



ORIGINAL ARTICLE

## Knowledge, Perception, and Uptake of Mandatory COVID-19 Vaccination among Nigerian Civil Servants: Implications for Evidence-Based Policies

Awunor NS<sup>1</sup>, Obong DT<sup>1</sup>, Jalo RI<sup>2</sup>, Lar L<sup>3</sup>, Oyefabi A<sup>4</sup>, Okeke C<sup>5</sup>, Audu O<sup>6</sup>, Soter A<sup>7</sup>, Isara AR<sup>8</sup>, Akinyemi O<sup>9</sup>, Abejegah C<sup>10</sup>

For the Association of Public Health Physicians of Nigeria (APHPN) Research and Grants Committee

<sup>1</sup>Department of Community Medicine, Delta State University Teaching Hospital, Oghara, Delta State.

<sup>2</sup>Department of Community Medicine, Aminu Kano Teaching Hospital, Kano, Kano State.

<sup>3</sup>Department of Community Medicine, University of Jos, Jos, Plateau State.

<sup>4</sup>Department of Community Medicine, Barau Dikko Teaching Hospital, Kaduna, Kaduna State.

<sup>5</sup>Department of Community Medicine, University of Nigeria Teaching Hospital, Enugu, Enugu State.

<sup>6</sup>Department of Community Medicine, Federal University of Health Sciences, Otukpo, Benue State.

<sup>7</sup>Department of Community Medicine, University of Calabar Teaching Hospital, Calabar, Cross River State.

<sup>8</sup>Department of Public Health and Community Medicine, University of Benin Teaching Hospital, Benin City, Edo State.

<sup>9</sup>Department of Community Medicine, University College Hospital, Ibadan, Oyo State.

<sup>10</sup>Department of Community Medicine, Federal Medical Center, Owo, Ondo State.

### Keywords

Civil servants;

COVID-19;

vaccination  
mandate;

vaccination  
uptake;

vaccine completion

### ABSTRACT

**Background:** In 2021, some state governments in Nigeria made it compulsory for all civil servants to get vaccinated against COVID-19. Subsequently, the federal government adopted this policy which was met with mixed reactions. This study assessed knowledge, perception, willingness to be vaccinated, uptake, and determinants of full vaccination among Nigerian civil servants.

**Methods:** A descriptive cross-sectional study was conducted among 622 civil servants from Ministries across the six geopolitical zones and the Federal Capital Territory using self-administered structured questionnaires. Ethical approval was obtained from the National Health Research Ethics Committee and analyses done using IBM SPSS v.26.

**Results:** The mean age of the respondents was  $41.6 \pm 9.1$  years with most respondents (486; 78.1%) having good knowledge of COVID-19. Two-fifths (252; 40.5%) agreed that there should be no blanket policy for mandatory vaccination. Most of the respondents (463; 74.4%) had been vaccinated and about two-fifths (269; 43.2%) had been fully vaccinated while about a quarter 146 (23.5%) had not been vaccinated at all. Of those (n=159) who had not been vaccinated or were unwilling to disclose their status, the majority 116 (73.0%) were unwilling to be vaccinated. Respondents with a good knowledge of COVID-19 achieved full vaccination status ( $p = 0.007$ ).

**Conclusion:** Since the majority of the respondents who are Nigerian civil servants had a good knowledge of COVID-19 and had been vaccinated, this study recommends that the government continues its health promotional campaigns towards improved uptake of vaccination against COVID-19 in the populace.

### Correspondence to:

Awunor, Nyemike Simeon  
Department of Community Medicine,  
Delta State University Teaching Hospital,  
Oghara, Delta State.  
Email: [nyemikeawunor@gmail.com](mailto:nyemikeawunor@gmail.com)

## INTRODUCTION

Since the onset of the Coronavirus disease (COVID-19) pandemic in 2020, almost all areas of people's lives have been affected including business and travel. Due to the high morbidity and mortality associated with the disease, governments around the world were under a lot of pressure to respond to the pandemic. Various response structures were instituted to combat the pandemic such as travel bans for passengers coming from countries with ongoing high transmission, lockdown containment measures which included the closure of schools and workplaces, bans on religious and social gatherings, cancellation of public events, and restrictions on movement.<sup>1</sup> Despite these measures, the pandemic persisted. Nevertheless, in 2021, the introduction of COVID-19 vaccines was a game-changer.<sup>2</sup> For decades, vaccines have made great contributions to global health, protecting people from a myriad of diseases that would otherwise endanger their lives such as Smallpox, Polio, Pneumonia, Tuberculosis, Diarrhoea, Cancer, and Ebola. The COVID-19 pandemic was a reminder of the important role of vaccines in disease prevention, health promotion, social and economic development.<sup>2,3</sup>

Since vaccines are one of the most effective tools for protecting people against COVID-19 and the COVID-19 vaccination has been ongoing in many countries, some countries had considered and indeed made the COVID-19 vaccination mandatory in order to increase the uptake and achieve public health goals.<sup>4</sup> A mandatory COVID-19 vaccination in this context is defined as any “public law that makes COVID-19 vaccination legally compulsory with or without imposing a penalty, or any state or non-state policy which requires proof of vaccination in order to access a venue or enjoy a benefit.”<sup>5</sup> Therefore, public authorities in many countries had come up with policies mandating the vaccination of groups or individuals against COVID-19.<sup>6-8</sup> In Africa, countries such as Zimbabwe and Ghana had made policies for mandatory vaccination for public employees, but not without objections, such that Kenya's plan to require mandatory COVID-19 vaccinations for access to government services was met with criticism.<sup>9</sup>

In Nigeria, some state governments had announced that all civil servants should be vaccinated before they can access their offices or present a negative COVID-19 polymerase chain reaction (PCR) test result done weekly. This policy was also adopted by the federal government.<sup>10-13</sup> Mixed reactions had trailed this announcement by authorities in Nigeria over mandatory COVID-19 vaccination. While some civil servants showed interest in the vaccine, others did not.

Therefore, this study was carried out to assess the knowledge of COVID-19, willingness to be vaccinated, uptake of COVID-19 vaccine, determinants of full vaccination, and the perception towards the mandatory COVID-19 vaccination, among civil servants in Nigeria. Ultimately, to generate information that strengthens evidence-based policymaking and implementation in the country.

## METHODOLOGY

### Study area

The study was a nationwide survey, carried out in twelve states (two selected from each of the six geopolitical zones in Nigeria) including the Federal Capital Territory (FCT), over a period of six months from July to December 2022. Nigeria is a country divided into 36 states and it is located in the western coast of Africa. It is bordered on the North by Niger, East by Chad and Cameroon, south by the Gulf of Guinea of the Atlantic Ocean, and west by Benin. It is Africa's most populous country, with a population of over 200 million.<sup>14</sup>

### Study design

This was a descriptive cross-sectional study.

### Study population

The study population comprised federal and state civil servants in various ministries.

### Sample size calculation

The minimum sample size for the selection of civil servants in the various states was determined using the Cochran formula.<sup>15</sup> Prevalence was assumed to be 50%, an error margin of 5 % and standard normal deviate at 5% significance level. The determined minimum sample size was 384. Anticipating a non-response rate of 10%, the calculated sample size was approximately 427. However, for this study, 622 respondents were recruited for this study.

### Sampling technique

A multistage sampling technique was used in the selection of respondents for this study. In the first stage, two states per geopolitical zone were selected using a simple random sampling technique by

balloting then the FCT was added. The states selected per geopolitical zones include Benue and Plateau (North-Central), Borno and Gombe (North-East), Kaduna and Kano (North-West), Enugu and Imo (South-East), Delta and Cross River (South-South), Oyo and Ondo (South-West) and the Federal Capital Territory, Abuja. In the second stage, a list of ministries in the states was derived, two ministries were then selected by simple random sampling following a simple balloting process. In the third stage, a systematic sampling method was used to select 25 respondents in each ministry. The list of staff in the resumption register was used as the sampling frame and the sampling interval 'k' was determined by dividing the number of people in the sampling frame by 25. Starting point was determined using a simple random sampling technique within the sampling interval, and thereafter, every kth respondent was recruited for the study.

### Data Collection

Data collection was by means of a structured, self-administered questionnaire which was designed by the researchers and comprised sections on the socio-demographic and work-related characteristics of the respondents (17 items), respondents' knowledge about COVID-19 (15 items), willingness to be vaccinated and the vaccination status of the respondents, and respondents' perception about the mandatory COVID-19 vaccination using a five-point Likert scale ranging from strongly agree to neutral and then to strongly disagree.

Grading of variables: For each of the questions used to assess the knowledge of COVID-19, a score of 1 was assigned to each correct answer while a score of 0 was assigned to each incorrect answer. The maximum possible score was 15 and the minimum score was 0. Knowledge was categorised into good, average or poor based on scores (10-15 = good, 7-9 = average and 0-6 = poor). In this study "fully vaccinated" meant receiving the scheduled 1 or 2 doses, depending on the vaccine type.

The study instrument was pre-tested among twenty-five civil servants in Benin City, Edo State to determine the adequacy, relative difficulty of the questions and the average time required to fill the questionnaire. Reliability of the various scales in the tool was ascertained using Cronbach's Alpha; and Cronbach's Alpha coefficient of 0.715, 0.947, and 0.733 was obtained for the knowledge of COVID-19, willingness to vaccinate and perception about mandatory COVID-19 vaccination scale respectively.

### Data analysis

Data were checked for completeness, serialized according to states, and entered into IBM SPSS version 26 for statistical analysis. Descriptive analysis was done in counts, frequencies and proportions with the use of statements, tables and figures. Inferential statistics was done using the chi-square test and logistic regression analysis for crude and adjusted estimates of the odds ratio with their respective 95% confidence intervals. Statistical significance was set at  $p < 0.05$ .

### Ethical consideration

Ethical approval for this study was obtained from the National Health Research Ethics Committee (protocol number: NHREC/01/01/2007-22/06/2022). Institutional permission was sought and obtained from the respective ministries. Participants signed informed consent forms and the objective of the study was explained to them. Further, they were reassured of the privacy and anonymity of their responses. They were informed of their right to decline at any point from further participation at any time of the study.

## RESULTS

There was a total of 622 respondents with the mean age of  $41.6 \pm 9.1$  years and there were more males than females (58.7% vs 41.3%). The majority of respondents were urban residents (88.6%) and were educated up to tertiary level (92.9%). Approximately three-quarters of the respondents (73.2%) were married (Table 1).

Table 2 shows the majority of respondents (86.5%) were in full-time employment. Those who had spent less than 10 years in service were the most represented group of workers (38.6%) in terms of duration of service and less than 40% of respondents earned up to 100,000 naira monthly.

Regarding knowledge of COVID-19, the respondents' mean score was  $10.9 \pm 2.9$  with majority of them having a good knowledge 486 (78.1%), followed by average 88 (14.2%) then poor knowledge 48 (7.7%) of COVID-19. Less than half of them (40.8%) knew that unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with COVID-19. Approximately half of the respondents (51.1%) incorrectly thought that eating or touching wild animals would result in infection by the COVID-19. For all the other questions asked on knowledge of

COVID-19, most respondents answered correctly with the proportion of correct answers ranging from 59.2% to 92.1%. Overall, the majority of respondents (78.1%) had good knowledge of COVID-19 (Table 3). A total of 269 (43.2%) respondents had been fully vaccinated, 194 (31.2%) were vaccinated but not fully while about a quarter of respondents 146 (23.5%) had not been vaccinated at all. Few 13 (2.1%) were unwilling to disclose their status (Figure 1). Of those respondents who were neither vaccinated nor willing to disclose their vaccination status, about a quarter (26.4%) were willing to take the COVID-19 vaccine. Only a few (14.5%) were willing to pay for the COVID-19 vaccine while slightly more than a quarter (28.9%) were willing to recommend the vaccine to family and friends (Table 4).

Table 5 shows respondents' perception about the mandatory COVID-19 vaccination. A higher proportion of respondents (42.8%) agreed that they would get vaccinated if their employees could prove that the vaccines are safe. Similarly, 252 (40.5%) agreed that there should be no blanket policy for everyone to be subject to a mandatory vaccination. Also, 250 (40.2%) of the respondents agreed that vaccination should not be made mandatory if they abide by the stipulated preventive measures. When asked about the possibility of having some unforeseen future effects of the COVID-19 vaccine, 41.2% respondents were neutral; only 7.2% strongly disagreed, with a similar proportion (7.6%) also strongly agreeing.

The association between sociodemographic variables and full vaccination status is shown in table 6. No statistically significant associations were found between the sociodemographic variables and the full vaccination status of respondents. Table 7 shows possible association between sociodemographic variables and willingness to be vaccinated by respondents. However, there was no significant association with regards to age group ( $p=0.849$ ), sex ( $p=0.926$ ), residence ( $p=0.629$ ), level of education ( $p=0.560$ ), marital status ( $p=0.709$ ) and willingness to be vaccinated among respondents.

The association between knowledge of COVID-19 and full vaccination status is shown in table 8. The proportion of respondents willing to be vaccinated was higher among those with good knowledge (30.2%) compared to those with poor knowledge (15.1%). This difference was however not statistically significant ( $p = 0.084$ ). Respondents with good knowledge who were fully vaccinated (61%) was higher than those with average/poor knowledge (46.6%), and this association was statistically significant ( $p = 0.007$ ). The level of education of the respondents was a

significant determinant of good knowledge of COVID-19. There was very strong evidence that those who were educated up to post-secondary level had three-fold odds of having good knowledge compared to those educated below post-secondary level (AOR=3.34, 95% CI=1.68-6.66,  $p=0.001$ ) [Table 9].

## DISCUSSION

The demography of the respondents in this study showed that the majority of the Nigerian workforce had a balanced male-female ratio in keeping with the sustainable development goal (SDG) 5 of enhancing gender equality.<sup>16</sup> The study revealed that the majority (78.1%) of the respondents had good knowledge of COVID-19. This was higher than what was obtained in a study carried out in India where 58.6% of respondents had good knowledge,<sup>17</sup> but lower than that obtained from Saudi Arabia, 81.6%,<sup>18</sup> and Uganda, 84.5%.<sup>19</sup> In this study, most of the respondents correctly answered all the questions about knowledge of COVID-19 with the proportion of correct answers ranging from 59.2% to 92.1% and a mean score of  $10.9 \pm 2.9$  indicating that the respondents had a high knowledge of COVID-19. This finding was not surprising considering that the study population comprised civil servants, the majority of whom had tertiary education. Besides, COVID-19 was a pandemic that disrupted all spheres of human lives, and many were involved in applying precautionary methods suggested by the health authorities to protect themselves. Additionally, there was abundant information about the pandemic including misleading information in the print, digital and social media both locally and globally, which in some instances undermined public health responses.<sup>20,21</sup> Though, knowledge was generally high, there is still a need for further health education on COVID-19 as shown by proportion of those with wrong answers.

This study also showed that despite the high level of knowledge about COVID-19 disease and vaccination among respondents, two-fifths were not fully vaccinated despite the policy of mandatory vaccination in some of the states where the study was carried out. This could be attributed to myths and misconceptions about the vaccine and poor information. The non-availability of the vaccines for the second dose may be a remote factor. Almost a quarter (23.5%) had not been vaccinated and of these, the majority were not willing to be vaccinated. This finding was higher than what was found in a previous study conducted in the United States of America (USA) where willingness to be vaccinated was found to be 21.0%,<sup>22</sup> but lower in Malaysia (64.0%).<sup>23</sup>



However, the study showed that a higher proportion of respondents with good knowledge were willing to be vaccinated. This underscores the need for correct information about the disease. Misinformation and disinformation can prevent people from encountering accurate, life-saving information on COVID-19 such as prevention.<sup>24</sup> Information containing anti-vaccine content, for example, could encourage those already vaccine hesitant to remain unvaccinated, leaving them at higher risk of serious illness and death; making public health control measures difficult.<sup>25</sup> Vaccine hesitancy stems from doubts about the efficacy and safety of the vaccines especially with the speed of vaccine development and registration in less than a year as well as the numerous conspiracy theories surrounding the vaccine development.<sup>26-28</sup> Vaccination aims to reduce population susceptibility to the virus; thus, it is important to address vaccine hesitancy and skepticism observed in this study through sustained public health education and community mobilization activities. Many also do not feel the need to be vaccinated because they no longer consider COVID-19 as a threat and consider themselves less at risk of infection because of the dwindling number of cases reported in the media over time.<sup>2,29</sup>

In this study, respondents expressed various views concerning their perception of the mandatory COVID-19 vaccination. However, a little more than half (53.5%) of them agreed that mandatory vaccination is a breach of their fundamental human right, while less than a third feared that an untoward side effect might occur in the future if they were mandated to take the vaccines. These perceptions have been well-documented in several other studies.<sup>29,30</sup> The perception of fear of untoward side effects is understandable considering the speed of vaccine development. However, the World Health Organization (WHO) had authorized the use of these vaccines in many countries,<sup>31,32</sup> and uptake has increased especially among the elderly in countries like the United Kingdom,<sup>33</sup> USA<sup>34</sup> and many European countries.<sup>35</sup> According to scientific evidence available, vaccination of the entire population is currently the most efficient measure available for a country to attain herd immunity and mitigate the consequences of infection and transmission of COVID-19. The fact remains that achieving herd immunity to fully prevent infection and reinfection is unrealistic and vaccination, as a stand-alone method, is not strong enough to prevent outbreaks.<sup>36,37</sup> This underscores the need for people to continuously adhere to basic protective measures of hand hygiene, face mask-wearing, and physical and social distancing.<sup>5,36</sup> Notwithstanding, the WHO had warned against mandatory vaccinations unless all other protective measures have been exhausted.<sup>38,39</sup> This is because

these measures have been proven to be effective in protecting people from COVID-19 even before the introduction of vaccines.<sup>36,40</sup> Besides, there is the effect that mandating vaccination could have on public confidence and trust, as well as vaccination uptake. Worthy of note is the fact that vaccination not only protects the vaccinated individual but also prevents them from directly harming others by passing on infection, and indirectly harming others by unnecessarily requiring health care resources.<sup>39</sup> Implementing a vaccine mandate makes it clear that vaccination is not a personal choice, but rather something expected as a member of a population, similar to taxes and is generally aimed at those who are vaccine-hesitant rather than those who are staunchly opposed to vaccination.<sup>41</sup>

In this study, more than half of the respondents felt that mandatory COVID-19 vaccination is a breach of their fundamental human rights, but experts on human rights violation say that a more fundamental human right is for everyone to be protected from COVID-19 especially as variants continue to disproportionately impact the unvaccinated.<sup>42,43</sup> That is why mandatory vaccination was proposed by some countries in Europe including Germany, Greece, France, Italy, Hungary and Austria where COVID-19 posed a serious threat to many countries.<sup>44</sup>

The strength of the study includes the following: first, the spread of the over six hundred civil servants that participated across twelve states and the FCT which helped with the representativeness of the sample. Secondly, findings from this study helps in reviewing the policy on mandatory COVID-19 vaccination as declared by the presidential task force on COVID-19 and some states in Nigeria. A limitation observed in this study was the fact that since the questionnaire was self-administered, some civil servants did not disclose their age and income. This accounted for the proportion of non-response reported for some sociodemographic variables in the results.

In conclusion, majority of the civil servants had a good knowledge of COVID-19 with post-secondary education status of respondents being a significant determinant of knowledge about the disease. The majority of the respondents had been vaccinated; and less than half were fully vaccinated. Starting the process of vaccination at all seemed to be the critical step to ensuring completion of the vaccination dosage among civil servants. Most civil servants who were not yet vaccinated showed an unwillingness to be vaccinated. Indeed, the proportion of those who had been fully vaccinated was higher in those with good knowledge of COVID-19.

It is recommended that the government should continue in its educational campaign to the populace regarding health promotion and uptake of vaccination against COVID-19. Therefore, state actors should ensure that there is increased synergy among them to forge a common front for the promotion of COVID-19 vaccination. Finally, and where applicable, lessons learned from the COVID-19 pandemic in using mandates to push for interventions such as vaccination against specific diseases can be adapted in the control of selected notifiable diseases.

**Funding:** This research was funded by the Association of Public Health Physicians of Nigeria (APHPN)

**Conflict of interest:** There is none to declare.

**Acknowledgments:** We appreciate the efforts of Dr. Zara Wudiri (APHPN, Borno State Branch), Dr. Joshua Diffa (APHPN, Gombe State Branch), Dr. Chinedu Iwu (APHPN, Imo State Branch), Dr. Dan Gadzama Apagu (APHPN, FCT Branch) who served as state coordinators and helped in data collection. Finally, we appreciate the numerous research assistants across respective states for their diligent effort in data collection.

**Authors' contribution:** The research was conceptualized by AO and ANS. Protocol development was done by ANS, ODT, AO, LL, JRI, SA, OC and AC. Data was collected by ODT, LL, AO, JRI, SA, OC, AC and OA. Drafting of the manuscript was by ANS, IAR, ODT and OA. All authors read and approved of the final manuscript.

**Table 1: Sociodemographic characteristics of participants (n=622)**

Variable	Frequency	Percent
<b>Age group in years (n=535)</b>		
20 – 29	59	11.0
30 – 39	159	29.7
40 – 49	186	34.8
≥ 50	131	24.5
<b>Mean age of respondents: 41.6 ± 9.1 years</b>		
<b>Sex</b>		
Male	365	58.7
Female	257	41.3
<b>Residence (n=585)</b>		
Urban	518	88.6
Rural	67	11.4
<b>Highest level of education completed</b>		
Primary education	6	1.0
Secondary education	38	6.1
Tertiary education	578	92.9
<b>Marital status</b>		
Married	455	73.2
Single	142	22.8
Widowed	12	1.9
Separated	9	1.5
Divorced	4	0.6

**Table 2: Employment characteristics of participants (n=622)**

<b>Variable</b>	<b>Frequency</b>	<b>Percent</b>
<b>Type of employment (n=585)</b>		
Full time	538	92.0
Part time	27	4.6
Contract	20	3.4
<b>Cadre</b>		
Senior staff	444	71.4
Junior staff	142	22.8
<b>State of work</b>		
Gombe	54	8.7
Borno	53	8.5
Plateau	52	8.4
Kano	51	8.2
Enugu	50	8.0
FCT	50	8.0
Imo	50	8.0
Kaduna	50	8.0
Ondo	50	8.0
Oyo	48	7.7
Benue	44	7.1
Delta	40	6.4
Cross River	30	4.8
<b>Number of years in service</b>		
< 10	240	38.6
10 – 19	199	32.0
20 – 29	106	17.0
≥ 30	77	12.4
<b>Average monthly income in naira (n=463)</b>		
< 30000	24	5.2
30000 – 99999	290	62.6
100000 – 199999	112	24.2
200000 – 299999	25	5.4
≥ 300000	12	2.6

**Table 3: Knowledge of participants about COVID-19**

<b>Variables</b>	<b>Correct answer, n (%)</b>
The main clinical symptoms of COVID -19 are fever, fatigue, dry cough, and body aches	511 (82.2)
Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in person infected with the COVID-19 virus	254 (40.8)
Currently, there is no effective cure for COVID -19, but early symptomatic and supportive treatment can help most patients recover from the infection.	499 (80.2)
There are effective vaccines for COVID-19	372 (59.8)
Not all persons with COVID-19 will develop severe disease	398 (64.0)
Eating or touching wild animals would result in the infection by the COVID-19 virus	304 (48.9)
Persons with COVID -19 cannot infect others if they do not have a fever	368 (59.2)
The COVID -19 virus spreads via respiratory droplets of infected individuals	482 (77.5)
The COVID-19 virus is airborne	435 (69.9)
Ordinary residents can wear face mask to prevent the infection by the COVID-19 virus	530 (85.2)
Washing hands frequently with soap and water for at least 20 seconds or use of an alcohol -based hand sanitizer is important to prevent infection with COVID-19	573 (92.1)
It is not necessary for children and young adults to take measures to prevent the infection by the COVID-19 virus	415 (66.7)
To prevent the COVID-19 infection, individuals should avoid going to crowded places and avoid taking public transportations	500 (80.4)
Isolation and treatment of COVID -19 infected people are effective ways to reduce the spread of the virus	569 (91.5)
People who have contact with someone infected with COVID -19 virus should be immediately isolated in a proper place	563 (90.5)

*Mean score = 10.9 ± 2.9; good knowledge = 486 (78.1%); average knowledge = 88 (14.2%); poor knowledge = 48 (7.7%)*



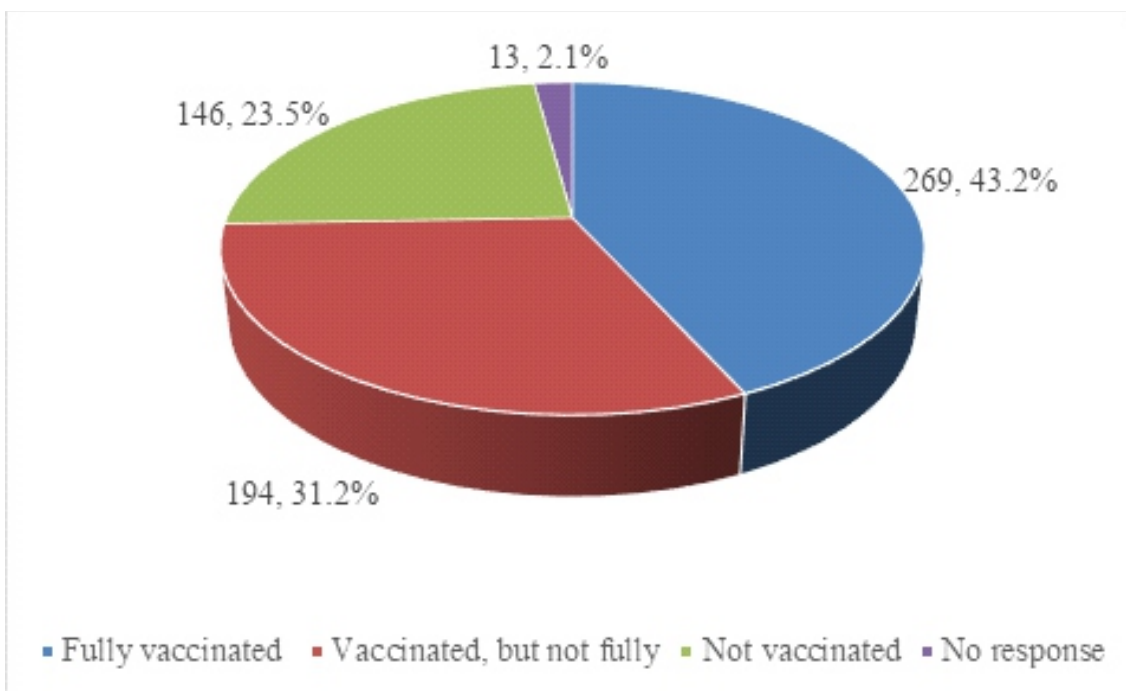


Figure 1: COVID-19 vaccination status of participants

Table 4: Participants' Willingness to be vaccinated (n=159)\*

Variables		Willingness	
		Yes n (%)	No n (%)
Willingness to take the vaccine.	COVID-19	42 (26.4)	117 (73.6)
Willingness to pay for COVID vaccine.	-19	23 (14.5)	136 (85.5)
Willingness to recommend the COVID-19 vaccine to family and friends.		46 (28.9)	113 (71.1)

\*Total number of respondents who were either not vaccinated or not willing to state their status

**Table 5: Perception of participants about mandatory COVID-19 vaccination**

<b>Variable</b>	<b>Strongly agree n (%)</b>	<b>Agree n (%)</b>	<b>Neutral n (%)</b>	<b>Disagree n (%)</b>	<b>Strongly disagree n (%)</b>
It is discriminatory for my employers or a service provider to require me to get vaccinated.	128 (20.6)	161 (25.9)	105 (16.9)	176 (28.3)	52 (8.4)
It is an act that is a breach of my fundamental human rights.	137 (22.0)	198 (31.8)	96 (15.4)	156 (25.1)	35 (5.6)
Requiring employees to be vaccinated is unlawful.	106 (17.0)	124 (19.9)	133 (21.4)	194 (31.2)	65 (10.5)
The vaccine is highly effective against severe illness, hospitalization, and death.	117 (18.8)	156 (25.1)	173 (27.8)	127 (20.4)	49 (7.9)
The vaccine will keep all employees safe.	127 (20.4)	209 (33.6)	153 (24.6)	90 (14.5)	43 (6.9)
Mandating vaccination for employees is not the best way to protect against COVID-19.	116 (18.7)	186 (29.9)	120 (19.3)	160 (25.7)	40 (6.4)
Vaccination should not be made mandatory if I abide by the stipulated preventive measures.	151 (24.3)	250 (40.2)	75 (12.1)	108 (17.4)	38 (6.1)
Mandatory vaccination is a ploy to make more financial gains by the government and the pharmaceutical companies.	102 (16.4)	106 (17.0)	173 (27.8)	179 (28.8)	62 (10.0)
The side effects of these vaccines are dangerous	54 (8.7)	131 (21.1)	232 (37.3)	141 (22.7)	64 (10.3)
I might have some unforeseen future effects of the COVID-19 vaccine.	47 (7.6)	156 (25.1)	256 (41.2)	118 (19.0)	45 (7.2)
There should be no blanket policy for everyone to be subject to a mandatory vaccination	136 (21.9)	252 (40.5)	119 (19.1)	94 (15.1)	21 (3.4)
Vaccination should only be mandated for employees who are at higher risk of exposure	119 (19.1)	188 (30.2)	88 (14.2)	187 (30.1)	40 (6.4)
If my employer can prove that the vaccines are safe, I will get vaccinated	149 (23.9)	266 (42.8)	105 (16.9)	76 (12.2)	26 (4.2)
It is an invasion of my right to privacy and my right to bodily integrity	125 (20.1)	220 (35.4)	154 (24.8)	101 (16.2)	22 (3.5)
The mandatory vaccination scheme is important because COVID -19 is serious and lethal	122 (19.6)	195 (31.4)	175 (28.1)	95 (15.3)	35 (5.6)
The mandatory vaccination scheme during a crisis can be counterproductive	74 (11.9)	194 (31.2)	233 (37.5)	98 (15.8)	23 (3.7)
Mandatory vaccination scheme should be encouraged but it should be incentivized	105 (16.9)	215 (34.6)	160 (25.7)	103 (16.6)	39 (6.3)
My employers will not be responsible if I experience side effects	112 (18.0)	225 (36.2)	111 (17.8)	121 (19.5)	53 (8.5)

**Table 6: Association between sociodemographic variables and full vaccination status (n=463)**

Variable	Full vaccination status		$\chi^2$	p value
	Not fully vaccinated. n (%)	Fully vaccinated. n (%)		
<b>Age (years)</b>				
20 – 29	22 (53.7)	19 (46.3)	3.786	0.285
30 – 39	40 (38.1)	65 (61.9)		
40 – 49	51 (37.2)	86 (62.8)		
≥ 50	45 (40.2)	67 (59.8)		
<b>Sex</b>				
Male	116 (41.6)	163 (58.4)	0.030	0.862
Female	78 (42.4)	106 (57.6)		
<b>Residence</b>				
Urban	163 (41.9)	226 (58.1)	0.0002	0.989
Rural	21 (42.0)	29 (58.0)		
<b>Highest level of education completed</b>				
Secondary education	20 (52.6)	18 (47.4)	1.958	0.162
Post-secondary education	174 (40.9)	251 (59.1)		
<b>Marital status</b>				
Single	48 (47.5)	53 (52.5)	1.868	0.393
Married	137 (40.1)	205 (59.9)		
Separated/divorced/widowed	9 (45.0)	11 (55.0)		

**Table 7: Association between sociodemographic variables and willingness to be vaccinated (n=159)**

Variable	Willingness to be vaccinated		$\chi^2$	p value
	No n (%)	Yes n (%)		
<b>Age group in years (n=140)</b>				
20 – 29	14 (77.8)	4 (22.2)	0.803	0.849
30 – 39	38 (70.4)	16 (29.6)		
40 – 49	37 (75.5)	12 (24.5)		
≥ 50	15 (78.9)	4 (21.1)		
<b>Sex</b>				
Male	63 (73.3)	23 (26.7)	0.009	0.926
Female	53 (72.6)	20 (27.4)		
<b>Residence (n=146)</b>				
Urban	98 (76.0)	31 (24.0)	0.234	0.629
Rural	12 (70.6)	5 (29.4)		
<b>Highest level of education completed</b>				
Secondary education	5 (83.3)	1 (16.7)	0.340	0.560
Post-secondary education	111 (72.6)	42 (27.4)		
<b>Marital status</b>				
Single	28 (68.3)	13 (31.7)	0.687	0.709
Married	84 (74.3)	29 (25.7)		
Separated/divorced/widowed	4 (80.0)	1 (20.0)		

**Table 8: Knowledge of COVID-19 and willingness to be vaccinated and Full Vaccination Status**

Variables	Knowledge of COVID-19		$\chi^2$	p value
	n (%)			
	Average/Poor	Good		
<b>Willingness to be vaccinated (n=159)</b>				
No	28 (84.9)	88 (69.8)	2.985	0.084
Yes	5 (15.1)	38 (30.2)		
<b>Full vaccination Status (n=463)</b>				
Fully vaccinated	55 (53.4)	139 (38.6)	7.193	0.007
Not fully vaccinated	48 (46.6)	221 (61.4)		

**Table 9: Logistic regression showing the sociodemographic determinants of good knowledge of COVID-19**

Variable	n (%)	Crude odds ratio (95% CI)	p value	Adjusted odds ratio (95% CI)	p value
<b>Sex</b>					
Male	296 (81.1)	1 [reference]	0.034	1 [reference]	0.150
Female	190 (73.9)	0.66 (0.45 – 0.97)		0.73 (0.47 – 1.12)	
<b>Education</b>					
Primary/Secondary	25 (56.8)	1 [reference]	0.001	1 [reference]	0.001
Post-secondary	461 (79.8)	2.99 (1.59 – 5.62)		3.34 (1.68 – 6.66)	

## REFERENCES

- Dan-Nwafor C, Ochu CL, Elimian K, Oladejo J, Ilori E, Umeokonkwo C et al. Nigeria's public health response to the COVID-19 pandemic: January to May 2020. *J Glob Health*. 2020;10(2): 1-9. DOI: 10.7189/JOGH.10.020399.
- World Health Organization. COVID-19 vaccines. WHO Regional Office for Africa. [cited May 21, 2023]. Available at: <https://www.afro.who.int/health-topics/coronavirus-covid-19/vaccines>.
- African Population and Health Research Centre (APHRC). Vaccines as game-changer in fighting coronavirus. APHRC. [cited May 20, 2023]. Available at: <https://aphrc.org-biogarticle>.
- World Health Organization (WHO). Episode #53 - COVID-19: Booster Shots. [cited May 21, 2023]. Available at: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/media-resources/science-in-5/episode-53---covid-19-booster>.
- King J, Ferraz OLM, Jones A. Mandatory COVID-19 vaccination and human rights. *Lancet*. 2022;399(10321):220-222. DOI: 10.1016/S0140-6736(21)02873-7.
- Davis HE, Assaf GS, McCorkell L, Wei H, Low RJ, Reem Y, et al. Characterizing long COVID in an international cohort: 7 months of symptoms and their impact. *eClinicalMedicine*. 2021;38. DOI: 10.1016/J.eclinm.2021.101019.
- Ward T, Christie R, Paton RS, Cumming F, Overton CE. Transmission dynamics of monkeypox in the United Kingdom: contact tracing study. *BMJ*. 2022;379. DOI: 10.1136/BMJ-2022-073153.1-10.
- Reuters. Factbox: Countries making COVID-19 vaccines mandatory. Reuters. 2021. [cited May 22, 2023]. Available at: <https://www.reuters.com/business/healthcare-pharmaceuticals/countries-making-covid-19-vaccines-mandatory-2021-08-16/>.

9. Fick M. Kenya's COVID-19 vaccine mandate draws praise and criticism. Reuters. 2021. [cited May 22, 2023]. Available at: <https://www.reuters.com/world/africa/kenya-state-directive-will-boost-low-covid-vaccine-takeup-business-group-2021-11-22>.
10. Fatunmole M. Nigeria begins enforcement of compulsory COVID-19 vaccine for workers on December 1 - International Centre for Investigative Reporting. [cited May 20, 2023]. Available at: <https://www.icirnigeria.org-nigeria>.
11. Aldane J. Nigeria to ban unvaccinated civil servants from their offices - Global Government Forum. [cited May 20, 2023]. Available at: <https://www.globalgovernmentforum.com>.
12. Adebowale-Tambo N. COVID-19: Nigerian government directs all workers to resume, get vaccinated. Premium Times Nigeria. 27th November, 2021. [cited May 19, 2023]. Available at: <https://www.premiumtimesng.com>.
13. Adebowale-Tambe N. COVID-19: Nigerian govt makes vaccination mandatory for civil servants. Premium Times Nigeria. 13th October, 2021. [cited May 19, 2023]. Available at: <https://www.premiumtimesng.com>.
14. United Nations Population Fund. Country Programme Document for Nigeria. [cited June 5, 2023]. Available at: <https://nigeria.unfpa.org/populations/united-nations>.
15. Cochran WG. Sampling Techniques 3rd Edition. 1977. New York. Published online 1997:76-78.
16. Agarwal B. Gender equality, food security and the sustainable development goals. *Curr Opin Environ Sustain*. 2018;34:26-32. DOI: 10.1016/j.cosust.2018.07.002.
17. Singh PK, Anvikar A, Sinha A. COVID-19 related knowledge, attitudes, and practices in Indian Population: An online national cross-sectional survey. *PLoS One*. 2022;17(3): e0264752. DOI: 10.1371/journal.pone.0264752.
18. Al-hanawi MK, Angawi K, Alshareef N, Qattan AN, Helmy HZ, Abudawood Y. Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. *Frontiers*. 2020;8:217. DOI: 10.3389/fpubh.2020.00217.
19. Kamacooko O, Kitonsa J, Bahemuka UM, Kibengo FM, Wajja A, Basajja V. et al. Knowledge, Attitudes, and Practices Regarding COVID-19 among Healthcare Workers in Uganda: A Cross-Sectional Survey. *Int J Environ Res Public Heal*. 2021;18:7004. DOI: 10.3390/ijerph18137004.
20. World Health Organization and Pan American Health Organization. Understanding the infodemic and misinformation in the fight against COVID-19. Digital transformation toolkit. Pan Am Heal Organ. Published online 2020:2. [cited May 15, 2023]. Available at: [https://iris.paho.org/bitstream/handle/10665.2/52052/Factsheet-infodemic\\_eng.pdf](https://iris.paho.org/bitstream/handle/10665.2/52052/Factsheet-infodemic_eng.pdf).
21. World Health Organization. Infodemic. WHO. [cited May 15, 2023]. Available at: <https://www.who.int-healthtopics>.
22. Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? *Vaccine*. 2020;38(42):6500-6507. DOI: 10.1016/J.VACCINE.2020.08.043.
23. Mohamed NA, Solehan HM, Mohd Rani MD, Ithnin M, Isahak CIC. Knowledge, acceptance and perception on COVID-19 vaccine among Malaysians: A web-based survey. *PLoS One*. 2021;16(8): e0256110. DOI: 10.1371/journal.pone.0256110.
24. Germani F, Pattison AB, Reinfelde M. WHO and digital agencies: how to effectively tackle COVID-19 misinformation online. *BMJ Glob Heal*. 2022;7(8). DOI:10.1136/bmjgh-2022-009483.
25. World Economic Forum. Dangers of COVID misinformation and how we can tackle it World Economic Forum. [cited May 18, 2023]. Available at: <https://www.weforum.org/agenda/2022/01/covid-misinformation-omicron-and-how-to-combat-it/>.
26. Mannan KA, Farhana KM. Knowledge, Attitude and Acceptance of a COVID-19 Vaccine: A Global Cross-Sectional Study. *International Research Journal of Business and Social Science* 2020;6(4). DOI:10.2139/ssrn.3763373.
27. De Coninck D, Frissen T, Matthijs K, d'Haenens L, Lits G, Champagne Poirier O, et al. Beliefs in Conspiracy Theories and Misinformation About COVID-19: Comparative Perspectives on the



- Role of Anxiety, Depression and Exposure to and Trust in Information Sources. *Front Psychol.* 2021;12:1340. DOI: 10.3389/fpsyg.2021.646394/bibtex.
28. Hughes JP, Efstratiou A, Komer SR, Baxter LA, Vasiljevic M, Leite AC. The impact of risk perceptions and belief in conspiracy theories on COVID-19 pandemic-related behaviours. *PLoS One.* 2022; 17(2): e0263716. DOI:10.1371/JOURNAL.PONE.0263716.
  29. Gagneux-Brunon A, Botelho-Nevers E, Bonneton M, Watel PP, Verger P, Launey O et al. Public opinion on a mandatory COVID-19 vaccination policy in France: a cross-sectional survey. *Clin Microbiol Infect.* 2022;28(3):433-439. DOI: 10.1016/J.CMI.2021.10.016.433-439.
  30. Abdelkader FA, Alkubati SA, Alsabri M, McClean C, Albagawi B, Alsagri SH et al. COVID-19 Vaccination Knowledge, Perception, and Reason for Adherence and nonadherence Among Nursing Students in Egypt. *SAGE Open Nurs.* 2022; 8: 23779608221141234. DOI: 10.1177/23779608221141234.
  31. Williams BM. The Ethics of Selective Mandatory Vaccination for COVID-19. *Public Health Ethics.* 2022;15(1):74-86. DOI: 10.1093/Phe/phab028.74-86.
  32. World Health Organization. WHO validates Sinovac COVID-19 vaccine for emergency use and issues interim policy recommendations. [cited May 16, 2023]. Available at: <https://www.who.int/news/item/01-06-2021-who-validates-sinovac-covid-19-vaccine-for-emergency-use-and-issues-interim-policy-recommendations>.
  33. Perry M, Gravenor M, Cottrell S, Bedston S, Roberts R, Williams C, et al. COVID-19 vaccine uptake in adults aged 50 years and older in Wales UK: a 1.2m population data-linkage cohort approach. *Vaccine.* 2022;18(2):1-10. Doi: 10.1080/21645515.2022.2031774.
  34. Centers for Disease Control and Prevention. U.S. Embassy and Consulate in Nigeria. [cited May 23, 2023]. Available at: <https://ng.usembassy.gov/cdc/>.
  35. European Centre for Disease Prevention and Control. COVID-19. [cited May 16, 2023]. Available at: <https://www.ecdc.europa.eu/en>.
  36. Cheng FK. Debate on mandatory COVID-19 vaccination. *Ethics Medicine and Public Health.* 2022; 21: 100761. DOI: 10.1016/j.jemep.2022.100761.
  37. Strizova Z, Smetanova J, Bartunkova J, Milota T. Principles and Challenges in anti-COVID-19 Vaccine Development. *Int Arch Allergy Immunol.* 2021;182(4):339-349. DOI: 10.1159/000514225
  38. World Health Organization. COVID-19 and mandatory vaccination: Ethical considerations and caveats. WHO 2021. [cited June 6, 2023]. Available at: <https://apps.who.int/iris/rest/bitstreams/1342697/retrieve>.
  39. World Health Organization. Mandatory vaccinations are a last resort. WHO 2021. [cited June 6, 2023]: Available at: <https://unric.org/en/who-mandatory-vaccinations-are-a-last-resort/>.
  40. World Health Organization. Advice for the public. Coronavirus Disease. WHO 2023. [cited June 6, 2023]: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>.
  41. Giubilini A. An Argument for Compulsory Vaccination: The Taxation Analogy. *J Appl Philos.* 2020;37(3):446-466. DOI: 10.1111/japp.12400.
  42. World Economic Forum. Are COVID-19 vaccine mandates human rights violations? 2022. [cited May 18, 2023]. Available at: <https://www.weforum.org/agenda/2022/01/are-covid-19-vaccine-mandates-a-human-rights-violation/>.
  43. United Nations Human Rights. In Dialogue with Cambodia, Experts of the Human Rights Committee Ask about Freedom of Expression and Raise Issues Concerning COVID-19 Prevention Measures. Geneva. 2022. [cited May 18, 2023]. Available at: <https://www.ohchr.org/en/press-releases/2022/03/dialogue-cambodia-experts-human-rights-committee-ask-about-freedom>.
  44. Burki T. COVID-19 vaccine mandates in Europe. *Lancet Infect Dis.* 2022;22(1):27-28. DOI:10.1016/S1473-3099(21)00776-3.