

# BMJ Open COVID-19 vaccine hesitancy among Nigerians living with non-communicable diseases: a qualitative study

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## ABSTRACT

**Objectives** The discovery and subsequent manufacture of various types of COVID-19 vaccines were considered a breakthrough in the fight against the COVID-19 pandemic. Initially, limited supplies of COVID-19 vaccines warranted vulnerable populations such as people living with chronic non-communicable diseases and the elderly to be prioritised for vaccination. Nevertheless, the uptake of the COVID-19 vaccines among these populations was suboptimal. In this study, we aimed to describe the drivers of COVID-19 vaccine hesitancy among people living with chronic non-communicable diseases in Ibadan, Nigeria.

**Method** We applied qualitative methods to explore the feelings and thoughts of people living with chronic non-communicable diseases towards COVID-19 vaccines, at a tertiary hospital in Ibadan, Nigeria. Data were obtained from 25 people living with chronic conditions through in-depth interviews. We thematically analysed the transcripts inductively and deductively. Dedoose qualitative data management software was used to manage the data.

**Findings** Emerging subthemes were grouped into two major themes: Hesitancy towards the COVID-19 vaccine related to biological concerns and those related to sociopolitical issues. Hesitancy towards the COVID-19 vaccine associated with biological factors included:

(1) concerns over the COVID-19 vaccine worsening the underlying chronic condition; (2) fear of harmful physiological consequences; (3) concerns over insufficient testing of vaccine for safety and (4) perceived vaccine ineffectiveness. Sociopolitical factors were related to (1) misconceptions of vaccines as a treatment for those with COVID-19; (2) mistrust of manufacturers ('the whites'); (3) mistrust of government and (4) COVID-19 misinformation.

**Conclusion** Public health education on the nature and benefits of the COVID-19 vaccine is urgently needed among people living with chronic non-communicable diseases. These measures could improve COVID-19 vaccine uptake and healthcare usage in general. Paying attention to these factors could have implications for the management of the next global pandemic requiring mass vaccination.

## INTRODUCTION

The COVID-19 pandemic is an unprecedented 21st century health issue. Globally, as of December 2022, the disease had affected

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ To our knowledge, this is the first study in Nigeria that qualitatively explores the thoughts/feelings of vaccine-hesitant individuals living with non-communicable diseases towards the COVID-19 vaccine.
- ⇒ This study looked at vaccine hesitancy in a sub-population. The findings can, therefore, inform population-specific interventions towards improving the uptake of preventive health services.
- ⇒ The public and patients were not involved in designing the study. There is a growing consensus that public and patient involvement in research contributes to improving the quality of research projects and strengthening their relevance and impact.

well over half a billion (640 395 651) people causing mortality in close to seven million people within 2 years.<sup>1</sup> Although high COVID-19-related mortality was recorded in the USA and many European countries, Nigeria has had its share of morbidity and negative socio-economic impact due to the infection.<sup>2</sup>

Comorbidities in the form of chronic non-communicable diseases (NCDs) increase the risk of dying from the COVID-19 infection. Patients with COVID-19 who have comorbidities such as hypertension or diabetes mellitus are more likely to develop a more severe course and progression of the disease.<sup>3</sup> In Nigeria, NCDs accounted for 29% of all deaths in 2016 and the probability of premature deaths from NCDs is higher than the global trend.<sup>4</sup> High mortality was recorded among Nigerian males with comorbid conditions of NCDs and COVID-19.<sup>5</sup> People living with chronic NCDs along with the elderly were, therefore, placed on the priority list regarding the emergency vaccination against the COVID-19 pandemic.

With the arrival of the COVID-19 vaccine, Nigeria received its first shipment of four million vaccines in March 2021.<sup>6</sup> The initial

limited supply compelled the government to prioritise the vaccination of health professionals, people with NCDs and the elderly.<sup>7</sup> This was soon followed by the supply of more vaccine doses supported by the COVID-19 Vaccines Global Access (COVAX), UNICEF and other organisations, to cater for the rest of the Nigerian population. However, the response to the vaccination has been low among the entire Nigerian population. As of April 2022, only 4.5% and 5.4% of Nigerians had received their full dose and a single dose, respectively.<sup>8</sup> This poor uptake is attributed to a negative attitude towards the COVID-19 vaccine—accine hesitancy.

The WHO defines vaccine hesitancy as ‘a motivational state of being conflicted about, or opposed to, getting vaccinated; this includes intentions and willingness’.<sup>9</sup> For instance, a quantitative study carried out among 423 Nigerian adults living with chronic health conditions showed that only 46% of people with chronic NCDs in Nigeria were willing to take the COVID-19 vaccines with more than half of them having negative attitudes towards the vaccines.<sup>10</sup>

Common reasons driving the COVID-19 vaccine hesitancy among the general population in Cameroon, Vietnam and the USA include doubts about vaccine reliability and its cost, perceiving vaccines as not being beneficial, fear about vaccine non-safety, mistrust of pharmaceutical companies, concern over the speed of development of vaccines and mistrust of the government.<sup>11–13</sup> With the inability of the Nigerian healthcare system to cope with the COVID-19 pandemic, it became important to increase the uptake of the vaccine among the general population and particularly among those with chronic medical conditions. Nevertheless, vaccine hesitancy persisted especially among people living with chronic NCDs. The need for a qualitative study to explore the reasons why people living with chronic NCD conditions do not want to get vaccinated has been suggested.<sup>14</sup> To this end, we conducted an exploratory qualitative study to highlight some of the drivers of COVID-19 vaccine hesitancy among people living with a chronic condition in Ibadan, Nigeria. We, therefore, sought to answer the following research question: what are the reasons why people living with NCDs hesitate to take the COVID-19 vaccine?

## METHODS

### Study design

We conducted an exploratory qualitative study. This approach allows researchers to provide a comprehensive summarisation, in everyday terms, of specific events experienced by individuals or groups of individuals.<sup>15</sup> We sought to obtain relevant information on how and why COVID-19 vaccine hesitancy occurs among people living with chronic NCDs. The study is part of a larger study on the ‘exploration of COVID-19 health-related issues among people living with chronic health conditions in Ibadan.’

### Study setting and sample

As part of the larger study on ‘exploration of COVID-19 health-related issues among people living with chronic health conditions in Ibadan’; there had been a prior data collection using a survey method a month before, in which the vaccination intention of patients attending the same clinic was estimated to be less than 50%. This qualitative study was, therefore, designed to explore the drivers of the COVID-19 vaccine hesitancy. We sought to recruit new participants because those who took part in the quantitative study did not want to participate further. Consequently, we adopted a purposive sampling approach. Prospective participants were met in person at the Medical Outpatient clinic of a tertiary hospital in Ibadan. The clinic is held from Monday to Friday with different medical conditions managed on different clinic days. We then asked these participants if they were willing to take the COVID-19 vaccines, when they said ‘no’, then we asked them if they would like to be interviewed while waiting their turn to receive their NCD-related services.

We used this convenient purposive sampling technique to select 25 people with chronic NCDs. Participants were eligible if they were (1) not willing to take the COVID-19 vaccine, on being asked by the first author who later conducted the interviews; (2) living with a chronic NCD condition for more than 6 months since official medical diagnosis; (3) older than 18 years; (4) willing to consent and participate in the study and (5) physically and mentally sound to take part in the study. [Table 1](#) displays the characteristics of the study participants.

Other participants<sup>3</sup> who met the inclusion criteria but did not participate offered reasons such as having no time or not being interested in taking part in the study. Our selection of 25 participants was informed by thematic saturation<sup>16</sup> Our saturation was informed by the comprehensiveness of both the data collection and analysis.

### Study context

In-depth interviews were conducted in April 2021. This was at a time when COVID-19 vaccines were available in Nigeria but were only available for healthcare workers and people with chronic NCDs.<sup>6</sup> The government, at that time, was using media outlets (radio, newspaper and television) to create awareness about the vaccine. In addition, the vaccine receipt by the President and some other top government officials was televised on the National television station.

### Data collection

A semistructured interview guide was used for data collection—online supplemental file 1. The interview guide was first piloted among five<sup>5</sup> participants who were not included in the study. It was found to elicit the requisite and desired responses from the study participants. Each participant was interviewed alone in a secluded area of the clinic by the first author who has a doctoral degree in nursing science and whose research is focused on the care of people with chronic health conditions. In addition, the

**Table 1** Characteristics of study participants

| Variable                    | Categories                 | n  | %  |
|-----------------------------|----------------------------|----|----|
| Gender                      | Male                       | 12 | 52 |
|                             | Female                     | 13 | 48 |
| Age—years                   | 20–30                      | 1  | 4  |
|                             | 31–40                      | 4  | 16 |
|                             | 41–50                      | 6  | 24 |
|                             | 51–60                      | 6  | 24 |
|                             | 61–70                      | 6  | 24 |
|                             | 71–80                      | 1  | 4  |
|                             | 81–90                      | 1  | 4  |
| Ethnic group                | Yoruba                     | 22 | 88 |
|                             | Others (Igbo, Edo, Ibibio) | 3  | 12 |
| Religion                    | Christianity               | 20 | 80 |
|                             | Islam                      | 5  | 20 |
| Marital status              | Single                     | 2  | 8  |
|                             | Married                    | 22 | 88 |
|                             | Divorced                   | 1  | 4  |
| Educational level           | No formal                  | 1  | 4  |
|                             | Primary                    | 3  | 12 |
|                             | Secondary                  | 4  | 16 |
|                             | Diploma                    | 6  | 24 |
|                             | First degree               | 7  | 28 |
|                             | Postgraduate               | 4  | 16 |
| Occupation                  | Civil service              | 5  | 20 |
|                             | Trading                    | 9  | 36 |
|                             | Retiree                    | 6  | 24 |
|                             | others                     | 5  | 20 |
| Health condition            | Hypertension               | 10 | 40 |
|                             | Diabetes mellitus          | 6  | 24 |
|                             | Hypertension and DM        | 3  | 12 |
|                             | Chronic kidney disease     | 2  | 8  |
|                             | Sickle cell anaemia        | 2  | 8  |
| Others                      | 2                          | 8  |    |
| Illness duration (in years) | 1–10                       | 15 | 60 |
|                             | 11–20                      | 5  | 20 |
|                             | >20                        | 5  | 30 |

DM, diabetes mellitus.

first author, a female, had undergone training in in-depth interviewing. The data collection was directed and overseen by the second author who is a seasoned Global health qualitative methods researcher.

Before commencing the interview, the interviewer was introduced by the nurse in charge of the medical outpatient clinic to all the patients. The introduction included the professional affiliation of the interviewer and the goal

of the data collection. The goal of the study, which was to determine the reasons for vaccine hesitancy, was further reiterated by the interviewer during her one-on-one meeting with the patients.

The interview guide contained a section to capture the sociodemographic characteristics of the study participants and questions about their underlying health condition(s). Examples of hesitancy-specific in-depth interview questions included: ‘now that people are taking the vaccines, what have you heard about it?’ ‘You had mentioned earlier that you will not take the vaccine, can you tell me about the reasons for this decision? (Probe: lack of trust in the government, fear of side effects, availability, religious bias, not interested, etc). In the end, the participant was asked again ‘Do you still feel the same way about the vaccine? About not taking it. The interviews were conducted in Yoruba and English languages based on the preference of the participant.

The interview guide was used throughout the interview to ensure consistency and standardisation in all the interviews while allowing for in-depth exploration of the phenomenon in question. The interviewer probed for emerging concepts based on participants’ responses. Each interview lasted between 15 and 20 min and was audiotaped using a tape recorder with permission from the study participants. Field notes were taken after each interview.

### Data management

The recordings were transcribed verbatim by a research assistant who has a master’s degree in Public Health and who is proficient in both English and Yoruba languages. She transcribed both Yoruba and English audios into English texts. Names or any information that could make it possible to identify the participants were not captured. Transcribed text in word format was entered into the Dedoose qualitative data management software. Dedoose is a collaborative web-based software that allows researchers to filter through their data using different codes, variables and descriptors while including the participant information.

### Data analysis

Thematic analysis guided our data analysis. Thematic analysis is a method for describing qualitative data and attributing meaning and providing interpretation in the processes of selecting codes and constructing themes—a thread of underlying meanings, within which similar components of data are connected for abstraction.<sup>17</sup> The coding of the transcripts was completely inductive, in the sense that the authors allowed the themes and subthemes to emanate from the transcripts ‘naturally’.

Codes were generated as the first stage of reducing the data and were done independently by the two authors. After the independent coding, the authors met and worked on developing the subthemes and themes discursively. Both authors were engaged in an iterative process

of comparing and classifying code clusters into subthemes and then themes in relation to the whole data.

### Rigour and trustworthiness

Rigour and trustworthiness were ascertained in three ways. First, by piloting the interview we established that the data collection instrument was able to elicit the necessary information from the participants and consequently requisite data to answer the research question.

Second, investigators held a series of meetings as the study unfolded to incorporate suggestions and fine-tune the different methods for data collection and its interpretation. This was very important for determining thematic saturation.

Third, the data analysis was conducted by the two authors. The initial open axial coding was done independently but the identification and classification of the subthemes and themes was achieved through iterative and discursive sessions between both authors. The entire research process was documented to have an audit trail of the decisions made and why.

### Patient and public involvement

It was not possible to involve patients or the public in the design, conduct, reporting or dissemination plans of our research.

## RESULTS

The themes that emerged from interviews with the 25 participants were organised into the 2 main constructs, which are biologically-related COVID-19 vaccine hesitancy and sociopolitical-related COVID-19 vaccine hesitancy. Biologically-related COVID-19 vaccine hesitancy included: (1) concern over the COVID-19 vaccine worsening the underlying chronic condition; (2) fear of harmful physiological consequences; (3) concern over insufficient testing of vaccine for safety and (4) perceived vaccine ineffectiveness. Sociopolitical-related COVID-19 vaccine hesitancy included (1) a misconception of vaccines as a treatment for those with COVID-19; (2) mistrust of manufacturers ('the whites'); (3) mistrust

of government and (4) COVID-19 misinformation. The subthemes and themes are illustrated in figure 1. Further, codes generated from the responses are available—online supplemental file 2.

### Biologically related COVID-19 vaccine hesitancy

Several respondents reported that they were afraid that they would develop harmful side effects because of the COVID-19 vaccine. Hence, their unwillingness to take it as they felt it was unsafe.

I have already mentioned it, what I hear [about the COVID-19 vaccine] makes me scared, some people get vaccinated and start complaining of headaches, cold... I heard some have blood clots, and some even die, so why should I worry myself... [R8, Male in his 70's, Clergyman, Hypertension and diabetes]

I heard that once you get vaccinated, ... someone who does not have COVID before, if vaccinated, the person will come down with COVID (R9, Male in his late 60's, Artisan, diabetes)

Some said they became sick after been vaccinated, that it triggered other ailments. You know our bodies are different (R25, Female in her late 70's, coronary artery disease)

Some of the respondents were reluctant as they felt that the vaccine might aggravate the underlying chronic condition, they were already burdened with.

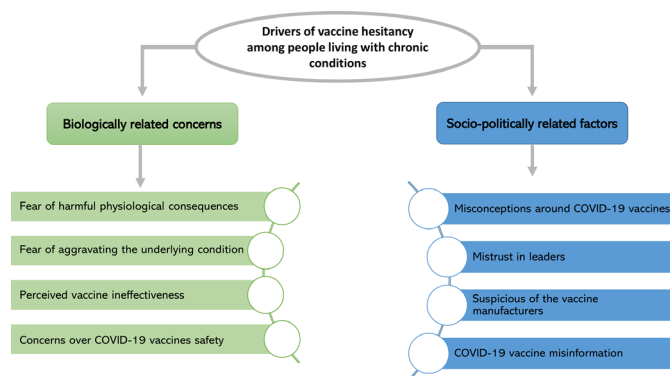
... the issue is all this diabetes and cardiac stuff that am having. As I have earlier mentioned, that, can I be able to withstand the vaccine? that in order to prevent COVID-19, I should not come down with another problem, ...so I would not like anything to add to the burden I'm having now and ... I don't want to die ... [R11; Female in her late 40's, Diabetes & Coronary Artery Disease]

Several of the respondents felt that at the time of the initial rollout of the COVID-19 vaccine, it had not undergone rigorous testing to guarantee its safety.

The drug has not undergone a thorough clinical trial before they start giving it to humans, we don't know what people will start conceiving after using the vaccine (R13, Male in his 80's, Diabetes & Hypertension)

There was a belief among some of the respondents that the vaccine was ineffective particularly since it was recommended that people should continue to wear face masks and maintain social distance, among other preventive measures.

Why I don't want to take it [COVID-19 vaccine] is because people said that when you take the vaccine, that does not mean you will not cover your nose, that does not mean the COVID-19 will not happen to them [i.e., one might still contract COVID-19]. When you take the COVID-19 vaccine why then do you have to maintain social distancing, why do you have to cover



**Figure 1** Thematic diagram illustrating the factors influencing vaccine hesitancy among people living with chronic conditions.

your nose, why do you have to do all these things...?  
[R10, Female, in her early 60's, Diabetes].

### Sociopolitically related COVID-19 vaccine hesitancy

Sociopolitical factors associated with the refusal or reluctance to be vaccinated against the COVID-19 pandemic include misconception of vaccine as treatment; suspicion/mistrust of the manufacturers (the whites); mistrust of Nigerian leaders and vaccine misinformation.

Some of the participants mistook the COVID-19 vaccine for treatment for the disease. They, therefore, felt that only those having the disease should be vaccinated.

The reason why I don't want to take the vaccine is because I don't have the COVID-19. Since I don't have it, so it's those that have it that will take the vaccine, so since I don't have it, why will I take it? (R21, middle age in his 50's, Male, Hypertension, Chronic Kidney Disease)

Poor knowledge about the mode of action of the vaccine was revealed in the belief that the vaccine can alter the body's genetic code leading to a loss of identity and deleterious effect on pregnancy. One of the participants expressed it in the following way:

...the vaccine disrupts our nature, changes us, changes our DNA, it will affect our identity. The drug has not undergone thorough clinical trial before they start giving it to humans, we don't know what people will start conceiving after using the vaccine (R13, Male in his 80', DM & Hypertension) Doubts about the willingness of the 'whites' to make a genuine vaccine for Africans alongside the suspicion that COVID-19 was 'created' artificially to reduce African population were reasons why some of the patients did not want to take the vaccine. As some stated

We could be swindled by the 'Whites'. ... I don't have confidence in the Whites doing (manufacturing) the vaccine, if it is in Nigeria, I will trust it [R20, Male, in the early '60s, Hypertension]

Some rich people in America said we are overpopulated in Africa, they wanted to use covid in reducing our population in Africa because we are not useful.... God blessed us but we are not utilizing it yet they are the one utilizing it so why don't they eliminate us since they know how to utilize our resources and God gave them wisdom and understanding so they should continue using it. It seems the COVID is artificial (R13, Male in his 80', DM & Hypertension)

A few of the study participants suggested that they would not take the COVID-19 vaccine because they feared that they would receive a substandard vaccine, whereas political leaders would receive more reliable ones. This is because the existing social disparity in healthcare services in Nigeria indicates a pattern whereby top government officials receive healthcare abroad or in special hospitals in the country.

So, everybody is scared, they said the President has taken it (the vaccine) and the Governor, and (political) counsellors. How do I believe that the injection they will give us, that is what they will give those (politicians)? I don't believe that is the one because since this hospital has been here, I have never seen the President come for a check-up, and this is the biggest hospital in Nigeria, I have never seen Governor or Counsellor come for a check-up. If they are not well, they will go abroad. Nobody can deceive me to take it [R23, Female, in the late '40s, Hepatitis].

Some of the participants indicated trusting the 'information' they receive from various sources which speak against the vaccine. As such, they felt that it was not safe to take the vaccine.

I heard about this Johnson & Johnson that it's not good, that it is dangerous, that if you take it, it can even send you to an early grave. I saw it on social media. All those things scare me off [R10, Female in her early 60's, DM].

### DISCUSSION

In this study, we explored the drivers of vaccine hesitancy among people with chronic NCDs in Ibadan, Nigeria. Our findings show that the COVID-19 vaccine hesitancy of people living with chronic NCDs was influenced by a negative attitude shown in mistrust of government and manufacturers. Their negative attitude towards vaccination was further aggravated by fear of side effects and possible aggravation of their underlying condition (negative outcome evaluation). Furthermore, vaccine hesitancy among people with chronic NCDs was influenced by the attitude of family and friends who fuelled misinformation and misconception on social media. There was also a perceived lack of COVID-19 vaccine effectiveness, which affected the 'motivation to comply' among people living with chronic conditions.

COVID-19 vaccine hesitancy associated with 'mistrust of the whites (drug manufacturers)' among our participants may have been fuelled by various incidences that took place in Africa both before and during the COVID-19 pandemic era. Nigerians and many Africans generally venerate the Western world as greener pastures. However, the negative experience with the 1996 Pfizer drug trial in Northern Nigeria, which led to the death of eleven children created doubts about drugs from the West.<sup>18</sup> This antecedent and the belief that the Western world wanted to reduce the Muslim population by contaminating polio vaccines with agents that could cause infertility and HIV led to the polio vaccination boycott in 2002–2004.<sup>19</sup> Further, it has been posited that many Africans harbour a mistrust of the 'whites (drug manufacturers)' due to past exploitation and unethical drug trials; and this influences their health-seeking behaviour, particularly towards trials of new vaccines from the West.<sup>20</sup> Vaccine hesitant

participants in a study that took place in Cameroon also expressed a fear that pharmaceutical companies in the West took advantage of their unstable political system to test substandard vaccines.<sup>11</sup> Bhopal *et al.*<sup>21</sup> further suggested that the statement made by some French scientists that the COVID-19 vaccine should first be tested in Africa,<sup>22</sup> although it was followed by an apology, could have caused prejudices against the vaccine among many Africans.

COVID-19 vaccine hesitancy reflected in the mistrust and suspicion of the manufacturers (the whites) have implications for vaccine manufacture in African countries. Good enough, vaccine manufacture in various African institutions has been approved by the WHO. This was announced during a European Union and African Union summit that took place in Brussels on 18 February 2022.<sup>23</sup> The WHO had expressed concern over the low uptake of vaccines in many African countries. As one of the measures to increase vaccine uptake on the continent, the World Trade Organization waived the licence for COVID-19 vaccine manufacture so that African countries can produce the vaccine. Following this, the Moderna vaccine was reproduced in South Africa successfully by the first week of February 2022.<sup>24</sup> Five other countries including Nigeria have been permitted to reproduce the vaccine.<sup>25</sup> This line of thinking should be adopted when it comes to future pandemics and diseases where the manufacture of preventive and treatment substances should also take place in Africa to improve confidence and consequently uptake.

Mistrust of the government was another major driver of vaccine hesitancy among our participants. This belief was in the context of government officials' medical tourism and failure to use government health facilities available to the general population. Such an observation has given credence to the thinking that a substandard vaccine would be given to the general population while government officials would receive a better one. The onus is, therefore, on the government to increase citizen's trust in public healthcare systems by ensuring those in influential political positions use the available local services. As in our findings, mistrust of the government was cited as one of the reasons for vaccine hesitancy among several UK participants, but this was in the context of the perceived failure of the government to be completely transparent about the COVID-19 vaccine—unusually short timeline to vaccine development, secrecy in its production and granting of legal indemnity to pharmaceutical companies involved in production.<sup>25</sup> Similar to this study, Africans in Ghana and Zimbabwe also felt hesitant about taking the COVID-19 vaccine due to mistrust of the government's ability to secure an effective vaccine.<sup>26</sup>

COVID-19 vaccine hesitancy was also instigated by various circumstances. While the COVID-19 vaccine is expected to reduce disease fatality among people with chronic conditions, we found that people remain unconvinced that the benefits of the vaccine would outweigh the risk of not taking the vaccine. There is a feeling that the

vaccine would aggravate their health conditions. Hence, they were not willing to take the vaccine because they felt their disease condition, could get worse. In line with our findings, concerns about the negative effect of the COVID-19 vaccine have been expressed by people with comorbidities in other countries.<sup>12 27</sup> Such concerns are not unfounded as studies have shown that a few healthy individuals developed serious side effects, such as myocarditis, following COVID-19 vaccination.<sup>28</sup> However, there are reports that support the benefits of the vaccine over the risk of developing side effects.<sup>29 30</sup> Certainly, a lot of 'convincing' would have to be done to get people with chronic conditions to focus more on the benefits rather than the risks of the vaccine.

In this study, COVID-19 hesitancy was exacerbated by concerns over perceived less rigorous testing of the COVID-19 vaccine, to guarantee its safety among humans, because of the quick rollout. This means that participants equated vaccine efficacy with the speed of its development. This points to the need for researchers and the government to consider people's preconceived ideas about how a new treatment/intervention is to be developed before making such available for general use. Our findings align with that conducted among vaccine-hesitant participants in Arkansas, USA. These participants were reluctant to be among the first to be vaccinated because of the comparatively faster period within which the COVID-19 vaccine testing and approval occurred.<sup>13</sup> The same sentiment expressed by our participants was expressed by some individuals with comorbid conditions in an Australian study.<sup>31</sup> Similarly, participants in a study on vaccine hesitancy in South Korea also expressed concerns over the quickness of COVID-19 vaccine development.<sup>32</sup>

Detrimental attitudes towards COVID-19 vaccinations are also being formed through misconceptions and poor knowledge about the COVID-19 vaccine, for instance, as causing DNA mutation. It could be argued that some participants were misinformed and that the information, if any, provided at the health facilities were not in sufficient depth to douse the misinformation. Like our findings, some vaccine-hesitant participants in the USA believed that the vaccine would alter people's DNA structure. They also showed a poor understanding of how the vaccine works in general.<sup>33</sup> The same falsely and confidently held theory about DNA alteration was captured in an Australian study.<sup>31</sup> As happened with our study participants, misconceptions about the COVID-19 vaccine were also reported among health workers and the general population in a study that took place in Iraq.<sup>34</sup> Even among some Pharmacists in Pakistan, there were misconceptions about the possibility of the vaccine causing infertility.<sup>35</sup>

Information on social media, notably Facebook and WhatsApp platforms, also influences vaccine hesitancy through the formation of negative subjective norms about the COVID-19 vaccine. Such misinformation leads to fear of the vaccine engendering hesitancy among people living with chronic conditions and among the general

population. Like our findings, the influence of vaccine misinformation on COVID-19 vaccine hesitancy has been shown among Vietnamese and South Koreans.<sup>12,32</sup> This has been further demonstrated by other authors in different settings.<sup>14, 27</sup> While it may be difficult for health professionals and the government to control the dissemination of wrong information during a pandemic, it is important that the social media is used to effectively disseminate the correct information to douse any misinformation.

The negative attitude of people living with chronic NCDs towards COVID-19 vaccinations suggested that the vaccine influences potential changes in normal human physiological processes. Perceived harmful side effects attributed to the vaccines include fear of developing blood clots, general illness, developing COVID-19 and the possibility of triggering other illnesses. The fear of side effects cannot be discountenanced and must therefore be addressed if the uptake of the vaccine is to improve. Similar observations were made in a study among Vietnamese adults including respondents with an underlying medical condition.<sup>12</sup> The same concern was expressed by a vaccine priority group comprising healthcare workers, the aged and people with comorbid conditions in Australia.<sup>31</sup> From the inception of the COVID-19 vaccine rollout, there were concerns over its tendency to cause blood clots.<sup>36–38</sup> We also identified concerns over the effect of the vaccine on pregnancy. This is an important concern as a study among pregnant women in France showed that less than a third of them were not willing to receive the COVID-19 vaccine due to fear of teratogenic effects among others.<sup>39</sup> Additionally, a study in Malaysia reported 13% abnormal pregnancy incidences among pregnant female healthcare workers who received the vaccine.<sup>40</sup>

### Study limitations

The findings of this study should be considered in the light of the following study limitations:

While the data collection tool development was informed by a review of the literature on vaccine hesitancy and barriers to access healthcare services, it did not focus on people living with chronic disease.

Good interviewing as a method of data collection requires building a rapport with the interviewee. Because we conveniently sampled our participants at the treatment centres, there was no previous relationship/rapport between the interviewer and the participants, which would have helped in immediately creating trust and putting the participants at ease and enhance information sharing. The interviewer, however, made efforts to establish a good rapport with the participants.

### CONCLUSION AND RECOMMENDATIONS

We uncovered various reasons for the COVID-19 vaccine hesitancy and conceptualised them into two major themes: biologically related COVID-19 vaccine hesitancy and COVID-19 vaccine hesitancy related to sociopolitical

factors. Given the low uptake of the vaccine among Africans, including in Nigeria; several misconceptions/knowledge about it and the tendency of people to trust information from social media, the following recommendations are made: (1) Use of all media resources (including social media) to provide information as this could counter the misinformation. (2) A well-tailored educational programme could be carried out during NCD clinic visits to provide information on the benefits of COVID-19 vaccine. (3) Hotlines should be available for call-ins and clarifications about the vaccine. (4) Government officials should endeavour to use public health facilities to promote trust in the services offered there.

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**Patient consent for publication** Not applicable.

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**Data availability statement** Data are available on reasonable request. All data relevant to the study are included in the article or uploaded as online supplemental information.

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