

# Personality Traits as Key Determinants of COVID-19 Vaccine Uptake among Healthcare Workers in Nigeria

Mohammed Yusuf Mahmood<sup>1</sup>, Abdurrahman Ashiru<sup>1</sup>, Falmata Baba Shettima<sup>1</sup>, Abdulkareem Abashe Abdullahi<sup>1</sup>, Abdulhakeem Mamman Ngulde<sup>1</sup>, Zaharadeen Umar Abbas<sup>1</sup>, Inuwa Murtala Jibrin<sup>2</sup>, Umar Baba Musami<sup>3</sup>, Ibrahim Abdu Wakawa<sup>3</sup>

Departments of <sup>1</sup>Mental Health and <sup>2</sup>Psychology, Federal Neuro-psychiatric Hospital Maiduguri, <sup>3</sup>Department of Mental Health, College of Medical Sciences, University of Maiduguri, Maiduguri, Borno State, Nigeria

## Abstract

**Background:** The coronavirus disease 2019 (COVID-19) pandemic has posed a significant global challenge, necessitating the development and administration of vaccines to halt its spread. Nevertheless, there is limited information on the predictors, patterns, and personality variables influencing COVID-19 vaccine uptake among Nigerian health-care workers (HCWs). **Aim:** The study set to assess level of factors including personality factors that influence acceptance of the COVID-19 vaccines among HCWs in Nigeria. **Materials and Methods:** From August 9 to October 11, 2021, a web-based, cross-sectional survey was conducted on 300 HCWs in Nigeria, aged 19 and above, with social media access and English language proficiency. Descriptive statistics, Chi-square, and binary logistic regression were used to analyse the data on the SPSS version 20. **Results:** The findings revealed that while 64% of those who participated in the study received the first dosage of the COVID-19 vaccine, only 48.3% returned for the second dose. The impression of heightened susceptibility to contracting COVID-19 was the primary reason for vaccination uptake. Although education level was associated with vaccination uptake, it did not predict it independently. The age distribution, agreeableness, conscientiousness, and high vulnerability as a rationale for receiving a vaccine were all the independent predictors of vaccine uptake. **Conclusion:** This study reveals that despite their role as vaccination advocates, HCWs can exhibit hesitancy toward novel vaccines. To increase vaccine uptake among HCWs and the general population, it is crucial to recognise the factors that influence vaccine acceptance among them, including individual personality variables, and incorporate this understanding into vaccination promotion programs.

**Keywords:** Coronavirus disease 2019 vaccine, health-care workers, Nigeria, predictors, personality traits, vaccine uptake

## INTRODUCTION

December 2019 witnessed the emergence of an acute respiratory viral infection from Wuhan City, the Hubei Province of the People's Republic of China which presents, majorly, with a sore throat, fever, cough, and difficulty breathing. The disease is caused by a viral strain known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and was termed coronavirus disease 2019 (COVID-19).<sup>[1,2]</sup> By the virtue of the mode of transmission of the virus, it spread rapidly globally and became the largest pandemic in recent times, putting global health systems under serious strain sparing none even the most advanced health systems.<sup>[3]</sup> The first confirmed case of the pandemic in Nigeria was announced by the Nigerian Center for Disease Control on February 27, 2020 and on March 9, 2020, the second case of the virus was confirmed in Ewekoro, Ogun state, Southwestern Nigeria.<sup>[4]</sup> The risk of mortality is higher

among older adults and people who had a chronic medical related disease such as lung cancer, asthma, type 2 diabetes mellitus, heart diseases, and immune-compromised patients.<sup>[5-7]</sup>

The global efforts to lessen the effects of the pandemic and to reduce the health and socio-economic impact rely to a large extent on preventive measures such as consistent use of face masks, maintaining physical distance, avoiding overcrowded places, regular hand hygiene (washing and the

**Address for correspondence:** Dr. Abdurrahman Ashiru, Department of Mental Health, Federal Neuro-psychiatric Hospital Maiduguri, P.M.B. 1322, Ibrahim Taiwo Housing Estate, Federal Low-Cost, Baga Road, Maiduguri, Borno State, Nigeria. E-mail: aasheer532@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Mahmood MY, Ashiru A, Shettima FB, Abdullahi AA, Ngulde AM, Abbas ZU, *et al.* Personality traits as key determinants of COVID-19 vaccine uptake among healthcare workers in Nigeria. *Niger J Med* 2023;32:293-301.

**Submitted:** 17-Apr-2023

**Revised:** 07-Jun-2023

**Accepted:** 18-Jul-2023

**Published:** 22-Sep-2023

### Access this article online

#### Quick Response Code:



**Website:**  
<http://journals.lww.com/NJOM>

**DOI:**  
10.4103/NJM.NJM\_40\_23

use of alcohol-based hand sanitizers), surface disinfectants and use of personal protective equipment such as gloves, gowns, eye protection, face mask, and N95 respirator especially by health-care workers (HCWs).<sup>[8-10]</sup> In addition, the responsibility of the government is early detection, isolation, and treatment of the infected person is paramount to curtail the spread of the virus and rebound of a positive case.<sup>[8]</sup> There is a consensus that mass vaccination against SARS-CoV-2 will ultimately end the COVID-19 pandemic.<sup>[10,11]</sup>

There have been tremendous efforts by the global scientific community toward developing efficacious and safe vaccines for the disease.<sup>[12]</sup> These efforts were manifested by the approval of many vaccines within the shortest period ever.<sup>[11]</sup> Nigeria as a country received Astra Zeneca COVID-19 vaccine and started immunisation of HCWs and other small segments of the population.<sup>[13]</sup> In March 2021, administration of the first doses of the vaccine commenced in Nigeria and the second doses in late May, 2021.<sup>[13,14]</sup> Despite the availability of the COVID-19 vaccines, there have been anecdotal reports of vaccines hesitancy, nonacceptance and doubts occasioned by misinformation shrewd in myth and misconception, questions around the speed of the development of the vaccines and conspiracy theories about the COVID-19 not only in the general population but among HCWs.<sup>[15]</sup> This will potentially constitute a major hindrance to the success of the prevention and control measures of the disease. According to a study conducted in nine low- and middle-income countries, the major reasons for refusing to take the COVID-19 vaccine were fear of side effects and lack of assurance for the effectiveness of the vaccine in 41.2% and 15.1%, respectively.<sup>[16]</sup> Other factors associated with uptake or hesitancy of taking the COVID-19 vaccines were female gender and chronic illness. Similarly, various psychological and social factors have been seen to significantly influence the uptake of vaccines among HCWs.<sup>[17]</sup> For instance personality traits, such as neuroticism, characterised by a tendency to experience negative emotions such as anxiety and worry have been linked with the uptake of vaccines. Persons with high neuroticism traits are disposed to experience negative emotions, including anger, anxiety, self-consciousness, irritability, emotional instability, and depression. Persons with elevated levels of neuroticism respond poorly to environmental stress, interpret ordinary situations as threatening, and can experience minor frustrations as hopelessly overwhelming.<sup>[18]</sup> Conscientiousness is defined as the propensity to follow socially prescribed norms for impulse control, to be goal-directed, to plan, and to be able to delay gratification or the tendency to think, feel, and behave in a relatively enduring and consistent fashion across time in trait-affording situations;<sup>[19]</sup> has been identified as predictors of vaccine uptake. In addition, the ability for cognitive reflection, which involves careful decision-making and avoidance of impulsivity, is associated with higher vaccine uptake rates generally. Meanwhile, altruistic beliefs, emphasising the importance of aiding others, motivate individuals to protect themselves and others by getting vaccinated.<sup>[20]</sup> Moreover,

locus of control, which pertains to beliefs about personal control over one's life, influences vaccine uptake. Those with an internal locus of control, perceiving control over their health and will be more likely to receive the vaccines than those with an external locus of control.<sup>[21,22]</sup> Conversely, social factors such as low educational status, religious beliefs, and mistrust of authorities and professionals (which may undermine confidence in vaccine-related information from these sources) can contribute to a lack of uptake of vaccines. Individuals with limited education may face barriers in accessing accurate information related to vaccines generally, while religious beliefs can sway individuals toward or against vaccination.<sup>[16,21,22]</sup> However, these studies were conducted among the general population not HCWs. There is a relative paucity of information on the levels, patterns, and related factors of acceptance of COVID-19 vaccines among HCWs across Nigeria generally. Studies that look at psychological factors and personality traits are lacking, especially as they relate to the occupational characteristics of HCWs. It is, therefore, important to know the factors that affect COVID-19 vaccine acceptance among HCWs who are considered advocates and agents of change in the health-care sector and whom the general population looks up to for inspiration.<sup>[23]</sup> This can be a target for interventions toward combating vaccine hesitancy, nonacceptance, and the pandemic as a whole. Therefore, this study set out to assess the levels of and factors, including personality factors, that influence acceptance of the COVID-19 vaccines among HCWs in Nigeria.

The specific objectives of the study are to assess:

1. Levels of uptake of COVID-19 vaccine among HCWs
2. Socio-demographic, health-related predictors of the uptake of COVID-19 vaccine among HCWs in Nigeria
3. Personality traits as the predictors of uptake of COVID-19 vaccine among HCWs in Nigeria.

## MATERIALS AND METHODS

### Study design, sampling technique, and study participants

A web-based, cross-sectional study was conducted in 2021; data were collected using an electronic questionnaire designed on Google Forms. The form was administered and circulated using the snowball technique through a link on WhatsApp over two months, from August 9, to October 11, 2021. The self-administered anonymous questionnaire which required about 5–7 min to complete, was configured in such a way that each participant/device can only fill it out once with no opportunity to edit responses after submission. This is to avoid multiple entries from participants. To ensure all respondents are HCWs, the Google form was designed such only participants who identified as HCWs by answering “yes” were allowed to proceed. All HCWs in Nigeria who were 19 years and above, had access to social media, could communicate in the English language, and had given informed consent were eligible to participate in the survey. The study was conducted in all 36 States of Nigeria and the Federal

Capital Territory; Abuja. Members of the research team were exempted from the survey.

The Google form consisted of four (4) sections on (i) sociodemographic characteristics of the participants, (ii) working or occupational characteristics such as the history of past diagnosis of COVID-19 perceived risk of contracting COVID-19, any existing medical conditions such as diabetes, hypertension, asthma, etc., vaccination history and the reasons for taking the vaccine or not, (iii) an aspect of knowledge of COVID-19 disease and (iv) personality traits using the big 5 personality inventory version 10 items, the 10-items Big Five Personality Inventory.<sup>[24]</sup>

Personality traits were assessed using the Big-Five Personality Inventory 10 items (BFI-10),<sup>[25]</sup> which is a 10-item instrument that measures personality traits along five dimensions: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Each trait is measured by two items using a five-point Likert scale that ranges from “strongly disagree” (1) to “strongly agree” (5). The scale measures each personality trait using only two items in each dimension. Higher score in each dimension reflect higher level of that particular personality trait.<sup>[25]</sup> The scale has good reliability and validity, validation study in Nigeria showed construct validity of 0.627 and good reliability with Cronbach Alpha of  $r = 0.71$ .<sup>[22,24]</sup>

### Data analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) software version 20 (IBM SPSS Statistics 20. IBM Corporation. Chicago, IL, USA. 2015). Descriptive statistics such as mean, range, and standard deviation (SD) were used to describe the continuous variables. Frequencies and percentages were used to analyse the categorical variables. The Chi-square test was used to analyse the relationship between socio-demographic variables, occupational variables, level of knowledge and pattern of personality traits, and acceptance of COVID-19 vaccines. Binary logistic regression was used to assess the independent predictors of uptake of COVID-19 vaccines. The level of statistical significance for the analysis was set at 0.05.

### Ethical considerations

Ethical clearance was obtained from the Research Ethics Review Committee of Federal Neuropsychiatric Hospital, Maiduguri. The informed consent section soliciting for the enrollees' participation and explaining the study protocol was provided on the Google form for participants who were assured of the utmost confidentiality of the information provided as the use of only codes were employed for the purpose of analysis and no means of identification was indicated on the Google form.

## RESULTS

### Sociodemographic characteristics of the participants

The mean age of the respondents is (mean  $\pm$  SD) (37.00  $\pm$  7.79), the majority were within the age bracket of 30–39 years old,

males 224 (74.7%), and were married 233 (77.7%). About half (53.0%) were from the North-East geopolitical zones of the country. About four-fifths (85.7%) of the respondents were clinical duty staff. Furthermore, in terms of the location of practice 2/3 (66.0%) of the respondent were working in the city while the remaining was either working in the towns or villages. Other sociodemographic characteristics of the participants are shown in Table 1.

### Clinical/medical characteristics of the study participants

The majority of the study participants (55.3%) were frontline HCWs and only 8.3% had been diagnosed with covid-19. About two-fifths (40.3%) of the population believed they have a medium risk of contracting COVID-19. While 77.7% had no existing medical conditions, hypertension was the most common medical condition reported and only 12.0% of respondents were not observing COVID-19 disease preventive measures. Other medical characteristics of the participants are captured in Table 2.

**Table 1: Sociodemographic characteristics (n=300)**

| Variables              | Frequency, n (%)            |
|------------------------|-----------------------------|
| Sex                    |                             |
| Male                   | 224 (74.7)                  |
| Female                 | 76 (25.3)                   |
| Age group              |                             |
| Mean $\pm$ SD          | 37.00 $\pm$ 7.79 (20–60=40) |
| 20–29                  | 40 (13.3)                   |
| 30–39                  | 159 (53.0)                  |
| 40–49                  | 75 (25.0)                   |
| 50–60                  | 26 (8.7)                    |
| Educational status     |                             |
| Diploma/NCE            | 23 (7.7)                    |
| 1 <sup>st</sup> degree | 152 (50.7)                  |
| 2 <sup>nd</sup> degree | 57 (19.0)                   |
| 3 <sup>rd</sup> degree | 55 (18.3)                   |
| Postgraduate diploma   | 13 (4.3)                    |
| Marital status         |                             |
| Married                | 233 (77.7)                  |
| Single                 | 62 (20.7)                   |
| Divorced               | 3 (1.0)                     |
| Separated              | 2 (0.7)                     |
| Location of practice   |                             |
| City                   | 198 (66.0)                  |
| Town                   | 87 (29.0)                   |
| Village                | 15 (5.0)                    |
| Geopolitical zone      |                             |
| NE                     | 204 (68.0)                  |
| NW                     | 41 (13.7)                   |
| NC                     | 32 (10.7)                   |
| SW                     | 16 (5.3)                    |
| SE                     | 4 (1.0)                     |
| SS                     | 3 (1.3)                     |
| Clinical/nonclinical   |                             |
| Clinical               | 257 (85.7)                  |
| Nonclinical            | 43 (14.3)                   |

SD: Standard deviation

### Levels and reasons for the uptake of corona virus disease 2019 vaccine

About 2/3 (64.0%) of the participants took the first dose of the AstraZeneca vaccine but only about half (48.3%) came back to take the second dose of the vaccine. Perception of increased vulnerability to contracting COVID-19 disease is the most common reason for taking the vaccine for both first and second doses. Most people who did not receive the vaccine reported a lack of trust in the vaccines. Other findings are displayed in Table 3.

### Relationship between socio-demographic factors and uptake of vaccine

There is a statistically significant relationship between the educational status of the participants and AstraZeneca vaccine uptake with ( $P = 0.032$ ) and ( $P = 0.041$ ) for the first and second doses, respectively. While this was so in the case of the age group, it was only for the second dose  $P = 0.018$ . Other sociodemographic variables were not significantly related to acceptance and are displayed in Table 4.

### Clinical factors and uptake of coronavirus disease 2019 vaccine

There was a statistically significant relationship between vaccine uptake and perceived risk ( $P = 0.023$ ) during the administration of the first dose of the AstraZeneca vaccine; that is, those who had high perceived risk took the vaccine much more than those who had low perceived risk. However, there was no longer a statistically significant relationship between the uptake of the vaccine and perceived risk of contracting the disease at the point of second dose administration. Other clinical variables were not statistically significantly related to uptake of the vaccines.

### Personality traits as determinants of vaccine uptake

Majority of the respondents 141 (69.8%) had the high score on conscientiousness scale, this is followed by extraversion scale in which 83 (68.6%) of respondents had high scores. Furthermore, most respondents 166 (67.5%) had high scores on agreeableness scale than the rest of the respondent. Conscientiousness ( $P = 0.05$  for the first dose,  $P = 0.029$  for the second dose) and agreeableness ( $P = 0.036$  for the first dose,  $P = 0.001$  for the second dose) were significantly related to the uptake of the vaccines for both first and second doses administration. However, the other three personality traits of the big-five personality inventory were not significantly related to first or second-dose uptake, as shown in Table 5.

### Reasons for the uptake of coronavirus disease 2019 vaccine

For the majority, the reasons for taking the doses of the COVID-19 vaccines were significantly related to the uptake of both the first ( $P \leq 0.0001$ ) and second doses ( $P = 0.004$ ) of the vaccines, respectively, while the reasons provided for nonuptake were not significantly associated with nonuptake.

**Table 2: Health-related characteristics**

|   | Frequency, n (%) |
|---|------------------|
| Front-line health worker?                   |                  |
| Yes   | 166 (55.3)       |
| No  | 109 (36.3)       |
| May be (not sure whether front-line or not) | 25 (8.3)         |
| Diagnosed with COVID-19 before?             |                  |
| No  | 275 (91.7)       |
| Yes   | 25 (8.3)         |
| Perceived risk                              |                  |
| Very high                                   | 47 (15.7)        |
| High  | 60 (20.0)        |
| Medium                                      | 121 (40.3)       |
| Low   | 36 (12.0)        |
| Very low                                    | 36 (12.0)        |
| Presence of medical condition               |                  |
| None  | 233 (77.7)       |
| Asthma                                      | 20 (6.7)         |
| Hypertension                                | 26 (8.7)         |
| Diabetes                                    | 2 (0.7)          |
| Multiple conditions                         | 7 (2.3)          |
| Others medical conditions                   | 12 (4.0)         |
| Still observing preventive measure          |                  |
| Yes   | 264 (88.0)       |
| No  | 36 (12.0)        |

COVID-19: Coronavirus disease 2019

**Table 3: Levels and reasons for the uptake of coronavirus disease 2019 vaccine**

|   | 1 <sup>st</sup> dose, n (%) | 2 <sup>nd</sup> dose, n (%) |
|---|-----------------------------|-----------------------------|
| Have you taken COVID-19 vaccine           |                             |                             |
| Yes                                       | 192 (64.0)                  | 145 (48.3)                  |
| No  | 108 (36.0)                  | 155 (51.7)                  |
| Reason for taking the vaccine             |                             |                             |
| Highly vulnerable                         | 124 (41.3)                  | 83 (27.7)                   |
| At risk of severe disease                 | 7 (2.3)                     | 12 (4.0)                    |
| Have an existing medical condition        | 6 (2.0)                     | 5 (1.7)                     |
| Having confidence in the efficacy         | 31 (10.3)                   | 35 (11.7)                   |
| It is readily available/easy to get       | 10 (3.3)                    | 12 (4.0)                    |
| It just want to get registered            | 13 (4.3)                    | 11 (3.7)                    |
| Other reasons for taking the vaccines     | 7 (2.3)                     | 0                           |
| Reason for not taking the vaccine         |                             |                             |
| I do not believe COVID-19 exists          | 3 (1.0)                     | 3 (1.0)                     |
| I don't trust the vaccine                 | 50 (16.7)                   | 57 (19.0)                   |
| Am afraid of side effects                 | 36 (12.0)                   | 33 (11.0)                   |
| Existing medical condition                | 7 (2.3)                     | 4 (1.3)                     |
| Vaccine not available/difficult to obtain | 10 (3.3)                    | 33 (11.0)                   |
| Not aware of vaccine                      | 10 (3.3)                    | 13 (4.3)                    |
| Other reasons for not taking the vaccines | 3 (1.0)                     | 0                           |

COVID-19: Coronavirus disease 2019

Agreeableness, conscientiousness, and reasons for uptake of the vaccine were the independent predictors of acceptance of the first dose of COVID-19 vaccines while age group, agreeableness, conscientiousness, and reasons for uptake



**Table 4: Relationship between sociodemographic factors and uptake**

|                                   | Uptake of vaccine    |                  |          |          |                      |                  |          |          |
|-----------------------------------|----------------------|------------------|----------|----------|----------------------|------------------|----------|----------|
|                                   | 1 <sup>st</sup> dose |                  |          |          | 2 <sup>nd</sup> dose |                  |          |          |
|                                   | Yes, <i>n</i> (%)    | No, <i>n</i> (%) | $\chi^2$ | <i>P</i> | Yes, <i>n</i> (%)    | No, <i>n</i> (%) | $\chi^2$ | <i>P</i> |
| Age group                         |                      |                  |          |          |                      |                  |          |          |
| 20–29                             | 19 (47.5)            | 21 (52.5)        | 7.134    | 0.068    | 14 (35.0)            | 26 (65.0)        | 10.017   | 0.018    |
| 30–39                             | 101 (63.5)           | 58 (36.5)        |          |          | 70 (44.0)            | 89 (56.0)        |          |          |
| 40–49                             | 54 (72.0)            | 21 (28.0)        |          |          | 46 (61.3)            | 29 (38.7)        |          |          |
| 50–60                             | 18 (69.2)            | 8 (30.8)         |          |          | 15 (57.7)            | 11 (42.3)        |          |          |
| Gender                            |                      |                  |          |          |                      |                  |          |          |
| Male                              | 148 (66.1)           | 76 (33.9)        | 1.647    | 0.126    | 113 (60.4)           | 111 (49.6)       | 1.581    | 0.130    |
| Female                            | 44 (57.9)            | 32 (42.1)        |          |          | 32 (42.1)            | 44 (57.9)        |          |          |
| Marital status                    |                      |                  |          |          |                      |                  |          |          |
| Married                           | 155 (66.5)           | 78 (33.5)        | 3.082    | 0.379    | 118 (50.6)           | 115 (49.4)       | 2.364    | 0.50     |
| Single                            | 34 (54.8)            | 28 (45.2)        |          |          | 25 (40.3)            | 37 (59.7)        |          |          |
| Divorce                           | 2 (66.7)             | 1 (33.3)         |          |          | 1 (33.3)             | 2 (66.7)         |          |          |
| Separate                          | 1 (50.0)             | 1 (50.0)         |          |          | 1 (50.0)             | 1 (50.0)         |          |          |
| Educational status                |                      |                  |          |          |                      |                  |          |          |
| Diploma/NCE                       | 16 (69.6)            | 7 (30.4)         | 10.582   | 0.032*   | 15 (65.2)            | 8 (34.8)         | 9.958    | 0.041    |
| Trust degree/HND                  | 98 (64.5)            | 54 (35.5)        |          |          | 66 (43.4)            | 86 (56.6)        |          |          |
| 2 <sup>nd</sup> degree/membership | 31 (54.4)            | 26 (45.6)        |          |          | 23 (40.4)            | 34 (59.6)        |          |          |
| 3 <sup>rd</sup> degree/fellowship | 45 (81.8)            | 10 (18.2)        |          |          | 32 (58.2)            | 23 (41.8)        |          |          |
| Postgraduate                      | 10 (76.9)            | 3 (23.1)         |          |          | 9 (69.2)             | 4 (30.8)         |          |          |

**Table 5: Relationship between personality traits and uptake of vaccine**

|                         | Yes vaccine, <i>n</i> (%) | No vaccine, <i>n</i> (%) | $\chi^2$ | <i>P</i> | Yes vaccine, <i>n</i> (%) | No vaccine, <i>n</i> (%) | $\chi^2$ | <i>P</i> |
|-------------------------|---------------------------|--------------------------|----------|----------|---------------------------|--------------------------|----------|----------|
| Openness Scale          |                           |                          |          |          |                           |                          |          |          |
| High score              | 98 (64.0)                 | 54 (36.0)                | 1.79     | 0.41     | 72 (48.3)                 | 77 (51.7)                | 0.942    | 0.624    |
| Borderline score        | 0                         | 1 (100.0)                |          |          | 0                         | 1 (100.0)                |          |          |
| Low score               | 98 (64.0)                 | 54 (36.0)                |          |          | 73 (48.7)                 | 77 (51.3)                |          |          |
| Conscientiousness Scale |                           |                          |          |          |                           |                          |          |          |
| High score              | 141 (69.8)                | 61 (30.2)                | 10.706   | 0.005*   | 104 (51.5)                | 98 (48.5)                | 7.102    | 0.029    |
| Borderline score        | 38 (57.6)                 | 28 (42.4)                |          |          | 32 (48.5)                 | 34 (51.5)                |          |          |
| Low score               | 13 (41.9)                 | 18 (58.1)                |          |          | 8 (25.8)                  | 23 (74.2)                |          |          |
| Extroversion Scale      |                           |                          |          |          |                           |                          |          |          |
| High score              | 83 (68.6)                 | 38 (31.4)                | 3.78     | 0.151    | 63 (52.1)                 | 58 (47.9)                | 3.443    | 0.179    |
| Borderline score        | 45 (64.3)                 | 25 (35.7)                |          |          | 35 (50.0)                 | 35 (50.0)                |          |          |
| Low score               | 56 (56.0)                 | 44 (44.0)                |          |          | 40 (40.0)                 | 60 (60.0)                |          |          |
| Agreeableness Scale     |                           |                          |          |          |                           |                          |          |          |
| High score              | 166 (67.5)                | 107 (35.8)               | 6.623    | 0.036*   | 131 (53.3)                | 115 (46.7)               | 15.189   | 0.001*   |
| Borderline score        | 20 (47.6)                 | 22 (52.3)                |          |          | 9 (21.4)                  | 33 (78.6)                |          |          |
| Low score               | 6 (54.5)                  | 5 (45.5)                 |          |          | 4 (36.4)                  | 7 (63.6)                 |          |          |
| Neuroticism scale       |                           |                          |          |          |                           |                          |          |          |
| High score              | 68 (66.7)                 | 34 (33.3)                | 1.023    | 0.600    | 54 (52.9)                 | 25 (55.8)                | 1.798    | 0.407    |
| Borderline score        | 92 (62.6)                 | 55 (37.4)                |          |          | 66 (44.9)                 | 81 (55.1)                |          |          |
| Low score               | 25 (58.1)                 | 18 (41.9)                |          |          | 19 (44.2)                 | 48 (47.1)                |          |          |

SD: Standard deviation

were the independent predictors of acceptance of the second dose of the vaccine. Other variables that were statistically significantly relate to acceptance or uptake the bivariate analysis were not found to independently predict uptake as shown in Table 6.

## DISCUSSION

This study found that 64% of participants received the first dose of the COVID-19 vaccine, but only 48.3% returned for the second dose. The most common reason for

**Table 6: Independent predictors of uptake of coronavirus disease 2019 vaccine**

| Variables                   | Predictors         | Exp (B) | P     | 95% CI      |
|-----------------------------|--------------------|---------|-------|-------------|
| 1 <sup>st</sup> dose uptake | Age group          | 0.732   | 0.064 | 0.526–1.019 |
|                             | Educational status | 0.893   | 0.396 | 0.688–1.159 |
|                             | Agreeableness      | 0.613   | 0.045 | 0.381–0.988 |
|                             | Conscientiousness  | 0.567   | 0.002 | 0.399–0.808 |
|                             | Reason for taking  | 3.211   | 0.010 | 1.329–7.758 |
| 2 <sup>nd</sup> dose uptake | Age group          | 0.664   | 0.010 | 0.487–0.906 |
|                             | Educational status | 0.969   | 0.801 | 0.761–1.235 |
|                             | Agreeableness      | 0.411   | 0.001 | 0.289–0.709 |
|                             | Conscientiousness  | 0.638   | 0.014 | 0.447–0.912 |
|                             | Reason for taking  | 1.379   | 0.013 | 1.070–1.777 |

CI: Confidence interval

getting vaccinated was a perceived increased susceptibility to contracting COVID-19. Although education level was associated with vaccination uptake, it was not an independent predictor. Independent predictors of vaccination uptake were age distribution, agreeableness, conscientiousness, and a high vulnerability rationale for taking the vaccine.

### Levels and reasons for the uptake of corona virus disease 2019 vaccine

In this study, the rate of uptake was 64.0% for the first dose of the AstraZeneca vaccine and that of the second dose was only 48.3%, meaning 36.0% and 51.7% declined to take the vaccine at the first dose and second dose, respectively. This further shows that the rate of uptake of the vaccine declined among HCWs during the second dosing. This finding is consistent with similar works by Iwu *et al.*,<sup>[26]</sup> and Amuzie *et al.*,<sup>[27]</sup> both in South-Eastern Nigeria, in which they reported uptake rate of 64.6% (hesitancy of 35.4%) and 50.5% respectively among HCWs. Similarly, Ackah *et al.*,<sup>[28]</sup> reported an uptake of 46% among HCWs in Africa, generally, while 37% in North Africa, 48% in West Africa, and 49% in East Africa. However, contrary to this study, there are studies both local and international that reported higher vaccine uptake rates among HCWs. For example, Abubakar *et al.*,<sup>[29]</sup> in North-Western Nigeria, reported 90%, Nomhwange *et al.*,<sup>[30]</sup> 92% (in a nationwide study in Nigeria), Dubov *et al.*,<sup>[31]</sup> in Southern California 84%, Ackah *et al.*, in Indonesia, 86.4% and 90% in Southern Africa.<sup>[28]</sup> Reasons for these differences in uptake rates could be variations in the timing of the studies concerning the course of the pandemic, the effect of vaccine acceptance campaigns and general public awareness of the vaccine, sample size, and composition of the study participants. Vaccine uptake rates were statistically significantly associated with age distribution ( $P = 0.018$ ) and the level of education of the participants ( $P = 0.032$ ). This is in keeping with the work of Nomhwange *et al.*,<sup>[30]</sup> in which they showed age was significantly associated with uptake among other factors. Amuzie *et al.*, however, found that uptake was significantly predicted by marital status, location of practice, profession, and level of income, in addition to age distribution.<sup>[27]</sup> While

Iwu *et al.*,<sup>[26]</sup> and Galanis *et al.*,<sup>[32]</sup> reported that, while males were significantly more likely to be hesitant than females, half (51.0%) of the study participants in Iwu *et al.* study expressed mistrust and safety concerns about the vaccines.<sup>[26]</sup> They observed that HCWs within the 20–29 years age group, males, married, and having a diploma as the highest level of education had the major proportion of vaccine-hesitant HCWs within their respective categories, however, apart from the age, these observations were not significant ( $P > 0.05$ ).<sup>[26]</sup> Dubov *et al.* in the US found political affiliation, education level, and income was shown to be significant factors associated with vaccine uptake and hesitancy was associated with older age and higher education.<sup>[31]</sup>

Furthermore, the age distribution was found to be an independent predictor of uptake of the vaccine at the second dose administration. This finding was supported by Amuzie *et al.*,<sup>[27]</sup> who found being single, and having lower income were predictors of hesitancy vis-a-vis uptake in addition to being of younger age.<sup>[27]</sup> Similarly, Dubov *et al.*, in a nationwide US-based study, showed that the levels of education, ethnicity, and age distribution were the predictors of COVID-19 vaccine acceptance, and concerns about side effects and efficacy were associated with increased vaccine hesitancy.<sup>[33]</sup>

In this study, the perception of increased vulnerability to contracting COVID-19 is the most common reason for taking the vaccine for both first and second doses. This is in keeping with Viswanath *et al.*,<sup>[34]</sup> There was a decline in the proportion of participants with perceived increased vulnerability to the infection from 41.3% to 27.7% at the first and second doses, respectively, which were six months apart. The decreasing infection rates, case fatality rates, virulence of the virus, and severity of the clinical disease,<sup>[35]</sup> perhaps partly, as a result of building herd immunity,<sup>[36,37]</sup> might have been responsible for the decline.

On the other hand, lack of awareness of the second dose which stood at 4.33% at the second dose as against 1.00% at the first dose, and negative campaigns against the vaccines might have adversely affected the HCWs' attitudes toward the uptake of the second dose. This, of course, may contribute to the trust issues that most people who did not take the vaccine advanced as the only statistically significant reason for not taking the vaccines. Lack of trust in the vaccine (16.7% and 19.0% for first and second doses, respectively), and fear of side effects (12.0% and 11.0% for first and second doses, respectively) were the most common reasons for not taking the vaccine. These findings are similar to that of Ackah *et al.*, who found that major reasons for vaccine hesitancy were fear of side effects, concerns around its effectiveness, short duration of the clinical trials, and social trust.<sup>[28]</sup> Furthermore, participants in Iwu *et al.*, Gadoth *et al.*, and Qatam *et al.* studies expressed safety concerns and mistrust towards the vaccines.<sup>[26,38,39]</sup> All of these underscore the importance of tailored communication strategies to disseminate the scientific information to increase HCWs' confidence around novel vaccines generally.

In contrast to this study which did not find any clinical factors as predictors of uptake of the vaccine, Huynh *et al.* reported that the predictors of uptake included perceived high risk of contracting the disease, fear of severe clinical disease, having good knowledge of the disease, and being medical doctor.<sup>[40]</sup>

### Pattern personality traits and relationship with vaccine uptake

Those who received the vaccine had higher scores on all five (5) scales of the personality instrument than those who did not take the vaccine. More than half (69.8%) of the participants who received the vaccine had a high score on conscientiousness. A high score conscientiousness scale depicts a tendency to be organized and dependable, show self-discipline, be ethical, aim for high achievements, and preferred planned rather than spontaneous behaviours. People who score high on conscientiousness are often seen as stubborn and obsessive. While those who are low are seen as flexible and spontaneous but can be perceived as sloppy and unreliable. Again, substantially, more than half of all the participants had high scores on agreeableness (67.5%). High agreeableness depicts a tendency to be compassionate, appreciative, generous, straightforward, and cooperative rather than suspicious and antagonistic toward others, while low agreeableness personalities are often seen as competitive, critical, or challenging which can be seen as argumentative or untrustworthiness. Although 66.7%, 68.6%, and 64.0% of the population had high scores on neuroticism, extraversion, and openness scales, respectively, these scores were not significantly associated with vaccine uptake. A high score on extraversion denotes energy, positive emotion, assertiveness, sociability, gregariousness, talkativeness, and the tendency to seek stimulation in the company of others. A low score on the extraversion scale is associated with a reserved, reflective personality which can be perceived as aloof or self-absorbed. A high score on neuroticism indicates anxiety, self-pitying, tension, emotional instability, impulsiveness, touchiness, and worry. People with low neuroticism tend to be confident, secure, not irritable, and emotionally stable. The finding of high score on neuroticism is in keeping with Yanto *et al.*, a study which, in addition, showed high openness scores among their study participants.<sup>[41]</sup>

Although conscientiousness and agreeableness were the significant predictors of uptake of COVID-19 vaccines uptake, the other three personality traits of the big-five personality inventory (namely neuroticism, openness, and extraversion) were neither significantly associated with the uptake of the first dose nor the second dose of COVID-19 vaccines. This is in variance with the Ireland and UK studies which reported lower agreeableness scores were significantly associated with uptake in the case of the Ireland study ( $d = 0.15$ )<sup>[22]</sup> and lower scores on both agreeableness ( $d = 0.22$ ) and conscientiousness ( $d = 0.17$ ) were significantly associated with uptake in the case of the UK study, in addition to higher scores on neuroticism scale.<sup>[22]</sup> Yanto *et al.* equally showed mixed findings of agreeableness

and neuroticism being independent predictors of vaccine uptake, in addition, to trust in the government, trust in scientists, and trust in health-care professionals.<sup>[41]</sup>

### Limitation

This study is not without some limitations. One significant limitation was the low response rate among potential participants, with only 300 HCWs who responded to the questionnaire shared. Similarly, the study was conducted online by sharing the link to the questionnaire on WhatsApp platforms, limiting the study's reach to HCWs who were active online during the study period. Consequently, the findings may not be representative of the entire population of HCWs. Despite these limitations, the study provides valuable insights into the predictors of COVID-19 vaccine uptake among HCWs and serves as a starting point for further research in this area.

### CONCLUSION

The study shows that a significant percentage of HCWs did not take the first dose of the vaccine and there was even a decline in the percentage (48.3%) of workers who took the second dose. Perception of high vulnerability to contracting the COVID-19 disease was the most common reason for taking the vaccine, the sense of which declined at the time of the second dose administration. While personality factors such as conscientiousness and agreeableness, on the one hand, and age distribution and educational levels, on the other hand, predict uptake of the vaccine. This study suggests that HCWs who are supposed to be ambassadors and advocates of the uptake of vaccines can be hesitant with regard to taking up a novel vaccine and this hesitancy is not only predicted by the level of education and age of the participants but also the personality traits and perceived risk of contracting the disease.

### Recommendation

There is a need to design population-specific measures to improve vaccine uptake among HCWs and indeed the general population and these measures should take into consideration the effects of individual personality traits of target populations on the outcomes.

### Acknowledgment

We acknowledge the efforts and sacrifices of the entire health workforce, globally, in combating the COVID - 19 particularly those involved in the frontline management of the disease. We express our empathy to those who contracted the disease, and sympathy to those who lost loved ones to the disease. Finally, we appreciate all HCWs who spared their time to participate in this study.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

## REFERENCES

- Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, *et al.* Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: A scoping review. *Infect Dis Poverty* 2020;9:29.
- Lu H, Stratton CW, Tang YW. Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *J Med Virol* 2020;92:401-2.
- Sultana J, Mazzaglia G, Luxi N, Cancellieri A, Capuano A, Ferrajolo C, *et al.* Potential effects of vaccinations on the prevention of COVID-19: Rationale, clinical evidence, risks, and public health considerations. *Expert Rev Vaccines* 2020;19:919-36.
- Maclean R, Dahir AL. Nigeria Responds to First Coronavirus Case in Sub-Saharan Africa. *The New York Times*; 2020. p. 28. Available from: <https://www.nytimes.com/2020/02/28/world/africa/nigeria-coronavirus.html>. [Last accessed on 2023 Jul 31].
- Flaherty GT, Hession P, Liew CH, Lim BC, Leong TK, Lim V, *et al.* COVID-19 in adult patients with pre-existing chronic cardiac, respiratory and metabolic disease: A critical literature review with clinical recommendations. *Trop Dis Travel Med Vaccines* 2020;6:16.
- Gao YD, Ding M, Dong X, Zhang JJ, Kursat Azkur A, Azkur D, *et al.* Risk factors for severe and critically ill COVID-19 patients: A review. *Allergy* 2021;76:428-55.
- Williamson EJ, Walker AJ, Bhaskaran K, Bacon S, Bates C, Morton CE, *et al.* Factors associated with COVID-19-related death using OpenSAFELY. *Nature* 2020;584:430-6.
- Kamel Boulos MN, Geraghty EM. Geographical tracking and mapping of coronavirus disease COVID-19/severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) epidemic and associated events around the world: How 21<sup>st</sup> century GIS technologies are supporting the global fight against outbreaks and epidemics. *Int J Health Geogr* 2020;19:8.
- Güner R, Hasanoğlu I, Aktaş F. COVID-19: Prevention and control measures in community. *Turk J Med Sci* 2020;50:571-7.
- Viana J, van Dorp CH, Nunes A, Gomes MC, van Boven M, Kretzschmar ME, *et al.* Controlling the pandemic during the SARS-CoV-2 vaccination rollout. *Nat Commun* 2021;12:3674.
- Huang B, Wang J, Cai J, Yao S, Chan PK, Tam TH, *et al.* Integrated vaccination and physical distancing interventions to prevent future COVID-19 waves in Chinese cities. *Nat Hum Behav* 2021;5:695-705.
- Kaur SP, Gupta V. COVID-19 vaccine: A comprehensive status report. *Virus Res* 2020;288:198114.
- World Health Organization. Nigerian Health Workers Take country's First COVID-19 Vaccin Nigeria: Reliefweb; 2021. Available from: <https://reliefweb.int/report/nigeria/nigerian-health-workers-take-country-s-first-covid-19-vaccine>. [Last accessed on 2021 Sep 02, Last updated on 2021 Mar 19].
- Adepoju P. Nigeria Moves Ahead With Second AstraZeneca Dose In Move To Build Vaccine Immunity Among Highest Risk Groups Nigeria: Health Policy Watch; 2021. Available from: <https://healthpolicy-watch.news/nigeria-shuns-who-covid-19-vaccine-allocation-recommendations-even-as-country-prepares-for-third-wave/>. [Last accessed on 2021 Sep 02, Last updated on 2021 May 13].
- El-Elimat T, AbuAlSamen MM, Almomani BA, Al-Sawalha NA, Alali FQ. Acceptance and attitudes toward COVID-19 vaccines: A cross-sectional study from Jordan. *PLoS One* 2021;16:e0250555.
- Bono SA, Faria de Moura Villela E, Siau CS, Chen WS, Pengpid S, Hasan MT, *et al.* Factors affecting COVID-19 vaccine acceptance: An International survey among low- and middle-income countries. *Vaccines (Basel)* 2021;9:515.
- Ng TW, Cowling BJ, So HC, Ip DK, Liao Q. Testing an integrative theory of health behavioural change for predicting seasonal influenza vaccination uptake among healthcare workers. *Vaccine* 2020;38:690-8.
- Widiger TA, Oltmanns JR. Neuroticism is a fundamental domain of personality with enormous public health implications. *World Psychiatry* 2017;16:144-5.
- Roberts BW, Lejuez C, Krueger RF, Richards JM, Hill PL. What is conscientiousness and how can it be assessed? *Dev Psychol* 2014;50:1315-30.
- Kraaijeveld SR, Mulder BC. Altruistic vaccination: Insights from two focus group studies. *Health Care Anal* 2022;30:275-95.
- Murphy J, Vallières F, Bental RP, Shevlin M, McBride O, Hartman TK, *et al.* Preparing for a COVID-19 vaccine: Identifying and psychologically profiling those who are vaccine hesitant or resistant in two general population samples; 2020. Available from: <https://psyarxiv.com/pev2b/>. [Last accessed on 2023 Jul 31].
- Murphy J, Vallières F, Bental RP, Shevlin M, McBride O, Hartman TK, *et al.* Psychological characteristics associated with COVID-19 vaccine hesitancy and resistance in Ireland and the United Kingdom. *Nat Commun* 2021;12:29.
- Solis Arce JS, Warren SS, Meriggi NF, Scacco A, McMurry N, Voors M, *et al.* COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. *Nat Med* 2021;27:1385-94.
- Umeaku NN, Nnedum OA, Nweke KO. The validation of the ten-item personality inventory (Tipi) in the Nigerian sample. *Interdiscip J Afr Asian Stud (IJAAS)* 2021;7:70-5.
- Rammstedt B, John OP. Measuring personality in one minute or less: A 10-item short version of the big five inventory in English and German. *J Res Pers* 2007;41:203-12.
- Iwu CA, Ositadinma P, Chibiko V, Madubueze U, Uwakwe K, Oluoha U. Prevalence and predictors of COVID-19 vaccine hesitancy among health care workers in tertiary health care institutions in a developing country: A cross-sectional analytical study. *Adv Public Health* 2022;2022. <https://doi.org/10.1155/2022/7299092>. [Last accessed on 2023 Jul 31].
- Amuzie CI, Odini F, Kalu KU, Izuka M, Nwamoh U, Emma-Ukaegbu U, *et al.* COVID-19 vaccine hesitancy among healthcare workers and its socio-demographic determinants in Abia State, Southeastern Nigeria: A cross-sectional study. *Pan Afr Med J* 2021;40:10.
- Ackah M, Ameyaw L, Gazali Salifu M, Afi Asubonteng DP, Osei Yeboah C, Narkotey Annor E, *et al.* COVID-19 vaccine acceptance among health care workers in Africa: A systematic review and meta-analysis. *PLoS One* 2022;17:e0268711.
- Abubakar AT, Suleiman K, Ahmad SI, Suleiman SY, Ibrahim UB, Suleiman BA, *et al.* Acceptance of COVID-19 vaccine among healthcare workers in Katsina state, Northwest Nigeria. *MedRxiv* 2022. Available from: <https://www.medrxiv.org/content/10.1101/2022.03.20.22272677v1>. [Last accessed on 2023 Jul 31].
- Nomhwange T, Wariri O, Nkereuwem E, Olanrewaju S, Nwosu N, Adamu U, *et al.* COVID-19 vaccine hesitancy amongst healthcare workers: An assessment of its magnitude and determinants during the initial phase of national vaccine deployment in Nigeria. *EClinicalMedicine* 2022;50:101499.
- Dubov A, Distelberg BJ, Abdul-Mutakabbir JC, Beeson WL, Loo LK, Montgomery SB, *et al.* Predictors of COVID-19 vaccine acceptance and hesitancy among healthcare workers in Southern California: Not just "anti" versus "pro" vaccine. *Vaccines (Basel)* 2021;9:1428.
- Galanis P, Moissoglou I, Vraga I, Siskou O, Konstantakopoulou O, Katsiroumpa A, *et al.* Predictors of COVID-19 vaccine uptake in healthcare workers: A cross-sectional study in Greece. *J Occup Environ Med* 2022;64:e191-6.
- Mondal P, Sinharoy A, Su L. Sociodemographic predictors of COVID-19 vaccine acceptance: A nationwide US-based survey study. *Public Health* 2021;198:252-9.
- Viswanath K, Bekalu M, Dhawan D, Pinnamaneni R, Lang J, McLoud R. Individual and social determinants of COVID-19 vaccine uptake. *BMC Public Health* 2021;21:818.
- Zhou CM, Qin XR, Yan LN, Jiang Y, Yu XJ. Global trends in COVID-19. *Infect Med* 2022;1:31-9.
- Ashton J. COVID-19 and herd immunity. *J R Soc Med* 2022;115:76-7.
- Neagu M. The bumpy road to achieve herd immunity in COVID-19. *J Immunoassay Immunochem* 2020;41:928-45.
- Gadoth A, Halbrook M, Martin-Blais R, Gray A, Tobin NH, Ferbas KG, *et al.* Cross-sectional assessment of COVID-19 vaccine acceptance among health care workers in Los Angeles. *Ann Intern Med* 2021;174:882-5.
- Qattan AM, Alshareef N, Alsharqi O, Al Rahahleh N, Chirwa GC, Al-Hanawi MK. Acceptability of a COVID-19 vaccine among healthcare workers in the Kingdom of Saudi Arabia. *Front Med (Lausanne)* 2021;8:644300.



40. Huynh G, Nguyen TV, Nguyen DD, Lam QM, Pham TN, Nguyen HT. Knowledge about COVID-19, beliefs and vaccination acceptance against COVID-19 among high-risk people in Ho Chi Minh City, Vietnam. *Infect Drug Resist* 2021;14:1773-80.
41. Yanto TA, Octavius GS, Heriyanto RS, Ienawi C, Nisa H, Pasai HE. Psychological factors affecting COVID-19 vaccine acceptance in Indonesia. *Egypt J Neurol Psychiatr Neurosurg* 2021;57:177.