Perceptions of Covid-19 vaccine among life science students of a Tertiary Institution in Nigeria

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ABSTRACT

The COVID-19 pandemic has had a profound impact on global populations, resulting in over 5 million deaths worldwide as of September 2021. The development and widespread distribution of vaccines have emerged as crucial strategies for combating the spread of COVID-19. This research endeavours to investigate the acceptance of COVID-19 vaccines among life science students at the University of Calabar, Nigeria. The study presents an analysis of the socio-demographic characteristics of 500 respondents, revealing that 182 individuals (36.4%) expressed acceptance of the vaccine, while 318 individuals (63.6%) declined it. Personal reasons emerged as the most prevalent factor influencing vaccine acceptance, followed closely by concerns regarding potential side effects. Additionally, the research findings indicate that a minority of respondents perceive the COVID-19 vaccine as effective, yet a significant proportion harbour beliefs in various myths surrounding the vaccine, notably the misconception that it contains microchips. Furthermore, the study underscores the importance of targeted interventions aimed at addressing individual concerns and enhancing awareness regarding the safety and efficacy of the COVID-19 vaccine while dispelling prevalent myths. These efforts are crucial in fostering increased vaccine uptake and promoting public health resilience against the ongoing pandemic. Finally, the results emphasise the ongoing necessity for comprehensive educational initiatives aimed at informing and enlightening the public about the significance of COVID-19 vaccination in curtailing the transmission of the disease.

INTRODUCTION

The COVID-19 pandemic has drastically affected the world's population, leading to over 5 million deaths globally as of September 2021 (Ioannidis 2022). The development of vaccines has been a critical measure in combating the spread of COVID-19. Many measures have been taken to combat

the coronavirus disease 2019 (COVID-19) since the World Health Organisation (WHO) declared it a healthcare crisis in March 2020, including lockdowns, quarantines, travel bans, social seclusion, and online education (Shah et al., 2020; Ignatius, et al. 2022)). Particularly when people had to use masks and wash their hands after interaction with the outside world, anxiety and psychological effects grew (Dubey et al., 2020). Vaccination is the most efficient method of safeguarding people and boosting their immunity against the disease, even as healthcare professionals suggest other countermeasures to the pandemic. However, the acceptance and adoption of the COVID-19 vaccine have been met with mixed reactions globally, with some people expressing fear and reluctance towards taking the vaccine (Khankeh et al., 2021).

Vaccination hesitancy, which is defined as the delay in accepting or refusing vaccines even though they are available, is seen as a growing global problem. It was listed as one of the top ten global health hazards for 2019 by the WHO (Hui et al., 2020). The precise setting differs depending on the time, location, and immunizations. It depends on a variety of variables that vary from place to region, including political perspectives and the effects of social media on the spread of rumours and conspiracy theories, communication and media, historical influences, religion/culture/gender/socioeconomic, political, geographic barriers, experience with vaccination, risk perception, and vaccination programme design (Umotong, 1999; Umotong, 2000). Life science students represent a crucial demographic in the COVID-19 vaccination effort, as they possess knowledge and understanding of the vaccine's scientific principles. The University of Calabar is a prominent institution of higher learning in Nigeria that provides education in various life science disciplines. As such, the perceptions of life science students towards the COVID-19 vaccine can significantly impact vaccination uptake in the region. Research has shown that individuals' attitudes towards vaccination can be influenced by various factors, including education, knowledge, and perceptions (Afolabi et al., 2021).

However, there is a lack of research on the paradisiacal perceptions of the COVID-19 vaccine among life science students at the University of Calabar. Therefore, this study seeks to explore the perceptions of life science students towards the COVID-19 vaccine and the factors that influence their decisions to take or reject the vaccine. This research aimed to contribute to the literature on COVID-19 vaccination by providing insights into the paradisiacal perceptions of life science students towards the vaccine. Additionally, the findings of this study can inform public health strategies aimed at improving COVID-19 vaccination uptake in the region.

Coronaviruses are frequently detected in human illnesses (sub-family Coronavirinae, order Nidovirales). It is known that both people and animals can infect these enclosed, positive-sense, single-stranded RNA viruses from the family Coronavirdiae and have acute respiratory, hepatic, and neurological diseases of varying severity (Patil et al., 2022). Over the past 20 years, there have been more coronaviruses found than ever before. Examples include the Lassa and Ebola hemorrhagic fever viruses in West Africa, the Middle East respiratory syndrome coronavirus (MERS-CoV) in Saudi Arabia, and novel coronaviruses like the severe acute respiratory syndrome coronavirus (SARS-CoV) and highly pathogenic influenza (avian influenza A H7N9 virus). Several viral pandemics have resulted in numerous deaths. Positive-sense RNA viruses with an envelope diameter of 60 to 140 nm are coronaviruses. These coronaviruses can be identified by protein outgrowths that resemble crowns under an electron microscope and clubs on their surface (coronam is the Latin word for crown) (Yesudhas et al., 2021).

The extraordinarily lengthy viral RNA genome (30 kb) of CoVs has a unique replication method that permits it to serve as an mRNA for the translation of the replicase polyproteins because it contains a 5′ cap structure and a 3′ poly (A) tail. SARS-CoV-2 is unique among coronaviruses in that it connects with human cell receptors with a high affinity. It is commonly recognised that coronaviruses can cause a variety of illnesses in mammals and birds, such as enteritis in cows, pigs, and chickens, as well as potentially fatal respiratory infections in humans (Shang et al., 2020). The spread of four different virus families that cause moderate respiratory illness in people was previously identified as HKU1, 229E, NL63, and OC43. The main exposure

for these initial cases was a seafood market in Huanan that traded live animals. On December 8th, adults in Wuhan, Hubei Province, China, reported cases of severe pneumonia of unknown origin. A surveillance system was activated as quickly as feasible, and respiratory specimens from ill patients were collected for etiological investigation (Chen et al., 2020).

The incident was reported as an outbreak by WHO on December 31, 2019, and the Huanan seafood market was shut down on January 1, 2020. A coronavirus infection with >70% homology to SARS-CoV and >95% homology to bat coronavirus was identified as the virus epidemic on January 7, 2020, based on virological investigations. Additionally, SARS-CoV-2-positive environmental samples from the Huanan seafood market were reported. The number of cases was seen to be increasing rapidly, yet some instances did not directly involve the seafood industry, indicating that there had been human-to-human transmission. The first patient was discovered to have been hospitalised on November 17, 2019, although it was only discovered on December 8 due to research into the virus's genesis and transmission. Cases were reported in other nations and on other continents as a result of the massive migration of Chinese people around the Chinese New Year. The first case of transmission to medical personnel caring for affected patients was documented between January 20 and 23, 2020. Wuhan was put under lockdown to stop its further spread, and 11 million people were restricted from entering and leaving the province. Typically, COVID-19 symptoms begin to manifest within 5.2 days on average after an incubation period of 2 to 14 days.

The most typical symptoms of COVID-19 include fever, dry cough, exhaustion, and muscle soreness, along with other signs and symptoms like headaches, lymphopenia, and dyspnea. Before an infection, some patients may experience nausea or diarrhoea for 1-2 days (Parvin et al., 2020); five days after the start of the infection, patients may experience breathing problems. On day eight, they may experience acute respiratory distress syndrome (ARDS). Depending on their immune and health status, the patient may develop pneumonia if their condition worsens, in addition to other functional problems. From the moment of infection to death, which can take anywhere between 6 and 41 days on average, this time frame depends on some variables, including age and health, and is shorter for patients with comorbid conditions and those who are older than 70 (Marengoni et al., 2011).

In most developing nations, annual immunisation reduces infection and serious hazards. The development of vaccines is a truly spectacular example of how humans have been able to better grasp the biological world that exists both outside of us and inside of us. They enable our adaptive immune systems to work, resulting in the production of incredibly specialised antibodies and immunological memory against a potential future infection. In reality, vaccines are typically made of a weakened or attenuated variant of a certain pathogen. It's important to note that this attenuation is carried out in a way that prevents the pathogens from causing infections while leaving them sufficiently intact for our immune systems to recognise them as aliens (Yadav et al., 2020).

The invention, testing, approval, and quick use of the COVID-19 vaccines by all parties—scientists, pharmaceutical firms, drug regulators, lawmakers, medical professionals, and the patients who have received them—represents a significant accomplishment, but since these vaccines are new, we don't yet have enough information about their effectiveness and safety. Therefore, disseminating this knowledge is important for public health and may persuade those who are wary about vaccination that getting the COVID-19 shot is the best course of action. To prevent the pandemic, several efforts have been made to create vaccines against COVID-19, and the majority of the vaccine candidates under development use the S-protein of SARS-CoV-2 (Samrat et al., 2020).

The global SARS-CoV-2 vaccine landscape as of July 2, 2020, consists of 158 vaccine candidates, 135 of which are in the preclinical or exploratory stages of research. Pathogen-specific aAPC (ShinzenGeno-Immune Medical Institute), Ad5-nCoV (CanSino Biologicals), INO-4800 (Inovio, Inc.), LV-SMENP-DC, and ChAdOx1 (University of Oxford) are now in phase I/II clinical

trials. The vaccines that are now being used are based on inactivated or live-attenuated viruses, protein subunits, virus-like particles (VLP), viral vectors (replicating and non-replicating), DNA, RNA, nanoparticles, etc., each of which has certain benefits and drawbacks. Synthetic peptides or recombinant antigenic proteins, which are required for triggering long-lasting protective and/or therapeutic immune responses, are the foundation of the protein subunit vaccine (Cid & Bolívar, 2021). To enhance the vaccination-induced immune responses, an adjuvant is necessary because the subunit vaccine has poor immunogenicity.

Additionally, a vaccine constructed from viral vectors offers a possible preventative treatment for a virus. These vaccines effectively induce an immune response by delivering the genes to the target cells in a very targeted and efficient manner (Ura et al., 2014). They contain a high degree of antigenic protein production that lasts for a long time, making them ideal for preventive use because they excite and activate cytotoxic T lymphocytes (CTL), which then destroy virus-infected cells. The development of the DNA vaccine, which encodes for the antigen plus an adjuvant that triggers the adaptive immune response, is the most innovative method of vaccination. The transgene is expressed in the transfected cells, producing a constant stream of transgene-specific proteins that are very similar to those of the live virus. Additionally, the antigenic material is endocytosed by the developing dendritic cells, which then present the antigen to the CD4+ and CD8+ T cells together with the MHC 2 and MHC 1 antigens on the cell surface, thus triggering humoral as well as cell-mediated immune responses (Petersen et al., 2010). The key to preventing the spread of the SARS-CoV-2 pandemic is vaccination. The creation of COVID-19 vaccines has advanced quickly in recent years, and three distinct vaccines have so far demonstrated good COVID-19 protection. The public's willingness to receive vaccinations is crucial, in addition to the creation and distribution of vaccines.

The COVID-19 pandemic has had a profound impact on the world and has resulted in the widespread distribution of vaccines. The study aims to explore the perceptions of life science students towards the COVID-19 vaccine. Understanding their attitudes towards the vaccine can help to identify any concerns or misconceptions that students may have, which can inform communication strategies aimed at addressing these concerns and promoting vaccine acceptance.

To stop the pandemic spread of SARS-CoV-2 and COVID-19, vaccination is essential. Many researchers (Rabaan et al., 2020) suggested the significance of sociodemographic characteristics with regard to the acceptability of the COVID-19 vaccination as well as for vaccines for other diseases in the past. One of the most often cited causes of vaccine reluctance was mistrust in science and the vaccines (for example, due to concerns about their rapid development, unfavourable side effects, and other unpleasant events). More contagious strains of the coronavirus disease 2019 (COVID-19) pandemic are continuously evolving. Hence, determining the factors that predict vaccine willingness is essential to developing interventions that will increase acceptance. In a number of studies, socio-demographic characteristics were found to be significant in determining the acceptability of the COVID-19 vaccination as well as vaccines for other diseases in the past.

One of the most frequently cited causes of vaccine reluctance was mistrust in science and vaccines, especially due to their quick development, unfavourable side effects, and other unfortunate events (Umotong & Dennis, 2018; Dennis, 2022). Also, the sometimes confusing, fast-shifting, and changing research environment at the start of the pandemic may have contributed to the lack of trust in research. Social media, in particular, appears to play a significant role in this environment for media communication. Social media was linked in multiple studies to conspiracy theories, vaccine reluctance, and worries around the COVID-19 pandemic, whereas earlier research focuses on social media. The function of official media reporting (e.g., websites of the government and health authorities) with regard to vaccine uptake was scarcely explored (Dennis, 2018; Demuyakor et al., 2021).

In early studies, subjective measures of anxiety, fear, and personal risk appeared to be significant predictors of vaccine acceptance in Turkey, the UK (Bendau et al., 2021), and France.

Individuals with higher risk perception and more anxiety demonstrated significantly higher vaccine acceptance. Anxiety was also explored in terms of a practical fear that forecasts public health compliance. Yet, there were contradictions in this, emphasising the necessity for a thorough evaluation of the function of worry. Hence, we sought to disentangle various forms of concern with reference to vaccination adoption. They conducted an online survey from January 1 through January 11, 2021, with 1,779 German participants who were not randomly selected to fill the knowledge gap on COVID-19 vaccine acceptance and its relationship with fears, media usage, and socio-demographic factors. The study found that 64.5% of participants were open to receiving the vaccine, with COVID-19-related anxiety and health-related anxieties positively correlating with vaccine acceptance and social and economic fears negatively correlating with vaccine willingness. The study also found that generalised anxiety and depression symptoms did not predict vaccine uptake significantly. The results suggested the need to categorise different forms of worry and fear to predict their influence on vaccine uptake and provide useful data for future research and initiatives.

In a study conducted by Khankeh et al. (2021), 13,426 individuals from 19 countries were surveyed to investigate their willingness to receive the COVID-19 vaccine and the factors influencing their decision. Participants were recruited through various online panel providers in each country to avoid coverage bias, and their identities were verified to ensure they were genuine. The survey found that 71.5% of respondents were inclined to get the vaccine, while 48.1% would follow their employer's advice. China had the highest acceptance rate (around 90%), while Russia had the lowest (less than 55%). The survey included a representative sample of people from 19 countries, covering approximately 55% of the world's population. The respondents were diverse in terms of gender, age, education level, and income. Higher education levels and trust in government were associated with a greater likelihood of supporting vaccination and following employer advice. Respondents who had experienced the COVID-19 illness were no more likely to support vaccination than those who had not.

PERCEPTION OF COVID-19 VACCINE IN MALAYSIA

According to a 2020 study, vaccine hesitancy has been identified by the World Health Organization as one of the top 10 global health threats due to a decline in measles, mumps, and rubella vaccination rates worldwide. Currently, vaccine reluctance is a significant problem hindering efforts to immunise a significant proportion of the population and achieve herd immunity, particularly with the COVID-19 vaccine. Kennedy (2020) conducted a survey among 1,411 adults in Malaysia to assess their attitude towards the COVID-19 vaccination. The survey was conducted online due to the limitations imposed by the pandemic. The study found that 83.3% of respondents were willing to receive the vaccine, while 16.7% were hesitant. Those who were hesitant expressed concerns about the vaccine's negative effects, safety, and lack of information. The study also found that age, religion, and place of residence were predictors of vaccine resistance. Therefore, while the high acceptance rate is promising, it is crucial to address concerns and misinformation to ensure that a larger proportion of Malaysians get vaccinated.

In a study conducted by Samanta et al. (2022) on COVID-19 vaccine acceptance and associated factors in the general population of West Bengal, India, The study utilised an online survey circulated through email, WhatsApp, and other social media platforms. A total of 803 individuals participated, with 54.17% men and 45.83% women. The participants' demographic information was presented, including age, education, occupation, and health issues. Most participants were under the age of 25 and identified as students, while a smaller percentage worked in business. A majority of the population had not been recently exposed to SARS-CoV-2, and a significant portion reported chronic illnesses and high blood pressure. Participants' COVID-19 knowledge was assessed through various questions, and a significant percentage did not think the risk factor had been eliminated or were unaware of the virus's presence. About half of the participants regularly used protective measures, while the other half did not consistently adhere

to COVID-19 safety protocols. The majority of participants expressed willingness to receive the vaccine, with a preference for Covaxin. The study revealed a concerning lack of awareness and scientific knowledge about the pandemic and its associated vaccination programme, despite participants' vaccine willingness. The survey area did not have a vaccination reluctance problem, but inadequate vaccine availability and awareness campaigns may discourage some individuals from getting vaccinated.

In a study conducted by Al-Mustapha et al. (2022), adult respondents from Nigeria's six geo-political zones were surveyed cross-sectionally to evaluate the acceptability of the COVID-19 vaccine in light of its anticipated arrival. The survey included 3,076 respondents, the majority of whom had tertiary education and believed that COVID-19 was legitimate and not a scam. However, only 27.9% of the trial participants were open to receiving the COVID-19 vaccine when it became available, and only 17.8% of the respondents who were tested had positive results. The likelihood that people would accept the vaccination increased with age and monthly income, and those who accepted the existence of the coronavirus disease were more likely to accept the vaccination. Perceptions of the disease, the need for a COVID-19 vaccine, willingness to pay, and the respondents' assessment of how well the government handled the pandemic were all important factors in determining whether the vaccine would be accepted in Nigeria (Al-Mustapha *et al.,* 2022).

In a study by Olawade et al. (2022) to investigate the level of vaccine hesitancy among university students in Southwestern Nigeria, they employed a descriptive cross-sectional design and distributed a self-administered questionnaire to 366 participants. The researchers used a convenience sampling technique and a snowball approach to recruit the participants. The findings of the study revealed a considerable communication gap between the participants and local health authorities. To increase COVID-19 vaccine acceptance, the researchers suggested that targeted and comprehensive health promotion campaigns should be implemented to address specific concerns raised by the public. The findings suggested that there was a considerable lack of communication between the people surveyed and the health authorities in their area. In order to improve the willingness of individuals to receive COVID-19 vaccinations, it is necessary to conduct comprehensive and focused health education campaigns that address the specific concerns raised by the public. Regrettably, it has been reported that there was a low uptake of the COVID-19 vaccine among adults in Nigeria (Solís Arce et al., 2021).

MATERIALS AND METHODS

Study Setting
The University of Calabar is located in Cross River State, Nigeria, specifically in the city of Calabar. The university is situated on a sprawling campus that covers over 17,000 hectares of land, which provides an ideal environment for academic pursuit. Its geographical coordinates are approximately 5.0056° N latitude and 8.3456° E longitude. The campus is strategically located near major transportation routes, making it easily accessible to students, staff, and visitors. It is located about 8 kilometres from the city centre and 10 kilometres from the Calabar International Airport, which makes it convenient for students travelling from different parts of the country or abroad.

Scope of study
The study included students enrolled in the life science programme at the University of Calabar between the ages of 16 and 30 across all levels.

Study design
The study was a cross-sectional descriptive study.

Study population

The study comprised 500 University of Calabar students currently enrolled in a life science programme across all levels.

Instruments for Data Collection

Questionnaire: A structured questionnaire was developed to collect data from the life science students of the University of Calabar.

Computer: A computer with a Microsoft Excel package was used to analyse the data.

Internet Access: Access to the internet was required for online surveys.

Data collection

The questionnaire was distributed online via social media platforms.

Ethical considerations

Ethical considerations were taken into account throughout the research process. Participation in the study was voluntary, and participants were informed about the purpose of the study. Confidentiality and anonymity for participants were ensured.

Data analysis

The data collected from the questionnaire was analysed using descriptive statistics. The results were expressed in frequencies, percentages, and charts. The statistical relationships between the selected socio-demographic variables and the dependent variables were measured using a p-value (<0.05) at a 95% confidence interval.

RESULTS AND DISCUSSION

Socio-demographic characteristics of respondents

From the study population in Table 1, a total of 500 respondents were reached at the University of Calabar. There were more females (57.0%) than males (42.4%), with a total of (0.6%) other sexes. A majority of the respondents, 54.8%, were between the ages of 21 and 25, 30.6% were between 16 and 20, and a minority of respondents (14.6%) were between 25 and 30. For religion, 95% of the respondents in this study were Christians, 4% were Muslims, 0.6% were traditionalists, and 0.4% practiced other religions. All 500 (100%) respondents were University of Calabar students studying life science programmes across all levels. 100 Level (12.2%), 200 Level (34.2%), 300 Level (17.4%), 400 Level (33.4%), 500 Level (2.8%)

TABLE 1:

Socio-demographic characteristics of respondents

Variable	Frequency	Percentage (%)
Age		
16-20	153	30.6%
21-25	274	54.8%
25-30	73	14.6%
Sex		
Male	212	42.4%

Female	285	57.0%
Other	3	0.6%
Religion		
Christianity	475	95.0%
Muslim	20	4.0%
Traditionalist	3	0.6%
Other	2	0.4%
Are you a student of University of Calabar?		
Yes	500	100.0%
Area of specialty		
Life Sciences	500	100.0%
Level of Education		
100 Level	61	12.2%
200 Level	171	34.2%
300 Level	87	17.4%
400 Level	167	33.4%
500 Level	14	2.8%

Recipients of COVID-19 vaccine amongst respondents

According to the questionnaire results in table 2, (36.4%) of respondents have received the COVID-19 vaccine, while (63.6%) have not. Of those who have received the vaccine, the most commonly reported vaccine is Johnson and Johnson, 65 respondents (13.0%), followed by Astrazeneca/Oxford having 53 respondents (10.6%) and Moderna having 23 respondents (4.6%). Notably, over half of the respondents 256(51.2%) reported not knowing the types of vaccines. When asked about the factors that influenced their decision to receive or not receive the vaccine, personal reasons were the most commonly reported having (50.4%) responses, followed by concerns about side effects with (26.2%) responses and family influence of (18.0%) responses. Only a small percentage of respondents, 27 responses cited religious reasons as a factor in their decision (5.4 %).

TABLE 2:

Respondents' reception of COVID-19 vaccine		
Variable	Fre-quency	Percentage (%)
Have you received the COVID-19 vaccine yet?		
Yes	182	36.4 %
No	318	63.6 %
If yes, which vaccine did you receive?		
Astrazeneca/oxford	53	10.6 %
Johnson and Johnson	65	13.0 %
Moderna	23	4.6 %
I don't know	256	51.2 %
What influenced your decision to receive or not receive the vaccine?		
Family	90	18.0 %
Personal reasons	252	50.4 %

Religious reasons	27	5.4 %
Side effects	131	26.2 %

Effectiveness and myth that influence COVID-19 vaccine acceptance among respondents

According to the results of the vaccine acceptance survey in Table 3, a majority of respondents (24.8 %) believe that the COVID-19 vaccine is effective, 15.2 % believe it is very effective. However, a small percentage of respondents (2.8 %) believe that the vaccine is not effective. More than half of the respondents (57.2 %) haven't taken the vaccine yet. When it comes to side effects, 18.2% of respondents reported experiencing side effects after taking the vaccine, while 25.8 % did not experience any side effects, and 24.4 % were unsure if they had any side effects. Regarding the safety of the vaccine, nearly half of the respondents (48.2%) believe that the COVID-19 vaccine is safe, while 27.2 % believe that it is not safe. The remaining respondents (24.6 %) are not bothered by the safety of the vaccine.

Furthermore, the survey reveals that the most common COVID-19 vaccine myth among the respondents is the belief that it contains microchips (24.8 %). Other myths include the vaccine altering DNA (14.6 %), the vaccine being dangerous due to its ingredients (15.2 %), and the vaccine causing death (9.2 %). A substantial number of respondents (36.2%) believe in all of the myths listed above.

TABLE 3:
Vaccine effectiveness and myth influencing acceptance among respondents

Variable	Frequency	Percentage (%)
How effective do you think the COVID-19 vaccine is?		
Effective	124	24.8 %
Very effective	76	15.2 %
Not effective	14	2.8 %
I haven't taken it	286	57.2 %
Have you experienced any side effects after taking the vaccine?		
Yes	91	18.2 %
No	129	25.8 %
I didn't take note of any	122	24.4 %
Do you think the COVID-19 vaccine is safe?		
Yes it is safe	241	48.2 %
No it is not	136	27.2 %
It doesn't bother me	123	24.6 %
Which of these myth have you heard about COVID-19 vaccine ?		
All of the myths above	181	36.2 %
It can alter one's DNA	73	14.6 %
It contains microchips	124	24.8 %
It is dangerous because of the ingredients	76	15.2 %
It kills	46	9.2 %

Consequences, behaviour of COVID-19 vaccine acceptance among respondents

The survey results in table 4, suggest that a majority (61.4 %) of the respondents believe that it's an individual's choice whether or not to get vaccinated against COVID-19, and this choice should be respected. However, a significant proportion (13.2 %) believe that there should be consequences for people who choose not to get vaccinated. Additionally, around a quarter of the respondents (25.6 %) feel more comfortable being around vaccinated people compared to unvaccinated people, while 60.2 % said it doesn't bother them. In terms of mandating COVID-19 vaccines, 24.6 % of the respondents believe that it should be mandatory for all citizens, while 60.0 % do not. A relatively smaller proportion (15.4 %) said they care less about whether the vaccine is made mandatory or not (Table 4).

TABLE 4:
Consequences, behaviour of COVID-19 vaccine acceptance among respondents

Variable	Frequency (N=500)	Percentage (%)
Do you think that there should be consequences for people who choose not to get vaccinated?		
Yes	66	13.2%
No	127	25.4%
It's their choice and it should be respected	307	61.4%
Do you feel more comfortable being around vaccinated people compared to unvaccinated people?		
Yes	128	25.6%
No	71	14.2%
It doesn't bother me	301	60.2%
Do you think that the COVID-19 vaccine should be mandatory for all citizens?		
Yes	123	24.6%
No	300	60.0%
I care less	77	15.4%

Vaccine alternative awareness and stigmatisation

The results from the survey in table 5, indicate that there is a significant lack of awareness about alternative treatments for COVID-19 in the community, with only 22.6% of respondents being aware of any alternative treatments that are being promoted. Regarding the stigmatization of COVID-19 vaccination status, 10.4% of respondents reported experiencing stigma or discrimination based on their vaccination status. The results also indicate that there is some resistance to making COVID-19 vaccination mandatory for students, with 67.6% of respondents indicating that they do not think it should be mandatory. However, 24.8% of respondents did indicate that they think it should be mandatory, which suggests that there is some support for mandatory vaccination policies.

TABLE 5:
Vaccine alternative awareness and stigmatisation among respondents

Variable	Frequency (N=500)	Percentage (%)

Are you aware of any alternative treatments for COVID-19 that are being promoted in your community?		
Yes	113	22.6 %
No	337	67.4 %
I'm not bothered	50	10.0 %
Have you experienced any stigma or discrimination based on your vaccination status?		
Yes	52	10.4 %
No	384	76.8 %
I care less	64	12.8 %
Do you think that the COVID-19 vaccine should be made mandatory for students?		
Yes	124	24.8 %
No	338	67.6 %
I care less	38	7.6 %

Attitude of respondents towards COVID-19 vaccine

According to the provided data in Table 6, a significant portion of the respondents have not observed any changes in the behaviour or attitudes of people who have been vaccinated (41.8%), and people who have not been vaccinated (37.0%). However, a noticeable number of respondents have observed changes in both categories, with 10.6% observing changes in people who have been vaccinated and 9.0% observing changes in people who have not been vaccinated. When asked about the idea of gifts and rewards for people who are vaccinated, 21.4% of the respondents agreed with the concept, while 50.0% disagreed. Furthermore, 28.6% of the respondents indicated that even if there are rewards, they would not take them.

TABLE 6:
Respondents' attitude to COVID-19 vaccine

Variable	Frequency (N=500)	Percentage (%)
Have you observed any changes in the behaviour or attitudes of people who have been vaccinated?		
Yes	53	10.6%
No	238	47.6%
I haven't taken note of any	209	41.8%
Have you observed any changes in the behaviour or attitudes of people who have NOT been vaccinated?		
Yes	45	9.0%
No	270	54.0%

I haven't taken note of any	185	37.0%
Do you think that there should be gifts and rewards for people who are vaccinated? Yes	107	21.4%
No	250	50.0%
Even if there are rewards, I won't take it.	143	28.6%

Respondents' willingness to advocate for COVID-19 vaccine uptake

Regarding advocating for others to take the vaccine, as shown in table 7, 37.4% of the respondents are willing to do so, while 31.4% are not, and 31.2% do not care about others' vaccination status. This suggests that a significant proportion of the population is still hesitant about recommending the vaccine to others. Concerning the idea that the vaccine is a way of expunging the black race, 19.6% of the respondents believe this to be true, while 65% disagree. This highlights the presence of vaccine-related conspiracy theories and misinformation, which can contribute to vaccine hesitancy among certain groups. In terms of the vaccine's protective properties, 57.8% of the respondents believe that the vaccine is effective against the COVID-19 virus, while 27.6% do not. Again, this shows that there is still a considerable amount of skepticism about the vaccine's efficacy, which can potentially hinder vaccination effort.

TABLE 7:
Respondents' willingness to advocate for COVID-19 vaccine uptake

Variable	Frequency (N=500)	Percentage (%)
Will you willingly advocate for others to take the vaccine? Yes	187	37.4%
No	157	31.4%
Their vaccination status doesn't bother me	156	31.2%
Do you think the vaccine is a way of expunging the black race? Yes	98	19.6%
No	325	65.0%
The aim of the vaccine doesn't concern me	77	15.4%
Do you think the vaccine is actually protective towards the COVID-19 virus? Yes	289	57.8%
No	138	27.6%
The aim of the vaccine doesn't concern me	73	14.6%

DISCUSSION

Vaccination is crucial for the prevention of COVID-19. However, some people still have reservations towards the COVID-19 vaccine in terms of safety and efficacy. The study aimed to explore the COVID-19 vaccine acceptance among University of Calabar life science students. The sociodemographic characteristics of the 500 respondents was presented, which showed that a majority were females (57%) aged between 21-25 (54.8%) and Christians (95%). The covid-19 vaccine acceptance rate in the targeted community 182(36.4%) was lower than the rejection rate, 318 (63.6%). This acceptance rate does not correspond with the study conducted in Malaysia where there was 83% acceptance rate than reluctance rate of 16.7% (Tran, et al. 2021). The willingness to take the COVID-19 vaccine was lower than previously reported studies among students with wide geographic distribution across Africa, Asia, Europe and America by Harapan *et al.,* (2022).

Less than half number of respondents 124(24.8%) agreed to the effectiveness of vaccine while a greater number affirmed that they have not taken the vaccine. The hesitancy of the COVID-19 vaccine could be due to the fact that, less than half of the respondents 241(48.2%) believed in the safety of the vaccine. This findings is similar to that of Tran, et al. 2021), where even though there was a high Covid -19 vaccine acceptance rate, those who were on the fence expressed concern about the vaccine's negative effects (95.8%), safety (84.7%), and lack of information (80.9%). The efficiency of the vaccine was a further issue raised by more than half of the respondents (63.6%).

Additionally, 36.4% of the respondents have received the COVID-19 vaccine, with the Johnson and Johnson vaccine being the most commonly reported. Personal reasons were the most commonly reported factor influencing vaccine acceptance (or refusal) (50.4%), followed by concerns about side effects (26.2%). This findings is similar to a previous study by Dudley et al., (2022) concerning COVID-19 vaccine acceptance and hesitancy in low and middle income countries where potential risk and personal wellbeing benefits was notable among the respondents, which affected the acceptance (refusal) of the covid-19 vaccine. Also in their studies, concerns towards the safety (side effects) of the covid-19 vaccine was a common determinant of the vaccine acceptance.

The study also revealed that the COVID-19 vaccine is perceived as effective by the minority of respondents but myths surrounding the vaccine are believed by a substantial proportion of respondents, with the most common myth being the belief that it contains microchips (24.8%). This reaffirms the conclusion of [38] that the COVID-19 vaccine may not be widely accepted in many African settings due to a number of misconceptions about the disease's existence and the rapid pace of the vaccine's development (Ackah, et al., 2022). This findings suggested that efforts to increase vaccine uptake should focus on addressing personal concerns and increasing awareness of the vaccine's effectiveness and safety while debunking common myths.

Findings from the survey shows that majority of the respondents believe were of the opinion that covid-19 vaccine should not be made mandatory to citizens 300(60.0%) and should not also be made mandatory to students 338(67.6%) while accepting that it's an individual's choice whether or not to get vaccinated against COVID-19, and this choice should be respected 307(61.4%). This is similar to a study by Rib (2022) where by majority of participants in the study (n = 2180/3076, 70.9%) believed that the vaccination should not be required for all residents. Moving forward in accordance to the survey, 37.4% of respondents said they would be willing to encourage others to get the vaccine, compared to 31.4% who would not and 31.2% who did not care whether or not others were immunised. This shows that a sizable section of the respondents is still reluctant to advise others to get the vaccine. The results from the survey also show that there is a lack of awareness about alternative treatments for COVID-19 in the community among the respondents 337(67.4%) with only a small proportion of respondents being

aware of any alternative treatments being promoted,113(22.6%) and smaller proportion of the respondents expressed less concern towards any alternative treatments for COVID-19. This was similar to the previous studies by Rib (2022) where there was insufficient adherence to the established non-pharmaceutical criteria, particularly the usage of face masks (45.4%, n = 1397/3076). Regarding the idea of gifts and rewards for people who are vaccinated, the findings suggest that there is a significant divide in opinion among the respondents. While 21.4% of the respondents agreed with the concept of gifts and rewards for people who are vaccinated, a majority of 50.0% disagreed with it. Furthermore, a notable proportion of respondents (28.6%) indicated that even if there are rewards, they would not take them. These findings could have important implications for public health policy regarding COVID-19 vaccination. While gifts and rewards have been suggested as potential incentives to encourage people to get vaccinated, the results suggest that this may not be a universally accepted approach. Therefore, policymakers may need to consider alternative approaches to incentivize COVID-19 vaccination, such as education campaigns or improving access to vaccines.

Overall, the results highlight the need for continued efforts to educate and inform the public about the benefits and risks associated with COVID-19 vaccination. It is important to respect an individual's decision to get vaccinated or not, while also encouraging everyone to take appropriate measures to protect themselves and others from the spread of the virus. The results also suggest the need for more research and awareness about alternative treatments for COVID-19, and addressing the stigma and discrimination based on vaccination status.

CONCLUSION

Summary
This study aimed at the evaluation the relative acceptance rate of Covid-19 vaccine in the population of life science students of the University of Calabar. The study was a cross sectional descriptive study involving life science students in University of Calabar within age group (16-30) across all educational levels (100-500). An Online survey was used as the instrument for primary data collection. The data collected was analysed using Microsoft Excel. From the study Population, majority of the respondents were females 57.0 %, major age range 21 to 25 54.8 %, major religion was Christianity which was 95.0 % and majority of respondents were in 400 level 33.4 %. Over half of the respondents 63.6 %, reported to not have received the COVID-19 vaccine at all, Personal reasons (50.4 %) and side effects (26.2 %) were major factors that influenced the acceptance or (refusal) of the vaccine.

The hesitancy of the COVID-19 vaccine could be due to the fact that less than half of the respondents believed in the safety of the vaccine, while the efficiency of the vaccine was a further issue raised by more than half of the respondents. The study also revealed that the COVID-19 vaccine is perceived as effective by the minority of respondents but myths surrounding the vaccine are believed by a substantial proportion of respondents. Majority of the respondents were of the opinion that the COVID-19 vaccine should not be made mandatory to citizens and students. There was a lack of awareness about alternative treatments for COVID-19 in the community among the respondents.

Conclusion
This study revealed a lower COVID-19 vaccine acceptance rate among University of Calabar life science students in Nigeria compared to previous studies in other regions. The respondents' hesitancy towards the vaccine was primarily due to concerns about safety, efficacy, and potential side effects. The study also found a lack of awareness about

alternative treatments for COVID-19 and a significant divide in opinion regarding gifts and rewards for vaccination. These findings underscore the importance of targeted public health campaigns aimed at addressing concerns about the vaccine's safety and efficacy while dispelling common myths. Policymakers should consider alternative approaches to motivate COVID-19 vaccination, such as education campaigns or improving access to vaccines. Ultimately, continued efforts are needed to increase vaccine uptake and promote public health in the face of the ongoing pandemic.

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