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Research Article

Associations between COVID-19 vaccine hesitancy and the experience of violence among women and girls living with and at risk of HIV in Nigeria[‡]

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Aim: Women and girls living with and at high risk of HIV (WGL&RHIV) had an increased risk for gender-based violence (GBV) during COVID-19. The study aimed to assess the associations between vaccine hesitancy and GBV, HIV status and psychological distress among these vulnerable women and girls in Nigeria.

Methods: This cross-sectional study collected data from WGL&RHIV in 10 states in Nigeria between June and October 2021. The dependent variable was vaccine hesitancy. The independent variables were the experience of physical, sexual, economic and emotional GBV, HIV status and psychological distress during the COVID-19 pandemic. We conducted a multivariable logistics regression analysis to test the associations between vaccine hesitancy and the independent variables and covariates.

Results: Among the 3 431 participants, 1 015 (22.8%) were not willing to be vaccinated against COVID-19. Not knowing or willing to disclose HIV status (aOR 1.40) and having mild (aOR 1.36) and moderate (aOR 1.38) symptoms of anxiety and depression were significantly associated with higher odds of vaccine hesitancy. Being a survivor of intimate partner physical violence (aOR 5.76), non-intimate partner sexual violence (aOR 3.41), as well as emotional abuse (aOR 1.55) were significantly associated with respectively more than five, three and one and half times higher odds of vaccine hesitancy. One positive outcome is that HIV-positive women and girls appeared to be more likely to get the COVID-19 vaccine when available.

Conclusions: Sexual and gender-based violence, low socio-economic status, psychological distress and an unknown HIV status are essential determinants of COVID-19 vaccine hesitancy among vulnerable women and girls in Nigeria. National authorities and civil society organisations need to better integrate COVID-19 mitigation activities with HIV and gender-based violence interventions through a more feminist approach that promotes gender equality and the empowerment of women and girls in all their diversity for better access to health services.

Keywords: gender-based violence, intimate partner violence, psychological distress, sexual violence, women empowerment

[‡]This article is part of a special section on AIDS in the time of COVID-19.

Introduction

COVID-19 vaccine hesitancy — a delay in the acceptance or refusal of vaccination despite the availability of vaccination

services (MacDonald et al., 2015) — is a global concern. Vaccination is one of the most effective ways of achieving herd immunity and halting the COVID-19 pandemic (Anderson & May, 1985). Vaccine uptake can also prevent

medical facilities from being overwhelmed by the care of critically ill patients (Sekizawa et al., 2022). Despite the importance of COVID-19 vaccination, many people are not willing to be vaccinated for reasons ranging from being young (Machida et al., 2021; Ogilvie et al., 2021; Okubo et al., 2021; Soares et al., 2021), having low income (Killgore et al., 2021; Robertson et al., 2021; Williams et al., 2021) and low education status (Daly & Robinson 2021; Paul et al., 2021). Many studies point out that fewer women than men are willing to be vaccinated (Kreps et al., 2020; Edwards et al., 2021; Wang et al., 2021; Yoda & Katsuyama, 2021) despite more women than men being willing to use COVID-19 preventive measures (Galasso et al., 2020). The reasons for the observed female resistance to COVID-19 vaccination are not known.

A factor mediating the association between gender and COVID-19 vaccine hesitancy may be the experience of gender-based violence (GBV). The COVID-19 pandemic is also associated with an increase in the reports of GBV (van Gelder et al., 2020) because of the restricted access of abused individuals to safety nets and a prolonged period of isolation with abusers during the lockdown (UN Women, 2020a; 2020b; Gottert et al., 2021). Victims of GBV often have poor decision-making power and poor self-sufficiency (Dillon et al., 2013). They are also isolated from social networks that may facilitate learning about and access to COVID-19 vaccinations, have poor health-seeking behaviour and use health care services poorly (Rahman et al., 2012).

The weak volition of women who are victims of intimate partner violence (IPV) to seek health care (Kennedy et al., 2012) may result in insufficient access to preventive health care services (Bonomi et al., 2009; Rahman et al., 2012) like COVID-19 vaccinations. Poor access to COVID-19 vaccinations by women victims of IPV may result from direct and indirect partner interference with access to services (McCloskey et al., 2007). Intimate partner violence is also associated with depression and anxiety disorders (Schaefer et al., 2021), which are known risk factors for poor health behaviour (Paine et al., 2019).

Factors associated with IPV may also mediate the pathway associating IPV and COVID-19 vaccine hesitancy. For example, GBV/IPV is associated with an increased risk for HIV infection (Siemieniuk et al., 2013), and COVID-19 vaccine hesitancy is high among people living with HIV (Mesfin et al., 2021; Kaida et al., 2022). Women living with HIV have a higher risk for IPV (Campbell et al., 2008), depression and anxiety disorders (Albert, 2015; McLean et al., 2011) than men. There is, however, nothing known about the association between IPV and vaccine hesitancy among women and the effect that living with HIV may have on the association between IPV and COVID-19 vaccine hesitancy.

The study aimed to assess the associations between GBV and COVID-19 vaccine hesitancy among women and girls living with and at high risk for HIV. The study also aimed to explore the associations between psychological distress, HIV status and COVID-19 vaccine hesitancy among this population of vulnerable women and girls in Nigeria, as well as the reasons for vaccine hesitancy. We hypothesise that women and girls living with and vulnerable to HIV who experienced gender-based violence during the COVID-19 pandemic had higher odds of vaccine hesitancy when

compared with those who did not experience GBV during the pandemic. Those who experienced psychological distress during the COVID-19 pandemic would be more likely to be vaccine hesitant, and there would be a difference in vaccine hesitancy and HIV status and being HIV positive meant being more likely to be COVID-19 vaccine hesitant.

Methods

Ethical considerations

The study protocol was approved by the Institute of Public Health Research Ethics Committees from Obafemi Awolowo University (IPH/OAU/12/1692) and the ethics committee in Lagos State (LS/C.350/S.1/215), Anambra State (MH/AWK/M/321/363), Adamawa State (ADHEC07/06/2021), Akwa Ibom State (MH/PRS/99/Vol.V/994), Benue State (MOH/STA/208/VOL.1/183) and Kaduna State (MOD/ADM/774/VOL.1/1008). Participants were asked to provide their written informed consent before filling out the online questionnaire by ticking a checkbox. A waiver for parental consent for adolescents of 15 to 17 years old was obtained for this non-intrusive sexual and reproductive health research in line with the national guidelines on sexual and reproductive health research conducted with adolescents (Federal Ministry of Health, 2014).

Study design, study sites and study population

This cross-sectional study collected data from June to October 2021, coinciding with the period between Nigeria's second and third waves of the COVID-19 pandemic. Participants were recruited from Adamawa, Akwa Ibom, Anambra, Benue, Kaduna, and Lagos states in Nigeria, using the venue-based and snowball sampling methods. Study participants were also recruited from Enugu, Gombe, Nassarawa and Niger states using the online river sampling method.

The target populations were adolescent girls and women living with or at risk of HIV acquisition as defined by the WHO (<http://www.emro.who.int/asd/health-topics/vulnerable-groups-and-key-populations-at-increased-risk-of-hiv.html>). These were women with disabilities (women who have long-term physical or sensory impairments), women who sell sex (women who engaged in commercial sex work), migrants, refugees and displaced persons (non-Nigerians who have moved across an international border away from their habitual place of residence, and referred to as people on the move from here on), women who use psychoactive substances (women injecting or using illegal drugs), women who engage in transactional sex (entering into a sexual relationship with a man — not the husband — to get needed or important things such as food, clothing, school fees, gifts) and transgender women who were 15 years old and older.

Sample size

The sample size for each of the six target populations for the survey was determined based on comparable surveys of key and vulnerable populations in Nigeria. The pre-survey minimum sample size for this study was set at 60 valid respondents per key population group in each of the six states, corresponding to a minimum sample size of 2 160 participants. From a statistical modelling perspective, we tried to have a minimum of 108 valid participants per vulnerability category at the national level, enabling us

to perform regressions with up to eight predictors with a minimum probability level (p -value) of 0.05.

Study instrument

The questionnaire for the survey contained validated instruments for collecting survey data among women and key populations. The questionnaire was first reviewed for content validity by 18 field workers, followed by 36 community representatives, and then pretested with 18 community members. The questionnaire content was harmonised with standard indicators and protocol checklists used in behavioural surveillance. The data was collected using LimeSurvey™, a web-based survey platform.

The survey was made available in English. Keywords in the questionnaires were translated into Yoruba, Igbo, or Hausa and to specific dialects or local languages that were predominant in the target states. Community leaders validated the translated words. This approach was used to implement the 2005 and 2007 National HIV/AIDS and Reproductive Health surveys, and the 2008 and 2010 Integrated Biological and Behavioural Surveillance surveys conducted in Nigeria.

Study procedures

The study team contacted networks of target populations marked for study participation as part of a community engagement process. The leadership of the networks reviewed the study protocol and data collection instruments with the research team. They gave suggestions for the adjustments of the study protocol before submission to the ethics committee. The networks also suggested which states to recruit study participants from, considering the safety of researchers and study populations and the ease of recruitment of a large number for the study. They also identified the community entry leads for each target population in each state. The community entry leads were connected with organisations that had access to a large population of target community members through their work with community organisations. Recruitment was, therefore, through venue-based sampling.

Community entry leads for adolescent girls and women living with HIV were identified by the African Network of Adolescent and Young Person's Development (ANAYD). The National Association of Persons with Physical Disability (NAPWPD) identified the community entry leads for females living with a disability. The National Sex Workers Association (NSWA) identified the community entry leads for sex workers. YouthRise identified the community entry leads for female drug users. The Northern Nigerian Transgender Initiative identified the community entry leads for transgender women, and Jami Al Hakeem Foundation identified the community entry leads for migrants and refugees.

The research team conducted a three-day online training session for 18 field workers (three per state) and six supervisors. The teams were trained on the administration of the questionnaire, communication with participants, ethics of research engagement and the study implementation process. Field workers were linked to the selected community leads. Each field worker was required to recruit 100 persons per target group per state.

The field workers and supervisors held a two-day,

face-to-face training session with community leads in each state to discuss the study protocol, study tools and their role as seeds for the recruitment of community members. Recruitment strategies were discussed and adjusted to ensure the diversity of recruitment locations (rural, urban, and semi-urban) and socio-economic strata.

The community leads introduced the study to their community members and linked interested study participants with field workers who were at the offices of the community-based organisations working with the target groups in the state. The field workers administered the consent form to the study participants and provided them with a web link to the survey. The questionnaires were filled in independently by participants using a phone, tablet, or computer-assisted self-interviewing. If the participant had literacy issues, the interviewer offered computer-assisted personal interviewing. Interested study participants who came to the study venue and had no electronic devices could access the field worker's device. The personal electronic device used by respondents for the survey could only be used once, thereby limiting multiple survey responses by a respondent.

Respondents were given a face mask and hand sanitiser, valued at about USD 1.00, for use during the data collection process. Physical distancing was observed, and close contact was minimised. Respondents who participated in the study were given airtime vouchers for data/internet usage valued at USD 1.70 (≈NGN 1 000) and coupons to invite up to five peers not connected to the local community organisations. Additional participants were recruited through the river sampling method.

Referrals to health care and other services

All participants were offered referrals to local services if they reported experiencing gender-based violence, rape or suicidal ideation. Information about local services was provided to them through links in the electronic survey that the participant could access while completing the survey, or through a facilitated referral to local community health care workers or services.

Dependent variable of the study

COVID-19 vaccine hesitancy

Study participants were asked about their willingness to take a COVID-19 vaccination by asking if they strongly agree, agree, disagree, or strongly disagree with the statement: "If a vaccine for COVID-19 were available to me, I would get it". Respondents who ticked the options "disagree" or "strongly disagree" were considered vaccine hesitant.

Reasons for vaccine hesitancy

Respondents who identified as vaccine hesitant were required to tick a box for a list of eight options option(s) that best reflected the reason for their hesitancy. These options were "I am afraid of side effects", "I'm against vaccines in general", "I do not trust what the authorities say", "I think the risk to me of getting COVID-19 is low", "It is not a priority for me", "I think it is against my religion", "My family or the person I live with is against it", "I do not have time to go for a vaccine" and "Registering for it could put me in trouble due to my situation" (e.g., I'm an illegal worker, migrant, etc.). Respondents also had the option of writing down the

reason(s) for their hesitancy not reflected by the options available.

Independent variables of the study

One of the independent variables was GBV, defined as any behaviour within an intimate relationship that causes physical, sexual, economic, or emotional harm, including acts of physical aggression, sexual coercion, psychological abuse and controlling behaviours (WHO, 2010). We treated each form of GBV as an independent variable, as well as mental health and self-perception of COVID-19 risks. Other independent variables, such as age, education level, subjective socio-economic status and HIV status, were included as covariates. We describe each variable below.

Economic abuse

We used Stylianou and colleagues' (2013) validated instrument and scale. Study participants were asked two questions to measure their exposure to economic violence: (1) "Since the COVID-19 crisis began, how often did your partner, husband, or parent try to keep you from going to work or school?"; and (2) "Since the COVID-19 crisis began, how often did your partner or husband withhold money, make you ask for money, or take your money?". Possible answers were: "Very often", "Often", "Sometimes", "Rarely", or "Never". Respondents who chose "Very often", "Often", "Sometimes" and "Rarely" were classified as experiencing economic abuse.

Emotional abuse

We used Stylianou and colleagues' (2013) validated instrument and scale. Study participants were asked two questions to measure their exposure to emotional violence. The questions were: (1) "Since the COVID-19 crisis began, how often did your partner, husband, or parent try to keep you from seeing friends and family?"; and (2) "Since the COVID-19 crisis began, how often did your partner or husband try to insult and criticise you?". Possible answers were: "Very often", "Often", "Sometimes", "Rarely" or "Never". Respondents who chose "Very often", "Often", "Sometimes" and "Rarely" were classified as experiencing economic abuse. We combined the scores of the two questions into a single dichotomic variable.

Intimate partner physical violence

Participants were asked the following question: "Since the COVID-19 crisis began, has your partner/s husband slapped, punched, kicked, or shoved you?". The options were: "Yes", "No", "I cannot or do not wish to answer this question". Respondents who chose "Yes" were classified as experiencing intimate partner physical violence.

Intimate partner sexual violence

Participants were asked the following question: "Since the COVID-19 crisis began, has your partner or husband physically forced you to have sexual intercourse or do something sexual when you did not want to?". The options were: "Yes", "No", "I cannot or do not wish to answer this question". Respondents who chose "Yes" were classified as experiencing intimate partner sexual violence.

Non-intimate partner sexual violence

Participants were asked the following question: "Since the COVID-19 crisis began, has someone who is not your regular partner forced or pressured you into sexual activity?". The options were: "Yes", "No", "I don't know", and "I cannot or do not wish to answer this question". Respondents who chose "Yes" were classified as experiencing non-intimate partner sexual violence.

Psychological distress

Psychological distress was measured using the Patient Health Questionnaire-4 (PHQ-4). This four-item inventory uses a four-point Likert-type scale. The instrument screens for depression and anxiety (Kroenke et al., 2009). It was used to screen for psychological distress during the COVID-19 pandemic in Nigeria (Workneh et al., 2021). The possible scores ranged from 0 to 12. Psychological distress was categorised into none (0–2), mild (3–5), moderate (6–8) and severe (9–12).

Subjective perception of the risks associated with COVID-19

The subjective perception of the risks related to COVID-19 infection was assessed. Participants were asked the following question: "Are you worried that you or someone in your immediate family may become seriously ill from COVID-19?". Possible answers were "Very worried", "Somewhat worried", "Not too worried", and "Not worried at all". The first two choices of answers were grouped as "Yes", and the last two as "No".

Covariates

We included sociodemographic variables such as age (grouped as adolescent girls and young women (15–24 years old), adults (25–44 years old) and older adults (≥ 45 years old), educational achievement (primary level, secondary level and post-secondary level), subjective socio-economic status (terciles) and HIV status as covariates. HIV status was self-reported in response to the question "Do you know your HIV status?". The response options were "I am HIV positive", "I am HIV negative", "I do not know my HIV status" and "I cannot or do not want to answer this question". Considering that people do not test for the same reason they do not disclose their HIV status (Kingdon et al., 2016; Grainger, 2017; Nwaozuru et al., 2019), "I do not know" and "I do not want to answer this question" were combined into a single response.

Data analysis

We conducted a descriptive analysis for all the study variables, including the tests of independence using the Pearson chi-squared. We controlled for any confounding role among covariates. The multivariable logistic regression accounts for eventual interactions between age and educational achievement as well as between each type of gender-based violence. Statistical significance was taken at a p -value less than 0.05. All statistical analyses were performed using Stata 16.

Results

Sociodemographic characteristics

Table 1 shows that among the 4 446 valid participants, 1 015 (22.8%) indicated they were not willing to be vaccinated against COVID-19. Adolescent girls and young women have the highest proportion of vaccine hesitancy (30.1%). Those with no formal education or who only completed primary school have a higher proportion (28.9%) of vaccine hesitancy, but this should be put in relation to the 15-to-24-year-old age group. Among the lower tercile of the subjective socio-economic status, we find the largest share (30.1%) of vaccine hesitancy. Regarding HIV status, women and girls living with HIV have the smallest proportion (19.9%) of vaccine hesitancy. Conversely, those who do not know their HIV status have the largest proportion of vaccine hesitancy (38.3%).

Variables associated with COVID-19 vaccine hesitancy

Table 2 shows the results of the multivariable logistic regression for vaccine hesitancy. Survivors of intimate partner physical violence have higher odds (aOR 5.76; 95% CI 1.86–17.85) of being hesitant to get the COVID-19 vaccine compared to those not reporting such gender-based violence. Similarly, adolescent girl and women survivors of non-intimate partner sexual violence have higher odds (aOR 3.41; 95% CI 1.04–11.87) to be vaccine hesitant compared to those who did not face such violence. Regarding mental health, women and girls with mild (aOR 1.36; 95% CI 1.09–1.70) or moderate (aOR 1.38; 95% CI 1.09–1.76) symptoms of anxiety or depression had significantly higher odds of being vaccine hesitant compared to those with no symptoms of anxiety and depression. Compared to women and girls who are HIV

Table 1. Sociodemographic characteristics of women and girls living with and most at risk of HIV in Nigeria, in terms of vaccine hesitancy

| Variable | Not vaccine hesitant | | Vaccine hesitant | |
|--|--|-------|------------------|-------|
| | <i>n</i> | % | <i>n</i> | % |
| Total participants (<i>N</i> = 4 446) | 3 431 | 77.2 | 1 015 | 22.8 |
| Age group (years) | Pearson's $\chi^2(2) = 83.9330, p < 0.001$ | | | |
| 15–24 | 1 185 | 69.9 | 510 | 30.1 |
| 25–44 | 1 965 | 82.1 | 429 | 17.9 |
| 45+ | 281 | 78.7 | 76 | 21.3 |
| Subjective socioeconomic status | Pearson's $\chi^2(2) = 4.5829, p < 0.001$ | | | |
| Lower tercile | 1 116 | 69.9 | 480 | 30.1 |
| Middle tercile | 1 516 | 80.7 | 362 | 19.3 |
| Higher tercile | 761 | 82.3 | 164 | 17.7 |
| Missing | 38 | 80.9 | 9 | 19.1 |
| Highest level of education | Pearson's $\chi^2(2) = 40.9267, p < 0.001$ | | | |
| From none to primary education | 968 | 71.1 | 394 | 28.9 |
| Secondary education | 1 617 | 79.4 | 419 | 20.6 |
| Post-secondary or university degree | 829 | 80.5 | 201 | 19.5 |
| Missing | 17 | 94.4 | 1 | 5.6 |
| HIV status | Pearson's $\chi^2(2) = 76.4358, p < 0.001$ | | | |
| Negative | 1 452 | 77.8 | 415 | 22.2 |
| Positive | 1 621 | 80.1 | 403 | 19.9 |
| Don't know/Won't say | 303 | 61.7 | 188 | 38.3 |
| Missing | 55 | 85.9 | 9 | 14.1 |
| Symptoms of anxiety and depression | Pearson's $\chi^2(3) = 7.5762, p = 0.056$ | | | |
| None | 812 | 80.2 | 201 | 19.8 |
| Mild | 984 | 75.4 | 321 | 24.6 |
| Moderate | 808 | 76.9 | 243 | 23.1 |
| Severe | 527 | 77.7 | 151 | 22.3 |
| Missing | 300 | 75.2 | 99 | 24.8 |
| Gender-based violence | | | | |
| Intimate partner economic abuse | $\chi^2(1) = 35.88, p < 0.001$ | | | |
| <i>n</i> = 1 733, missing = 17 | 1 421 | 82.00 | 312 | 18.00 |
| Intimate partner emotional abuse | $\chi^2(1) = 4.068, p = 0.044$ | | | |
| <i>n</i> = 1 652, missing = 20 | 1 305 | 79.00 | 347 | 21.00 |
| Intimate partner physical violence | $\chi^2(1) = 9.11, p = 0.003$ | | | |
| <i>n</i> = 342, missing = 6 | 242 | 70.76 | 100 | 29.24 |
| Intimate partner sexual violence | $\chi^2(1) = 0.00, p = 0.997$ | | | |
| <i>n</i> = 264, missing = 6 | 204 | 77.27 | 60 | 22.73 |
| Non-intimate partner sexual violence | $\chi^2(1) = 1.36, p = 0.243$ | | | |
| <i>n</i> = 264, missing = 5 | | | | |
| Self-assessment of COVID-19 risks | Pearson's $\chi^2(1) = 221.44, p < 0.001$ | | | |
| Yes | 2 136 | 62.26 | 365 | 35.96 |
| No | 1 266 | 36.90 | 640 | 63.05 |
| Missing | 29 | 0.85 | 10 | 0.99 |

Table 2. Association between vaccine hesitancy and gender-based violence between adolescent girls and women living with or at high risk of HIV in Nigeria

| Vaccine hesitancy | aOR | p-value | 95% CI | |
|--|-----------|---------|--------|--------|
| Age group (years) | | | | |
| Adolescent girls & young women (15–24) | 1.579 | 0.001 | 1.217 | 2.049 |
| Adults (25–44) | base | | | |
| Older adults (45+) | 1.166 | 0.613 | 0.643 | 2.115 |
| Education level | | | | |
| None to primary education | 1.529 | 0.003 | 1.161 | 2.015 |
| Secondary education | base | | | |
| Post-secondary or university degree | 1.364 | 0.035 | 1.022 | 1.821 |
| Socio-economic status | | | | |
| Lower tercile | 1.655 | 0.000 | 1.375 | 1.992 |
| Middle tercile | base | | | |
| Higher tercile | 1.021 | 0.863 | 0.806 | 1.293 |
| Symptoms of anxiety and depression | | | | |
| None | base | | | |
| Mild symptoms | 1.362 | 0.007 | 1.090 | 1.701 |
| Moderate symptoms | 1.384 | 0.007 | 1.092 | 1.755 |
| Severe symptoms | 1.237 | 0.133 | 0.937 | 1.633 |
| HIV status | | | | |
| HIV-negative | base | | | |
| HIV-positive | 0.767 | 0.004 | 0.640 | 0.918 |
| Don't know or cannot answer | 1.397 | 0.010 | 1.083 | 1.804 |
| Gender-based violence | | | | |
| Intimate partner economic abuse | 0.809 | 0.228 | 0.574 | 1.141 |
| Intimate partner emotional abuse | 1.552 | 0.009 | 1.115 | 2.162 |
| Intimate partner physical violence | 5.755 | 0.002 | 1.855 | 17.853 |
| Intimate partner sexual violence | 3.412 | 0.128 | 0.704 | 16.541 |
| Non-intimate partner sexual violence | 3.522 | 0.042 | 1.045 | 11.872 |
| Self-assessment of COVID-19 risks | 0.286 | 0.000 | 0.240 | 0.342 |
| Constant | 0.242 | 0.000 | 0.183 | 0.320 |
| Number | 3 681 | | | |
| Log likelihood | –1 852.55 | | | |
| Likelihood ratio $\chi^2(40)$ | 217.02 | | | |
| Probability > χ^2 | 0.000 | | | |

negative, those living with HIV have lower odds (aOR 0.77; 95% CI 0.64–0.92) of being vaccine hesitant, while those who ignore their HIV status have higher odds (aOR 1.40; 95% CI 1.08–1.80) of being vaccine hesitant when a COVID-19 vaccine is available to them.

Other factors associated with COVID-19 vaccine hesitancy were age, education and socio-economic status. Adolescent girls and young women of 15 to 24 years old had significantly higher odds (aOR 1.58; 95% CI 1.22–2.05) of being vaccine hesitant compared with adults. Participants from the lowest socio-economic status tercile had higher odds (aOR 1.66; 95% CI 1.38–1.99) of being vaccine hesitant compared to the middle socio-economic tercile. Unsurprisingly, participants who reported being worried about themselves or someone in their immediate family becoming seriously ill from COVID-19 had lower odds (aOR 0.29; 95% CI 0.24–0.34) of being vaccine hesitant.

Table 3 shows that when participants were asked why they were vaccine hesitant, almost half (45.8%) of the participants said they were afraid of side effects. A fifth (20.4%) of participants reported being against vaccines in general, and more than one participant out of six (17.5%) reported not trusting what the authorities say. For more than 13% of participants, one of the reasons for being vaccine hesitant

was either because they think the risk for them of getting COVID-19 is low or the vaccine is not a priority for them.

Discussion

This study suggests that about one in five women and girls living with and at risk of HIV in Nigeria participating in the survey were COVID-19 vaccine hesitant. The study found that gender-based violence plays a role in vaccine hesitancy among vulnerable women and girls. In particular, women who experienced intimate partner physical violence and emotional abuse, as well as those survivors of non-intimate partner sexual violence, had a higher likelihood of vaccine hesitancy. Adolescents and girls living with HIV had a lower likelihood of being vaccine hesitant, while those who did not know their HIV status had a higher odds of being vaccine hesitant than HIV-negative participants. Mental unwellness was associated with vaccine hesitancy, particularly in those with mild to moderate psychological distress symptoms during the COVID-19 pandemic. The top three reasons for vaccine hesitancy were concerns about the vaccine's side effects, being against vaccination in general and not trusting the government authorities. The study findings partially supported the study hypotheses.

Table 3. What are the reasons you are not sure you want a vaccine for COVID-19?

| Reasons (multiple choices possible) among those who were vaccine hesitant (<i>n</i> = 1 015) | Yes | | No | |
|---|----------|------|----------|------|
| | <i>n</i> | % | <i>n</i> | % |
| I am afraid of side effects | 511 | 45.8 | 605 | 54.2 |
| I'm against vaccines in general | 228 | 20.4 | 888 | 79.6 |
| I do not trust what the authorities say | 195 | 17.5 | 921 | 82.5 |
| I think the risk to me of getting COVID-19 is low | 150 | 13.4 | 966 | 86.6 |
| It is not a priority for me | 147 | 13.2 | 969 | 86.8 |
| I think it is against my religion | 40 | 3.6 | 1 076 | 96.4 |
| My family or the person I live with is against it | 35 | 3.1 | 1 081 | 96.9 |
| I do not have time to go for a vaccine | 18 | 1.6 | 1 098 | 98.4 |
| Registering for it could put me in trouble due to my situation (e.g., I'm an illegal worker, migrant, etc.) | 5 | 0.4 | 1 111 | 99.6 |

One of the study's strengths was recruiting a large and diverse population of women and girls living with and vulnerable to HIV. This enabled us to conduct inter-group comparisons and identify even minor differences. We also identified risk indicators for vaccine hesitancy for a population at high risk of being left behind in the national COVID-19 vaccine programming because they are hard to reach. Our findings can, therefore, inform the design and implementation of vaccine hesitancy responses for these vulnerable populations as the country continues to witness the impact of the COVID-19 pandemic.

The study, however, has some limitations. It is a cross-sectional study, so the results cannot infer cause-effect relationships. The convenient sample limits the generalisability of the study findings to the general population, and caution needs to be taken when trying to extrapolate the results of this study to the general population. However, we believe the study design was appropriate for the research question. Using multiple sampling techniques suitable for sampling hidden populations helped reach out to diverse participants. It minimised the risk of exclusion due to a lack of internet-enabled devices or reading impairment. Also, access to field workers reduces the bias that an exclusive online recruitment strategy could bring to the sampling. Despite these limitations, our study findings raise a few pertinent issues discussed below.

First, the proportion of women and girls living with and vulnerable to HIV who were vaccine hesitant in the current study was lower than the 31.6% reported among pregnant women in south-eastern Nigeria (Ogbuabor & Chime, 2021), 35.4% to 44.5% among health care workers (Adejumo et al., 2021); close to the lower limit of 20% reported for adults in Nigeria (Olu-Abiodun et al., 2022); but higher than the 19.1% among a convenience sample of adults in Nigeria (Adedeji-Adenola et al., 2022). This result indicates that women and girls living with and vulnerable to HIV may get vaccinated if they have access to the vaccine. Only 9.6% of the general population had been vaccinated in June 2022 (Reuters COVID-19 Tracker, 2022). Strategic efforts should be made to reach this critical mass of likely vaccine adopters when vaccines are made more accessible to Nigerians.

Targeted interventions are required for women and girls living with and vulnerable to HIV infection to address their concerns about COVID-19 vaccines. Concerns about the side effects of the vaccine, trust in the government and poor interest in vaccination can be addressed through literacy

campaigns. In particular, women and girls living with and vulnerable to HIV who do not know their HIV status need to be targeted strategically for COVID-19 vaccination campaigns. HIV-positive individuals who ignore their HIV serostatus should be prioritised to access COVID-19 vaccines to reduce the risk for morbidity and mortality (Danwang et al., 2022). This sub-population of women and girls may be high-risk takers with a low perception of health risk (Clifton et al., 2016), or they have poor health literacy, which may be the reason for their low uptake of HIV testing (Palumbo, 2015). These postulations need to be investigated further.

Second, the study found that intimate partner physical and emotional violence, as well as non-intimate partner sexual violence, may be a risk factor for COVID-19 vaccine hesitancy. Survivors of intimate partner violence are more than five times likely to be vaccine hesitant. Victims of emotional abuse by husbands, partners or parents are more than one and a half times likely and survivors of non-intimate partner sexual violence are more than three times likely to be vaccine hesitant. This result indicates that, in addition to concerns about the safety of the vaccine (Adedeji-Adenola et al., 2022; Olu-Abiodun et al., 2022) and the lack of trust in the government (Rzymiski et al., 2021; Latkin et al., 2021; Verger et al., 2021; Olu-Abiodun et al., 2022) driven by widespread misinformation about the vaccines (Wells & Galvani, 2022), there might be a female dimension to vaccine hesitancy (WHO, 2021), which in this case, is gender-based violence.

Gender-based violence may be a critical factor moderating the efficacy of the COVID-19 vaccine in HIV-positive individuals who are willing to be vaccinated. GBV increases the risk of poor adherence to antiretroviral therapy (Biomndo et al., 2021; Siemieniuk et al., 2013) and the risk of a fall in CD4 counts (Anderson et al., 2018), and the vaccine is advocated for use in people living with HIV on antiretroviral therapy (Gong et al., 2022). Nevertheless, the effectiveness of COVID-19 depends on high CD4 counts (Hassold et al., 2022). This link between GBV, poor adherence to antiretroviral therapy and low CD4 counts could place women living with HIV who experience GBV at increased risk for low COVID-19 vaccine effectiveness. This postulation should be studied further.

We also feel that the experience of psychological distress may have moderated the association between COVID-19 vaccine hesitancy and physical and emotional gender-based

violence. Psychological distress (Beydoun et al., 2012; Chuang et al., 2012; Devries et al., 2013; Dillon et al., 2013) is associated with IPV (Pico-Alfonso et al., 2006; Renner et al., 2014) and COVID-19 vaccine hesitancy (Okubo et al., 2021; Xu et al., 2021; Sekizawa et al., 2022). A few studies have, however, shown no association between psychological distress and COVID-19 vaccine hesitancy (Bai et al., 2021; Bendau et al., 2021; Killgore et al., 2021), and others had shown no association between psychological distress and other disease-related vaccination hesitancy (Chan et al., 2015; Lawrence et al., 2020; Mohammed et al., 2020). These studies that showed associations between psychological distress and vaccination hesitancy were not gender-focused. There is a gender dimension to psychological distress, particularly when it is linked to gender-based violence. More studies are needed to determine if mental health disorders may modulate our postulation of the gender connection with vaccine hesitancy.

Finally, we found that younger respondents and those with low socio-economic status were more likely to be vaccine hesitant as prior studies had identified (Robertson et al., 2021; Lee & Huang, 2022). The implications of having a large population of unvaccinated young people should not be underestimated. The high risk for asymptomatic carriers to spread COVID-19 (Jiang et al., 2020; Li et al., 2020; Murata et al., 2021) and the continued public health risk of virus mutation in communities with low vaccine coverage exist. Vaccinated individuals are less likely to spread the virus (Harris et al., 2021). Targeted interventions are needed for young women and girls living with and at risk of HIV as well as those who are socio-economically disadvantaged who are at more risk of COVID-19 (Niedzwiedz et al., 2020). Additional studies on the determinants of youth's hesitancy in Africa are needed and will help design targeted messages for these sub-populations.

Conclusion

The study showed that about one in five women and girls living with and vulnerable to HIV in Nigeria participating in the survey express COVID-19 hesitancy. Sociodemographic factors such as low socio-economic status or low education achievement appear to be associated with vaccine hesitancy. Alarmingly, the hesitation to get vaccinated for COVID-19 is more than five times higher among survivors of gender-based violence. One encouraging outcome is that women and girls living with HIV appear more likely to get vaccinated than HIV-negative individuals. Conversely, those who ignore their HIV status are statistically more likely to be vaccine hesitant.

Therefore, the COVID-19 vaccine hesitancy reported by women living with and at risk of HIV in Nigeria appears to result from intersectional factors that keep these women and girls away from much-needed health services. National COVID-19 interventions need to be better integrated with HIV and gender-based violence interventions through a more feminist approach that promotes gender equality and the empowerment of women and girls in all their diversity. It is the right and sustainable way to reduce poverty and inequality and promote access to health services.

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