Paper type: Research article

Knowledge, Attitudes, Myth, and Perceptions towards COVID-19 Vaccine among typical educated Sub-Saharan Africa: A Web-Based Survey

Nweze Chiamaka Nneoma
Department of Educational Leadership and Management, Southwest University, Tiansheng Road, Beibei, Chongqing, 400715, China. ORCID:0000-0001-8034-5213

Peter Davis Sumo
College of Textile Science & Engineering and International Institute of Silk, Zhejiang Sci-Tech University, Hangzhou, Zhejiang, 310018, China. ORCID: 0000-0002-0750-1997

Houlda Fambo
School of economics, Nankai University, 94 Weijin Road, Tianjin, 300071, China. ORCID: 0000-0002-1815-5663

Lillian Moshoeshoe
School of Insurance and Economics, University of International Business and Economics, 10 Hueing Eastern Street, Chaoyang District, Beijing,100029, China. ORCID: 0000-0002-7934-9461

Ishmael Arhin
Department of Business Administration, Dokuz Eylul University, Turkey. ORCID: 0000-0002-8484-5937

Roseline Yocelle Semaho Goussebeo
Donlinks School of Economics and Management, Department of Management Science and Engineering, University of Science and Technology Beijing. ORCID: 0000-0002-8826-3037

Oloulade Babatounde Moctard
School of Computer Science and Engineering, Central South University, 932 South Lushan Rd, Changsha, Hunan, 410083, China. ORCID: 0000-0003-0078-2148

Abstract

The covid-19 pandemic is a major health challenge for society and health workers globally. The study sought to determine the effect of perception, attitudes, and myths on vaccine acceptance in residents in West African countries. This cross-sectional study of 1170 respondents was conducted while maintaining social distancing measures in sub-Sahara Africa. Data was collected using a validated self-administered questionnaire via social media platforms. Data gathered were analysed using SPSS version 25.0 for windows. Of 1170 responses received, 59.5%, 51.8%, 70.8%, and 39.5% were from respondents between 30–39 years, males, from English-speaking countries, and had a college degree or above. Respondents had good knowledge (96.999%) of the COVID-19 vaccine, and information about the vaccine was mainly through social media/ internet (55.6%) and media houses (23.8%). The overall results show that the majority of the respondents, 96.80% were aware of the Vaccine through social media. However, the findings from covariates show that myth and perception, gender, educational qualification, and employment status have a significant impact ($p<0.05$) on COVID-19 vaccine acceptance. The study suggests that people in Sub-Saharan Africa need to be reassured of the importance of vaccinations through proper information dissemination. Thus, information highlighted a need for Stakeholders and Policymakers to contribute to holding an optimistic attitude and perception free of devoid of misconceptions circulating on social media towards vaccine acceptance.

Keywords: African's perception, Attitudes, Myths, Pandemic, Vaccine hesitancy

Received: 9.7.2022.
Accepted: 5.9.2022.

DOI: 10.2478/crdj-2022-0009

Introduction

Described as a droplet infectious disease, COVID-19 is a viral outbreak that began in Wuhan in 2019. It is characterized by rapid transmission and a high mortality rate. The outbreak of covid-19 is reported to have infected millions and is causing substantial health complications worldwide (Al-Hanawi et al., 2020). Several measures, such as social distancing, staying at home, school lockdowns, border closures, wearing masks, and washing hands, have been employed to curb the spread of the disease (Ilesanmi et al., 2021). The scale of the pandemic, as demonstrated by the daily increase of COVID-19-related cases and deaths, has, however, dwarfed the efforts made by these measures. As a result, scientists have stressed the necessity of rapid, mandatory uptake of vaccines as the best preventive method against the pandemic (Largent et al., 2020; Li et al., 2021). Vaccination is an effective approach that prevents people from severe illnesses. It has historically shown an excellent ability to eradicate various infectious diseases such as tetanus, diphtheria, polio, rabies, whooping cough, measles, yellow fever, and other complications of vaccine-preventable diseases (Chukwuocha et al., 2018; F.-Y. Lin & Wang, 2020).

In the wake of the World Health Organization (WHO) publishing the results of phase-one clinical trials for vaccine development in 2020, widespread distribution of the COVID-19 vaccination has occurred unprecedentedly (AlKetbi et al., 2021). Effective vaccines, such as Moderna and Pfizer, which account for more than 90%, are designed to vaccinate against COVID-19. However, obtaining effective vaccination results depends not only on availability but also on the acceptance and willingness of the population to be vaccinated (Butter et al., 2021). Vaccination campaigns are faced with significant challenges that result from various factors such as resistance, anti-vaccine movements, skepticism, and hesitancy, which significantly impact the effectiveness of vaccines at an unprecedented level. For instance, skepticism and hesitancy were identified as one of the most significant challenges facing public health in 2019 (Dror et al., 2020; Geoghegan et al., 2020). Vaccine hesitancy remains a potential barrier to community inoculation efforts (see Hussain et al., 2018; Nyhan & Reifler, 2015).

In addition, Lazarus et al. (2020) report on a global study of possible approval for a COVID-19 vaccine. The authors identified that 48% of the population studied were unsure about a COVID-19 vaccine and whether they would accept taking the vaccine. Similarly, a study in China found that, despite the virus originating in the country, just a little over half of the Chinese population (54%) planned to be vaccinated (Y. Lin et al., 2020). Similar vaccine hesitancies have been recorded in Africa (see (Aroh et al., 2021; Chukwuocha et al., 2018; Cooper et al., 2021; Jegede, 2007; Otu et al., 2021; Reuters, 2021), which sometimes resulted in a total boycott. For example, according to Jegede, (2007), influenced by beliefs and judgments of political and religious leaders in northern Nigeria, a polio immunization campaign was boycotted, with

parents urged not to vaccinate their children for fear that the vaccine could be contaminated with anti-fertility agents (estradiol hormone), HIV, and cancerous agents. In neighboring Ghana, fearmongering and widespread misleading reports surrounding the country's first deworming exercise in 2007 led to a mass boycott. In addition, the process was marred by public disorder, attacks on teachers, and forceful closure of schools (Dodoo et al., 2007).

Based on official data, only about 441 million vaccine doses have been administered in Africa, representing the lowest rate worldwide (Mathieu et al., 2021). The ongoing COVID-19 pandemic is similar to previous vaccine hesitancies in parts of Africa, especially in West Africa, where a large percentage of the population is hesitant to get the vaccine (Ilesanmi et al., 2021; Mesesle, 2021). Although several recent empirical studies have investigated the attitudes and perceptions of people toward vaccine acceptance and identified the factors influencing peoples' willingness to accept COVID-19 in the world (Almoughales et al., 2022; Alnasser et al., 2021; Liu & Liu, 2021; Paul et al., 2021) cause of the high COVID-19 vaccine hesitancy in West Africa has received less attention. Furthermore, studies on vaccinations in the region lack a holistic consideration of how perceptions, beliefs, myths, and attitudes shape a person's knowledge of infection and willingness to inoculate. Therefore, it is crucial to understand attitudes towards COVID-19 vaccines and identify the drivers of vaccine hesitancy, both at the individual and societal levels. This study explores these behaviors to understand individual changes and beliefs about health conditions and acceptance of vaccination against COVID-19 in West Africa, which would consider a better adjustment in communications and vaccination strategies for a successful fight against the pandemic in West Africa.

This paper is organized as follows: section two presents a brief literature review, section three explains the method used, section four presents the analysis of our findings and the last section concludes the paper.

Literature Review

Overview of Covid-19

Coronavirus disease (COVID-19) was in January 2020 declared a public health emergency by the World Health Organization (WHO) (Wu et al., 2020). Since then, the virus has recorded over 2.3 million deaths associated with COVID-19 and still counting, mainly as new virus variants have emerged. Around the globe, the initial responses set by the government and other health agencies include lockdowns, washing of hands, wearing of face masks, social distancing, etc. However, these acts of promoting protective behavior among the general population have not yielded the intended purpose as the COVID-19 continues (Africa Center for Strategic Studies, 2021; Cabore et al., 2022; Tessema et al., 2021). According to Rosenthal et al. (2020), Egypt reported the first case of the pandemic in Africa on 14 February 2020; the temporary measures drafted to decrease the spread of the virus have not returned a sense of normality in the African continent (Africa Center for Strategic Studies, 2021; Cabore et al., 2022; Tessema et al., 2021). Normalcy and hope for the world lie in developing safe and active vaccines. Nevertheless, even a highly effective vaccine necessitates significant widespread and uniform preparedness to accept to protect the world successfully.

Vaccination

The study by Mupandawana & Cross (2016) shows that girls from minority ethnic groups have a lesser vaccine acceptance rate. El-Elimat et al. (2021) examined the COVID-19 vaccine acceptance rate in Jordan; the researchers found that the acceptability of COVID-19 vaccines by the public was reasonably low (37.4%). In the study of Sallam (2021), he discovered that vaccine acceptance in the Middle East, Russia, Africa, and other European countries were low. Other scholars revealed that distrust in government or international bodies, lack of confidence in the safety and effectiveness of vaccines, uncertainty, religious or traditional beliefs, and the influences of misinformation and disinformation circulating both online and other mainstream media might influence COVID-19 vaccine acceptance (Cooper et al., 2021; Ilesanmi et al., 2021). Empirical evidence on COVID-19 Vaccine acceptance in Africa shows mixed results. For instance, six sub-Saharan cross-country study results about the readiness to accept the Vaccine show that acceptance rates were generally high. According to Kanyanda et al. (2021), one of the challenges of vaccine acceptance ranges from safety concerns and its negative impact to the crucial hesitations toward a COVID-19 vaccine across countries.

Vaccine hesitancy by the public is a persistent problem for public health authorities, particularly in the era of social media, where information dissemination is made easier and faster, however, at a costly and deadly rate of spreading misinformation

(Sallam, 2021). Social media is a major contributing factor toward public hesitation and acceptance of vaccines, including concerns about their safety and efficacy and the spread of misinformation that is mainly increasing in the context of the COVID-19 pandemic (Sevidzem Wirsiy et al., 2021). Different clutches spread other propaganda related to the COVID-19 Vaccine through social media. Barely two years after the first endorsement of COVID-19 vaccines, vaccine hesitancy has been identified as part of the main threats to global health (Wiysonge et al., 2022). Social media sites spread anti-vaccination messages long before the COVID-19 pandemic (Wilson & Wiysonge, 2020). The ethic was outbidding works so that misinformation from a small group becomes so powerful that the majority absorbs it in fear of tragic consequences lest it turns out to be correct. Many people do not believe anti-vaccination messages based on their credibility, but they are right in the unlikely event (Wilson & Wiysonge, 2020). In this case, social media tends to appeal to the emotional faculties of social media users. Parents tend to be the most victims of misinformation from social media (Shelby & Ernst, 2013), followed by users who are more vulnerable to these narratives, emotional appeals, such as older age, cognitive damage, less digital literacy, and lower literacy (Callender, 2016).

Covid-19 Myth

Myth is a commonly held notion or concept based on unfounded belief, which has also been acknowledged as one factor that inhibits the acceptance of vaccines. For instance, (El-Elimat et al., 2021) found that the conspiracy theory behind COVID-19 brings vaccine fears. (Africa Center for Strategic Studies, 2021) also exaggerated the seriousness of COVID-19 and its association with blood clotting. According to Dror et al. (2020), the Center for Disease Control and Prevention (CDC) demonstrated that vaccine hesitancy rising from myths and perceptions compound the COVID-19 threat (Dror et al., 2020). Religious beliefs and fear of vaccination serve as government tracking or surveillance, influencing people's decision to accept vaccination (Dzinamarira et al., 2021). Also, perceptions about the efficacy and safety of the Vaccine seemed to affect the decision to take the COVID-19 Vaccine (Cooper et al., 2018). Again, personal characteristics such as; educational qualification, sex, marital status, age, monthly household income, and living area can influence the intention to take the COVID-19 Vaccine to various degrees (Wong et al., 2020). A study that assessed the acceptance and perceptions of (SARS-CoV-2) vaccination found that the overall approval of the vaccine was 90.1%, which contrasted significantly by level of education. Adeniyi et al. (2021) found people with lower educational qualifications were less likely to accept the. COVID-19 Vaccine, while the optimistic perceptions about the Vaccine were independently associated with vaccine acceptance

Perception and Attitudes towards the Vaccine

Perception is an individual's primary way of cognitive engagement to be aware of or gain an understanding of sensory information about the world around them (Efron,

1969; Qiong, 2017). On the other hand, attitude is a pattern of behavior founded on conscious or unconscious mental beliefs that have been formed by experience (Altmann, 2008). Both attitude and perception toward the COVID-19 Vaccine appears to be influenced by individual differences and political factors in Africa. Several studies on the COVID-19 Vaccine and African perspectives found that older adults are less concerned and are more willing to accept the Vaccine. At the same time, those with higher educational qualifications have a lower chance of taking the Vaccine than other groups. On the other hand, women were less hesitant than men toward COVID-19 vaccine acceptance. In contrast, those who believe and accept how the government handles COVID-19-related cases were more likely to take the COVID-19 Vaccine, according to a web-based cross-sectional study in 4 regions of sub-Saharan Africa. The study's finding shows that the two groups' awareness of COVID-19 was linked to perception and attitudes (Ekpenyong et al., 2021).

Material and Methods

Study design, measures, and samples

An internet cross-sectional study was conducted in West Africa from 10 August 2021 to 30 October 2021. According to the WHO, all the west African counties have reported a case of COVID-19 pandemic (Ekpenyong et al., 2021). Due to the social distancing measures, some other restrictions like lockdown and the population-based survey were not feasible under the current pandemic, so this study's data was collected online via a self-reported questionnaire using Survey Monkey. The survey was only available in English. An e-link to the survey was posted via social media platforms like (WhatsApp groups, Facebook and WeChat groups) which are commonly used by the locals in the participating countries. The link was also forwarded directly to close contacts people. The study population was individuals who were 18 years and above, with access to the internet and a good understanding of English. Respondents were pulled across the countries in West Africa, including; Nigeria, Ghana, Benin, Liberia, Côte d'Ivoire and the Gambia. Since the study is an online survey using a Snowball sampling method, this survey allows the participant to be drawn from different countries to participate based on their willingness.

Process of Data Collection

The authors developed the questionnaire based on an extensive literature review of local and international data. A total of 21 items were used to measure their perception, attitudes, and myths about the Covid-19 vaccination. The questionnaire was conducted in English to avoid any bias in translation. Before launching the survey, a pilot study was conducted on (n=15) participants who were not part of the research team. The questionnaire was reshaped into an easier and shorter instrument that respondents could fill within 5 minutes based on the suggestions. A Cronbach alpha analysis was also performed for the entire instrument used and was found to be (α = 0.99). This reliability coefficient was sufficiently reliable. During the launching of the survey, all participants on those social media platforms and emails were informed about the study's background and objective.

Respondents were also informed that participation in this survey is voluntary and that they are free to terminate participation without any prior notice for withdrawal. They were all assured of confidentiality and anonymity of their responses which will only be used for statistical purposes. The e-link for the collection of data was valid for three months. The survey provided some consented to prevent data fluctuations, disallowing incomplete requests, and restricting multiple submissions. The self-administered questionnaire was divided into 4 sections: (1) demographic characteristics, including gender, age, religion, educational background, and work status. (2) knowledge about vaccines, and the third section access respondent

perception, myths attitudes towards vaccine hesitance. In this section, the respondents were requested to state the degree to which they agree with a particular statement using a five-point Likert scale. For each statement, they were required to state their level of agreement, from "1=strongly disagree" to "5= strongly agree".

Independent Variables

For this study, the independent variables were the demographics, including gender, coded as male and female (1=male; 2=female). The age of participants was grouped into various categories: 18-29years, 30-39,40-49, and ≥ 50. Education level was categorized into Secondary or high school (reference category), BS.C/H.N. D / O.N.D holders, Master/ postgraduate degree and Ph.D. The marital statuses of our respondents were also captured as binary married and single (1 =married; 2=single,3=divorced). On the other hand, employment status was broken down into Employed, Unemployed and students.

Dependent Variables

Three dependent variables were considered continuous variables for this study—knowledge, attitudes, perception and myth. Three items were used to survey participant source of knowledge about Covid-19. The response is grouped as (1=no, yes=2, maybe=3). The survey included 9 items that assessed people's myths about the Covid-19 vaccine. Each item used a 5point Likert Scale, and the Cronbach alpha coefficient was 0.98, which indicated satisfaction. Another section was about their reluctance to take the vaccine. It had four items and was assessed using the 5-point Likert scale, including questions about the distance in location and vaccination not being free. The Cronbach alpha for this item was an average of 0.97. For the perception of the Covid-19 vaccine, 8 items were used in measuring and were scaled on a 5-point Likert scale. This item's Cronbach alpha was gotten to be 0.98, indicating satisfaction.

Statistical Analysis

Statistical Analysis: The data collected through the online google were extracted into an excel sheet and examined before exporting into IBM SPSS version 25.0. Descriptive statistics were used to analyze the demographics, and one-way ANOVA was used to analyze the significant differences between the demographic variables. A *p*-value with less or equal to 0.05 was considered statistically significant.

Results

Social and Demographic Characteristics

A total of 1210 participants completed the online questionnaire, a figure remaining after removing incomplete submissions, submissions outside the context, and those from countries with less than 50 participants. For analysis, the countries retained included Nigeria, Ghana, Benin, Liberia, Côte d'Ivoire, and the Gambia. The final sample consisted of 1170 participants. Table 1 shows the social and demographic characteristics of the study participants. As shown in Table 1, the mean score of participants' knowledge about the COVID-19 vaccine was (M=1.04, SD=.231, range 2), mean of attitude score for the COVID-19 vaccine (M=2.56, SD=1.09, range =4). The mean attitude score for this indicating a negative attitude. The mean score for the perception of the COVID-19 Vaccine was (M=2.91, SD=1.03, range=4). The mean myth score for the COVID-19 Vaccine was (M=2.80, SD=1.01, range =4). The majority of the study population were from Nigeria 356(30.4%), male 605 (51.7%), between the age of 30-39years 566(48.4%), 871 were single (74.4%), 679 (58%) identified themselves as Christians, 605(51.7%) come from English-speaking countries, 463(39.6%) were bachelor's/ College degree.

The current finding showed that almost all the participants, 96.8% (1133), had a good knowledge of the COVID-19 vaccine and a higher awareness of the COVID-19 vaccine 650 (55.6%) and 279 (23.8%) came from social media and media houses such as television, radio as their main source of Covid-19 vaccine information. Although they had good knowledge, only 403 (34.4%) were vaccinated and were willing to encourage others to vaccinate (Table 2). Although, as shown in Table 3, a 21 Likert scale was used to determine the perception, myth and attitudes of participants towards vaccine hesitancy, based on their responses, we found that the following statements; vaccine affecting immune 3.22, effectiveness 3.69, worried about the side effect 3.14, I hear a lot of rumors about the vaccine 3.22, vaccine damages human DNA 3.34, through prayer one can be healed of Covid-19 3.29, the vaccine is proper gander by the elite for the poor 3.18, taking the vaccine is against my belief 2.63, I don't trust the company or country that produces the vaccine 3.29. To be above the mean cut for perception 2.9, Myth 2.80 and attitude 2.6. This indicated they all agreed it was what caused vaccine hesitancy among them.

Table 1
Sociodemographic characteristics of the study respondents

Variables	**Mean**	**SD**
Knowledge score	1.04	0.231
Attitude score	2.56	1.09
Myth score	2.80	1.01
Perception score	2.92	1.03
Gender	**N**	**%**
Male	605	51.7
Female	565	48.3
Age		
18-29years	298	25.5
30-39years	566	48.4
40-49years	139	11.9
>50years	167	14.3
Country		
Ghana	131	11.2
Nigeria	356	30.4
Benin	181	15.5
Liberia	203	17.4
Côte d'Ivoire	123	10.5
The Gambia	176	15
Language		
English	605	51.7
French	400	34.2
Others	165	14.1
Educational		
Secondary/High school	94	8.0
Bachelor/College	463	39.6
Masters	418	35.7
PhD	195	16.7
Marital Status		
Single	871	74.4
Married	279	23.8
Divorced/Widowed	20	1.7
Employment Status		
Employed	468	40.0
Unemployed	141	12.1
Student	561	47.9
Religion		
Christian	679	58.0
Islam	371	31.7
Others	120	10.3

Table 2
Knowledge and Vaccination rate of respondents

No	**Question**		**Frequency (n=1170)**	**Percent (%)**
1	Did you contract the virus?	Yes	102	8.7
		No	1005	85.9
		Maybe	63	5.4
2	Have you heard of the Covid-19 Vaccine?	Yes	1133	96.8
		No	28	2.4
		Maybe	9	0.8
3	Have you vaccinated?	Yes	403	34.4
		No	751	64.2
		Maybe	16	1.4
4	Source of Covid-19 vaccine information?	Social media	650	55.6
		Media houses	279	23.8
		Public health	164	14.0
		Others	77	6.6
5	Are you willing to encourage others to get vaccinated?	Yes	403	34.4
		No	751	64.2
		Maybe	16	1.4

Table 3
Responses to attitudinal, myth, and perception statements regarding COVID-19 vaccine acceptance

Statement	Frequency %						
	SD	**D**	**N**	**A**	**SA**	**M**	**Std D**
Perceptions							
I think the Covid-19 vaccine affects the human immune system.	13.8.	21.0	13.3	43.8	8.1	2.81	1.088
I believe my immune system can fight against coronavirus.	16.3	28.2	6.1	46.6	2.8	2.51	.932
I think the vaccine is not safe.	13.8	24.5	14.3	40.1	7.3	2.77	1.086
I am worried about the side effect of the vaccine.	9.7	12.2	30.3	40.0	7.8	3.14	1.052
I doubt the effectiveness of the Covid-19 vaccine.	6.6	6.2	36.3	24.6	26.2	3.69	1.122
I think it might cause infertility.	13.8	23.7	21.0	34.8	6.8	2.83	1.114
The rumors I hear about the effect of the Covid-19 Vaccine.	5.6	12.8	24.1	46.6	10.9	3.22	.991
The covid-19 vaccine will protect me from contracting the virus.	29.7	27.2	12.4	24.6	6.1	2.38	1.201
Cluster Mean						2.92	
Attitude							
I will not take the vaccine because the location where to take the Vaccine is far.	28.7	32.7	13.4	22.0	3.2	2.30	1.114
I will not vaccinate because I don't trust the country that manufactures the vaccine	10.7	12.4	31.2	29.7	16.0	3.29	1.191
I will not vaccinate because the vaccine intake is not free	37.4	34.4	4.1	20.0	4.2	2.03	1.056
I will not vaccinate because it's against my beliefs.	18.4	34.0	17.8	22.1	7.8	2.63	1.194
Cluster mean						2.6	
Myth							
Covid-19 vaccine damages human DNA	7.1	13.3	31.9	32.8	14.9	3.34	1.103
Health care workers use COVID-19 vaccines to	12.2	17.4	8.8	55.	5.6	2.7	.964

make money.				9		8	
I believe that the Covid-19 Vaccine was developed to reduce the African population.	16.3	26.0	5.1	50.1	2.5	2.51	.910
I believe spiritual power can also cure the coronavirus, not the Vaccine alone. MYTH	17.9	24.7	14.9	35.3	7.3	2.69	1.143
The covid-19 Vaccine causes a person to get Covid-19.	20.4	23.6	9.3	38.9	7.8	2.60	1.141
I believe people can also be healed from Covid-19 by taking traditional medicine.	27.7	17.9	23.4	29.7	1.3	2.53	1.162
I believe that through prayers, people can be healed from the coronavirus	7.7	12.7	33.3	34.4	11.8	3.29	1.076
Covid-19 helps to boost the immune system	24.4	30.0	5.1	39.4	1.1	2.29	.928
Covid-19 vaccination is a propaganda by the elite on the poor masses	9.1	13.9	29.2	37.4	10.3	3.18	1.085
Cluster mean						2.80	

Note: Responses of each statement rages:1=strongly disagree to 5=Strongly agree

H1: There is a significant impact of perception, myth and attitude on vaccine hesitancy.

Multiple regression was conducted to investigate whether perception, myth and attitude could significantly predict participants' vaccine hesitance. As shown in Table 3, the regression results indicated that the model explained 45.3% of the variance and that the model was a significant predictor of vaccine hesitancy, F (3,1166) =322.093, p=0.001). This indicated that perception, myth, and attitude play a significant role in shaping vaccine acceptance or reluctance. Perception contributed significantly to the model (B=-.403 p<0.05), attitude (B=.336, p<0.01) and myth (B=0.371, p<0.01). The final predictive model was: Vaccine score =0.946, + 0.403*perception) +(0.336* attitude) +(0.371* myth).

Table 4
A multi-regression table showing perception, myth, and attitude towards vaccine hesitancy

Hypothesis	Regression weight	Beta Coefficient	R^2	F	P-value	Hypothesis supported
H1	PC,MY and AT⟹on VH	543.707	.453	322.093	.000	Yes

Note *p<0.05. PC: Perception, MY: Myth, AT: attitude, VH: vaccine hesitancy

H2: There is a significant statistical difference between demographic characteristics and COVID-19 vaccine acceptance.

Gender: An ANOVA was done to determine whether or not there is any difference between male and female willingness to accept the vaccine. Our findings from the ANOVA showed that there is a significant association between gender and vaccine hesitancy. F (1,1168) = 1096.3I6, p<0.001). Furthermore, the study shows male (n=605, M=1.33, SD = .472) were more likely to accept the vaccine while the female (n=565, M=2.03, SD=0.166) has higher reluctance rate. Their perception, myth and attitude toward vaccines (p<0.001) are shown in Table 4. Some assumptions about why females tend to be reluctant to accept vaccines more can be attributed to a lack of good knowledge about vaccines. Most studies have predicted males to be at higher risk of contracting the virus than women; hence more men are likely to accept the vaccines than females. Also, psychological studies predict that men are more robust in taking new phenomena over females. Therefore, trying things such as vaccines is easier for males than for females. Again, most African cultural practices expect men to lead the path while females follow. Hence, it is not surprising to see more males accepting the vaccine than females

Educational Qualification: Educational level plays a vital role in vaccine acceptance or hesitance. A one-way ANOVA revealed a statistically significant difference between at least two educational qualifications F (4,1165) = 737.912 p<0.001). The educational qualification variable comprises four levels: Secondary/College, Bachelor, master's, and Ph.D. The descriptive comparison, as shown in Table 4, indicates that those with Bachelor /College degree holders have a more positive myth (M=1.89), perception (M=1.50) and attitude (M=1.78) towards the vaccine, and it increases their chance of likely acceptance than any other qualification.

Age factor: Over the years, studies have found that age plays a key role in COVID-19 vaccine acceptance. A one-way between-subjects ANOVA was used to find the significant difference. Our result showed that F (3,1166) = 204.346 p<0.001). On the other hand, our finding (Table 5) shows that adults between the ages of 18-29years are more likely to accept the vaccine when compared to their means score towards their perception, myth and attitude. At the same time, those in secondary school have a higher rate of vaccine hesitancy compared to their perception, myth, and attitude.

Marital and employment status factor: COVID-19 vaccine varies by marital status and employment. The finding shows that there is a significant association between one of the subjects F (2,1167) = 189.214 p<0.001). However, our data found singles are more likely to accept the vaccine than any other group. When compared, the means score of their perception, myth and attitude Table 5. While in employment status, there is a significant association between employment and Covid-19 vaccine acceptance F (2,1167) = 1459.276 p<0.001). In comparing their perception, myth, and attitude, students have a lower mean score which indicates a higher rate of acceptance.

Religious belief: Different studies have shown that religion has played a significant role in preventive attitudes such as vaccination for the past decade. Furthermore, the

study found a significant positive correlation between faith and vaccine acceptance (Lahav et al., 2022). Other papers indicated that religion has no considerable impact on accepting vaccines. Some studies found a negative association or no relationship between people's degree of religiosity. Our findings from a one-way ANOVA showed a significant association between religion and Covid-19 vaccine acceptance F (2,1167) = 372.127 p<0.001). Based on the comparison of demographic characteristics and the mean of Perception, Attitude and Myth, as shown in Table 5, Christians have a lower mean score in both perceptions, attitude and myth, which indicate a higher level of acceptance. We further speculated that one of the reasons Christians are more willing to get vaccinated might be because of the level of awareness created in the churches, while other religions have certain presumptions or beliefs despite their religious faith.

Differences in Perception, Attitudes, and Myth Toward COVID-19 vaccine

Table 5
Regression result on the comparison of demographic characteristics and the mean of Perception, Attitude and Myth

Variables	N	%	Perception			Attitude			Myth		
			Mean	SD	*P*	Mean	SD	*P*	Mean	SD	*P*
Gender											
Male	605	51.7	2.14	.67	<.001	1.68	.48	<.001	2.56	.64	<.001
Female	565	48.3	3.75	.61		3.51	.70		2.01	.53	
Age											
18-29years	298	25.5	1.59	.48		1.24	.25		1.44	.39	
30-39years	566	48.4	2.92	.37	<.001	2.47	.44	<.001	2.87	.39	<.001
40-49years	139	11.9	3.82	.16		3.57	.19		3.54	.12	
50+years	167	14.3	4.51	.41		4.41	.39		4.37	.37	
Education											
Bachelor	463	39.6	1.89	.56		1.50	.42		1.78	.55	<.001
Masters	418	35.7	3.19	.39	<.001	2.75	.55		3.13	.42	
PhD	195	16.7	4.01	.42		3.83	.51		3.78	.47	
Secondary	94	8.0	4.48	.34		4.30	.27		4.32	.26	
Marital											
Single	871	74.4	2.47	.76	<.001	.70	2.05		2.39	.79	<.001
Married	279	23.8	4.16	.43		.47	3.98		3.94	.45	
Divorced	20	1.7	5.00	.00		.00	5.00		4.93	.10	
Employment											
Employed	468	40.0	1.90	.56		1.51	.42		1.79	.56	<.001
Unemployed	141	12.1	2.95	.06	<.001	2.25	.00		2.76	.17	
Student	561	47.9	3.76	.61		3.52	.70		3.66	.53	
Religion											
Christian	679	58.0	2.24	.69		1.79	.57		2.128	.69	<.001
Islam	371	31.7	3.59	.32	<.001	3.33	.41		3.48	.22	
others	120	10.3	4.71	.32		4.57	.36		4.54	.29	

Discussion

The idea of perception encompasses several concepts, including beliefs, values, knowledge, motivations, and preferences (Bennett, 2016). By contrast, an attitude refers to an individual's inclination to respond favorably or negatively to an item, idea, or event. And one of the best ways to understand people's behavior is to consider their attitudes (Kanyanda et al., 2021). Myth has also been acknowledged as one factor that inhibits the acceptance of vaccines. For instance, (El-Elimat et al., 2021) found that the conspiracy theory behind COVID-19 created vaccine fears. Recent data from several countries show that many citizens either do not plan to be vaccinated against COVID-19 or would rather postpone their vaccination. A similar finding was also found in the study carried out by (Josiah & Kantaris, 2021), who assessed the perception and acceptance of the COVID-19 vaccine in Nigeria. The study reveals that most of their respondents' reluctance to take the vaccine was associated with their concern about the side effect of the COVID-19 Vaccine. Kitro et al. (2021) also found concern about the side effect of the Vaccine, efficacy, and safety as most vaccines are produced using new technology as the reasons for vaccine reluctance.

Covid-19 was claiming lives, and authorities in different African countries provided several measures to curb the spread of the deadly virus and dispel public doubt, perception, and myth about the virus and its vaccine. Knowledge about Covid-19 varies across countries (Bono et al., 2021). However, the current finding on participants' overall knowledge of the COVID-19 Vaccine showed that 96.8% (1133) had a good knowledge of the vaccine. A similar finding was found in (Josiah & Kantaris, 2021), revealing that 76.6% were aware of the COVID-19 Vaccine for a more significant percentage. This high level of awareness was shared equally, irrespective of the educational level. However, having seen a high rate of Covid-19 vaccine awareness, it’s essential to understand the participants' source of information about the vaccine. Knowing that misinformation can influence people's perceptions and attitudes towards the vaccine's acceptance is imperative.

Information dissemination can come from different sectors, but its originality and genuineness are also challenging. Therefore, optimizing the effectiveness of those sources of information is very paramount. The result from this study showed that a higher awareness of the COVID-19 vaccine 440 (37.6%) comes from social media. A similar finding of participant knowledge of vaccines coming from social media can be found in the study of Reuben et al. The authors found that 95.5% of the respondents had good knowledge about Covid-19 and a more significant percentage of the information comes from social media and media houses (Reuben et al., 2021).

In-depth studies have been carried out on vaccine hesitancy in recent years. The hesitancy among individual groups of people was attributed to their perceptions, myth, and attitude toward vaccines, which gives rise to complete refusal of all vaccine intake or complete vaccine acceptance (Mascherini & Nivakoski, 2022). The findings from this study reveal that 64.2% were unvaccinated, 34.4% were vaccinated, and 1.4% were indifferent. The low rate of vaccine acceptance as seen in this study is also

similar to an empirical review by (Sallam, 2021), who found that in the following countries; Ecuador (97.0%), Malaysia (94.3%), Indonesia (93.3%), China (91.3%), has the highest rate of COVID-19 vaccine acceptance, whereas Kuwait (23.6%), Jordan (28.4%), Italy (53.7%), Russia (54.9%), Poland (56.3%), US (56.9%) and France (58.9%) have lower acceptance rates. However, the highest percentage of vaccine acceptance did not include any African country; this indicates vaccine hesitancy. One of the assumptions for the low vaccination rate among Africans is connected with perception, attitude and myth.

In addition, most studies have predicted males to be at higher risk of contracting the virus than women; hence more men were likely to accept the vaccines than females. Some of the assumptions why female tends not to accept vaccine more can be because females possess lesser knowledge about the vaccine. Also, psychological studies predict that men are more robust in taking new phenomena over females. Therefore, trying things such as vaccines is easier for males than for females. Again, most African cultural practices expect men to lead the path while females follow. Hence, it is not surprising to see more males accepting the vaccine than females.

Educational-wise, those respondents with higher educational qualifications displayed higher chances of getting vaccinated. This was not the case for lower educational qualification groups; mainly, those with secondary educational qualifications were less accepting of the vaccine.

Our study also revealed an interesting finding—more young people between the ages of 18 and 23 were more willing to get inoculated. In contrast, those above 40 years of age were reluctant to accept the vaccine. Interestingly, this finding differs from that of (AlKetbi et al., 2021; Gorelik et al., 2022; Khan et al., 2021; Neumann-Böhme et al., 2020), where more older people were willing to get vaccinated. However, a possible explanation for the variation in this finding could be that, contrary to the studies mentioned above, older people in Africa tend to be less interested in the social media platforms through which our questionnaire was distributed. Additionally, the high acceptance rate among young people in this study also stresses the importance of social media publicity in inoculation campaigns (Ahmad Rizal et al., 2022; Alfatease et al., 2021). Thus, there is a need for vaccine advocates to maximize the use of social media in the ongoing fight against vaccine hesitancy and refusal in a bid to benefit public health (Clark et al., 2022). In addition, organizations could employ the use of social media to perform research into the relationships between social media techniques and changes in community views and behaviors. This presents significant benefits, such as boosting the reach of vaccination campaigns, enhancing the creation of targeted credibility and technologies, and strengthening cooperation to help promote trustworthy information (Steffens et al., 2020).

Another interesting result of our research is that single people were more willing to accept the COVID-19 vaccine in the marital status variable. At the same time, a significant reluctance was observed amongst respondents who reported being married, divorced, widowed or widower. This finding also conforms to that of (Marzo et al., 2022). The authors also found that married individuals were less likely to

vaccinate than unmarried individuals in their study. Furthermore, our survey data emphasize that unmarried individuals are more exposed to COVID-19 disease. However, similar web-based studies such as (Al-Mohaithef & Padhi, 2020) conducted in Saudi Arabia revealed that married people were more likely to accept vaccine inoculations than single ones. The variations in the two studies can be explained by taking into account the number of single people in the survey, the targeted population, and geographic, religious and cultural differences (Pelčić et al., 2016; Trepanowski & Drążkowski, 2022).

Religious-wise, Christians were more willing to accept the vaccine than their Muslim counterparts. This was not surprising because several studies from West Africa have evidenced similar vaccination campaign scenarios, which were highly influenced by the beliefs and judgments of political and Islam religious leaders in northern Nigeria (Jegede, 2007). It has been found from other studies as well that religion is a predictor of vaccination status in India. The result of Shrivastwa et al. (2015) study showed that religion predicts the vaccination status of children. Compared to Hindu children, the study found that Muslim children had a much greater likelihood of either being under-vaccinated or not being vaccinated. Religion influences vaccination choices in many ways, and religious concern is sometimes cited by parents as a reason to avoid vaccination of their children (Pelčić et al., 2016). Thus, our study contributes to the ongoing advocacy for designing mechanisms that would ideally integrate religious perspectives into successful mass vaccination programs in West Africa.

In the employment category, respondents who reported as employed were more willing to accept the vaccination than others. A surprising result from this category was that those reporting as students were hesitant to accept the vaccine. This can be explained by the fact that employed people have more knowledge and are aware of the vaccine. In furtherance, the possession of this knowledge can be accrued to policies and preventive measures instigated by governments that are then passed down to various employing entities for the combined fight against the spread of the disease.

If these sociodemographic characteristics in relation to the COVID-19 vaccine are addressed, this may assist in enhancing participation in the immunization effort to combat future pandemics. In addition, targeted health education activities are essential to encourage more people to vaccinate against COVID-19 (Al-Mohaithef & Padhi, 2020).

Conclusion and Research Implications

For an increase in covid-19 vaccination in West Africa, there is an urgent need for governments and relevant authorities to dip deeper and address the public concern related to vaccination. This can be done by implementing several robust strategies, such as applying appropriate information dissemination in circulating Covid-19-related information rather than allowing citizens to rely on proper ganders on social media. Also, the general public, whom the vaccines are meant for, needs to be reassured of vaccine safety and the importance of vaccination. Doing this will increase community awareness and ensure higher acceptance.

The study findings can be used to support West Africa and other national governments in using appropriate means of passing down information to best address vaccine hesitancies seen not just in West Africa but also across other African countries.

We recommend governments employ appropriate means of disseminating information to educate their citizens on vaccine-related details while reassuring them about the importance of taking the vaccine. Such an effort will result in a higher turnout for vaccination. The study further recommends that the cause of vaccine hesitancy be the priority of diverse African countries' governments, as indicated in this study. Moreover, we also recommend that the study findings help create vaccination programs and vaccination campaign information-sharing platforms, which can help increase public confidence in accepting to inoculate in both present and future vaccination campaigns.

Limitation of the Study

The study first combines different countries and uses an exploratory mixed-method design to examine the effect of myth, perception, and attitudes towards vaccine acceptance. Despite the strengths, this study has limitations, such as limited scope in the countries covered. The number of responses, even though large, is not enough to represent the views of the entire study area—we received responses from just a few West African countries. Participants for the interview section of the study were recruited voluntarily. In addition, some participants were unwilling to fill out the online questionnaires with the intention that online links are usually from scammers. While our result is useful for enhancing participation in the immunization effort to combat future pandemics, we encourage future researchers to expand the sample size, include more countries as possible, and employ pen and paper questionnaires as the participant might prefer.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author.

References

Adeniyi, O. V., Stead, D., Singata-Madliki, M., Batting, J., Wright, M., Jelliman, E., Abrahams, S., & Parrish, A. (2021). Acceptance of covid-19 vaccine among the healthcare workers in the eastern cape, south africa: A cross sectional study. *Vaccines*, *9*(6), 1–11. https://doi.org/10.3390/vaccines9060666

Africa Center for Strategic Studies. (2021). *Dispelling COVID Vaccine Myths in Africa*. *May*, 1–5. https://africacenter.org/spotlight/dispelling-covid-vaccine-myths-in-africa/

Ahmad Rizal, A. R., Nordin, S. M., Ahmad, W. F. W., Ahmad Khiri, M. J., & Hussin, S. H. (2022). How Does Social Media Influence People to Get Vaccinated? The Elaboration Likelihood Model of a Person's Attitude and Intention to Get COVID-19 Vaccines. *International Journal of Environmental Research and Public Health*, *19*(4), 2378. https://doi.org/10.3390/ijerph19042378

Al-Hanawi, M. K., Angawi, K., Alshareef, N., Qattan, A. M. N., Helmy, H. Z., Abudawood, Y., Alqurashi, M., Kattan, W. M., Kadasah, N. A., Chirwa, G. C., & Alsharqi, O. (2020). Knowledge, Attitude and Practice Toward COVID-19 Among the Public in the Kingdom of Saudi Arabia: A Cross-Sectional Study. *Frontiers in Public Health*, *8*. https://doi.org/10.3389/fpubh.2020.00217

Al-Mohaithef, M., & Padhi, B. K. (2020). Determinants of COVID-19 Vaccine Acceptance in Saudi Arabia: A Web-Based National Survey. *Journal of Multidisciplinary Healthcare*, *Volume 13*, 1657–1663. https://doi.org/10.2147/JMDH.S276771

Alfatease, A., Alqahtani, A. M., Orayj, K., & Alshahrani, S. M. (2021). The Impact of Social Media on the Acceptance of the COVID-19 Vaccine: A Cross-Sectional Study from Saudi Arabia. *Patient Preference and Adherence*, *Volume 15*, 2673–2681. https://doi.org/10.2147/PPA.S342535

AlKetbi, L. M. B., Elharake, J. A., Memari, S. Al, Mazrouei, S. Al, Shehhi, B. Al, Malik, A. A., McFadden, S. M., Galal, B., Yildirim, I., Khoshnood, K., Omer, S. B., Memish, Z. A., AlZarouni, A. A., AlNeyadi, A. M., & Hosani, F. Al. (2021). COVID-19 vaccine acceptance among healthcare workers in the United Arab Emirates. *IJID Regions*, *1*, 20–26. https://doi.org/10.1016/j.ijregi.2021.08.003

Almoughales, A. A., Swed, S., Sawaf, B., & Alibrahim, H. (2022). COVID-19 vaccine hesitancy among indigenous people in Yemen: An incipient crisis. *Annals of Medicine and Surgery*, *73*, 103206. https://doi.org/10.1016/j.amsu.2021.103206

Alnasser, Y., Alnamnakani, M. A., Abuhaimed, J. M., Alshiha, L. Z., Alhamid, N. M., &

Alalshaikh, G. A. (2021). Preparedness of current and future Saudi Pediatricians to face vaccine hesitancy: Cross-sectional study within the capital city of Saudi Arabia, Riyadh. *Annals of Medicine and Surgery*, *69*, 102718. https://doi.org/10.1016/j.amsu.2021.102718

Altmann, T. K. (2008). Attitude: A Concept Analysis. *Nursing Forum*, *43*(3), 144–150. https://doi.org/10.1111/j.1744-6198.2008.00106.x

Aroh, A., Asaolu, B., & Okafor, C. T. (2021). *Myths and models: What's driving vaccine hesitancy in Africa and how can we overcome it?* Africa Portal. https://www.africaportal.org/features/myths-and-models-whats-driving-vaccine-hesitancy-in-africa-and-how-can-we-overcome-it/

Bennett, N. J. (2016). Using perceptions as evidence to improve conservation and environmental management: Perceptions and Conservation. *Conservation Biology*, *30*(3), 582–592. https://doi.org/10.1111/cobi.12681

Bono, S. A., Faria de Moura Villela, E., Siau, C. S., Chen, W. S., Pengpid, S., Hasan, M. T., Sessou, P., Ditekemena, J. D., Amodan, B. O., Hosseinipour, M. C., Dolo, H., Siewe Fodjo, J. N., Low, W. Y., & Colebunders, R. (2021). Factors Affecting COVID-19 Vaccine Acceptance: An International Survey among Low- and Middle-Income Countries. *Vaccines*, *9*(5), 515. https://doi.org/10.3390/vaccines9050515

Butter, S., McGlinchey, E., Berry, E., & Armour, C. (2021). Psychological, social, and situational factors associated with COVID-19 vaccination intentions: A study of UK key workers and non-key workers. *British Journal of Health Psychology*, bjhp.12530. https://doi.org/10.1111/bjhp.12530

Cabore, J. W., Karamagi, H. C., Kipruto, H. K., Mungatu, J. K., Asamani, J. A., Droti, B., Titi-ofei, R., Seydi, A. B. W., Kidane, S. N., Balde, T., Gueye, A. S., Makubalo, L., & Moeti, M. R. (2022). COVID-19 in the 47 countries of the WHO African region: a modelling analysis of past trends and future patterns. *The Lancet Global Health*, *10*(8), e1099–e1114. https://doi.org/10.1016/S2214-109X(22)00233-9

Callender, D. (2016). Vaccine hesitancy: More than a movement. *Human Vaccines & Immunotherapeutics*, *12*(9), 2464–2468. https://doi.org/10.1080/21645515.2016.1178434

Chukwuocha, U. M., Okorie, P. C., Iwuoha, G. N., Ibe, S. N., Dozie, I. N., & Nwoke, B. E. (2018). Awareness, perceptions and intent to comply with the prospective malaria vaccine in parts of South Eastern Nigeria. *Malaria Journal*, *17*(1), 187. https://doi.org/10.1186/s12936-018-2335-0

Clark, S. E., Bledsoe, M. C., & Harrison, C. J. (2022). The role of social media in promoting vaccine hesitancy. *Current Opinion in Pediatrics*, *34*(2), 156–162. https://doi.org/10.1097/MOP.0000000000001111

Cooper, S., Betsch, C., Sambala, E. Z., Mchiza, N., & Wiysonge, C. S. (2018). Vaccine hesitancy–a potential threat to the achievements of vaccination programmes in Africa. *Human Vaccines and Immunotherapeutics*, *14*(10), 2355–2357. https://doi.org/10.1080/21645515.2018.1460987

Cooper, S., van Rooyen, H., & Wiysonge, C. S. (2021). COVID-19 vaccine hesitancy in South Africa: how can we maximize uptake of COVID-19 vaccines? *Expert Review of Vaccines*, *20*(8), 921–933. https://doi.org/10.1080/14760584.2021.1949291

Dodoo, A., Adjei, S., Couper, M., Hugman, B., & Edwards, R. (2007). When rumours derail a mass deworming exercise. *The Lancet*, *370*(9586), 465–466. https://doi.org/10.1016/S0140-6736(07)61211-2

Dror, A. A., Eisenbach, N., Taiber, S., Morozov, N. G., Mizrachi, M., Zigron, A., Srouji, S., & Sela, E. (2020). Vaccine hesitancy: the next challenge in the fight against COVID-19. *European Journal of Epidemiology*, *35*(8), 775–779. https://doi.org/10.1007/s10654-020-00671-y

Dzinamarira, T., Nachipo, B., Phiri, B., & Musuka, G. (2021). COVID-19 Vaccine Roll-Out in South Africa and Zimbabwe: Urgent Need to Address Community Preparedness, Fears and Hesitancy. *Vaccines*, *9*(3), 250. https://doi.org/10.3390/vaccines9030250

Efron, R. (1969). *What is perception?* 137–138.

Ekpenyong, B. N., Osuagwu, U. L., Miner, C. A., Ovenseri-Ogbomo, G. O., Abu, E. K., Goson, P. C., Langsi, R., Nwaeze, O., Chikasirimobi, T. G., Charwe, D. D., Mashige, K. P., Oloruntoba, R., Ishaya, T., & Agho, K. E. (2021). Knowledge, Attitudes, and Perceptions of COVID-19 Among Healthcare and Non-Healthcare Workers in Sub-Saharan Africa: A Web-Based Survey. *Health Security*, *19*(4), 393–404. https://doi.org/10.1089/hs.2020.0208

El-Elimat, T., AbuAlSamen, M. M., Almomani, B. A., Al-Sawalha, N. A., & Alali, F. Q. (2021). Acceptance and attitudes toward COVID-19 vaccines: A cross-sectional study from Jordan. *PLoS ONE*, *16*(4 April), 1–15. https://doi.org/10.1371/journal.pone.0250555

Geoghegan, S., O'Callaghan, K. P., & Offit, P. A. (2020). Vaccine Safety: Myths and Misinformation. *Frontiers in Microbiology*, *11*. https://doi.org/10.3389/fmicb.2020.00372

Gorelik, Y., Anis, E., & Edelstein, M. (2022). Inequalities in initiation of COVID19 vaccination by age and population group in Israel- December 2020-July 2021. *The Lancet Regional Health - Europe*, *12*, 100234. https://doi.org/10.1016/j.lanepe.2021.100234

Hussain, A., Ali, S., Ahmed, M., & Hussain, S. (2018). The Anti-vaccination Movement: A Regression in Modern Medicine. *Cureus*. https://doi.org/10.7759/cureus.2919

Ilesanmi, O., Afolabi, A., & Uchendu, O. (2021). The prospective COVID-19 vaccine: willingness to pay and perception of community members in Ibadan, Nigeria. *PeerJ*, *9*, e11153. https://doi.org/10.7717/peerj.11153

Jegede, A. S. (2007). What Led to the Nigerian Boycott of the Polio Vaccination Campaign? *PLoS Medicine*, *4*(3), e73. https://doi.org/10.1371/journal.pmed.0040073

Josiah, B. O., & Kantaris, M. (2021). Perception of Covid-19 and Acceptance of Vaccination in Delta State Nigeria. *The Nigerian Health Journal*, *21*(2), 60–86. http://www.tnhjph.com/index.php/tnhj/article/view/510

Kanyanda, S., Markhof, Y., Wollburg, P., & Zezza, A. (2021). The acceptance of covid-19 vaccines in Sub-Saharan Africa: Evidence from 6 national phone surveys. *MedRxiv*, *July*, 1–21.

Khan, M. S. R., Watanapongvanich, S., & Kadoya, Y. (2021). COVID-19 Vaccine Hesitancy among the Younger Generation in Japan. *International Journal of Environmental Research and Public Health*, *18*(21), 11702. https://doi.org/10.3390/ijerph182111702

Kitro, A., Sirikul, W., Piankusol, C., Rirermsoonthorn, P., Seesen, M., Wangsan, K., Assavanopakun, P., Surawattanasakul, V., Kosai, A., & Sapbamrer, R. (2021). Acceptance, attitude, and factors affecting the intention to accept COVID-19 vaccine among Thai people and expatriates living in Thailand. *Vaccine*, *39*(52), 7554–7561. https://doi.org/10.1016/j.vaccine.2021.11.031

Lahav, E., Shahrabani, S., Rosenboim, M., & Tsutsui, Y. (2022). Is stronger religious faith associated with a greater willingness to take the COVID-19 vaccine? Evidence from Israel and Japan. *The European Journal of Health Economics*, *23*(4), 687–703. https://doi.org/10.1007/s10198-021-01389-8

Largent, E. A., Persad, G., Sangenito, S., Glickman, A., Boyle, C., & Emanuel, E. J. (2020). US Public Attitudes Toward COVID-19 Vaccine Mandates. *JAMA Network Open*, *3*(12), e2033324. https://doi.org/10.1001/jamanetworkopen.2020.33324

Lazarus, J. V, Ratzan, S., Palayew, A., Gostin, L. O., Larson, H. J., Rabin, K., Kimball, S., & El-Mohandes, A. (2020). Hesitant or not? A global survey of potential acceptance of a COVID-19 vaccine. *MedRxiv*, 2020.08.23.20180307. https://doi.org/10.1101/2020.08.23.20180307

Li, M., Luo, Y., Watson, R., Zheng, Y., Ren, J., Tang, J., & Chen, Y. (2021). Healthcare workers' (HCWs) attitudes and related factors towards COVID-19 vaccination: a rapid systematic review. *Postgraduate Medical Journal*, postgradmedj-2021-140195. https://doi.org/10.1136/postgradmedj-2021-140195

Lin, F.-Y., & Wang, C.-H. (2020). Personality and individual attitudes toward vaccination: a nationally representative survey in the United States. *BMC Public Health*, *20*(1), 1759. https://doi.org/10.1186/s12889-020-09840-w

Lin, Y., Hu, Z., Zhao, Q., Alias, H., Danaee, M., & Wong, L. P. (2020). Understanding COVID-19 vaccine demand and hesitancy: A nationwide online survey in China. *PLOS Neglected Tropical Diseases*, *14*(12), e0008961. https://doi.org/10.1371/journal.pntd.0008961

Liu, S., & Liu, J. (2021). Public attitudes toward COVID-19 vaccines on English-language Twitter: A sentiment analysis. *Vaccine*, *39*(39), 5499–5505. https://doi.org/10.1016/j.vaccine.2021.08.058

Marzo, R. R., Ahmad, A., Abid, K., Khatiwada, A. P., Ahmed, A., Kyaw, T. M., Abidin, I. B. Z., Srithar, M., Sinnathamby, S., Sarvasundram, A. P., & Shrestha, S. (2022). Factors influencing the acceptability of COVID-19 vaccination: A cross-sectional study from Malaysia. *Vacunas*, *23*, S33–S40. https://doi.org/10.1016/j.vacun.2021.07.007

Mascherini, M., & Nivakoski, S. (2022). Social media use and vaccine hesitancy in the European Union. *Vaccine*, *40*(14), 2215–2225. https://doi.org/10.1016/j.vaccine.2022.02.059

Mathieu, E., Ritchie, H., Ortiz-Ospina, E., Roser, M., Hasell, J., Appel, C., Giattino, C., & Rodés-Guirao, L. (2021). A global database of COVID-19 vaccinations. *Nature Human Behaviour*, *5*(7), 947–953. https://doi.org/10.1038/s41562-021-01122-8

Mesesle, M. (2021). Awareness and Attitude Towards COVID-19 Vaccination and Associated Factors in Ethiopia: Cross-Sectional Study. *Infection and Drug Resistance*, *Volume 14*, 2193–2199. https://doi.org/10.2147/IDR.S316461

Mupandawana, E. T., & Cross, R. (2016). Attitudes towards human papillomavirus vaccination among African parents in a city in the north of England: a qualitative study. *Reproductive Health*, *13*(1), 97. https://doi.org/10.1186/s12978-016-0209-x

Neumann-Böhme, S., Varghese, N. E., Sabat, I., Barros, P. P., Brouwer, W., van Exel, J., Schreyögg, J., & Stargardt, T. (2020). Once we have it, will we use it? A European survey on willingness to be vaccinated against COVID-19. *The European Journal of Health Economics*, *21*(7), 977–982. https://doi.org/10.1007/s10198-020-01208-6

Nyhan, B., & Reifler, J. (2015). Does correcting myths about the flu vaccine work? An experimental evaluation of the effects of corrective information. *Vaccine*, *33*(3), 459–464. https://doi.org/10.1016/j.vaccine.2014.11.017

Otu, A., Osifo-Dawodu, E., Atuhebwe, P., Agogo, E., & Ebenso, B. (2021). Beyond vaccine hesitancy: time for Africa to expand vaccine manufacturing capacity amidst growing COVID-19 vaccine nationalism. *The Lancet Microbe*, *2*(8), e347–e348. https://doi.org/10.1016/S2666-5247(21)00126-9

Paul, E., Steptoe, A., & Fancourt, D. (2021). Attitudes towards vaccines and intention to vaccinate against COVID-19: Implications for public health communications. *The Lancet Regional Health - Europe*, *1*, 100012. https://doi.org/10.1016/j.lanepe.2020.100012

Pelčić, G., Karačić, S., Mikirtichan, G. L., Kubar, O. I., Leavitt, F. J., Cheng-tek Tai, M., Morishita, N., Vuletić, S., & Tomašević, L. (2016). Religious exception for vaccination or religious excuses for avoiding vaccination. *Croatian Medical Journal*, *57*(5), 516–521. https://doi.org/10.3325/cmj.2016.57.516

Qiong, O. (2017). A brief introduction to Perception. *Perspectives in Public Health*, *15*(4), 18–28. https://doi.org/10.3968/10055

Reuben, R. C., Danladi, M. M. A., Saleh, D. A., & Ejembi, P. E. (2021). Knowledge, Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-

Central Nigeria. *Journal of Community Health*, *46*(3), 457–470. https://doi.org/10.1007/s10900-020-00881-1

Reuters. (2021). *Vaccine hesitancy slows Africa's COVID-19 inoculation drive Reuters*. https://www.reuters.com/world/africa/vaccine-hesitancy-slows-africas-covid-19-inoculation-drive-2021-05-04/

Rosenthal, P. J., Breman, J. G., Djimde, A. A., John, C. C., Kamya, M. R., Leke, R. G. F., Moeti, M. R., Nkengasong, J., & Bausch, D. G. (2020). COVID-19: Shining the Light on Africa. *The American Journal of Tropical Medicine and Hygiene*, *102*(6), 1145–1148. https://doi.org/10.4269/ajtmh.20-0380

Sallam, M. (2021). Covid-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. *Vaccines*, *9*(2), 1–15. https://doi.org/10.3390/vaccines9020160

Sevidzem Wirsiy, F., Nkfusai, N. C., Ebot Ako-Arrey, D., Kenfack Dongmo, E., Titu Manjong, F., & Nambile Cumber, S. (2021). Acceptability of COVID-19 Vaccine in Africa. *International Journal of Maternal and Child Health and AIDS (IJMA)*, *10*(1), 134–138. https://doi.org/10.21106/ijma.482

Shelby, A., & Ernst, K. (2013). Story and science: How providers and parents can utilize storytelling to combat anti-vaccine misinformation. *Human Vaccines \& Immunotherapeutics*, *9*(8), 1795–1801. https://doi.org/10.4161/hv.24828

Shrivastwa, N., Gillespie, B. W., Kolenic, G. E., Lepkowski, J. M., & Boulton, M. L. (2015). Predictors of vaccination in India for children aged 12–36 months. *Vaccine*, *33*, D99–D105. https://doi.org/10.1016/j.vaccine.2015.09.034

Steffens, M. S., Dunn, A. G., Leask, J., & Wiley, K. E. (2020). Using social media for vaccination promotion: Practices and challenges. *DIGITAL HEALTH*, *6*, 205520762097078. https://doi.org/10.1177/2055207620970785

Tessema, G. A., Kinfu, Y., Dachew, B. A., Tesema, A. G., Assefa, Y., Alene, K. A., Aregay, A. F., Ayalew, M. B., Bezabhe, W. M., Bali, A. G., Dadi, A. F., Duko, B., Erku, D., Gebrekidan, K., Gebremariam, K. T., Gebremichael, L. G., Gebreyohannes, E. A., Gelaw, Y. A., Gesesew, H. A., … Tesfay, F. H. (2021). The COVID-19 pandemic and healthcare systems in Africa: a scoping review of preparedness, impact and response. *BMJ Global Health*, *6*(12), e007179. https://doi.org/10.1136/bmjgh-2021-007179

Trepanowski, R., & Drążkowski, D. (2022). Cross-National Comparison of Religion as a Predictor of COVID-19 Vaccination Rates. *Journal of Religion and Health*, *61*(3), 2198–2211. https://doi.org/10.1007/s10943-022-01569-7

Wilson, S. L., & Wiysonge, C. (2020). Social media and vaccine hesitancy. *BMJ Global Health*, *5*(10), e004206. https://doi.org/10.1136/bmjgh-2020-004206

Wiysonge, C. S., Ndwandwe, D., Ryan, J., Jaca, A., Batouré, O., Anya, B.-P. M., & Cooper, S. (2022). Vaccine hesitancy in the era of COVID-19: could lessons from the past help in divining the future? *Human Vaccines & Immunotherapeutics*, *18*(1), 1–3.

https://doi.org/10.1080/21645515.2021.1893062

Wong, L. P., Alias, H., Wong, P.-F., Lee, H. Y., & AbuBakar, S. (2020). The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. *Human Vaccines & Immunotherapeutics*, *16*(9), 2204–2214. https://doi.org/10.1080/21645515.2020.1790279

Wu, Y.-C., Chen, C.-S., & Chan, Y.-J. (2020). The outbreak of COVID-19: An overview. *Journal of the Chinese Medical Association*, *83*(3), 217–220. https://doi.org/10.1097/JCMA.0000000000000270

About the authors

Nweze Chiamaka Nneoma is a Nigerian and a PhD student at Southwest University, Chongqing, China. Chiamaka is honest, passionate, and has the drive to keep going. This drive to keep going helps her collaborate with others, leading by example and adding value to organization or institutions she finds herself. Chiamaka's research interest includes Principal Leadership, Students Performance, Teachers' Professional Development, and School improvement. She can be contacted at Chimaxesthy@gmail.com

Peter Davis Sumo is a PhD student at the College of Textile Science & Engineering and International Institute of Silk at Zhejiang Sci-Tech University. His research interest includes reverse logistics, textile supply chain, second-hand clothing, multicriteria decision-making, and textile remanufacturing. He has a comprehensive logistics and supply chain background, mainly in production and service supply chains. He played a vital role as a UI designer, supervisor of Adobe Creative Suites, and supply chain lead for products and services promotion at the Zhejiang Cross-Border Trading Town in 2018. He can be contacted at petersumo3@gmail.com

Houlda Fambo is a PhD candidate in World Economy at School of Economics and Management at Nankai University in Tianjin, China. Her research interests include Belt and Road Initiative, Poverty alleviation, Economic Development, Trade Liberalization, United Nations SDGs and Inclusive growth. She has been recently working on academic papers related to the Belt and Road Initiative and Welfare in Africa. She can be contacted at houlix2020@gmail.com

Nthabeleng Lillian Moshoeshoe is a PhD researcher at the School of Insurance and Economics, University of International Business and Economics, Beijing, China. Her research interests include employee engagement. She can be contacted at nthaby4jesus@gmail.com

Ishmael Arhin is a Master's graduate from Dokuz Eylul University in Turkey, where he studied research masters in Entrepreneurship. His research interests are in the areas of responsible consumption and responsible production, social and women entrepreneurship, and SMEs financing. He has years of working experience in the

financial sector, emphasising SMEs financing, sales, and marketing. He enjoys collaboration with other scholars in producing scientific knowledge. He can be contacted at arhinishmael@yahoo.com

Roseline Yocelle Semaho Goussebeo is a PhD student in Management Science and Engineering at University of Science and Technology Beijing. Her research interest covers the field of management, sustainability, supply chain management and consumer behavior. She can be contacted at semaho_yocelle@yahoo.fr

Oloulade Babatounde Moctard is PhD student at Central South University in Changsha, Hunan, China. His research interest includes big data and data mining. He can be contacted at 708022@csu.edu.cn