. L'année de l'étude ($p = 0,014$), le déroulement de l'étude ($P = 0,024$) et le fait d'avoir reçu un vaccin auparavant ($p = 0,003$) étaient associés à la prise du vaccin covid-19.

Conclusion : Les étudiants avaient de bonnes connaissances, une attitude positive et une bonne perception du vaccin covid-19, mais l'adoption du vaccin était faible. Il est recommandé d'inclure les maladies transmissibles telles que l'infection au covid-19 dans le programme d'études des étudiants en médecine et en pharmacie.

Mots-clés : Vaccin covid-19, connaissance, perception, étudiants, prise

INTRODUCTION

The Coronavirus disease 2019 which originated in Wuhan City, Hubei Province, China, quickly spread with virtually no country left untouched.^{1,2} For more than two years into the global pandemic, several variants of the covid 19 virus were identified including alpha, delta, gamma, omicron and gamma.³ According to Centers of disease and control (CDC), these variants differ in terms of disease prognosis, severity, and transmissibility.⁴

Globally, the diagnosed cases of covid 19 are estimated at 753 479,439 million, with 6, 812, 788 million deaths, with a mortality rate of 1.05%.⁵ In Nigeria, the first case of covid-19 was confirmed in Lagos on February 27, 2020.⁶ Compared to the initial recorded rates of covid-19 cases (265,937 vs 3155 deaths), the current estimate revealed 266,463 of covid-19 cases, and 3155 death showing a progressive decrease in the number of cases in Nigeria.⁷

At the outset, the speed of spread and the alarming death toll necessitated the adoption of unprecedented infection prevention and control (IPC) measures by international organizations to curtail the spread of the covid-19 virus.^{6,8} The non-pharmaceutical measures including frequent hand washing, social distancing (maintaining a physical distance of at least 2 meters), and the use of a face mask/keeping hands away from the face have proved effective.^{9,10,11}

Vaccination represents one of the major strategies in reducing the spread of covid-19 by providing herd immunity and ameliorating the burden associated with infection.^{12,13}

According to the National Primary Health Care Development Agency, about 55. 3% of the target population have received covid-19 vaccine. This low coverage has been associated with misconceptions, myths, notions, and doubts about the efficacy of the vaccine. While some persons were concerned about the speed of the vaccine production, others thought that COVID-19 was political, and an avenue for business, resulting in hesitancy.¹⁴ Vaccine hesitancy translates to delays in acceptance, or total refusal of vaccination even when the vaccination services are made available, and has long been identified as a barrier to a successful immunization program and a threat to global health.^{15,16} According to the World Health Organization, complacency, lack of confidence, and inconvenience are the major drivers of vaccine hesitancy that need to be tackled.¹⁷ Therefore, the provision of authentic

information on covid-19 and good communication by the international community could shape public opinion and beliefs regarding the efficacy of the available covid-19 vaccines, and improve vaccine acceptance.¹⁶ Previous studies carried out in various parts of the world have documented variations in population knowledge of the covid-19 vaccine.^{18,19,20} Before the commencement of vaccination in Nigeria, a study found that 98% of the public knew what a vaccine is, 51% were willing to accept the covid-19 vaccine, 30% were not willing and 19% were indecisive.²¹ Another study conducted amongst health workers in Gombe State, Nigeria found that 99.1 % of respondents had good knowledge of the covid-19 vaccine.²² As future healthcare providers, ascertaining the level of knowledge of medical and pharmacy students remains pertinent and would add to the knowledge base of the populace. This study assessed the knowledge, perceptions and uptake of covid-19 vaccine among medical and pharmacy students in Nigeria. The findings of the study could provide the opportunity for an educational intervention aimed at dispelling rumors and improving the vaccination program among this group in Nigeria.

METHODS

Study design and setting

This was a cross-sectional descriptive study conducted at the Faculty of Pharmacy and College of Medicine of a Federal University in Lagos, Southwest Nigeria from July to October, 2021. The College of Medicine was founded to produce highly trained medical manpower to provide specialized medical services. The Pharmacy school is accredited to run a five-year Bachelor of Pharmacy program by the National Universities Commission (NUC) and Pharmacy Council of Nigerian (PCN). The agencies are responsible for development of minimum academic standards and accreditation of pharmacy schools respectively.^{23,24} Lagos is the most populous city in Nigeria with diverse ethnic groups, located at a latitude and longitude of 6.46542 N, 3.406440 E respectively.²⁵

Study participants and sample size determination

The study was conducted among Pharmacy and Medicine & Surgery students who were ≥ 18 years of age, in their 2nd, 3rd, 4th, 5th and 6th years at the time of the study and gave informed consent for the study. The sample size for cross-sectional study was used:
$$X = Z^2 \frac{P}{MOE^2}$$

where X is the minimum sample size, Z is the statistics corresponding to 95 % level of confidence (1.96), P is the

estimated rate of acceptance of covid-19 vaccine from a Nigerian study ($P = 0.662$)²⁷ and MOE² is the margin of error (5%). Based on these assumptions,

$$X = 1.96^2 \times 0.662 \times \frac{1 - 0.662}{0.05^2} \quad 344 \text{ students were}$$

estimated. To correct to a finite population using the students' population (1094), the formula $S = N \times \frac{X}{x-1+N}$

was used, where S is the final sample size, N is the students' population, a sample size of 262 students were estimated. Adding 10 % contingency for non-responders or incomplete data, gave a final sample size of ~ 288. First year students and those who refused to fill the questionnaire were excluded from the study. A non-probability sampling was used to recruit the students.

Research instrument and data collection

A semi-structured, pretested, self-administered questionnaire adapted from relevant literature was used for the study^{28,29}. The questionnaire was designed using Google form which was shared across students' official (email), and social media platform (WhatsApp). Informed consent was required to be checked by the students to complete the survey. The developed questionnaire consisted of four sections: 1. Socio-demographic characteristics of the respondents such as gender, age, course of study, year of study. 2. Uptake of covid 19 vaccine, 3. Respondents' knowledge, attitude and perception (KAP) of covid 19 vaccine. The face validity of the questionnaire was assessed by two independent researchers who agreed that the test is a valid measure of the concept being measured. The content validity was assessed for clarity and comprehensiveness. A pilot study was conducted on 20 students to determine the internal consistency of the questionnaire using coefficient (Cronbach) alpha.³⁰ The Cronbach's alpha (α) for the knowledge, attitude, perception, and covid 19 vaccine uptake subscales were 0.715, 0.869, and 0.750, 0.748 respectively. Knowledge on covid-19 vaccine was assessed using eight questions, with the correct response having a numerical value of 1, while the wrong response or "I don't know" had a value of zero. The total score ranged from 0-8, with the higher score indicating higher level of knowledge of covid-19 vaccine (1-3=poor knowledge, 4-5=fair knowledge, 6-8= good knowledge). Attitude of the students toward covid-19 were assessed with nine questions on a five-point Likert scale (strongly agree = 5, agree = 4, undecided = 3, disagree = 2, strongly disagree = 1). The total score obtained by summing the score of each question item ranged from 1 to 45, with an overall higher score indicating a positive attitude towards

covid-19 vaccine. Perceptions about covid-19 vaccine was evaluated with six questions using a five-point Likert scale (strongly agree = 5, agree = 4, undecided = 3, disagree = 2, strongly disagree = 1).

Data analysis

Data were entered into Microsoft Excel Spreadsheet, and analyzed using the Statistical Package for the Social Sciences version 25 (SPSS Inc., Chicago, USA). Descriptive statistics (frequencies and percentages) were used to summarize categorical data such as demographics (gender, education), having previously received one type of vaccine or the other, and types of family. Continuous variables such as age were checked for normality. Normally distributed continuous variables were presented as mean \pm standard deviation. Pearson Chi-squared test was used to determine the association between the categorical variables such as knowledge, attitude and perception of students regarding covid-19 vaccine, and uptake of covid-19 vaccine. Statistical significance was set at P-value < 0.05.

Ethical consideration

Ethical approval for the study was obtained from the Health, Research and Ethics Committee (HREC) of Lagos University Teaching Hospital, with approval number: ADM/DSCST/HREC/APP/4375. Respondents were told in advance of their right to cease involvement at any time without having to give any reason. Anonymity and confidentiality were maintained, as personal identifiers such as names, contact address or phone numbers were not collected.

RESULTS

Socio-demographic characteristics of the respondents

A total of 300 out of 314 respondents completed the survey, giving a completion rate of 95.5%. Table 1 summarizes the association between socio-demographic characteristics of the respondents and uptake of covid 19 vaccine. More than three quarter of the respondents (236; 78.7 %) were within ages 20 to 29 years, with a mean age of 23.6 years \pm 2.6. There were more females (190; 63.3 %) compared to males (110; 36.7 %), and mostly from monogamous family (254; 84.7 %). The year of study of the respondents ($p=0.014$), and course of the study ($P=0.024$) were associated with covid-19 vaccine uptake. Having previously received one type of vaccine or the other was associated with covid-19 vaccine uptake. (Table 1)

Table 1: Association between demographic characteristics of the respondents and uptake of covid-19 vaccines (N = 300)

Socio-Demographic Characteristics	Total (%)	χ^2	P-value
Age Range			
=19	59 (19.7)	1.594	0.810
20-29	236 (78.7)		
30-39 Mean age SD (23.6 ± 2.6 years)	5 (1.7)		
Sex			
Male	110 (36.7)	2.770	0.250
Female	190 (63.3)		
Family Background			
Monogamy	254 (84.7)	1.999	0.368
Polygamy	46 (15.3)		
Course of Study			
Pharmacy	155 (51.7)	7.422	0.024*
Medicine & Surgery	145 (48.3)		
Year of Study			
2 nd	68 (22.7)	19.089	0.014*
3 rd	63 (21.0)		
4 th	56 (18.7)		
5 th	73 (24.3)		
6 th	40 (13.3)		
Have you received any type of vaccine before?			
No	36 (12.0)	11.494	0.003*
Yes	264 (88.0)		
Have you presented with symptoms suggestive of COVID -19 infection?			
No	171 (57.0)	0.738	0.691
Yes	129 (43.0)		

* Test is significant at p<0.05

Uptake of COVID-19 vaccine

Figure 1 shows that almost half of the respondents (130; 43.4 %) had not received the COVID-19 vaccine.

Respondents that had received the COVID-19 vaccine

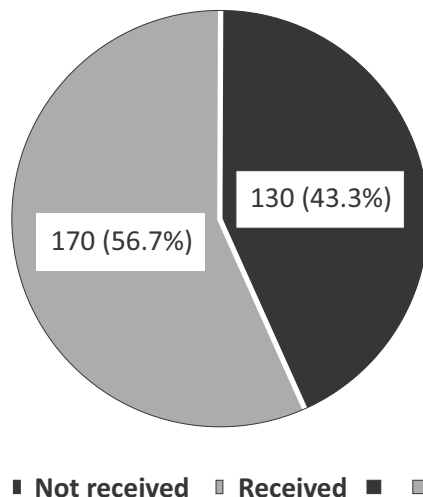


Figure 1: Respondents that have received covid-19 vaccine

Knowledge on covid-19 vaccine among the respondents

Table 2 summarize respondents' knowledge of covid-19 vaccine. More than three quarters of the respondents (77 %) had good knowledge of covid-19 vaccine in terms of availability (72%), efficacy (72%), and side effects (91.7%). AstraZeneca (72%) and Moderna (19 %) , Johnson & Johnson's Janssen (2%) were the available vaccines in Nigeria at the time of this study. About 89.7% of the respondents reported that adults 18 years and

above, and patients with chronic illnesses like hypertension, diabetes and heart diseases were the groups eligible for covid-19 vaccination. Allergic reactions such as Fever, Fatigue, Headache, Chills were the common side effects associated with covid-19 vaccine as noted by 91.7% of the respondents. Also, about 70% of them knew that protective immunity against covid-19 will be achieved after receiving second dose of the vaccine.

Table 2: Knowledge of covid-19 vaccine among the respondents.

Variables	Frequency (n)	Percent (%)
The covid-19 vaccine available in Nigeria		
Pfizer Bio-NTech	20	6.7
Moderna	57	19
Johnson & Johnson's Janssen	6	2
AstraZeneca*	216	72
AstraZeneca is an adenovirus vector vaccine		
True*	220	73.3
False	80	26.7
The covid-19 vaccine by AstraZeneca has an efficacy of 63.09% against symptomatic SARS-COV-2 infection		
True*	205	68.3
False	95	31.7
The approved storage temperature for covid-19 vaccine in Nigeria is		
-8°C to -2°C	113	37.7
0°C to +2°C	75	25.0
2°C to 8°C*	112	37.3
The side effects of covid-19 vaccines include		
Muscle pain, Depression, Diarrhea, Weight loss.	25	8.3
Allergic reactions such as Fever, Fatigue, Headache, Chills*	275	91.7
The group of people most eligible for covid-19 vaccination		
-Infant <1year, Pregnant women and lactating mothers	3	1.0
-Children and adolescents <18 years	11	3.7
-Adults (18 years and above), patients with chronic illnesses like hypertension, diabetes and heart diseases*	269	89.7
-Persons with active covid-19 infection, and allergies	17	5.6
Protective immunity against covid-19 will be achieved after		
First dose	10	3.3
Second dose*	210	70.0
14 days after first dose	41	13.7
I don't know	39	13.0
Overall Knowledge of the Respondents		
Good	231	77.0 %
Fair	46	15.3 %
Poor	23	7.7 %

Attitude of the respondents towards covid-19 Vaccine

Majority of the respondents (99 %) had a positive attitude towards covid-19 vaccine. They exhibited confidence in the vaccine. While half of the respondents (51.7%) agreed that "the covid-19 vaccine is effective", 51.3 % of them agreed that the vaccine is safe and that

"taking covid-19 vaccine is important in providing protection against covid-19 infection" (51.3%). Less than half (42%) of the respondents strongly agreed that "the covid-19 vaccine should be distributed fairly to all", while 42.7% of the respondents agreed that covid-19 vaccine should be taken, even if it has to be paid for (Table 3).

Table 3: Respondents' Attitude towards covid-19 vaccines (N = 300)

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean \pm SD
The covid-19 vaccine available in Nigeria is safe	73 (24.3)	154 (51.3)	67 (22.3)	4 (1.3)	2 (0.7)	3.97 \pm 0.76
covid-19 vaccine is effective	64 (21.3)	155 (51.7)	80 (26.7)	1 (0.3)	0 (0.0)	3.94 \pm 0.70
covid-19 vaccine is important in providing herd immunity	94 (31.3)	154 (51.3)	51 (17.0)	1 (0.3)	0 (0.0)	4.13 \pm 0.69
Vaccination against covid-19 is better than acquiring natural immunity	83 (27.7)	123 (41.0)	73 (24.3)	19 (6.3)	2 (0.7)	3.89 \pm 0.91
covid-19 vaccine should be taken, even if it has to be paid for	57 (19.0)	128 (42.7)	77 (25.7)	32 (10.7)	6 (2.0)	3.66 \pm 0.97
All persons eligible for covid-19 vaccine should take it	107 (36)	133 (44.3)	54 (18.0)	5 (1.7)	1 (0.3)	4.13 \pm 0.79
The covid-19vaccine should be distributed fairly to all	126 (42)	132 (44.0)	41 (13.7)	1 (0.3)	0 (0.0)	4.27 \pm 0.70
The services provided by the state ministry of health in making covid-19 available is satisfactory	45 (15)	115(38.3)	107 (36)	27 (9.0)	6 (2.0)	3.55 \pm 0.92
Taking the covid-19 vaccine is not very demanding and time consuming	49 (16.3)	110 (36.7)	86 (28.7)	49 (16.3)	6 (2.0)	3.49 \pm 1.01
Average mean \pm SD						3.89 \pm 0.82

Perception of the respondents towards COVID-19 vaccine

The study revealed some level of thrust on COVID-19 vaccine. Majority of the respondents (38%) perceived COVID-19 vaccine as beneficial in reducing the rate of the infection. About 44 % of the respondents agreed that COVID-19 vaccine is required to reduce the incidence,

hospitalization and death related to COVID-19. Likewise about 33.8 % of them disagreed that preventive measures such as wearing a mask, sanitization and social distancing are not needed after taking the COVID-19 vaccine (Table 4).

Table 4: Respondents’ perception of covid-19 vaccine (N= 300)

Items	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean ± SD
COVID-19 vaccine is required to reduce the incidence, hospitalization and death related to COVID-19	130 (43.3)	134 (44.7)	33 (11.0)	3 (1.0)	0 (0.0)	4.30± 0.70
The vaccine will save productive hours and money lost to COVID-19 disease	118 (39.3)	142 (47.3)	36 (12.0)	4 (1.3)	0 (0.0)	4.24± 0.71
The probability of COVID-19 vaccine related adverse reactions occurring is low	37 (12.3)	123 (41.0)	94 (31.3)	43 (14.3)	3 (1.0)	3.49± 0.91
The severity of COVID-19 vaccine related adverse reactions occurring is low	33 (11.0)	136 (45.3)	102 (34.0)	28 (9.3)	1 (0.3)	3.57± 0.82
COVID-19 vaccine is more dangerous than the infection	4 (1.3)	16 (5.3)	52 (17.3)	126 (42.0)	102 (34)	1.98± 0.92
Preventive measures such as wearing a mask, sanitization, and social distancing is not needed after taking COVID-19 vaccine	8 (2.7)	28 (9.3)	61 (20.3)	121 (40.3)	82 (27.3)	2.21± 1.03
Average Mean ± SD						3.30± 0.85

The study also revealed a significant association between respondent's level of the study and knowledge of covid-19 vaccine (p=0.001), and an association between level of study and attitude towards covid-19 vaccine (p=0.011). An association was found between course of study and attitude towards covid-19 vaccines (p=0.001). The age group significantly affected the respondents attitude towards covid-19 vaccines (p=0.001).

Respondents who had previously received some type of vaccine had more positive attitude towards covid-19 vaccines (p=0.001), and good perception of covid-19 vaccine (p=0.008). In addition, there is significant association between those who have presented with symptoms suggestive of covid-19 infection and attitude towards covid-19 vaccines (p=0.005) as well as perception of COVID-19 vaccines (p=0.015) as shown in Table 5.

Table 5: Association between demographic characteristics of the respondents and knowledge, attitude and perceptions of the respondents towards covid-19 vaccine

Socio-Demographic	N (%)	Knowledge		Attitude		Perception	
		χ^2	P-value	χ^2	P-value	χ^2	P-value
Age Range							
=19	59 (19.7)	6.854	0.144	23.183	0.001*	1.079	0.898
20-29	236 (78.7)						
30-39	5 (1.7)						
Gender							
Male	110 (36.7)	4.230	0.121	1.794	0.408	1.106	0.575
Female	190 (63.3)						
Family Background							
Monogamy	254 (84.7)	2.245	0.326	0.838	0.658	2.885	0.236
Polygamy	46 (15.3)						
Course of Study							
Pharmacy	155 (51.7)	0.166	0.920	21.019	0.001*	4.147	0.126
Medicine & Surgery	145 (48.3)						
Level of Study							
2 nd	68 (22.7)	25.719	0.001*	19.786	0.011*	11.068	0.198
3 rd	63 (21.0)						
4 th	56 (18.7)						
5 th	73 (24.3)						
6 th	40 (13.3)						
Have you received any type of vaccine before?							
No	36 (12.0)	3.034	0.219	23.168	0.001*	9.584	0.008*
Yes	264 (88.0)						
Have you presented with symptoms suggestive of covid-19 infection?							
No	171 (57.0)	1.156	0.561	10.668	0.005*	8.386	0.015*
Yes	129 (43.0)						

*Test is significant at $p < 0.05$

DISCUSSION

Vaccination is a preventive strategy that ameliorates the devastating effect of covid-19 infection and curbs its spread. Hence, effective vaccination implementation depends on the public acceptance of the vaccine, which is a function of beliefs, attitudes, and perceptions.²⁷ The endorsement of the covid-19 vaccine as a safe intervention triggered several studies among different sub-groups. Pharmacy and medical students as future health workers are a good source of information about covid-19 and are among the priority group for vaccination. Therefore, the assessment of students' knowledge, attitude, and perception of the covid-19 vaccine are essential as it offers the opportunity for educational interventions to debunk the myths and misconceptions about the vaccine.

The study found a low uptake of the covid-19 vaccine among the students despite good knowledge, positive attitude, and perception of the vaccine. As of the time of this study, nearly half of the students (43.3%) had not received the covid-19 vaccine. This finding is unexpected because medical students are expected to be media friendly, with access to reliable information on the covid-19 vaccine. Consistent with this finding is a study conducted in Tanzania in the early months of the covid-19 vaccination roll-out program that showed that only 18.5% of the healthcare professionals had received the vaccine, with an acceptance rate of 29%.³¹ Similarly, a study conducted three months after the deployment of the covid-19 vaccine across 15 West African countries found that only 0.27% of the region's total population was fully vaccinated in 2021.³² The study projected an increase in the speed of vaccination to achieve a vaccination coverage of at least 60% of the total population in the ECOWAS sub-region.³² A systematic review of the literature showed a vaccine acceptance rate ranging from 20% to 58.2% among adults across the six geopolitical zones in Nigeria.³³ The low uptake of the covid-19 vaccine observed in these studies is a proof that vaccine hesitancy is a global concern that needs to be addressed. The World Health Organization (WHO) considers vaccine hesitancy as one of the top-ten threats to global Health. Vaccine hesitancy arises from disinformation and misinformation about vaccines and has the potential to increase the incidence of vaccine-preventable diseases (VPDs), and trigger the emergence of mutant strains. A study by Lee et al. revealed that about 57.6% of working professionals in the US were exposed to conspiratorial misinformation about the covid-19 vaccine.³⁴ Hence, exposure to misinformation

about the nature and spread of the covid-19 virus can potentially lead to misguided estimation of the threat and other associated negative consequences.³⁵ Therefore, there is an urgent need for a proactive communication strategy by healthcare professionals to respond to misinformation. The current study revealed that having a history of taking any type of vaccine previously was associated with the uptake of the covid-19 vaccine, especially if the past experience was beneficial, with minimal or no adverse events.

As covid-19 infection evolves, studies have shown variations in the level of knowledge of covid-19 vaccines among different populations globally.^{36,37,38} In this study, the students' demonstrated good knowledge of the covid-19 vaccine in different domains. They had adequate knowledge of the covid-19 vaccines available at the time of this study, and the efficacy potentials of the vaccines especially AstraZeneca which was among the first vaccine available in Nigeria. The students also had good knowledge of the comorbidities for which covid-19 vaccination should be prioritized. Many factors may have contributed to the high knowledge of covid-19 infection and the vaccines documented in this study. Firstly, there was vast day-to-day information from the initial detection of covid-19 in December 2019 in Wuhan, Hubei Province, China to the first recorded case in Nigeria in 2020. Also, the medical students with supposedly high literacy levels and exposure to medical information such as basic knowledge of infectious diseases and their mode of transmission may have impacted the overall level of knowledge documented in this study. Corroborating this finding is a study that reported good knowledge of the covid-19 vaccine among Health Science students at a University in Eastern Nigeria.³⁹ In contrast, a study found that about 42% of university students reported poor knowledge of the COVID-19 vaccine.⁴⁰

This study revealed that students had a positive attitude toward the covid-19 vaccine. Most students believe that the covid-19 vaccine is safe, efficacious, and provides herd immunity, thereby curbing the rate of spread in the community. The students expressed trust in the services of the state ministry of health in making the vaccine available to the public. Consistent with these findings is a Bangladesh study that reported that respondents believed that the covid-19 vaccine is safe.¹⁸ However, despite the positive attitude toward the vaccine, most students failed to obtain the covid-19 vaccine. Hence, contrary to the initial belief that an individual attitude towards vaccines is a simple dichotomy of accepting or

rejecting, evidence have shown that vaccine hesitancy is a continuum of beliefs ranging from delays, total refusal to total acceptance of vaccines.⁴¹

According to the findings of this study, students had a positive perception of the covid-19 vaccine. They perceived the covid-19 vaccine as an important measure in the reduction of incidence, hospitalization, and death related to covid-19. They strongly agreed that taking the covid-19 vaccine will save productive hours and money lost to covid-19 infection. In line with this finding is a study that reported that most students perceived covid-19 vaccination as a strategy that could protect them from getting sick, and acknowledged that after getting a covid-19 vaccine, they can still test positive for covid-19 on a viral test (58.0%) if they get exposed.³⁹ The study found a link between attitudes and perceptions ($p < 0.05$). There is a significant association between perception of the covid-19 vaccine and history of previous vaccine uptake and presenting with symptoms suggestive of covid-19.

CONCLUSION

The uptake of the covid-19 vaccine among medical and pharmacy students was low, despite good knowledge, positive attitude and perception of the COVID-19 vaccine. Educational interventions that will include motivational interviewing and communication of facts about the covid-19 vaccine is needed to debunk myths and misinformation in our community.

ACKNOWLEDGEMENT

The authors acknowledge the students who participated in the study and the administrative staff of both Colleges for their assistance. We declare no conflict of interest and that the study received no funding.

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