Dimensions of Vaccination Attitudes in Nigeria: A Study of the Impacts of COVID-19 Vaccine Risk Perception and Acceptance

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Abstract

Nigeria has been affected by the COVID-19 pandemic, and vaccination is a key strategy. However, the country faces vaccination hesitancy, poor risk perception, and low acceptance. This study aimed to assess the direct and interactive impacts of COVID-19 vaccine risk perception and acceptability on COVID-19 vaccination attitudes in the general Nigerian population. In a cross-sectional approach, participants completed a structured questionnaire including demographics, COVID-19 vaccine risk perception, acceptance, and vaccination attitude from April 2-30, 2021. The sample included 1,026 participants from different ethnicities across four regions (Southwest, South, Southeast, and North Central) in Nigeria, which were selected using the convenience sampling method. Multivariate analysis of variance results showed that the COVID-19 vaccine's risk perception and acceptability have separate and interactive effects on overall vaccination attitudes. Interactively, individuals with high-risk perceptions and low acceptance expressed more skepticism about its benefits, were concerned about its long-term body effects, believed more in its commercialization, and preferred natural immunity. Nigerians' apprehension about COVID-19 vaccination is impacted by their high-risk perception and low vaccine uptake.

Keywords: attitude, COVID-19 vaccination acceptance, risk perception

Introduction

The COVID-19 pandemic has global repercussions. Since there is no permanent virus treatment, vaccination is needed.[1] Vaccination is a significant public health intervention that prevents virus spread and saves lives.[2-4] COVID-19 vaccines have been successfully developed and distributed across countries, but Nigeria's vaccination attitudes are concerns. This condition is because many Nigerians are skeptical about the vaccination, believing it could have unintended health consequences now or in the near future; thus, they have negative attitudes toward the COVID-19 vaccine.[5] Understanding the impact of COVID-19 vaccine acceptability and risk perceptions on various dimensions of vaccination attitudes in Nigeria is crucial for developing effective specific vaccination promotion strategies.

People's attitudes toward the COVID-19 vaccine may be negative or positive. Positive COVID-19 vaccination attitudes, however, may increase immunization rates. In accordance with the conceptualization of the Vaccination Attitude Examination (VAX) Scale by Martin and Petrie,[6] the dimensions of COVID-19 vaccination attitudes are described as mistrust of vaccine benefits, worries about unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity. Positivity in these dimensions may motivate an individual to receive the COVID-19 vaccine. It is generally assumed that a person's attitude toward an object affects their behavior. Thus, the COVID-19 vaccination attitude may predict vaccine uptake.

Negative COVID-19 vaccination attitudes in Nigeria are a public health concern; these negative feelings may have stymied COVID-19 vaccinations. Investigations conducted among various Nigerian demographic groups have revealed negative sentiments against COVID-19 vaccinations.[7-8] All of this indicates apprehension about taking COVID-19 vaccines in Nigeria.

On the contrary, the vaccination attitude in the

United States was positive. Baack, *et al.,*[9] noted that nearly half of the country's adults were fully vaccinated. It lends credence to the conclusion made in a systematic review that vaccination acceptance rates generally varied considerably from one country to the other.[10] However, individuals' attitudes toward COVID-19 immunization may be influenced by their impression of the probable hazards involved with the vaccine. Thus, COVID-19 vaccine risk perception is relevant for shaping vaccination attitudes.

Several health behavior theories rely on risk perception, including the health belief model and protective motivation theory.[11,12] Darker and Phillips defines risk perception as the belief about possible harm or loss.[13] Risk perception is crucial to the success of public health intervention programs. Low perception of COVID-19 vaccine health risks may be linked to positive views on vaccination. The COVID-19 vaccination risk perceptions are the perceived dangers of receiving the vaccine. These risk perceptions may include the likelihood and consequences of an unknown COVID-19 vaccine outcome. Several studies in Nigeria have shown high, moderate, or negative risk perceptions of COVID-19 vaccinations in various groups.[7,14-16] Thus, risk perception may be required for protective measures such as COVID-19 vaccinations. Oyekale argued that reducing people's perceptions of risk and vulnerability is necessary for Nigerians to accept COVID-19 vaccination.[17] This shows how risk perception affects vaccine attitudes in Nigeria. Low-risk perceptions of COVID-19 vaccinations may, therefore, increase Nigerian vaccine uptake.

Along with risk perceptions, vaccine acceptance may affect attitudes toward vaccination. Acceptance of the COVID-19 vaccine is a willingness to get immunizations. COVID-19 vaccination uptake is crucial for preventing virus spread.[18] People must accept the vaccination before getting it. However, studies have observed low to moderate acceptance rates of the COVID-19 vaccine across regions and demographics in Nigeria.[14,19-21] Although low or non-acceptance of COVID-19 vaccines in Nigeria has been connected to conspiracy theories, misinformation, and potential vaccine side effects.[22] Oyekale stated that to lower the frequency of the virus in Nigeria, and the COVID-19 vaccine must be accepted across the country.[15] Thus, the acceptability of the COVID-19 vaccine is necessary for creating vaccination attitudes and should not be overlooked in Nigerian studies. COVID-19 vaccines have been studied extensively across regions in Nigeria. For example, in the Southern Nigeria, Adetayo, Sanni, and Aborisade found a correlation between high COVID-19 vaccine acceptance and positive sentiments toward the vaccine.[23] In the Northern Nigeria, skepticism about the vaccine's efficacy, distrust in authority, rumors, and conspiracy theories were responsible for low COVID-19 vaccination acceptance.[24]

This study aimed to fill a gap in the literature by comparing COVID-19 vaccine acceptability to various dimensions of vaccination attitudes in Nigeria. Examining Nigerian vaccination attitudes and potential influencing factors is crucial. The findings could help stakeholders, policymakers, and public health professionals understand how to increase COVID-19 vaccination rates in the country and the myths that need to be addressed to ensure willingness to take the vaccines. Consequently, the study aimed to determine the direct and interactive impacts of COVID-19 vaccine risk perception and acceptance on vaccination attitudes in Nigeria.

Method

This cross-sectional study involved 1,026 participants completed structured questionnaires from 2 to 30 April, 2021. Data were collected from four geopolitical zones in Nigeria (Southwest, South, Southeast, and North Central) using a convenient sampling method to sample locations and participants from classrooms, workshops, and offices. Overall, 1,500 questionnaires were distributed, and 1,196 were returned, with a response rate of 79.7%. However, 1,026 properly completed questionnaires were used for the data analysis in the study. Copies were distributed to the consented participants at various locations, including schools, offices, and workshops. Participants gave verbal consent before completing the questionnaire and were assured of the anonymity and confidentiality of their responses since no form of identification was required. The questionnaires were distributed and 10 trained study assistants followed basic COVID-19 prevention protocols, including wearing face masks, keeping their distance, and using hand sanitizers. This study's inclusion criteria were 1) the participant was 18 or older, 2) a Nigerian resident, 3) could read and answer questionnaire items, and 4) had not received COVID-19 vaccines. These instructions were at the top of the questionnaire. The questionnaires consisted of questions regarding participants' age, sex, occupation, education, religion, marital status, ethnic group, and residence, along with vaccination attitude, COVID-19 vaccine acceptance, and risk perception scales.

The COVID-19 vaccine risk perception data was assessed using a questionnaire consisting of two questions devised based on the literature and explicitly designed for this study. The participants were asked, "Getting the COVID-19 vaccine can result in short-term health problems for me" and "Getting the COVID-19 vaccine can result in long-term health problems for me." Responses to these items were on a 7-point Likert scale, as follows: Not at All (1), Very Little (2), Little (3), Somewhat (4), Much (5), Very Much (6), and A Great Deal (7). A higher score reflected a greater COVID-19 vaccine risk perception.

Participants with scores above the mean (M = 5.72) were regarded as high in COVID-19 vaccine risk perception, while those below the mean were regarded as low. The data on COVID-19 vaccine acceptance was assessed using a single item devised based on the literature and designed specifically for this study. Participants were asked on one statement, "Whenever I am approached to take the COVID-19 vaccine, I will accept it without hesitation." Responses were made using a 5-point Likert scale, where strongly disagree was scored (1), disagree (2), undecided (3), agree (4), and strongly agree (5). A higher score indicated a higher acceptance of the COVID-19 vaccine. Participants with scores above the mean (M = 2.62) were regarded as high in acceptance, while those below the mean were regarded as low in acceptance.

While, the COVID-19 vaccination attitude data was assessed using Martin and Petrie's 12-item VAX Scale and adapted to assess COVID-19 vaccination attitudes.[6] The VAX Scale examines general views regarding vaccines. However, "COVID-19" was added to each of the 12 sentences to represent this study's topic. Samples of the items include "I will feel safe after being vaccinated against COVID-19" and "Authorities promote COVID-19 vaccination for financial gain, not for people's health." The VAX Scale has four dimensions: 1) mistrust of vaccine benefits, 2) worries about unforeseen future effects, 3) concerns about commercial profiteering, and 4) preference for natural immunity.[6] Responses were assessed on a 5-point Likert scale from strongly disagree (scored 1) to strongly agree (scored 5). However, items 1, 2, and 3 of the VAX Scale were reversed-scored. A higher score indicated a more negative attitude toward the COVID-19 vaccination. Cronbach's alphas previously reported in studies ranged from 0.77 to 0.93.[6,23]

The free version of statistical analysis software for social science was used to analyze the collected data. The demographics of the individuals were described using descriptive statistics, such as mean, standard deviation, percentages, and frequency distribution. The inferential statistics of multivariate analysis of variance (MANOVA) were used to determine the independent and joint influence of COVID-19 vaccine risk perception and acceptance on the dimensions of COVID-19 vaccination attitude for the study objectives. This study accepted a p-value of <0.05 as a statistical significance level. This study obtained a Cronbach's alpha of 0.75 for the VAX Scale and a Cronbach's alpha of 0.73 for the COVID-19 risk perception scale in a sample of 1,026. Thus, the scale was reliable and valid.

Results

The participants were aged 18-69, with a mean age of 26.11 (SD = 9.32). The participants were from all regions in Nigeria and of diverse demographics. Approximately 83.5% of the participants were from the Yoruba region where the study originated. The study participants had a higher representation of those living in urban areas (74.5%). Most participants were students (67.4%), while most had tertiary education (92.7%). Most of the participants were Christians (89.6%), singles (73.9%), and Yoruba (83.5%). Most participants (74.5%) stayed in the country's urban areas.

Specifically, the average age of the 1,026 participants was 26.11 years (SD = 9.32), with 427 (41.6%) male and 599 (58.4%) female. Of the participants, 692 (67.4%) were students, 151 (14.7%) were civil servants, 74 (7.2%) were from the private sector, 74 (7.2%) were self-employed, 12 (1.2%) were retirees, and 23 (2.2%)

Table 1. Univariate Tests of Between-subject Effects

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	Sig.	η²
COVID-19 vaccine risk perception	Mistrust of vaccine benefits	371.079	1	371.079	47.236	<0.001	0.045
	Worries about unforeseen future effects	331.939	1	331.939	42.887	<0.001	0.041
	Concerns about commercial profiteering	487.810	1	487.810	61.002	<0.001	0.057
	Preference for natural immunity	380.323	1	380.323	52.898	<0.001	0.050
COVID-19 vaccine acceptance	Mistrust of vaccine benefits	2,759.512	1	2,759.512	351.270	<0.001	0.259
	Worries about unforeseen future effects	1.795	1	1.795	0.232	0.630	<0.001
	Concerns about commercial profiteering	191.562	1	191.562	23.956	<0.001	0.023
	Preference for natural immunity	53.727	1	53.727	7.473	0.006	0.007
Risk perception*Acceptance	Mistrust of vaccine benefit	11.517	1	11.517	1.466	0.226	0.001
	Worries about unforeseen future effects	30.994	1	30.994	4.004	0.046	0.004
	Concerns about commercial profiteering	54.846	1	54.846	6.859	0.009	0.007
	Preference for natural immunity	146.659	1	146.659	20.398	<0.001	0.020
Error	Mistrust of vaccine benefit	7,902.948	1006	7.856			
	Worries about unforeseen future effects	7,786.343	1006	7.740			
	Concerns about commercial profiteering	8,044.540	1006	7.997			
	Preference for natural immunity	7,232.866	1006	7.190			
Total	Mistrust of vaccine benefit	11,518.199	1009				
	Worries about unforeseen future effects	8,157.509	1009				
	Concerns about commercial profiteering	8,896.749	1009				
	Preference for natural immunity	7,853.395	1009				

were unemployed. A total of 16 (1.6%) respondents had primary education, 59 (5.8%) had secondary education, and 951 (92.7%) had tertiary education. In addition, 919 (89.6%) of the participants were Christians, 91 (8%) were Muslims, and 16 (1.6%) were Traditionalists. Regarding the marital status of the participants, 758 (73.9%) were singles, 250 (24.4%) were married, 6 (0.6%) were separated, 8 (0.8%) were widows or widowers, and 4 (0.4%) were divorced individuals. There were 857 Yorubas (83.5%), 100 (9.7%) Igbos, 11 (1.1%) Hausas, and 58 (5.7%) members of other ethnic groups. Also, according to their residence, 262 (25.5%) of the participants were from rural areas, and 764 (74.5%) were from urban areas.

Table 1 shows the results of the univariate analysis of variance, which revealed that participants' perceptions of COVID-19 vaccination risk have a direct impact on their level of mistrust of vaccine benefits [$F(1, 1006) = 47.236$, p-value<0.001, partial $\eta^2 = 0.045$], worries about unforeseen future effects [$F(1, 1006) = 42.887$, p-value<0.001, partial $\eta^2 = 0.041$], concerns about commercial profiteering [$F(1, 1006) = 61.002$, p-value<0.001, partial $\eta^2 = 0.057$], and preference for natural immunity [$F(1, 1006) = 52.898$, p-value<0.001, partial $\eta^2 = 0.050$]. The results were supported by the mean differences in Table 2, which shows that individuals with a high-risk perception of COVID-19 vaccination (M = 10.27) reported significantly higher levels of vaccine benefit mistrust than those with a low-risk perception (M = 8.47). Participants with a high-risk perception (M = 10.99) expressed significantly more worries about unforeseen future effects of vaccines than those with a low-risk perception (M = 9.83). Participants with a high-risk perception (M = 10.47) reported higher concerns about commercial profiteering of the vaccines than those with a low-risk perception (M = 8.94). In addition, participants with a high-risk perception of COVID-19 vaccines (M = 9.17) indicated a significantly larger preference for natural immunity than those with a low-risk perception of vaccines (M = 7.90).

Furthermore, COVID-19 vaccine acceptance significantly affected participants' mistrust of vaccine benefits [$F(1, 1006) = 351.270$, p-value<0.001, partial $\eta^2 = 0.259$], concerns about commercial profiteering [$F(1, 1006) = 23.956$, p-value<0.001, partial $\eta^2 = 0.023$], and preference for natural immunity [$F(1, 1006) = 7.473$, p-value = 0.006, partial $\eta^2 = 0.007$]. These results were further observed in the mean differences in Table 3, where participants with low acceptance of the COVID-19 vaccine (M = 11.32) reported significantly higher mi-

Table 2. Means and Standard Deviations for Dimensions of COVID-19 Vaccination Attitude by Vaccine Risk Perception

Vaccine Risk Perception	Mistrust of Vaccine Benefit		Unforeseen Future Effects		Commercial Profiteering		Preference for Natural Immunity	
	M	SD	M	SD	M	SD	M	SD
Low	8.47	3.25	9.83	2.87	8.94	2.83	7.90	2.67
High	10.27	3.27	10.99	2.71	10.47	2.91	9.17	2.76

Notes: M = Mean, SD = Standard Deviation

Table 3. Means and Standard Deviations for Dimensions of COVID-19 Vaccination Attitude by Vaccine Acceptance

Vaccine Acceptance	Mistrust of Vaccine Benefit		Unforeseen Future Effects		Commercial Profiteering		Preference for Natural Immunity	
	M	SD	M	SD	M	SD	M	SD
Low	11.32	2.91	10.59	3.08	10.35	3.06	8.94	2.96
High	7.73	2.83	10.29	2.61	9.19	2.78	8.22	2.59

Notes: M = Mean, SD = Standard Deviation

Table 4. Means and Standard Deviations for Dimensions of COVID-19 Vaccination Attitude by Vaccine Risk Perception and Acceptance

Vaccine Risk Perception and Acceptance	Mistrust of Vaccine Benefit		Unforeseen Future Effects		Commercial Profiteering		Preference for Natural Immunity	
	M	SD	M	SD	M	SD	M	SD
High-risk and low acceptance	11.89	2.61	11.19	2.90	10.09	2.91	9.73	2.71
High-risk and high acceptance	8.30	2.89	10.75	2.44	9.73	2.73	8.49	2.66
Low-risk and high acceptance	7.28	2.70	9.93	2.69	8.78	2.75	8.01	2.52
Low risk and low acceptance	10.44	3.13	9.66	3.14	9.20	2.95	7.71	2.91

Notes: M = Mean, SD = Standard Deviation

strust of vaccine benefits than those with high acceptance (M = 7.73). Participants with low acceptance of the CO-VID-19 vaccine (M = 10.35) reported significantly higher concerns over commercial profiteering than those with high acceptance (M = 9.19). Similarly, participants with low vaccine acceptance (M = 8.94) indicated a stronger preference for natural immunity than those with high vaccine acceptance (M = 8.22).

Similarly, COVID-19 vaccine risk perception and acceptance had an interactive effect on various aspects of vaccination attitudes among the participants. Table 5 shows that participants with a high-risk perception and low acceptance of the COVID-19 vaccination (M = 11.19) indicated significantly more worries about the vaccine's future effects than those with a high-risk perception and high acceptance (M = 10.75), low-risk perception and high acceptance (M = 9.93), and low-risk perception and low acceptance (M = 9.66). Participants with a high-risk perception and low acceptance of the COVID-19 vaccine (M = 10.09) expressed significantly more concern about commercial profiteering than those with a high-risk perception but high acceptance (M = 9.73), low-risk perception and high acceptance (M = 8.78), and low-risk perception and low acceptance (M = 9.20). Furthermore, participants with a high-risk perception and low acceptance of COVID-19 vaccination (M = 9.73) showed significantly higher levels of preference for natural immunity than those with a high-risk perception but high acceptance (M = 8.49), low-risk perception and high acceptance (M = 8.01), and low-risk perception and low acceptance (M = 7.71).

The bivariate results in Table 5 show that COVID-19 vaccine risk perception has positive correlations with dimensions of vaccination attitudes as follows: mistrust of vaccine benefits (r = 0.30, p-value<0.01), worries about

unforeseen future effects (r = 0.19, p-value<0.01), concerns about commercial profiteering (r = 0.30, p-value<0.01), and preferences for natural immunity (r = 0.27, p-value<0.01) respectively. In addition, COVID-19 vaccine acceptance has negative correlations with dimensions of vaccination attitudes, as follows: mistrust of vaccine benefits (r = -0.56, p-value<0.01), worries about unforeseen future effects (r = -0.11, p-value<0.01), concerns about commercial profiteering (r = -0.24, p-value<0.01) and preferences for natural immunity (r = -0.11, p-value<0.01) respectively.

Table 6 shows the MANOVA results, demonstrating a statistically significant difference in overall vaccination attitudes between participants with high- and low-risk perceptions of the COVID-19 vaccine (Wilks' (^) = 0.883, F(4, 1003) = 33.089, p-value<0.001, η^2 = 0.117). In addition, the overall vaccination attitude of participants with high and low acceptance of the COVID-19 vaccine differed significantly (Wilks' (^) = 0.738, F(4, 1003) = 89.197, p-value<0.001, η^2 = 0.262). COVID-19 vaccine risk perception and acceptance substantially impacted the participants' overall vaccination attitudes (Wilks' (^) = 0.977, F(4, 1003) = 5.823, p-value<0.001, η^2 = 0.023).

Discussion

Several studies might have shown that certain factors influenced COVID-19 vaccination attitudes in Nigeria. However, the dimensions of COVID-19 vaccination attitudes, risk perception, and acceptance in Nigeria are poorly understood. This study, therefore, examined the direct and interactive effects of COVID-19 vaccine risk perception and acceptance on vaccination attitude dimensions in Nigeria. The findings demonstrated that people's perceptions of the COVID-19 vaccine risk signifi-

Table 5. Mean, Standard Deviation, and Bivariate Analysis of COVID-19 Risk Perception, Acceptance, and Dimensions of Vaccination Attitudes

Variable	Mean	SD	1	2	3	4	5	6
Risk perception	5.72	3.16	-					
Acceptance	2.62	1.33	-0.26**	-				
Mistrust of vaccine benefits	9.40	3.41	0.30**	-0.56**	-			
Worries about effects	10.41	2.87	0.19**	-0.11**	0.11**	-		
Concerns about profiteering	9.69	2.98	0.30**	-0.24**	0.26**	0.37**	-	
Preference for natural immunity	8.53	2.82	0.27**	-0.11**	0.17**	0.21**	0.38**	-

Notes: SD = Standard Deviation, **p-value<0.01

Table 6. Multivariate Effects of COVID-19 Vaccine Risk Perception and Acceptance on Overall Vaccination Attitude

Effect	Wilks' Lambda Value	F	Hypothesis df	Error df	Sig.	η^2
COVID-19 vaccine risk perception	0.883	33.089	4.000	1,003.000	<0.001	0.117
COVID-19 vaccine acceptance	0.738	89.197	4.000	1,003.000	<0.001	0.262
COVID-19 risk perception X acceptance	0.977	5.823	4.000	1,003.000	<0.001	0.023

cantly influenced their attitudes regarding mistrust of vaccine benefits, worries about unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity. Specifically, participants who perceived a high risk of COVID-19 vaccines displayed a higher level of mistrust in the benefits of the vaccine, worried more about unforeseen future effects if they took the vaccine, were more concerned about the possibility of giving it out to make money and had a higher preference for taking natural measures as forms of gaining immunity in the body.

These findings were consistent with earlier study that highlighted the importance of COVID-19 vaccine risk perception in fostering favorable attitudes toward the vaccines and the willingness to receive the vaccines among various groups in the Nigerian population.[6,14-16,26] These findings may be related to the unguided or inaccurate information that many Nigerians appear to have received concerning COVID-19 vaccines, as stated in a previous study.[27] It is possibly a significant contributing reason why people have high-risk judgments of immunizations and why they establish negative attitudes toward immunizations.

This study found that COVID-19 acceptance significantly influenced Nigerian vaccination attitudes regarding mistrust of vaccine benefits, concerns about its commercial profiteering, and preference for natural immunity. In other words, vaccination attitudes regarding mistrust of vaccine benefits, its commercial purpose, and preference for natural immunity over vaccination were a function of low acceptance of the vaccines in Nigeria. These findings were consistent with those of other studies that demonstrated a link between acceptance of the COVID-19 vaccine and attitudes held by various groups within the Nigerian community.[15,22] These findings may be ascribed to a lack of awareness of the benefits of immunizing against COVID-19, negative information, or concerns linked to safety. To provide evidence in favor of this claim, Nomhwange, *et al*., observed that reticence toward the COVID-19 vaccination in Nigeria might be attributable to a perceived lack of safety and inadequate information read about the vaccines on social media channels.[28]

Interactively, COVID-19 vaccine risk perception and acceptance influenced vaccination attitudes in the areas of worries about the vaccination's future effects, concerns about its commercial profiteering, and preference for natural immunity. In other words, participants perceived as high risk with a low acceptance of COVID-19 vaccines reported negative vaccination attitudes, believing that the vaccines have unforeseen future effects, were for money-making, and could not be effective as natural immunity. These findings were consistent with a study demonstrating that risk perception and acceptance are

relevant factors that could have combined influenced the implementation of COVID-19 vaccinations in Nigeria.[16] It demonstrated that several factors might be interactively responsible for various forms of Nigerians' attitudes toward COVID-19 immunization and the process of implementing it. Nevertheless, it is essential to note that the authors utilized a cross-sectional methodology in which the participants were selected at a particular time. As a result, it is possible that the study would not be able to consider all the potential confounding variables that could influence the vaccination attitudes held by the Nigerian public regarding COVID-19.

This study had several limitations. This was a cross-sectional study; thus, causal conclusions about the studied variables were limited. As a result, it could not be categorically inferred that risk perception and acceptance caused a change in participants' COVID-19 vaccination attitudes. The participants were limited to those who could read and write; thus, the findings should be evaluated in Nigeria's elite community context. The data collection tool was self-reported, meaning participants may have given socially acceptable answers.

Future studies should employ a longitudinal design to overcome the limitations noted above. This design would allow data collection over an extended period, perhaps documenting shifts in COVID-19 vaccination risk perception, acceptability, and attitudes. This should encompass a more varied sample, accounting for a wider variety of demographics that may influence vaccine attitudes. A qualitative study that includes in-depth interviews and focus group discussions may be conducted in future studies to better understand the factors influencing vaccination attitudes. Vaccination attitude is a complex phenomenon that cannot be comprehensively captured through a cross-sectional study alone because of the depth of information it can provide.

In addition, since vaccination attitude is a complex phenomenon, it cannot be comprehensively captured through a cross-sectional study alone. It is possible to gain a more comprehensive understanding of vaccination acceptance by integrating the insights from quantitative study with those gained from qualitative study. This, in turn, can inform the creation of more effective public health interventions and policies. Despite these limitations, the study showed the importance of COVID-19 vaccine risk perception and acceptability in the attitudinal change of Nigerians toward the vaccine.

The COVID-19 pandemic has affected millions of people worldwide and sparked the spread of misinformation and myths about the virus. Not enough effort has been put into dispelling the misconceptions and misunderstandings surrounding this virus. Thus, practice, policies, and educating diverse groups nationwide about COVID-19 myths are advocated for public health interven-

tion. This step will prevent people from using dangerous preventive measures. Policymakers, medical experts, and researchers working on COVID-19 pandemic challenges will also benefit from this study's findings, revealing that people's attitudes about disease transmission might be negatively influenced by high-risk and low acceptability.

The Nigerian Ministry of Health must be strengthened to counter any misinformation on vaccinations that may reduce acceptability. This will dispel any vaccine skepticism in the public's thinking. These efforts aim to increase awareness and understanding of the virus, its transmission, and the most effective methods for prevention and treatment. Specifically, education programs can provide accurate information, debunk myths, and address people's concerns. Policies, such as mask mandates and vaccination requirements, can encourage safe behavior and reduce the spread of the virus. By promoting the policies and practices mentioned above, Nigeria can work toward a more informed and healthier population regarding COVID-19 vaccinations. In addition, increasing vaccine use in Nigeria should include evidence-based risk communication, risk reduction, and trust-building efforts.

Conclusion

This study reveals that Nigerians have varying opinions about the COVID-19 vaccine and finds that risk perceptions and acceptance of COVID-19 vaccines shape their vaccine attitudes. It shows that high risk and low acceptance of COVID-19 vaccination have direct and interacting negative consequences in Nigeria. According to this study, a decrease in people's perception of the COVID-19 vaccine's risk and increased willingness to accept vaccinations will increase the number of Nigerians vaccinated against the virus.

Abbreviations
COVID-19: coronavirus disease 2019; VAX: Vaccination Attitude Examination; MANOVA: Multivariate Analysis of Variance; M: Mean; SD: Standard Deviation.

Ethics Approval and Consent to Participate
Ethics and Research Committee of The Department of Psychology, Federal University Oye-Ekiti approved the study. Respondents were recruited by completing a self-administered structured questionnaire. Responses were confidential, and participants could stop completing questionnaires if they wished. Participants were thanked after completing the questionnaires.

Competing Interest
The authors declared that there are no significant competing financial, professional, or personal interests that might have affected the performance.

References

1. Koirala A, Joo YJ, Khatami A, Chiu C, Britton PN. Vaccines for COVID-19: The current state of play. Paediatr Respir Rev. 2020; 35: 43–49. DOI: 10.1016/j.prrv.2020.06.010

2. Rémy V, Zöllner Y, Heckmann U. Vaccination: The cornerstone of an efficient healthcare system. J Mark Access Health Policy. 2015; 3. DOI: 10.3402/jmahp.v3.27041

3. Hajj Hussein I, Chams N, Chams S, El Sayegh S, Badran R, Raad M, et al. Vaccines Through Centuries: Major Cornerstones of Global Health. Front Public Health. 2015; 3: 269. DOI: 10.3389/fpubh.2015.00269

4. Rodrigues CMC, Plotkin SA. Impact of Vaccines; Health, Economic and Social Perspectives. Front Microbiol. 2020; 11: 1526. DOI: 10.3389/fmicb.2020.01526

5. Chutiyami M, Bello UM, Salihu D, Kolo MA, Alsharari AF, Sabo H, et al. Subjective Reasons for COVID-19 Vaccine Hesitancy and Sociodemographic Predictors of Vaccination in Nigeria: An Online Survey COVID. 2022; 2 (10): 1329-1340. DOI: 10.3390/covid2100097

6. Martin LR, Petrie KJ. Understanding the Dimensions of Anti-Vaccination Attitudes: The Vaccination Attitudes Examination (VAX) Scale. Ann Behav Med. 2017; 51 (5): 652–60. DOI: 10.1007/s12160-017-9888-y

7. James BC, Ede SS, Aroh CM, Okoh CF, Kanokwan C, Rasip ML, et al. Attitudes and perceptions of Nigerians regarding receiving COVID-19 vaccines: An online cross-sectional study. Pan Afr Med J. 2022; 41: 247. DOI: 10.11604/pamj.2022.41.247.33286

8. Uzochukwu IC, Eleje GU, Nwankwo CH, Chukwuma GO, Uzuke CA, Uzochukwu CE, et al. COVID-19 vaccine hesitancy among staff and students in a Nigerian tertiary educational institution. Ther Adv Infect Dis. 2021; 8. DOI: 10.1177/20499361211054923

9. Baack BN, Abad N, Yankey D, Khan KE, Razzaghi H, Brookmeyer K, et al. COVID-19 Vaccination Coverage and Intent Among Adults Aged 18-39 Years-United States, March-May 2021. MMWR Morb Mortal Wkly Rep. 2021; 70 (25): 928-933. DOI: 10.15585/mmwr.mm7025e2

10. Cascini F, Pantovic A, Al-Ajlouni Y, Failla G, Ricciardi W. Attitudes, acceptance and hesitancy among the general population worldwide to receive the COVID-19 vaccines and their contributing factors: A systematic review. eClinicalMedicine. 2021; 40: 101113.

DOI: 10.1016/j.eclinm.2021.101113

11. Ferrer R, Klein WM. Risk perceptions and health behaviour. Curr Opin Psychol. 2015; 5: 85-89. DOI: 10.1016/j.copsyc.2015.03.012

12. Tagini S, Brugnera A, Ferrucci R, Mazzocco K, Compare A, Silani V, et al. It won't happen to me! Psychosocial factors influencing risk perception for respiratory infectious diseases: A scoping review. Appl Psychol Health Well Being. 2021; 13 (4): 835–852.
DOI: 10.1111/aphw.12274

13. Darker C, Phillips A. Risk Perception. In: Gellman MD, Turner JR (eds) Encyclopedia of Behavioral Medicine. New York: Springer; 2016. DOI: 10.1007/978-1-4614-6439-6_866-2

14. Adejumo OA, Ogundele OA, Madubuko CR, Oluwafemi RO, Okoye OC, Okonkwo KC, et al. Perceptions of the COVID-19 vaccine and willingness to receive vaccination among health workers in Nigeria. Osong Public Health Res Perspect. 2021; 12 (4): 236-243. DOI: 10.24171/j.phrp.2021.0023

15. Eze UA, Ndoh KI, Ibisola BA, Onwuliri CD, Osiyemi A, Ude N, et al. Determinants for Acceptance of COVID-19 Vaccine in Nigeria. Cureus 2021; 13 (11): e19801. DOI: 10.7759/cureus.19801

16. Iheanacho CO, Enechukwu OH, Aguiyi-Ikeanyi C. Risk Perception and Acceptability of the COVID-19 Vaccine in Nigeria. Turk J Pharm Sci. 2022; 19 (16): 686-693. DOI: 10.4274/tjps.galenos.2021.75710

17. Oyekale AS. Factors Influencing Willingness to Be Vaccinated against COVID-19 in Nigeria. Int J Environ Res Public Health. 2022; 19 (11): 6816. DOI: 10.3390/ijerph19116816

18. Yamey G, Schäferhoff M, Hatchett R, Pate M, Zhao F, McDade KK, et al. Ensuring Global Access to COVID-19 Vaccines. The Lancet. 2020; 395 (10234):1405–1406.
DOI: 10.1016/S0140-6736(20)30763-7

19. Adigwe OP. COVID-19 vaccine hesitancy and willingness to pay: Emergent factors from a cross-sectional study in Nigeria. Vaccine X. 2021; 9: 100112. DOI: 10.1016/j.jvacx.2021.100112

20. Mustapha M, Lawal BK, Sha'aban A, Jatau AI, Wada AS, Bala AA, et al. Factors associated with acceptance of COVID-19 vaccine among University health sciences students in Northwest Nigeria. PLoS One. 2021; 16: e0260672. DOI: 10.1371/journal.pone.0260672

21. Reuben RC, Danladi MMA, Saleh DA, Ejembi P. Knowledge, Attitudes and Practices towards COVID-19: An Epidemiological Survey in North-Central Nigeria. J Community Health. 2021; 46 (3): 457-470. DOI: 10.1007/s10900-020-00881-1

22. Olu-Abiodun O, Abiodun O, Okafor N. COVID-19 vaccination in Nigeria: A rapid review of vaccine acceptance rate and the associated factors. PLoS ONE. 2022; 17 (5): e0267691
DOI: 10.1371/journal.pone.0267691

23. Adetayo AJ, Sanni BA, Aborisade, MO. COVID-19 Vaccine Knowledge, Attitude, and Acceptance among Students in Selected Universities in Nigeria. Dr. Sulaiman Al Habib Medical Journal. 2021; 3(4), 162–167. DOI: 10.2991/dsahmj.k.211014.001

24. Iliyasu Z, Umar AA, Abdullahi HM, Kwaku AA, Amole TG, Tsiga-Ahmed FI, et al. *"They have produced a vaccine, but we doubt if CO-VID-19 exists"*: correlates of COVID-19 vaccine acceptability among adults in Kano, Nigeria. Hum Vaccin Immunother. 2021; 17 (11): 4057-4064. DOI: 10.1080/21645515.2021.1974796

25. Wood L, Smith M, Miller CB, O'Carroll RE. The Internal Consistency and Validity of the Vaccination Attitudes Examination Scale: A Replication Study. Ann Behav Med. 2019; 53 (1):109–114.
DOI: 10.1093/abm/kay043

26. Adedeji-Adenola H, Olugbake OA, Adeosun SA. Factors influencing COVID-19 vaccine uptake among adults in Nigeria. PLoS ONE. 2022; 17 (2): e0264371. DOI: 10.1371/journal.pone.0264371

27. Wonodi C, Obi-Jeff C, Adewumi F, Keluo-Udeke SC, Gur-Arie R, Krubnier C, et al. Conspiracy theories and misinformation about CO-VID-19 in Nigeria: Implications for vaccine demand generation communications. Vaccine. 2022; 40 (13): 2114-2121.
DOI: 10.1016/j.vaccine.2022.02.005

28. 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.
DOI: 10.1016/j.eclinm.2022.101499