



Research



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Assessment of COVID-19 vaccine hesitancy among people living with HIV/AIDS: a single-centered study

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Abstract

Introduction: as the coronavirus disease 2019 (COVID-19) vaccines are distributed and administered globally, hesitancy towards the vaccine hinders the immunisation of a significant number of vulnerable populations, such as people living with HIV/AIDS. Hence, this study aims to assess COVID-19 vaccine hesitancy among people living with HIV/AIDS (PLHIV) attending clinical-outpatient follow-up at State Specialist Hospital Maiduguri (SSHM), Borno State, Nigeria. **Methods:** a hospital-based cross-sectional study design was conducted to assess COVID-19 vaccine hesitancy among 344 PLHIV receiving antiretroviral therapy (ART) at the United States President's Emergency Plan for AIDS (PEPFAR) clinic in SSHM from 4th January to 25th February 2022. Data were collected using a structured and pretested interviewer-administered questionnaire. The results were presented using frequencies and percentages. The factors that are associated with COVID-19 vaccine hesitancy were identified using the Chi-square statistical test. **Results:** among the 344 respondents of the study, only 88 (26.6%) received the COVID-19 vaccine. Out of the 256 respondents that did not receive the vaccine, only 10.5% (27/256) are willing to be vaccinated, while the majority; 57.8% (148/256) are not willing to be vaccinated and 31.7% (81/256) of the respondents are uncertain, thus resulting in a hesitation rate of 89.45%. There was no statistically significant association between COVID-19 vaccine hesitancy and the study's independent variables; where p -value is greater than 0.05. **Conclusion:** hesitancy towards COVID-19 vaccine is high among PLHIV and there is no any statistically significant association between COVID-19 vaccine hesitancy and the independent variables of the study where p -value is greater than 0.05. Hence, it is necessary to develop targeted strategies to boost vaccine uptake among this vulnerable population.

Introduction

The coronavirus disease 2019 (COVID-19) outbreak is a socio-economic and global health threat, which attempts are being made to prevent and manage its spread [1]. The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread rapidly worldwide as the primary agent of the COVID-19 pandemic since its debut in late 2019 [2]. The clinical course of COVID-19 has shown asymptomatic illness in some patients at the initial stages of the disease, other patients developed cough, mild fever, muscle pain, joint pain, and chest pain, shortness of breath, runny nose and general body weakness [3]. Key outcomes in the later stages were severe acute respiratory distress and mortality in the Intensive Care Unit (ICU) due to organ malfunction, bleeding, and septic shock [4]. The upsurge of the COVID-19 variants such as the Delta and the Omicron threatens the efforts to curb the spread of the virus, especially in African countries, where; Nigeria and Ghana were the first countries to report cases of Omicron variant in West Africa. Increased Omicron variant instances in Botswana, South Africa, and several West African nations, such as Nigeria and Ghana, might spell disaster for the continent's health system and further devastate the continent's faltering economies [5].

Since the majority of asymptomatic and mild infections of COVID-19 go unrecorded, published figures are likely to be underestimated [6]. However, as of 28th October 2022, there have been 626,337,158 confirmed cases of COVID-19 infection with 6,566,610 deaths worldwide [7]. Nigeria recorded a total of 266,043 confirmed cases and 3,155 deaths as of 30th October 2022 [8]. COVID-19 related outcomes are worse in vulnerable populations, such as people living with HIV/AIDS (PLHIV) than in the general population [9-11]. Despite the significant progress in expanding HIV/AIDS treatment coverage in recent decades, the high incidence of HIV/AIDS has remained a key problem globally [12]. The United Nations Agency for

International Development (UNAIDS) 2021 Global HIV/AIDS statistics factsheet unveiled that, the incidence of HIV infection was 1.5 million in 2020 and a total of 37.7 million people were living with HIV, with a total of 36.3 million death cases from AIDS-related illness since the inception of the epidemic. Reports have shown that the COVID-19 pandemic has impacted HIV prevention services, HIV testing, HIV treatment, and viral load suppression, perhaps, resulting in a loss of control over the HIV epidemic [13]. Although there is little evidence on how HIV infection influences the chance of poor COVID-19 results [14], according to a report from the World Health Organization, HIV infection significantly increases the probability of both severe/critical COVID-19 presentation at hospital admission and in-hospital death [15]. Previous studies in Spain and the United Kingdom show that, HIV-positive patients had greater rate of serious diseases [16] and risk of COVID-19 death [17] than HIV-negative people. The higher vulnerability expressed by PLHIV to COVID-19 may be probably due to their impaired immune system [18].

In the absence of a universal treatment option for COVID-19, the most reliable and cost-effective strategy to prevent COVID-19 and control its spread is the COVID-19 vaccination [19]. To mitigate the virus's negative impact on public health and the global economy, significant progress has been achieved in developing effective and safe COVID-19 vaccines [20,21] where 12,830,378,906 vaccine doses were administered globally as of 26th October 2023 [7]. The Nigerian government obtained numerous vaccination lots through the COVID-19 Vaccines Global Access Facility (COVAX), a collaboration of the Coalition for Epidemic Preparedness Innovations (CEPI), Gavi the Vaccine Alliance, United Nations Children's Fund (UNICEF), World Bank, and the World Health Organization [22]. Thereafter, Nigeria's National Primary Health Care Development Agency (NPHCDA) began vaccinating priority groups in stages, beginning with frontline healthcare professionals. Despite the paucity of

information on COVID-19 vaccine safety in PLHIV, the WHO recommended that COVID-19 vaccines are safe for PLHIV [23] although, the effectiveness of the vaccine is totally dependent on its uptake [24].

Herd immunity is frequently pursued to bring a disease outbreak under control in vaccination [25]. Herd immunity against COVID-19 infection is expected to be reached when at least 70% of the population is immune, either by vaccination or natural infection [26,27] and Nigeria has only 20.9% of its population fully vaccinated against the COVID-19 [28]. As a result, achieving high vaccine coverage rates is one of the most effective ways for reducing COVID-19-related morbidity and mortality [29]. As COVID-19 vaccines are disseminated and administered in many countries, including Nigeria, vaccination hesitancy is becoming a challenge and a barrier to reaching a large proportion of the susceptible population [1] such as PLHIV. The WHO's Strategic Advisory Group of Experts on Immunization (SAGE) defined vaccine hesitancy as the delay in accepting or refusing immunization notwithstanding the availability of vaccination services [30]. COVID-19 vaccine hesitancy has been seen as a worldwide issue. This poses a serious barrier to global efforts to contain the COVID-19 pandemic [24] further, exposing the vulnerable populations such as PLHIV to a greater risk. Hesitation to get vaccinated is complicated and context dependent, ranging over time, region, and type of vaccine, and impacted by characteristics including complacency, comfort, and confidence [31]. Hence, this study aims to assess COVID-19 vaccine hesitancy among PLHIV on ART at SSHM. We anticipated that the findings from this study will provide crucial information that will guide relevant authorities in improving COVID-19 vaccine uptake among PLHIV.

Methods

Study design: a hospital-based cross-sectional study design was conducted to assess COVID-19 vaccine hesitancy among PLHIV receiving ART at the United States President's Emergency Plan for AIDS Relief (PEPFAR) clinic in State Specialist Hospital Maiduguri (SSHM).

Study setting and population: State Specialist Hospital Maiduguri (SSHM) is one of the government-owned secondary healthcare facilities within Maiduguri metropolis, Borno State. The hospital had a total of 3309 PLHIV currently on ART at the time of the study. Respondents that participated in the study are PLHIV receiving ART at SSHM. Inclusion criteria for the study includes being aware of their HIV status; being on ART at SSHM; and being at least 15 years old. The respondents of this study were recruited from an earlier study that assessed the knowledge attitude and practice towards COVID-19 among PLHIV in the same setting [32].

Data resource and measurement

Data collection tool: a structured interviewer-administered questionnaire prepared in English language based on relevant published articles [33,34] and was translated to the participants in their respective local languages for proper understanding and responses.

Data collection: data were collected by three research assistants from 4th January to 25th February 2022 at SSHM. The questionnaire consists of two different sections. The first section contained information on the participants' socio-demographic characteristics, including sex, age, marital status, educational status, employment status and duration on ART. In the second section, participants were asked whether they have received COVID-19 vaccine or if they would be willing to receive the vaccine. Possible reasons for COVID-19 vaccine hesitancy were also assessed. The response modalities were "yes" or "no". A pretest using the prepared questionnaire was carried out among 20 PLHIV who were chosen at random at SSHM and did not participate in the

main study in order to determine the questionnaire's reliability. The pretested questionnaire was then administered to the research participants.

Sample size: Cochran's formula [35] was used to calculate the sample size at 95% level of confidence where Z is taken at 1.96.

$$n_o = \frac{Z^2 pq}{e^2}$$

Due to the lack of a comparable study in the study's location, the prevalence was estimated to be 50%, and the margin of error (e) was set at 5%. The sample size was calculated using the formula to be 384. Cochran's correction formula was used to further adjust the sample size since the study's target population is less than 10,000.

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}$$

Where n is the corrected sample size, n_o is the uncorrected sample size and N is the population size. This correction formula yielded a final sample size of 344. After then, respondents were selected using convenience sampling.

Data analysis: data were checked for completeness and consistency, coded, and entered to Microsoft Excel, 2016 and statistical analysis of the data was performed with Statistical Package for Social Sciences (Version 26). Characteristics of the study participants were described in terms of frequencies and percentages for all the variables. The Chi-square (X^2) statistical test was used to measure the association between the dependent variables (sex, age, marital status, educational status, employment status and duration on ART) and independent variable (COVID-19 vaccine hesitancy) at the bivariate level where; P-values were considered significant at values greater 0.05.

Ethical consideration: the State Specialist Hospital Maiduguri's ethical review and clearance committee provided a letter of approval for the study to be conducted. Study participant's anonymity was maintained, and no personal identifiers were used on the data collection forms. The aim and objectives of the research project were explained to the respondents, and they were assured that their treatment and other services they gain from the hospital will not be influenced by their participation in the study. Finally, they were asked for their informed consent for participation and use of their records for the study and its publication.

Results

Socio-demographic analysis: the socio-demographic characteristics of the respondents are shown in Table 1. Majority, 70.3% (242/344) of the respondents were females and most of the participants, 58.7% (202/344) are 25 years and above. 50.6% (174/344) of the respondents were married, 63.4% (218/344) were literate and only 20.3% (70/344) were employed. All the respondents were receiving ART at Maiduguri State Specialist Hospital (MSSH) and most of them, 56.4% (194/344) were diagnosed with HIV for 5 years or more.

COVID-19 vaccine uptake analysis: of the 344 respondents, only 88 have received COVID-19 vaccine, yielding an uptake rate of 25.6%. Out of the 256 respondents that have not received the vaccine, only 10.5% (27/256) are willing to receive the vaccine while majority, 57.8% (148/256) are not willing to receive the vaccine, and 31.7% (81/256) of the respondents are undecided, thus yielding a hesitancy rate of 89.45% as shown in Table 2.

Reasons for COVID-19 vaccine hesitancy analysis: among the 229 respondents that were hesitant about the COVID-19 vaccine uptake, majority, 46.3% (106/229) cited being worried about vaccine side effects as their reason for the

hesitations. Nineteen point two percent (19.2% (44/229)) had little or no confidence that the vaccine can protect against COVID-19 and 10% (23/229) reported not knowing anyone who died of COVID-19 as their reason for hesitancy. Fourteen percent (14% (32/229)) of the respondents needed more information on the COVID-19 vaccine than what is currently being given to the public while; 10.5% (24/229) did not believe that COVID-19 is real in Nigeria as shown in Table 3.

Bivariate analysis of factors associated with COVID-19 vaccine hesitancy: Table 4 shows the association between the independent variables of the study and COVID-19 vaccine hesitancy of the respondents. There is no any statistically significant association between COVID-19 vaccine hesitancy and the independent variables of the study; where P-value is greater than 0.05.

Discussion

Hesitancy may impair COVID-19 vaccine uptake and hinder the establishment of herd immunity as COVID-19 vaccines are developed and gradually made available [36]. Our study is aimed at assessing COVID-19 vaccine hesitancy among PLHIV; among whom the majority were women, aged 25 years and above, illiterates and unemployed. Despite PLHIV have an increased risk of COVID-19 associated morbidity and mortality [37], our findings revealed that only 25.6% of the participants received the COVID-19 vaccine. This percentage is lower than that of a similar study conducted in USA, where the COVID-19 vaccine uptake rate was reported to be 64% among PLHIV [38]. This low uptake rate reported is largely due to vaccine hesitancy. Our findings also show that only 10.5% of the participants that are yet to receive the COVID-19 vaccine are willing to be vaccinated while, 89.45% are unwilling or hesitant about getting vaccinated. This finding is congruent with that of a similar study conducted in Kano city of northern Nigeria, where COVID-19 vaccine acceptance was reported

to be low among PLHIV [39]. The COVID-19 vaccine hesitancy rate reported in this study is higher than in previous studies among PLHIV [19,35,40]. The high rate of the COVID-19 vaccine hesitancy may largely be attributed to COVID-19 safety concerns, where 46.3% of the participants that are hesitant towards the vaccine cited being worried about the vaccine side effects, despite the WHO, Nigeria's drug regulatory agency, and the National Agency for Food and Drug Administration and Control, approving the COVID-19 vaccine [41]. The safety concerns may be linked to the accelerated development of the vaccine where some people believed that the safety and efficacy of the vaccines may not have been completely captured [42]. Other factor that might have fueled the safety concern is misinformation from social media by anti-COVID-19 vaccine groups. Therefore, the federal and state ministries of health (MOH) should intensify their COVID-19 vaccine public enlightenment campaigns so as to address this concern in order to persuade more people especially the vulnerable groups such as PLHIV to get vaccinated and mitigate corona virus infection.

Other reasons for COVID-19 vaccine hesitancy that was revealed in this study are: lack of total confidence on the vaccine, disbelieve that people can die as a result of COVID-19 infection, inadequate public awareness on the COVID-19 vaccine and disbelieve in the existence of COVID-19 in Nigeria as 10.5% of the participants who are hesitant towards the vaccine do not believe that COVID-19 is real in Nigeria despite the high number of confirmed cases reported in the country. This is mainly due to lack of trust in government, where some people view COVID-19 reports in Nigeria as a hoax and a means of siphoning public funds by corrupt government officials. There was no statistically significant association between the independent variables of the study and vaccine hesitancy, with P-values greater than 0.05. This result is dissimilar to previous studies that reported age, sex, educational status, marital status and duration on

ART and diagnosis being associated with vaccine hesitancy [1,22,38,43,44]. The discrepancy might be due to the low sample size used in this study. Therefore, future studies about COVID-19 hesitancy among PLHIV should use a larger sample size. Our study had a few limitations. Results from the study cannot be generalized because it was a single-centred study with a small sample size. Moreover, the proportion reported to have been vaccinated may be an overestimation of the actual figure. This may have been avoided with a more objective approach to evaluation. Furthermore, unmeasured confounding factors such as prior vaccination experiences could have influenced vaccine hesitancy on a personal level. Despite these drawbacks, the study greatly adds to our understanding of COVID-19 vaccine hesitancy, particularly among PLHIV.

Conclusion

The study assessed COVID-19 vaccine hesitancy among PLHIV. Our findings show that COVID-19 vaccine hesitancy is high among PLHIV mainly due to safety concerns associated with the use of the vaccine. There was no statistically significant association between the independent variables of the study and vaccine hesitancy, where; P-values were significantly considered at values greater than 0.05. As a result, it is recommended that decision-makers at the state and federal ministries of health and other concerned parties such as civil society organisations and non-governmental organisations engaged in HIV care intensify their COVID-19 vaccination sensitisation programs, focusing primarily on health education campaigns about the vaccine's safety and efficacy. Antiretroviral therapy (ART) centres should be leveraged as media for providing accurate information and addressing misconceptions about the vaccine among PLHIV as they receive care and support services because they are more likely to believe vaccine-related information supplied by their primary care providers. Hence, COVID-19 vaccine sensitisation campaigns should also be improved at ART centres.

What is known about this topic

- PLHIV have an increased risk of COVID-19 associated morbidity and mortality;
- Age, sex, educational status, marital status and time since HIV diagnosis are associated with vaccine hesitancy.

What this study adds

- COVID-19 vaccine hesitancy is high among PLHIV in Maiduguri, mainly due to safety concerns associated with the use of the vaccine;
- Other reasons for COVID-19 vaccine hesitancy that was revealed in this study are: lack of total confidence on the vaccine, disbelieve that people can die as a result of COVID-19 infection, inadequate public awareness on the COVID-19 vaccine and disbelieve in the existence of COVID-19 in Nigeria;
- Our findings also show that out of the participants, only few (10.5%) that are yet to receive the COVID-19 vaccine are willing to be vaccinated.

Competing interests

The authors declare no competing interest.

Authors' contributions

All authors contributed equally, read and approved the final manuscript for publication.

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Tables and figures

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Table 3: reasons for COVID-19 vaccine hesitancy analysis among PLHIV at SSHM, Borno State, Nigeria, 2022

Table 4: bivariate analysis of factors associated with COVID-19 vaccine hesitancy among PLHIV at SSHM Borno State, Nigeria, 2022

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Table 1: socio-demographic characteristics of PLHIV at SSHM, Borno State, Nigeria, 2022

Variables	Frequency (N)	Percentage (%)
Sex		
Male	102	29.7
Female	242	70.3
Age (years)		
<25	142	41.3
≥25	202	58.7
Marital status		
Married	174	50.6
Unmarried	170	49.4
Educational status		
Literate	126	36.6
Illiterate	218	63.4
Employment status		
Employed	70	20.3
Unemployed	274	79.7
Duration on ART (years)		
<5	150	43.6
≥5	194	56.4

ART: antiretroviral therapy

Table 2: COVID-19 vaccine uptake among PLHIV at SSHM, Borno State, Nigeria, 2022

Variables	Frequency (N)	Percentage (%)
Have you received COVID-19 vaccine?		
Yes	88	25.6
No	256	74.4
If "No" to the question above, are you willing to receive the vaccine?		
Yes	27	10.5
No	148	57.8
I don't know	81	31.7

Table 3: reasons for COVID-19 vaccine hesitancy among PLHIV at SSHM, Borno State, Nigeria, 2022

Variables (n=256)	Frequency (N)	Percentage (%)
Worried about vaccine side effects	106	46.3
Little/no confidence vaccine protects against COVID-19	44	19.2
Not knowing anyone who died of COVID-19	23	10
I need more information on the COVID-19 vaccine than what is currently being given to the public	32	14
I don't believe that COVID-19 is real in Nigeria	24	10.5

Table 4: bivariate analysis of factors associated with COVID-19 vaccine hesitancy among PLHIV at SSHM, Borno State, Nigeria, 2022

Variables (n=229)	Hesitant	Nonhesitant	χ^2	P-value
Sex				
Male	60 (92.3%)	5 (7.7%)	0.752	0.386
Female	169 (88.5%)	22 (11.5%)		
Age (years)				
<25	103 (93.6%)	7 (6.4%)	3.578	0.059
≥25	126 (86.3%)	20 (13.7%)		
Marital status				
Married	112 (87.5%)	16 (12.5%)	1.035	0.309
Unmarried	117 (91.4%)	11 (8.6%)		
Educational status				
Literate	76 (86.4%)	12 (13.6%)	1.357	0.244
Illiterate	153 (91.1%)	15 (8.9%)		
Employment status				
Employed	40 (87%)	6 (13%)	0.370	0.543
Unemployed	189 (90%)	21 (10%)		
Duration on ART (years)				
<5	109 (90.8%)	11 (9.2%)	0.456	0.499
	120 (88.2%)	16 (11.8%)		