Assessment of the Knowledge Level of COVID-19 Vaccines and Vaccine Hesitancy Amongst Final-Year Medical Students in Southeast Nigeria

ABSTRACT

Background

Despite how ravaging and deadly COVID-19 infection is, vaccine hesitancy is high among the uneducated, medical students, and health workers, who as frontline workers, should lead by example and drive COVID-19 vaccination efforts.

Objectives

This research aims to assess the knowledge level of COVID-19 vaccines among final-year medical students in Southeast-Nigeria universities and determine the factors responsible for the hesitancy of this vaccine among them.

Methodology

A cross-sectional study of final-year medical students in six medical schools in Southeast Nigeria using an electronically distributed structured, validated online Google form amongst final-year medical students from which 125 of them responded.

Results

Out of a sample of 125 final-year medical students, 123 (98.4%) are aware of COVID-19 vaccines while 2 (1.6%) lack knowledge of COVID-19 vaccines. The demographics of the final year medical students comprised 68 (58%) males and 57 (45.6%) females, 74.4% (93/125) of the respondents do not have a preference for

any vaccine while 25.6% (33/125), shows a preference for various vaccine types. 95 (76%) final year medical students have not been vaccinated as against 30 (24%) who have received the vaccine for the Covid-19 virus, this large gap in the vaccination ratio accounted for many factors ranging from safety, availability, side effects, etc.

Conclusion

The level of awareness of COVID-19 vaccines is very high among final-year medical students but it is not equivalent to the level of uptake of the vaccines. Despite being future healthcare professionals, medical students' vaccination rates remain suboptimal, highlighting a significant vaccine hesitancy and a large gap between knowledge and practice. Understanding and addressing these underlying factors is crucial to improving vaccine uptake and ensuring that medical students, as future healthcare leaders, are equipped to promote evidence-based public health practice.

Key Words: COVID-19; Medical Students; Vaccines; Hesitancy; Nigeria

INTRODUCTION

With over 5 million cases and a significant financial strain on healthcare systems throughout the globe, the coronavirus disease pandemic (COVID-19) was a global public health emergency (1). Since the COVID-19 pandemic, there has been a significant negative effect on medical education for medical students and surgical residents in Nigeria. (2, 3) Even though COVID-19 is a pandemic disease, and can be easily transmitted via droplets from an infected person to an uninfected person, it is incredible to know that a lot of people in third-world countries especially Nigeria do not believe that this disease is deadly and this has resulted to poor attitude towards prevention measures such as social distancing, use of face masks, appropriate washing of hands and vaccination pro of COVID-19 virus.

Vaccine hesitancy is the delay in acceptance or the refusal of vaccines, despite the availability of vaccination services (4). According to WHO, vaccine hesitancy is one of the ten main threats to global health due to growing concern about increased numbers of individuals and communities who are questioning vaccines, seeking alternative vaccination schedules and delaying or refusing vaccination (5). This is a cause of concern especially since the acceptance rate of COVID-19 vaccines among healthcare workers is still less than optimal. [(15)]The focus of this study is on final year medical students being the future medical doctors. Ideally, final year medical students would have the expected level of knowledge about COVID-19. (6, 7) Many factors influence hesitancy, including confidence, level of trust in the vaccine or provider, complacency, the lack of perception of the need for a vaccine or the value

of the vaccine, convenience, and access issues (1). Other important factors such as adverse events, unduly rapid vaccine development, poor vaccine efficacy (8–11), misinformation, and distrust in governments (12–15), also contributed to some possible reasons for vaccine hesitancy among medical students. The available evidence shows that the intention to get vaccinated in general is lower among younger adults and healthcare workers (16), this is because younger individuals believe that the COVID-19 virus poses a less serious threat to themselves than to other age groups (17) and failure of the healthcare workers to promote vaccination among the general population (18). An addition cause to be worried is the fact that the hospital response to COVID-19 pandemic and awareness creation amongst institutions in Nigeria have been reported to be relatively inadequate. (19)

Acceptance of COVID-19 vaccination is crucial to reducing the mortality and morbidity rate due to COVID-19 infection. Vaccines have the benefit of protecting the person vaccinated and can be a platform to establish herd immunity to those who have not been opportune to receive the vaccines. Thus general acceptance by the public to take the vaccine is a key to halting the pandemic, (20). Medical students are at high risk of contracting this virus even as they rotate through different units in their medical careers. More so, they are good agents for promoting vaccination to patients and society at large. This study looks forward to assessing the knowledge level of COVID-19 vaccines and hesitancy among medical students in Southeast, Nigeria.

METHODOLOGY

Study Area

This study was conducted among the various tertiary institutions in south-eastern Nigeria which includes: the University of Nigeria, Nsukka (UNN), Nnamdi Azikiwe University (NAU), Enugu State University of Technology (ESUT), Imo State University (IMSU), Chukwuemeka Odumegwu Ojukwu University (COOU), Ebonyi State University (EBSU).

South-Eastern Nigeria is the indigenous homeland of the Igbo people. It is a cultural and common linguistic region in southern Nigeria. Politically, there are five major states in the southeast which include: Enugu, Anambra, Abia, Ebonyi, and Imo.

Study population

The study population includes final-year undergraduate medical students in various tertiary universities in the southeast who will consent to participate in this study. Survey responses will be collected anonymously.

Study type

This is a descriptive cross-sectional online survey conducted among undergraduate medical students in a developing African nation, Nigeria, to determine the knowledge level of COVID-19 vaccines and hesitancy among medical students.

Study design

A predesigned online-based questionnaire was developed by the principal investigator. The content accuracy for the study and internal validity of the survey items were finalized with expert multidisciplinary input from the study investigators. The questionnaire is made up of two sections. The data collected includes Social Demographics and Assessment of the knowledge level of COVID-19 vaccines and hesitancy, factors responsible for the hesitancy, and factors that can help encourage vaccine uptake. The type of questions used included: Yes/No questions, as well as other open questions. Bias was limited by minimizing social-order type questions and limiting non-response bias. The questionnaire was sent to the final year medical students and a brief informed consent stated in the opening of the electronic questionnaire to confirm approval for inclusion in the study.

Inclusion Criteria

Registered final-year undergraduate medical students.

Must be enrolled in a medical school in Southeast Nigeria.

Exclusion Criterion

Must not be a foreign exchange student on clinical postings in any of these medical schools.

Sampling Method

The stratified sampling method was adopted, where each of the above-listed south-eastern universities in Nigeria would be regarded as a stratum out of which each final-year student were randomly selected. Using this method of sampling, all strata have a proportionate representation in the sample as every unit in the strata has an equal chance of being selected.

Sample Size

A total of 125 final-year medical students participated in the study from the 170 total number recruited. The data was obtained from the submitted online Google form questionnaires.

Data Analysis

Data was analysed using the Statistical Package for the Social Sciences (SPSS) version 25.0.

RESULTS

Response rate was 73.5% as 170 final medical students were recruited for the study.

Social demographics characteristics of the respondents

Figure 1 below shows the gender distribution from the study sample of 125 final-year medical students.

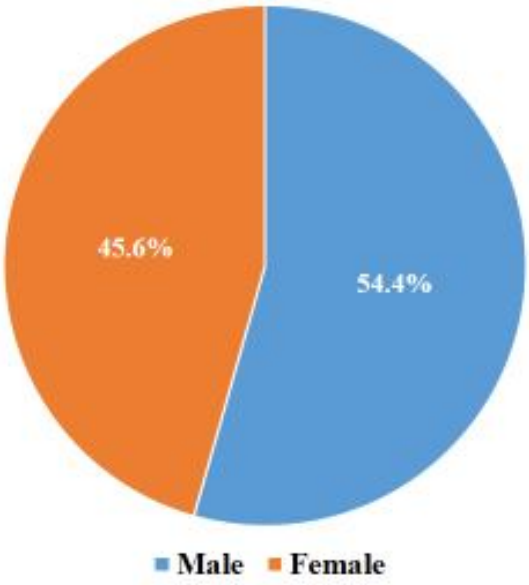

Figure1: Percentage distribution based on gender amongst the study respondents

Awareness of Vaccine types

Table 1 shows 123 respondents (98.4%) are aware of COVID-19 vaccines while 2 respondents (1.6%) claim not to be aware of COVID-19 vaccines. The distribution of each of the vaccines is shown in the table below.

Vaccine types	**No (percentage)**
AstraZeneca	95 (77.2)
Johnson & Johnson	31 (25.2)
Moderna	62 (50.4)

Sputnik	4 (3.3)
Pfizer BioNTech	42 (34.1)

Table 1; Awareness of various vaccine types

Preference for vaccine types

Table 2 shows that 74.4% (93/125) of the respondents do not have a preference for any vaccine while 25.6% (33/125) showed a preference for various vaccine types. Out of the 33 respondents, the percentage preference has been illustrated below.

Vaccine types	**No (percentage)**
AstraZeneca	13 (39.4)
Johnson & Johnson	4 (12.1)
Moderna	7 (21.2)
pfizer BioNTech	9 (27.3)
Sputnik	0
Total	33 (100)

Table 2; preference for vaccine types amongst the respondents

Reasons for choice of vaccines

Table 3 shows the reasons given by 33 respondents on the choice of vaccine.

Reasons	No (percentage)
Less side effect	16 (48.5)
Most people take it	9 (27.3)
More potent	4 (12.1)
Cheaper	1 (3.0)
Others	3 (9.0)
Total	33 (100)

Table 3; Reason for choice of vaccine

Body of organisations responsible for vaccine production, distribution in Nigeria

Table 4 shows the body of organization known to the 125 respondents and believed to be responsible for production, organization and regulation of the COVID-19 vaccines in Nigeria.

Body responsible for vaccine production and distribution in Nigeria	No (percentage)
NCDC	78 (62.4)
NPHCDA	22 (17.6)

Ministry of Health	19 (15.2)
WHO	6 (4.8)
Total	125 (100)

NCDC is the Nigerian Centre for Disease Control, **NPHCDA** is the National Primary Health Care Development Agency, **WHO** is the World Health Organization

Table 4; Bodies responsible for vaccine production and distribution in Nigeria based on respondents' awareness.

Knowledge of the Ideal time or period to take the second vaccine dose

Table 5, As regards when the second dose of the vaccine is taken, 53 respondents (42.4%) said 1 month after the first dose, 22 respondents (17.6%) said 2 months after the first dose, 27 respondents (21.6%) said 3 months after the first dose, 18 respondents (14.4%) said 6 months after the first dose and 5 respondents (4.0%) not aware

Ideal time for the second dose of Covid-19 vaccine	**No (percentage)**
1 month	53 (42.4)
2 months	22 (17.6)
3 months	27 (21.6)
6 months	18 (14.4)

Not aware	5 (4.0)
Total	125 (100)

Table 5; Ideal time for the second dose of covid-19 vaccine

Side effects of COVID-19 vaccines

Figure 2. About 121 respondents were able to correctly identify the side effects of COVID-19 vaccines such as fever 118 (97.5% of the respondents), muscle pain 97 (80.2%), pain at injection sites 121 (100%), fatigue 90 (74.4%), headache 100 (82.6%), chills 70 (57.9) and diarrhea 50 (41.3)

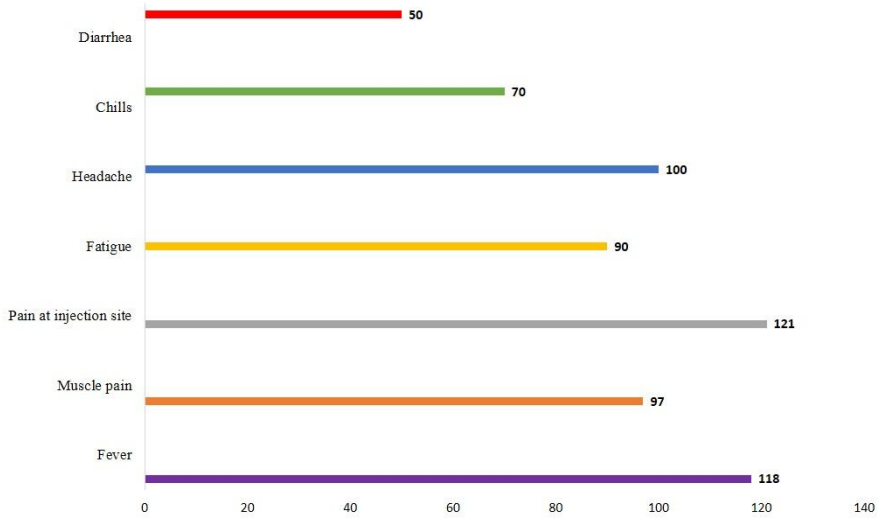

Figure 2. Side effects of Covid-19 Vaccine

Vaccination status of the participants

Furthermore, in the study, 95 respondents (76%) stated that have not been vaccinated while 31 respondents (24.0%) have been vaccinated. Out of the 95 unvaccinated respondents, 56 (58.9%) agreed that if the vaccines are brought close to their location they will take it while 39 (41.1%) respondents said they would not.

Reasons for taking COVID-19 vaccine

As shown in Figure 3 below, 30 respondents gave various reasons for taking the vaccines, these were for protection, to reduce transmission, for travel reasons, due to pressure from friends and family, and finally, some used it to avoid need to wear protective device.

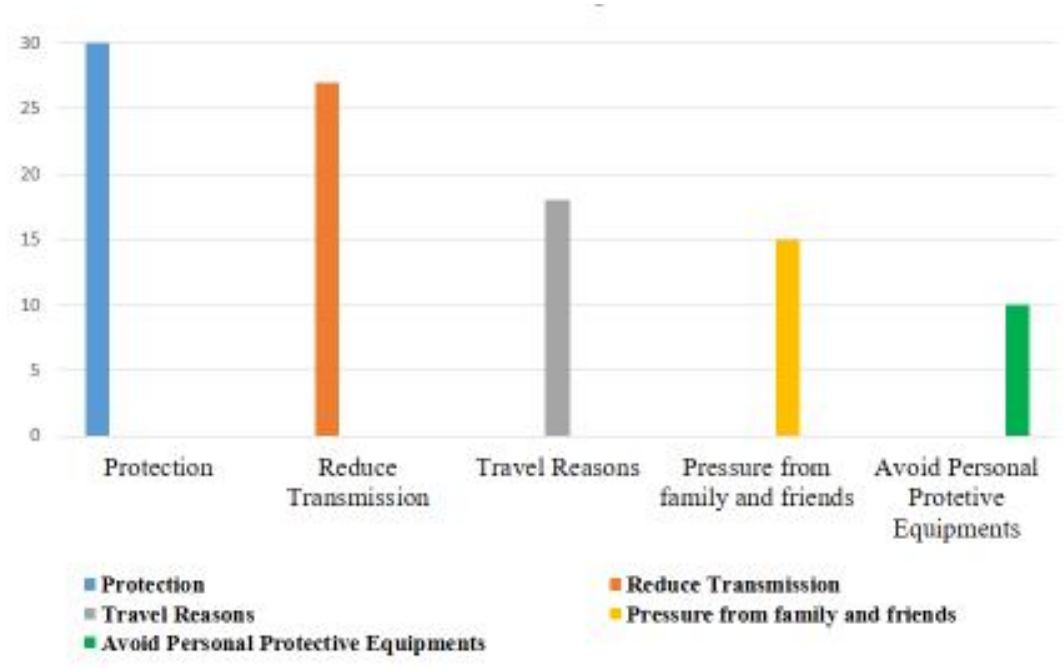

Figure 3. Reasons for taking Covid-19 vaccine

Reasons for not taking COVID-19 vaccine

As shown in Figure 4 below, 95 respondents gave reasons for not taking the vaccines. Majority was because of fear of side effects, possibility of being fake, lack of proximity, due to non-availability of vaccines, afraid of death from the vaccines while about 33 (34.7%) respondents had other reasons for not taking the vaccines.

68 (71.6%) respondents agreed they would take the vaccine if there were monetary incentives while 17 (17.9%) respondents disagreed. 40 (42.1%) respondents were not sure whether they will or not if monetary incentives is introduced.

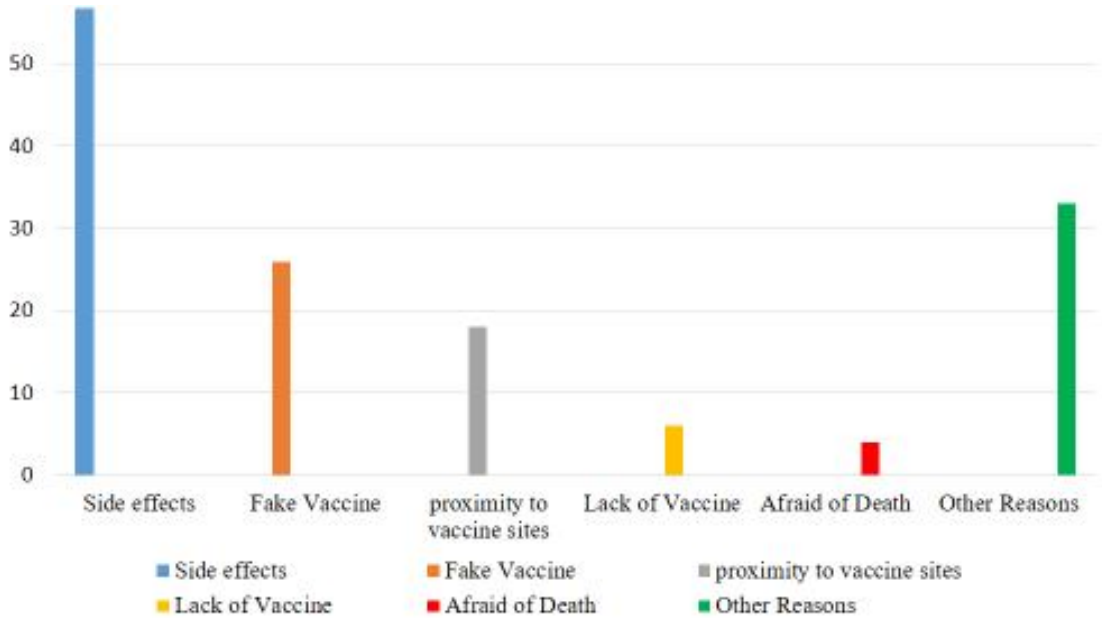

Figure 4. Reasons for not taking a vaccine

DISCUSSION

Globally, the COVID-19 pandemic created a crisis that impacted many facets of human existence, while social distancing, wearing face masks in public, a few months of lockdowns, quarantines, and other preventive measures helped limit the spread of the COVID-19 virus; long-term remedies like universal vaccination were desperately needed to get back to a normal life, because of COVID-19 vaccine's ability to lower disease mortality which consequently leads to improve socioeconomic and health outcomes and lessening of the severity of COVID-19 disease and the incidence of new cases, among those who have not received the vaccination through herd immunity.

Unfortunately, the aim of the vaccination program for COVID-19 disease was not met in all parts of the world, especially in Nigeria and other Sub-Saharan-African countries, partly attributed to unreliable claims about its harms and ineffectiveness from the internet and social media, which are often exaggerated, this raises concerns of both short and long-term complications of the COVID-19 vaccine among the populace leading to hesitancy or refusal to get vaccinated (21, 22).

Also trust or distrust in the public health care system in delivering safe and effective vaccines and on governmental agencies could be a leading factor in COVID-19 hesitancy (23, 24).COVID-19 vaccination raised many concerns about hesitancy in vaccines in general and COVID-19 vaccines in particular.

According to the WHO advisory committee, an individual's decision to accept a vaccine is a complicated combination of vaccine confidence, illness complacency (or dread), and ease of access to immunization (25). The findings of this study provide valuable insights into the COVID-19 knowledge level, vaccines, and hesitancy among medical students in Nigeria. This result revealed a significant awareness of COVID-19 vaccines among medical students in the south-eastern part of Nigeria, with AstraZeneca being the most popular followed by Moderna, Pfizer, Johnson and Johnson, and finally Sputnik. However, the preference for the AstraZeneca vaccine over the other vaccines may be attributed to fewer side effects, talked about by people, perceived efficacy, cheapness, and others.

Despite awareness and preference of various vaccine types as shown from the study, about 76% of final year medical students in the south-eastern part of Nigeria have not been vaccinated citing side effects, fake vaccines, proximity to the vaccination centre, reported death after taking the vaccine, and non-availability of vaccines as their reasons for not taking the vaccines, this is consistent with previous studies showing 41.5% hesitancy among Ethiopia medical students (26), 46% of Egyptian medical students (27), 30.6% of Uganda medical students (28), 10.6% of Indian medical students (29), 13.6% of Italy university students (30), and 23% of Michigan medical students (31), were hesitant for COVID-19 vaccination.

The 24% of the final year medical students in the south-eastern region of Nigeria who took the vaccine believed it would offer them protection, reduce transmission of the virus, opportunity to travel at ease, to avoid wearing PPE while the rest to avoid pressure from friends and family

Perceived adverse events of the COVID-19 vaccine were pain at the site of injection, fever, headache, muscle pain, fatigue, chills, and diarrhea which could explain the high rate of COVID-19 hesitancy in final-year medical students in the south-eastern region of Nigeria when compared to other studies, this was also a significant concern to various student as reported by Saied et al (32).

Improving the risk perception of college students through health education in various ways, and attention should be paid to some college students with low-risk perceptions (33). Among the frontline healthcare professionals who are most likely to come into contact with COVID-19 patients are final-year medical students, as they form a core part of the healthcare response team in regional and national referral hospitals making them a vulnerable group (34). So when a vaccine for COVID-19 becomes available, it is crucial to attain high immunization rates in this population because as future healthcare providers, they are entrusted with providing vaccine recommendations, health education and communication in their various communities counselling vaccine-hesitant patients, and ambassadors for vaccine promotion (35).

It is therefore imperative to assess the acceptability and attitudes of these students towards the COVID-19 vaccine, highlight the importance of restoring trust in the government, the healthcare system, scientists, and pharmaceutical industries in the COVID-19 era, and as well as inform the public of the initial results of real-life impact

and effectiveness in real-time, as clear and transparent communication which may increase public trust leading towards higher vaccination rates.

Addressing these concerns through evidence-based information, comprehensive vaccine education and healthcare professional recommendations is crucial.

CONCLUSION

The presence of available vaccines is the key element to minimize new infections, so it is crucial to vaccinate people, and especially healthcare workers.

This study revealed a low degree of desire to undergo COVID-19 vaccinations, with almost 75% of participants not having received the shot. This demonstrates a significant level of vaccine reluctance among medical students and provides a judgment indicator to gauge societal hesitancy overall. Quite a good number of the respondents are well cognizant about COVID-19 vaccines but have not been vaccinated. Increasing the availability of vaccines and accessibility is a significant factor in encouraging the uptake of vaccines.

Thus a need for targeted educational interventions to address COVID-19 knowledge gaps and vaccine hesitancy among medical students in Nigeria.

RECOMMENDATION

1. Incorporate comprehensive COVID-19 vaccine education into medical school curricula.
2. Develop targeted interventions to address vaccine hesitancy and misinformation.
3. Encourage healthcare professionals to promote vaccine uptake and address patient concerns.
4. Increasing awareness about the safety of the drugs and giving some incentives to those willing to receive the vaccines.

FUTURE DIRECTIONS

Further research is needed to explore COVID-19 vaccine knowledge and hesitancy amongst healthcare professionals and the general population in Nigeria.

Ethical Approval and consent:

Permission was obtained from the Health, Research and Ethical Department of the University of Nigeria, UNTH, Ituku-Ozalla, Enugu, Nigeria. Participants were told the purpose of the study and who the researchers were. They were also provided with information on risks, benefits, privacy, and anonymity in the language they could understand so that they could make an informed decision as to whether or not to participate. Participants who agreed to participate were asked to sign a consent form containing the above information.

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Details of the AI usage are given below:

1.

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