

Symptoms and Factors Associated with COVID-19 Vaccination among Key Populations Enrolled in Different One Stop Shops in Nigeria

Bartholomew Ochonye¹, Olaniyi Felix Sanni¹, Roger Abang¹, Olugbemi Motilewa², Abiye Kalaiwo³, Paul Amechi¹, Paul Umoh¹, Nanribet Mwoltu¹, Godwin Emmanuel¹

¹Research and Heartland Alliance, Abuja, Nigeria. ²Department of Community Health, University of Uyo Teaching Hospital, Uyo
³Program Management, USAID, Abuja, Nigeria

ABSTRACT

Background: Even though vaccination is one of the most efficient ways of treating infectious diseases like COVID-19, it is frequently hampered by hesitancy and resistance due to fear of certain symptoms and vaccine safety concerns.

Method: The study employed a retrospective design. The population comprised Key Populations (KPs) in Nigerian One Stop Shops (OSS). Five key population (KP) groups were examined across six states. Data spanning a period of three years and four months (May 2019 to September 2022) were sourced from Heartland Alliance OSS databases. Data was analysed using IBM-SPSS version 28.

Result: Among the participants, 99.3% reported no symptoms, compared to 0.7% who encountered certain symptoms after COVID-19 vaccination. Further examination based on vaccination status revealed that 81.5% of fully vaccinated KPs encountered specific symptoms, contrasting with a lower incidence of 18.4% among those who received booster doses. Fatigue (38.5%) emerged as the most prevalent post-vaccination symptoms. Notably, participants above 50 years were (AOR=1.582, 95% CI: 0.97 – 2.281) more likely to experience symptoms after vaccination compared to KPs under 20 years. KP categories demonstrated varying susceptibilities, with Persons Who Inject Drugs (PWID) being (AOR=4.532, 95% CI: 3.606 – 5.696) times more likely to experience symptoms compared to Men who have Sex with Men (MSM) and KPs in prison. Female Sex Workers (FSW) (AOR=2.965, 95% CI: 2.174-4.044) and KP's in prisons (AOR=2.735, 95% CI: 2.010– 3.722) also exhibited elevated likelihoods of post-vaccination symptoms compared to MSM. Surprisingly, Antiretroviral therapy (ARV) increased the likelihood of symptoms (AOR=1.833, 95% CI: 1.1538-2.184). In addition, Pre-Exposure Prophylaxis (PrEP) users had a higher symptom rate than non-users (AOR=3.098, 95% CI: 2.579-3.720).

Conclusion: This study underscores the critical role of safe and effective COVID-19 vaccination among key populations in Nigeria. Vigilance in monitoring and addressing symptoms and promoting public confidence in vaccination programs should be encouraged.

Keywords: Adverse effect, Key population, Vaccination, One-stop-shop, COVID-19.

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INTRODUCTION

As there is presently no generally accepted medicinal strategy for COVID-19, the primary way of management remains the use of safe and effective vaccination.¹ However, the efficacy of this strategy is now being harmed by vaccination hesitancy and resistance, which can be ascribed to concerns about potential harmful effects and safety difficulties. To achieve global eradication of COVID-19, a minimum of 70% of the

global population must be vaccinated against the virus.² However, Nigeria fell short of the 70% vaccination barrier required for eliminating COVID-19 by the end of 2022, as only 30.5% of the Nigerian population had full COVID-19 immunisation status as of February 2023.^{3,4}

Vulnerable groups such as key populations: Female sex workers (FSW), Men who have sex with men (MSM), and People who inject drugs (PWID) are more at risk of getting

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Address for Correspondence: Dr. Olaniyi Felix Sanni,

Research and Development Department, Heartland Alliance, Abuja, Nigeria.

E mail: sfelix@heartlandalliancenerigeria.org

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the virus through factors such as close physical contact with people through social, drug, and sexual behaviours; incarceration also plays a significant role.^{5,6} However, even though vaccination is one of the most efficient ways of treating infectious diseases like COVID-19 and among Key populations, it is frequently hampered by hesitancy and resistance due to fear of adverse effects and vaccine safety concerns.⁷ Although at present, no vaccine can be deemed devoid of adverse reactions entirely, most of such reactions are preventable or treatable, and symptoms such as headaches, fever and discomforts are related to immune surge.⁸ Symptoms or adverse reactions may emanate life-threatening reactions or mild side effects, and they may incite public apprehension regarding the safety of vaccines.⁶

Despite the availability of COVID-19 immunisations in Nigeria, there remains a substantial lack of vaccine acceptance.⁹ Many people have reservations about obtaining COVID-19 immunisations due to possible symptoms. According to the Centers for Disease Control and Prevention (CDC), in 2021, every symptom or side effect that occurs after vaccination is classified as an adverse event (AE).¹³ The global incidence of adverse events related to COVID-19 vaccination varies depending on the individual vaccine used. Weariness, headache, muscle and joint stiffness, low-grade fever, and soreness or redness at the injection site are typical symptoms.^{14,15}

Moreover, there is a scarcity of data on post-vaccination safety to support research regarding symptoms encountered after COVID-19 vaccination in key populations, which is a driver of vaccine hesitancy because symptoms following COVID-19 vaccination in populations may lead to vaccination unwillingness, which may act as a barrier to controlling the pandemic with its associated negative consequences.^{16,18} Hence, this study aims to examine the symptoms and factors associated with COVID-19 vaccination among key populations enrolled in different One stop shop in Nigeria

METHODOLOGY

Study Design

The factors related to symptoms following COVID-19 immunisation in KPs enrolled in Heartland alliance Ltd/Gte one stop shop (HALG OSS) in Nigeria were investigated using a retrospective study design. The factors examined mainly include sociodemographic characteristics such as gender, age category, target group, also ARV and PrEP Status. Purposive sampling method was employed to selectively choose participants who met the predetermined inclusion criteria for the study, which focused on five distinct groups: female sex workers (FSW), men who have sex with men (MSM), prison inmates, people who inject drugs (PWID), and transgender (TG) Individuals. The study area comprised of six Nigerian states: Lagos, Bayelsa, Cross River, Akwa Ibom,

Jigawa, and Niger. During the study period, HALG OSS presence was notable in these locations.

Data Source

Data for this study were taken from the HALG OSS database in the six selected states for three years and four months, beginning in May 2019 and ending in September 2022.

Study Population

The study population involved respondents who fell into the categories of key population in the six selected states in Nigeria (FSW, MSM, Prison Inmates, PWID, and Transgender Individuals (TG).

Inclusion and Exclusion Criteria

Participants must meet various requirements to be considered for inclusion in the study. They must first identify as a KP member. Second, they must be immunised against COVID-19. They must also be at least 18 years old. Finally, they must be currently using HALG services. On the other hand, specific conditions preclude persons from participating in the study. These include not identifying as a KP, not getting immunised against COVID-19, and individuals below the age of 18.

Data Analysis

The datasets were thoroughly cleansed before analysis in Microsoft Excel to verify their quality and completeness. This included removing duplicate records, filling in missing values, and ensuring data integrity. After cleaning the data, it was loaded into IBM SPSS Statistical package for further analysis. Descriptive statistics were utilised to summarise the sociodemographic and clinical features of the study population, including computing frequencies and percentages for age, gender, target group, source of referral, vaccination category, HIV status, and participants on PrEP and ARV. A logistic regression study was also performed to investigate the relationship between sociodemographic and clinical factors and the adverse impact status of KPs. The odds ratios (ORs) and 95% Confidence Intervals were determined, and factors with a p-value of less than 0.05 in the univariate analysis were included in the multivariate model. All statistical tests were two-sided, and statistical significance was defined as a p-value less than 0.05.

Ethical consideration

This study used the Heartland Alliance's approved KP-CARE 1 ethical clearance for project implementation research. Following HALG's consent to use the KPs' data, this was modified to ensure stringent data protection and security compliance. To protect the confidentiality and privacy of participants' records, rigorous procedures were implemented to anonymise and securely store the collected data.

RESULTS

Social demographics of vaccinated Key population Enrolled in OSS in Nigeria

As shown in Table 1, a higher proportion of the participants are male (50.1%) compared to female (49.9%). A significant proportion of the participants fall within the age bracket of 21-30 (43.4%) and 31 -40 (29.9%). The target group consist mainly of FSW (43.0%) followed by MSM (28.8%) and PWID (17.3%). The major source of referrals for vaccination was termed "others", consisting of 48.7% of the population, followed by community facilitators referrals (36.5%), self-referrals (11.5%) and referrals from counsellor testers (3.3%). A significant proportion of the respondents are HIV Negative (72.2%) compared to participants living with HIV (27.8%). Notably, all HIV-positive respondents are on ARV. Lastly, 12.7% of the KP's are on PrEP.

Table 1: Social demographics of Key population Enrolled in OSS in Nigeria

Variable	Frequency n= 120298	Percentage (%)
Gender		
Male	60225	50.1
Female	60073	49.9
Age Category		
Below 20	9528	7.9
21 - 30	52168	43.4
31 - 40	35980	29.9
41 - 50	15676	13.0
Above 50	6946	5.8
Target Group		
MSM	34605	28.8
FSW	51771	43.0
PWID	20810	17.3
TG	4062	3.4
Prisons	9050	7.5
Source of referral		
Community Facilitator	43930	36.5
Counselling tester	3975	3.3
*Others	58552	48.7
Self	13841	11.5
Vaccination Status		
Partially Vaccinated	8979	7.5
Fully Vaccinated	100915	83.9
Booster	10404	8.6
HIV Status		
Negative	86836	72.2
Positive	33462	27.8
On PrEP		
No	105061	87.3
Yes	15237	12.7
On ARV		
No	86836	72.2
Yes	33462	27.8

*Others - non-governmental organizations, Primary care physicians, friends or family members

Figure 1 examines the proportion of the Key population who recorded certain symptoms after vaccination. The findings revealed that most participants (99.3%) did not experience any symptoms after vaccination compared to those who experienced specific symptoms (0.7%).

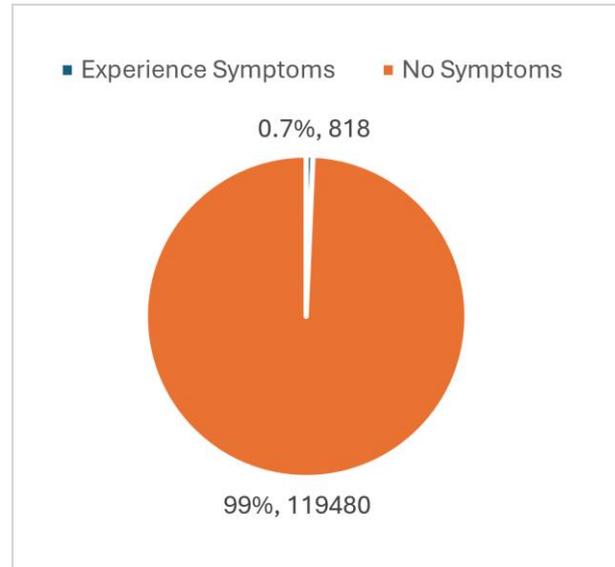


Figure 1: Symptoms of COVID-19 Vaccination among Key Population

Regarding symptoms reported post-COVID-19 vaccination within the key population. The data indicates that 81.5% of fully vaccinated participants experienced one or two symptoms following vaccination. Remarkably, among individuals who received booster doses, only a minority (18.4%) reported vaccination-related symptoms.

Figure 2 shows a range of symptoms experienced by the participants after vaccination. The most common symptoms experienced after the vaccination were Fatigue (38.5%), Headache (29.0%) and Muscle pain (23.0%).

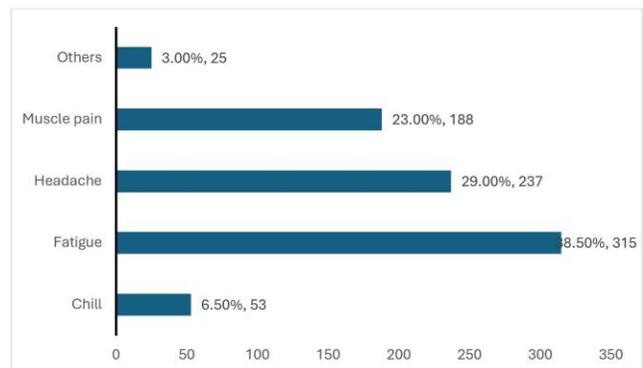


Figure 2: Symptoms Experienced after COVID-19 Immunization

Table 2: Association between social demographic factors and symptoms experienced after COVID-19 vaccination among Key populations enrolled in OSS in Nigeria

Variable	Experienced Symptoms (%)	No Symptoms	COR (95% CL)	p-value	AOR (95% CL)	p-value
Gender						
Male	383 (0.6)	59842 (99.4)	Ref	-	Ref	-
Female	435 (0.7)	59638 (99.3)	1.140 (0.993 -1.308)	(0.063)	0.805 (0.628 -1.033)	0.088
Age Category						
Below 20	52 (0.5)	9476 (99.5)	Ref	-	Ref	-
21 - 30	284 (0.5)	51884 (99.5)	0.997 (0.742 -1.342)	0.987	0.953 (0.707 - 1.284)	0.751
31 - 40	283 (0.8)	35697 (99.2)	1.445 (1.074 -1.943)	0.015*	1.289 (0.961 - 1.752)	0.089
41 - 50	132 (0.8)	15544 (99.2)	1.548 (1.122 -2.135)	0.008*	1.316 (0.951 - 1.821)	0.097
Above 50	67 (1.0)	6879 (99.0)	1.775 (1.234 -2.553)	0.002*	1.582 (1.097 - 2.281)	0.014*
Target Group						
MSM	115 (0.3)	34490 (99.7)	Ref	-	Ref	-
FSW	385 (0.7)	51386 (99.3)	2.247 (1.824 -2.769)	(<0.001)*	2.965 (2.174 -4.044)	(<0.001)*
PWID	244 (1.2)	20566 (98.8)	3.558 (2.849 -4.444)	(<0.001)*	4.532 (3.606 - 5.696)	(<0.001)*
TG	6 (0.1)	4056 (99.9)	0.444 (0.195 -1.009)	0.052	0.519 (0.227 - 1.187)	0.120
Prisons	68 (0.8)	8982 (99.2)	2.271 (1.681 -3.067)	(<0.001)*	2.735 (2.010 - 3.722)	(<0.001)*
On ARV						
No	557 (0.6)	86279 (99.4)	Ref	-	Ref	-
Yes	261 (0.8)	33201 (99.2)	1.218 (1.051 -1.411)	0.009*	1.833 (1.1538 - 2.184)	(<0.001)*
ON PREP						
No	622 (0.6)	104439 (99.4)	Ref	-	Ref	-
Yes	196 (1.3)	15041 (98.7)	0.457 (0.389 -0.537)	(<0.001)*	3.098 (2.579 - 3.720)	(<0.001)*

*Statistical significance ($p \leq 0.05$)

Association between Social demographic factors and symptoms experienced after COVID-19 vaccination among Key population enrolled in OSS in Nigeria

Table 2 evaluates the incidence of the symptoms reported by the key population following vaccination. Vaccination symptoms were recorded more in females (0.7%) than males (0.6%). Participants above 50 years were 1.582 [95% CI 0.97 - 2.281; $P = 0.014$] more likely to experience symptoms after vaccination compared to KP's under 20. The target group category shows that PWID were 4.532 [95% CI 3.606 - 5.696; $P < 0.001$] times more likely to experience certain symptoms after COVID-19 vaccination than FSW 2.965 [95% CI 2.174-4.044; $P < 0.001$] and KP's in prisons 2.735 [95% CI 2.010 - 3.722; $P < 0.001$]. Incidence of vaccination symptoms was higher among participants on ARV treatment (0.8%) with an AOR of 1.833 [95% CI 1.1538- 2.184; $P < 0.001$] when compared to KP's not on ARV. Similarly, the incidence of symptoms after COVID-19 vaccination was experienced more (1.3%) among participants on PrEP treatment and were 3.098 [95% CI 2.579- 3.720 $P < 0.001$] more likely to experience symptoms after vaccination when compared to KP's not on PrEP.

DISCUSSION

This study investigated the factors associated with symptoms following immunisation of the COVID-19 vaccine among Key populations enrolled in different One Stop Shops (OSS) in Nigeria. The use of safe and effective vaccination is critical

in the management and containment of pandemics. Vaccines remain a crucial component in preventing and controlling infectious disease epidemics. Concerns about potential side effects or symptoms have kept many from getting vaccines.¹⁹ As a result, extensive research on vaccination symptoms is essential to inform and educate the key population effectively.

The study found that most participants did not experience any post-COVID-19 vaccination symptoms (99.3%) compared to those 0.7% of KP who experienced symptoms. The low incidence of symptoms following COVID-19 vaccination could result from adequate training and competence among healthcare personnel who deliver vaccines, reducing the likelihood of errors and adverse events. However, these findings contradict the findings of Boi-Dsane et al. —18 where a higher proportion (50.5%) recorded incidence of symptoms after COVID-19 vaccination. Continuous professional development and training in vaccination practices are needed to maintain minimal vaccination symptoms. The effectiveness and safety profile of vaccines are crucial factors influencing the occurrence of adverse reactions or symptoms.

The overwhelmingly low incidence of post-COVID-19 vaccination symptoms among key populations will likely bolster public confidence in COVID-19 vaccination programs. Trust in the safety and efficacy of vaccines is crucial for achieving high vaccination coverage and controlling the spread of the virus.²⁰

The findings also reveal that a significant percentage of participants who experienced post-COVID-19 vaccination

symptoms were fully vaccinated (81.5%) compared to the participants on booster dose (18.4%); those partially vaccinated did not report any symptoms. The significant occurrence of symptoms among fully vaccinated individuals raises questions about the efficacy and safety of COVID-19 vaccines. This finding contradicts the general perception that complete vaccination provides heightened protection against adverse reactions or symptoms.²¹ Several factors could contribute to this result. In contrast to the findings, an Ethiopian study by Desalegn *et al.*¹⁶ showed a COVID-19 vaccine side effect prevalence of 91.3% among respondents after the first dose and 67% after the second dosage. However, the type of COVID-19 vaccine received may be crucial in adverse reactions. As highlighted by Rosenblatt & Stein²², different vaccines have distinct formulations, and some individuals may be more prone to reactions based on the specific vaccine they receive. Also, the emergence of new variants could impact the immune response generated by vaccines. A narrative review by Olatunde Olajuwon *et al.*²³ suggests that specific variants may reduce the effectiveness of vaccines, potentially leading to increased adverse events. The lower incidence of symptoms after COVID-19 vaccination among those receiving booster doses (18.4%) suggests a potential benefit in administering additional doses. Boosters are designed to enhance immunity, and this result aligns with previous studies indicating improved protection with booster shots.²⁴

The study also found that the most common symptoms after COVID-19 vaccination observed from the participants were Fatigue (38.5%), Headache (29.0%) and Muscle pain (23.0%). Similar symptoms were noticed in the Jarso *et al.*¹⁷ study in Ethiopia, where the predominant symptoms, listed in descending order of prevalence, included pain at the injection site (64.1%), fatigue (35.7%), Headache (28.9%), joint pain (26.5%), with muscle pain (21.5%) being the least frequently reported symptom. The reported frequency of these symptoms may be attributable to factors such as vaccination composition and administration methods and individual differences in immunological reactivity. The health and compliance of individuals undergoing vaccination depend on their understanding of and ability to cope with these typical adverse effects.

Fatigue, the most common symptom reported by 38.5% of participants, suggests this is a prevalent reaction among the key populations studied. Fatigue is a common symptom reported in various COVID-19 vaccine trials and real-world studies. The mRNA vaccines, such as Pfizer-BioNTech and Moderna, often list fatigue as one of the side effects or symptoms. This could be attributed to the immune response triggered by the vaccine as the body builds protection against the virus. Other studies, like the one conducted by Polack *et al.*¹⁵ on the safety and efficacy of the Pfizer-BioNTech COVID-19 vaccine, also reported fatigue as a common symptom. In addition, the finding that 29.0% of participants

experienced headaches aligns with the known side effects of COVID-19 vaccines. Headaches have been reported in various vaccine trials, including those for the AstraZeneca, Johnson & Johnson, and mRNA vaccines. The immune response the vaccine generates might cause inflammation, leading to headaches. Similar results were observed in the study by Susan Ali Zroog *et al.*²⁵ on the safety and efficacy of the Johnson & Johnson COVID-19 vaccine, where Headache was a reported side effect. Also, muscle pain, reported by 23.0% of participants, is another common side effect observed after COVID-19 vaccination. This aligns with findings from studies on different COVID-19 vaccines, including the study by Tobaiqy *et al.*¹⁻²⁶ on the safety and efficacy of the AstraZeneca vaccine. Muscle pain is often associated with the body's inflammatory response to the vaccine, indicating that the immune system responds as intended.

The findings revealed notable disparities in post-COVID-19 vaccination symptoms, with a focus on gender, age, key population category, and HIV-related treatments. The study observed a slightly higher incidence of symptoms following COVID-19 vaccination in females (0.7%) compared to males (0.6%). This might be attributed to hormonal differences between genders as female immune responses, influenced by hormonal fluctuations, could potentially result in a higher likelihood of the symptoms.¹⁻²⁷ Also, participants above the age of 50 recorded the highest incidence of post-COVID-19 vaccination symptoms (1.0%), showing a statistically significant association. This aligns with existing literature suggesting that older individuals may experience more pronounced reactions due to age-related changes in the immune system.²⁸ The increased vulnerability of this age group emphasises the importance of tailored vaccination strategies and post-vaccination monitoring.

Furthermore, the study identified key population categories with varying degrees of susceptibility to symptoms after COVID-19 vaccination. People who inject drugs (PWID), female sex workers (FSW), and key populations in prisons exhibited significantly higher odds of experiencing post-COVID-19 vaccination symptoms compared to men who have sex with men (MSM). This aligns with the study by Fredriksen-Goldsen²⁹, highlighting the unique challenges and health disparities these key populations face. Factors such as living conditions, access to healthcare, and pre-existing health conditions within these groups may contribute to the observed differences. In addition, participants on antiretroviral (ARV) treatment and pre-exposure prophylaxis (PrEP) displayed higher proportions of post-COVID-19 vaccination symptoms. The increased likelihood of symptoms in individuals on ARV treatment suggests potential interactions between COVID-19 vaccines and antiretroviral drugs, warranting further investigation. Similarly, those on PrEP exhibited a significantly higher occurrence of post-COVID-19 vaccination symptoms, indicating a need for

cautious monitoring and personalised vaccination approaches for individuals on PrEP.

Limitations of the study

Despite the valuable insights gained, this study has limitations. The retrospective design poses inherent biases and relies on historical data accuracy. The reliance on data from specific OSS facilities in six states may limit generalizability. Inclusion criteria may introduce selection bias, as only those engaged with HALG services were considered. Additionally, potential confounding variables not included in the analysis may impact the observed associations. Finally, the study's reliance on self-reported adverse events may introduce reporting bias, affecting the precision of findings.

CONCLUSION

This study underscores the critical role of safe and effective COVID-19 vaccination among key populations in Nigeria. Despite a low incidence of symptoms after COVID-19 vaccination, concerns persist, necessitating continuous professional development for healthcare providers. The unexpected occurrence of symptoms following COVID-19 vaccination among fully vaccinated individuals' challenges assumptions about vaccine efficacy, emphasising the importance of ongoing research. Varied adverse reactions or symptoms, particularly fatigue, headaches, and muscle pain, align with global vaccine studies. Notable disparities in adverse reactions based on gender, age, and key population category stress the need for tailored vaccination strategies. The study urges vigilance in monitoring and addressing symptoms after COVID-19 vaccination, promoting public confidence in vaccination programs.

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