



Original Article

## Willingness to receive COVID-19 vaccine: A survey among medical radiation workers in Nigeria

Grace Ben Inah<sup>1</sup>, Samuel Archibong Efanga<sup>1</sup>, Ekaete Vincent Ukpong<sup>2</sup>, Christiana Ifeyinwa Obiora<sup>3</sup>

Departments of <sup>1</sup>Radiology and <sup>2</sup>Radiography and Radiological Science, University of Calabar, <sup>3</sup>Department of Radiology, University of Calabar Teaching Hospital, Calabar, Nigeria.



**\*Corresponding author:**

Samuel Archibong Efanga,  
Department of Radiology,  
University of Calabar, Calabar,  
Nigeria.

samuelefanga@rocketmail.com

Receive : 10 May 2022

Accepted : 09 September 2022

Published : 26 November 2022

**DOI**

10.25259/CJHS\_20\_2022

**Quick Response Code:**



### ABSTRACT

**Objectives:** Coronavirus disease, also known as coronavirus disease (COVID-19), is a deadly infection that has contributed to global morbidity and mortality in recent years. Different brands of COVID-19 vaccines have been manufactured toward containing the pandemic. Unfortunately, poor uptake of these vaccines in developing countries has contributed to suboptimal containment of the pandemic. There is a need for a better understanding of the level of willingness, as a key determinant of vaccine uptake, especially among populations at higher risk of exposure to the virus. The main objective of this research is to assess the willingness of medical radiation workers to receive the COVID-19 vaccine.

**Material and Methods:** This was a prospective, cross-sectional, and observational study that utilized a non-probability snowball sampling technique. The study was done within 1 month and 50 responses from medical radiation workers within Nigeria were obtained. A structured and validated questionnaire was administered online using Google Forms for data collection. Data analysis was conducted using Statistical Package for the Social Sciences version 21.0.

**Results:** Only 45.45% of the medical radiation workers were willing to receive the COVID-19 vaccine. The factors that were associated with the willingness to receive the COVID-19 vaccine included older age ( $P = 0.016$ ) and longer duration of service ( $P = 0.021$ ), where it was observed that medical radiation workers who were 50 years and above and had offered >10 years in service were more willing to receive the vaccine.

**Conclusion:** The willingness of medical radiation workers to receive the COVID-19 vaccines was poor for health workers. Therefore, there is an urgent need to redouble educational and other interventional efforts, aimed at improving vaccine uptake, perhaps with much focus on younger radiation medical workers.

**Keywords:** COVID-19 vaccine, COVID-19, Willingness, Medical radiation workers, Nigeria

### INTRODUCTION

Coronavirus disease (COVID-19) is a highly infectious disease that was first discovered in Wuhan, China, and was subsequently reported to the World Health Organization (WHO) on December 31, 2019. The disease was declared a public health emergency of international concern on January 30, 2020, and then, a pandemic on March 11, 2020. The disease is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which is a ribonucleic acid (RNA) virus and is similar to the previous contagions, SARS-CoV-1, and the Middle East respiratory syndrome.<sup>[1-3]</sup> It has rapidly spread across 200 countries, with 510 million confirmed cases and over 6 million deaths globally.<sup>[3,4]</sup> As of May 9, 2022, Nigeria recorded 255,766 cases and 3143 deaths due to the pandemic.<sup>[5]</sup>

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The development and application of vaccines were, therefore, crucial to curb the spread of the virus across the globe. In this regard, the WHO in collaboration with some pharmaceutical establishments has produced various brands of COVID-19 vaccines for use to curb the spread of this highly infectious disease. However, it has been reported that there is unwillingness all over the world to accept the vaccines endorsed by the WHO and this unwillingness is listed among the top 10 global health threats.<sup>[6]</sup>

Health workers who are on the frontlines in the management and treatment of COVID-19 are most susceptible to this disease and, therefore, vaccinating them is extremely essential. Radiation workers are among the health workers who come in close contact with highly suspicious cases and are, thus, expected to show willingness toward accepting the WHO-endorsed COVID-19 vaccines, even when they are available for health workers.<sup>[7]</sup> However, there are reports of the unwillingness of some health workers in Nigeria to accept COVID-19 vaccination. Several factors have been identified following surveys conducted in the United States of America and Australia such as gender, age, education level, and ethnicity that underlie the hesitancy and willingness to uptake COVID-19 vaccination.<sup>[7,8]</sup>

In Nigeria, there is a paucity of records available for assessing the inclination of medical radiation workers concerning the uptake of COVID-19 vaccines. The study is, therefore, aimed at evaluating the willingness of medical radiation workers in Nigeria to receive the COVID-19 vaccines.

## MATERIAL AND METHODS

### Study design

This was a prospective, cross-sectional, and observational study.

### Setting

The research was conducted in Nigeria within 1 month (in May 2021). Ethical approval was obtained from the Health Research Ethics Committee of the University of Calabar Teaching Hospital.

### Participants

They were made up of medical radiation workers with requisite qualifications who were actively working in health facilities nationwide. Medical radiation workers in this study were radiologists, radiographers, radiotherapists, medical physicists, and radiology nurses.<sup>[9]</sup>

### Study size

Employing non-probability snowball sampling technique, the survey pooled convenient sample size of 50 respondents.

### Study instrument

The study utilized an A-27 item online survey form (Google Forms), which captured items on demographic data of respondents and questions bordering on COVID-19 vaccines and willingness in accepting these vaccines that had been endorsed by the WHO.

### Data collection

The survey was generated as a link was sent through different media including WhatsApp and emails to medical radiation workers across the six geopolitical zones of Nigeria. The survey commenced with a consent statement and the medical radiation workers who gave consent proceeded to complete the online survey. The respondents were at liberty to terminate the survey at any time with no valuable information offered. However, all survey responses that gave responses to two-thirds of the total questions were included irrespective of the number of questions answered by the subjects. During the survey period, the investigators assessed the data thrice (after 3 days, after a week, and after 10 days of commencing the survey) to assess the data quality. The respondents were only able to submit the completed survey once.

### Data analysis

Descriptive statistics including tables and figures were used to assess the distribution of gender, age group, religion, marital status, and year in service among respondents. For each statistical analysis, the Chi-squared test was used to evaluate categorical variables. The Statistical Package for the Social Sciences version 21.0 was used for data analysis. The significance level was set at  $P < 0.05$ .

## RESULTS

The data collected from 50 respondents were analyzed. The mean age of the respondents was  $38.04 \pm 12.25$  years and the most common age group was 30–39 years (54%), and most respondents were male (68%), married (74%), and Christian (80%), with 10 years or more duration of service (54%) [Table 1].

Pearson Chi-squared test analysis revealed that the age of medical radiation workers ( $P = 0.016$ ) and the number of years in service ( $P = 0.021$ ) were significantly associated with willingness to receive the COVID-19 vaccine. Medical radiation workers who were below 50 years of age and who had <10 years of working experience expressed more unwillingness to receive the vaccine. However, gender ( $P = 0.287$ ), marital status ( $P = 0.279$ ), and religion ( $P = 0.413$ ) were not significantly associated with willingness to receive the COVID-19 vaccine [Table 2].

**Table 1:** Sociodemographic characteristics of respondents.

Variable	Frequency (n, %)
Age	
20–29 years	5 (10)
30–39 years	27 (54)
40–49 years	8 (16)
50–59 years	8 (16)
≥60 years	2 (4)
Gender	
Male	34 (68)
Female	16 (32)
Marital status	
Married	37 (74)
Single	11 (22)
Widowed/divorced/separated	2 (4)
Religion	
Christianity	40 (80)
Islam	9 (18)
Others	1 (2)
Number of years in service	
≤5 years	14 (28)
5–9 years	9 (18)
10–14 years	8 (16)
15–19 years	3 (6)
20–24 years	4 (8)
25–29 years	2 (4)
30–34 years	1 (2)

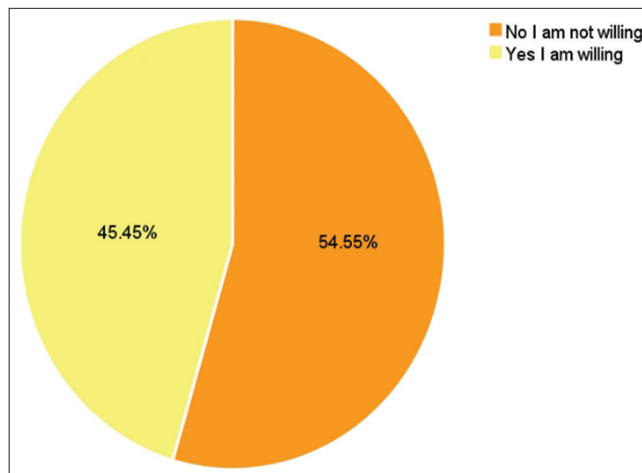
There were 44 responses obtained in this item of the survey that had to do with a willingness to receive the COVID-19 vaccine. It was shown that only 45.45% of medical radiation workers were willing to receive the COVID-19 vaccine [Figure 1].

It was shown that the inability to validate the safety of the vaccine (27.48%) and lack of trust in the vaccine (19.08%) were the common possible factors responsible for unwillingness to receive the COVID-19 vaccine. The least common factors reported by the respondents were that the risk of the infection was lower than the risks of vaccination (0.76%) and their firm religious belief (1.53%) [Figure 2].

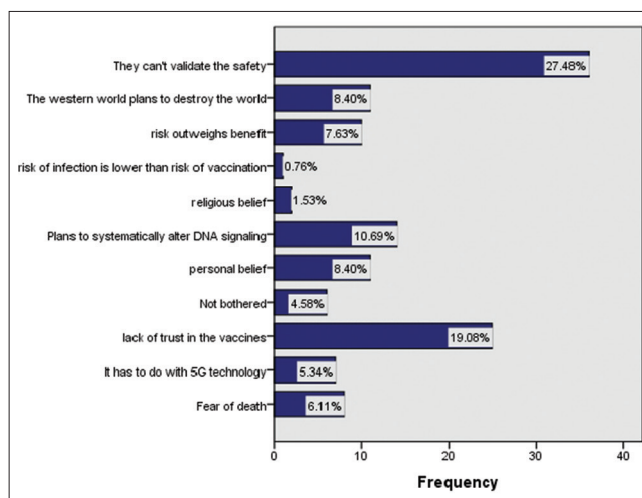
Report of prior uncertain, as well as certain experiences of COVID-19 symptoms, was not associated with willingness to receive the vaccine ( $P > 0.05$  [Table 3]).

## DISCUSSION

In this study, we discovered that 45.45% of medical radiation workers were willing to receive the COVID-19 vaccine. This finding is unexpected, considering that medical radiation workers, due to their occupational risk of exposure to the SARS-CoV-2 virus infections, should be willing to receive protection through cost-effective vaccination. Their occupational learning environment which potentially affords



**Figure 1:** Willingness of medical radiation workers to receive COVID-19 vaccine.



**Figure 2:** Possible factors that influence unwillingness to receive COVID-19 vaccination.

improved knowledge of adverse consequences of non-vaccination may have been insufficient to motivate and yield the will for vaccine uptake. It seems that the risk of suffering the severe form of the disease is not an adequate reason to increase the willingness of medical radiation workers to receive the vaccine. This is a pertinent cause for concern because a 75% willingness to receive the COVID-19 vaccine, and subsequent vaccination, in a given population, is the minimum requisite to attain herd immunity and, consequently, terminate the spread of COVID-19. In this study, the willingness to receive the vaccine by medical radiation workers, who are supposed to propagate the importance of the vaccine to the masses, is low, which may impair the attainment of herd immunity in our community. There are likely weighty factors beyond the knowledge and training acquired by medical radiation workers which have influenced their decision to be unwilling to receive the COVID-19 vaccine.<sup>[10]</sup>

**Table 2:** Factors associated with willingness to receive the COVID-19 vaccine.

Variable	Willingness to receive vaccine			P value
	Yes (n/%)	No (n/%)	Total	
Age				0.016*
20–29 years	1 (25)	3 (75)	4 (100)	
30–39 years	9 (37.5)	15 (62.5)	24 (100)	
40–49 years	2 (25)	6 (75)	8 (100)	
50–59 years	6 (100)	0 (0)	6 (100)	
≥ 60 years	2 (100)	0 (0)	2 (100)	
Gender				0.287
Male	12 (40)	18 (60)	30 (100)	
Female	8 (57.1)	6 (42.9)	14 (100)	
Marital status				0.279
Married	13 (41.9)	18 (58.1)	31 (100)	
Single	5 (45.5)	6 (54.5)	11 (100)	
Widowed/divorced/separated	2 (100)	0 (4)	2 (100)	
Religion				0.413
Christianity	17 (48.6)	18 (51.4)	35 (100)	
Islam	3 (33.3)	6 (66.7)	9 (100)	
Number of years in service				0.021*
≤ 5 years	5 (45.5)	6 (54.5)	11 (100)	
5–9 years	2 (12.5)	14 (87.5)	16 (100)	
10–14 years	6 (75)	2 (25)	8 (100)	
15–19 years	1 (50)	1 (50)	2 (100)	
20–24 years	3 (75)	1 (25)	4 (100)	
25–29 years	2 (100)	0 (0)	2 (100)	
30–34 years	1 (100)	0 (0)	1 (100)	

\*P-value is significant at  $P < 0.05$ **Table 3:** The effect of suffering COVID-19 symptoms on willingness to receive COVID-19 vaccine.

Have you had any symptom suggestive of COVID-19?	Willingness to receive vaccine		Total (%)
	Yes (n,%)	No (n,%)	
Maybe	2 (40)	3 (60)	5 (100)
No	8 (53.3)	7 (46.7)	15 (100)
Yes	10 (41.7)	14 (58.3)	24 (100)
Total	20	24	44 (100)

A study conducted in Egypt by Fares *et al.*<sup>[11]</sup> observed a lower value than what was obtained in this study, as only 21% of health workers were willing to receive the COVID-19 vaccine. However, in the studies done by Adejumo *et al.*<sup>[10]</sup> in Nigeria, Adane *et al.*<sup>[12]</sup> in Ethiopia, and Jacob *et al.*<sup>[13]</sup> in India, involving health workers, the willingness to receive the COVID-19 vaccine demonstrated was 55%, 64%, and 80.3%, respectively.

It was realized in this study that the age of medical radiation workers had an important role to play in the decision-making on the willingness to receive the vaccine. The association between age and willingness to receive the COVID-19 vaccine was found to be significant ( $P = 0.016$ ) and it

was noticed that the entire respondents in the age groups above 50 years expressed willingness to receive the vaccine. This might be due to the postulation that the younger age groups feel or think that they have high immunity and do not necessarily need to be vaccinated against COVID-19 or any infection. Moreover, they are also more exposed to vaccine-related misinformation that is widely found on social media.<sup>[14]</sup> Alqudeimat *et al.*<sup>[15]</sup> in Kuwait, however, demonstrated a different trend as they showed that the subjects aged between 21 and 24 years were willing to accept the COVID-19 vaccine more than any other age group (74.3%) while those within the 55–64 years age bracket were the least accepting of the vaccine (35.3%). In a similar finding to this study, Paul *et al.*<sup>[16]</sup> noticed that respondents who were 65 years and above were more likely to be willing to receive the COVID-19 vaccine.

It was observed in this study that the number of years in service as a medical radiation worker was significantly associated with willingness to receive the vaccine ( $P = 0.021$ ). The respondents with <10 years in service, in this study, were less inclined to be willing to receive the vaccine probably due to safety concerns of the vaccine coupled with the fact that they witness instant contrast media reactions regularly while attending to patients which will be a daily reminder



of the supposed dreaded adverse effects of the vaccine. In likewise fashion, Adejumo *et al.*,<sup>[10]</sup> in a study also conducted in Nigeria, realized that the duration of working experience above 10 years was associated with willingness to accept the vaccine ( $P = 0.016$ ).

In this study, we found that more female respondents (57.1%) were willing to receive COVID-19 vaccine compared to their male counterparts (40%) against the speculated notion that the vaccine impedes the capability to conceive, which is a serious concern for unmarried women and married women who are planning to have children or want to have more children.<sup>[17,18]</sup> In congruence, Alqudeimat *et al.*<sup>[15]</sup> in Kuwait noted that males were more likely to receive the vaccine (58.3% vs. 50.9%,  $P < 0.001$ ). Fares *et al.*<sup>[11]</sup> in Egypt also noticed that being male showed approximately 3 times higher odds of receiving the vaccine than females were. It was further observed that males (61.09%) were more willing to receive the vaccine compared to females (38.90%).<sup>[19]</sup> El-Elimat *et al.*<sup>[20]</sup> in Jordan discovered that females were also less likely to be willing to accept the vaccine compared to males (OR= 2.488, 95CI= 1.834–3.375,  $P < 0.001$ ). Al-Zalfawi *et al.*<sup>[18]</sup> in Saudi Arabia realized that females (66.9%) showed more positive attitude toward receiving the COVID-19 vaccine than males did (63.2%). The conflicting findings might be due to the regional differences produced by the diverse perceptions and beliefs of the people. However, the gender of the respondents was not seen to be associated with willingness to receive the COVID-19 vaccine in this study. In addition, marital status and religion were also not associated with willingness to receive the vaccine.

Surprisingly, a greater number of the respondents who did not suffer any COVID-19 like symptoms were more willing to receive the vaccine (53.3%) than those who suffered symptoms (41.7%). In variance with our finding, Adane *et al.*<sup>[12]</sup> observed that having a family member or friend who had suffered symptoms of COVID-19 was positively associated with willingness to receive the vaccine. Even Adejumo *et al.*<sup>[10]</sup> noted that the perceived risks of being infected with COVID-19 were a significant positive predictor of willingness to receive the vaccine ( $P = 0.002$ ). Alqudeimat *et al.*<sup>[15]</sup> found out that the subjects who strongly disagreed that contracting COVID-19 infection confers natural immunity were more willing to receive the vaccine (69.1% vs. 34.2%) than those who thought otherwise. Maybe the respondents who had suffered COVID-19 symptoms were less willing to receive the vaccine in this study because they had the confidence that they had acquired natural immunity.

This study highlighted the myriad psychosocial factors and widespread conspiracy theories disseminated as a consequence of the COVID-19 pandemic and its vaccine which were also likely responsible for the unwillingness expressed by a significant number of the respondents

to receive the vaccine. Medical radiation workers are humans and thus also liable to be swayed by circulating unsubstantiated beliefs and concerns about the characteristics of the COVID-19 vaccine. Some of the respondents stated that the inability to validate the safety of the vaccine (25.90%) and the lack of trust in the vaccines (17.99%) were behind their unwillingness to receive it. This disposition is believed to have been predicated by the fear instilled in the masses after listening to several recounted misconstrued harrowing experiences of those who had received the vaccine. Paul *et al.*<sup>[16]</sup> in the UK observed that 7.2% of the participants expressed high mistrust of the COVID-19 vaccine safety, while 16.3% expressed strong worries about unforeseen effects of the vaccine. In the study conducted by Adane *et al.*,<sup>[12]</sup> 55.4% of their subjects showed general mistrust and uncertainty over the effectiveness of the vaccine. Alqudeimat *et al.*<sup>[15]</sup> also noted that 71.8% of respondents were worried about the safety of the vaccine. Al-Zalfawi *et al.*<sup>[18]</sup> opined that people are apprehensive concerning their willingness to receive the vaccine because of the unexpected fatal adverse effects that occur following taking the COVID-19 vaccine. The lack of sufficient knowledge to explain why these untoward effects happened and misjudgment of these occurrences have been reported to be responsible for the unwillingness to receive the COVID-19 vaccine.<sup>[18]</sup> Fares *et al.*<sup>[11]</sup> reported that 52.7% of their participants agreed that hearing of a bad adverse reaction of the vaccine experienced by another was a significant component ( $P = 0.002$ ) in the decision-making that had to do with taking the vaccine and consequently, they were 2 times more likely to be unwilling to receive it.<sup>[11]</sup>

Few respondents in this study shared strong beliefs in the theories that had to do with expected doom such as the belief that the Western world plans to destroy the world (7.91%) through the vaccine and that the vaccine has to do with 5G technology (5.04%) which has been postulated through several social media propagandas to be extremely hazardous to one's health. This was in consonance with the findings shown in Wonodi *et al.*'s.<sup>[21]</sup> study as some respondents believed that the COVID-19 vaccine was a biological weapon or a 5G technology product developed by the Western world to control the population.<sup>[21,22]</sup> There are claims that the vaccine is a microchip meant for surveillance and subsequent elimination of Africans who willingly accept the vaccine.<sup>[21,23]</sup> The theories hovering around the contagion have taken an apocalyptic path as religious leaders brand COVID-19 as the devil made and the vaccine as the sign of the antichrist. They inferred that anyone who takes it will have the 666-mark printed on their skin, as a result, most people have decided to distance themselves from the COVID-19 vaccine and refused to even talk about coronavirus.<sup>[21,22]</sup>

In this study, we discovered that 10.07% of the respondents were convinced that the COVID-19 vaccine is the

culmination of plans to systematically alter DNA signaling in people who willingly receive the vaccine, especially Africans, and as a result, about 5.76% of the respondents expressed the fear of death (5.76%) after receiving the vaccine.

The safety of the vaccine is not certain because of the infinitesimal production time span without extensive and convincing clinical trials. The vaccines were fast-tracked and some were rolled out for emergency use without publishing the results of the Phase III trial which resulted in a lacuna of the knowledge of its efficacy and range of side effects in the public domain. It was claimed that the critical phases of clinical trials in vaccine development were skipped because pharmaceutical companies refused to compensate the participants. Moreover, it is monumentally worrisome to note that about 10 years had elapsed since a plethora of research endeavors for the development of a vaccine meant to curtail the virulent Ebola virus (which is similarly a mRNA-based vaccine) commenced without any headway only for the production of COVID-19 vaccine to be achieved in a very short period,<sup>[13,20,21,23,24]</sup> besides, there has been no report in the past of prior experience or success utilizing mRNA-based vaccines. All these factors have lent credence to the misconstrued belief that foreign actors intend to decimate the population of the developing countries through the vaccine by altering their DNA and dramatically turning them into genetically modified human beings, guinea pigs, or cause cancer.<sup>[20,21,23,24]</sup> However, the occurrences and media reports of mishaps which had been relayed to the respondents in this study of events such as paralysis, breathing difficulty, and even death as adverse effects of vaccines further dent the reputation of the COVID-19 vaccine.<sup>[13]</sup>

Most respondents in this study did not express religious or supernatural belief in being shielded from contracting the infection. In a poll survey conducted to evaluate the role of Nigeria's faith-based organizations in tackling health crises, some of the respondents (42%) inferred that they were immune to coronavirus because of their faith in God, regardless of their religious affiliation and about one-third of the population insisted that they were not willing to receive the vaccine.<sup>[25]</sup> Adane *et al.*<sup>[12]</sup> also observed that 34.9% of their subjects refused to get vaccinated because they were of the opinion that only God/Allah can protect one from COVID-19. About 90% of the respondents in a GeoPoll survey confidently stated that prayers were more effective than COVID-19 vaccines.<sup>[22]</sup>

Few respondents in this study expressed personal belief (7.91%) that natural immunity acquired from exposure to COVID-19-infected patients while working was better than receiving the vaccine. Aligning with this school of thought, a respondent in an African-based study vehemently stated that health care workers were already immunized because many had been exposed to a plethora of infected patients,

whose status could not be confirmed due to the dearth of COVID-19 testing kits in Africa and can, therefore, survive in this pandemic without a vaccine.<sup>[22]</sup> Similarly, Paul *et al.*<sup>[16]</sup> realized that 44.7% of their participants expressed some feelings that natural immunity might be better than a vaccine. Adetayo *et al.*<sup>[26]</sup> also noted that 39.9% strongly agreed and 44.5% agreed that natural immunity should be preferred to receiving the COVID-19 vaccine.

Few respondents in this study were of the view that the COVID vaccine has so much risk when compared to its benefits (7.63%) and as such should not be received. Adane *et al.*<sup>[12]</sup> in Ethiopia probably has an explanation for the line of thought expressed by the respondents in this study when they found out that 39.5% of the health care workers in their research believed that they could get infected with COVID-19 from taking the vaccine.

There is a need for the government and public health agencies to systematically formulate effective immunization strategies and public health interventional programs to promote the uptake of COVID-19 vaccine and to also prepare on how to respond to future pandemics.<sup>[27]</sup> Thorough training programs for the leaders in urban and rural areas who already have the trust of the members of the public should be embarked on and they will, in turn, advocate for the uptake of the COVID-19 vaccine by stating its benefits, in-depth description of the various side effects, and rectify the misconceptions that are rife in their locality. Celebrities (both local and international) and social media influencers should be actively engaged in this move.<sup>[16,18]</sup> These educational workshops should be held in gatherings such as marketplaces, schools, churches, mosques, universities, clubs, and banks. This is because the influence of the twisted knowledge disseminated by the poorly educated masses seems to have a preponderant effect on social media content and this appears to be quite overwhelming in the decision-making of more educated people.<sup>[18]</sup> Consistent periodical training of health workers, who are major stakeholders in the battle against COVID-19, must be put in place to avert indoctrination by propagandists.<sup>[10]</sup>

An obvious limitation of this study was the small sample size. The snowballing method of sampling did not allow most of the medical radiation workers in the country to participate, this means that the salient inferences are not a true reflection of the general opinion of the professionals in this country. A similar study with a larger sample size should be conducted to get a more panoramic opinion of medical radiation workers on the COVID-19 vaccine. Due to the simplified nature of the questionnaire, evaluation of other sociodemographics such as income and daily habits were not done. In addition, the study was cross-sectional and the data obtained were, therefore, limited when it comes to inferring the causal relationship between variables. Finally, the gender

representation in this study was distorted in favor of the male respondents instead of being matched.

## CONCLUSION

The willingness of medical radiation workers to receive COVID-19 vaccines was below the expected standard for health workers. The circulating conspiracy theories are likely to have negatively affected the decision-making of medical radiation workers, therefore, consistent re-education of health workers, especially aimed at altering unfounded theories held by the younger workers, is necessary.

## Acknowledgment

Immense gratitude goes to Mr. Akwa Erim for the production of the Google online forms.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

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**How to cite this article:** Inah GB, Efanga SA, Ukpong EV, Obiora CI. Willingness to receive COVID-19 vaccine: A survey among medical radiation workers in Nigeria. Calabar J Health Sci 2022;6:80-7.