Vaccine Research
ISSN: 2423-4923
eISSN: 2383-2819

Acceptance of COVID-19 Vaccination at Different Hypothetical Efficacy and Safety Levels in Nigeria: A Cross-Sectional Web-based Survey

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A R T I C L E I N F O

Research Article

VacRes, 2022
Vol. 9, No.1, 39- 47
Received: September 03, 2022
Accepted: November 18, 2022
Pasteur Institute of Iran

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KEYWORDS: COVID-19, Efficacy, Nigeria, Safety, Vaccine.

A B S T R A C T

Introduction: Vaccine hesitancy is a global phenomenon and vaccination efforts against the Coronavirus Disease 2019 (COVID-19) pandemic may be hampered by it. This study assessed the acceptance rate of COVID-19 vaccination at different hypothetical efficacy and safety levels in Nigeria. **Methods:** This web-based study was conducted among a selected Nigerian population between the month of February and May 2021 using an online self-administered structured questionnaire hosted by Survey Monkey. WhatsApp, Twitter and Facebook were used to disseminate the invitation to take the poll. **Results:** The finding of this study revealed that a larger proportion of the participants were males (53.9%), within the age group of 31-40 years (25.6%) and earn an average income of less than $500 per month. Individuals between the ages of 21 and 30 years and 31 to 40 years showed the highest levels of acceptability for the COVID-19 vaccine at 95% efficacy and 5% adverse effects. The older age group (>51 years and above) had the least vaccine acceptance rate (3.3%) at 75% vaccine efficacy and 20% side effect. Respondents who held the belief that vaccinations are essential for their health had a higher chance to accept the COVID-19 vaccine with OR: 0.76; 50%CI (0.00-0.00), OR: 95%CI (0.000-0.000), OR: 1.23; 95%CI (0.193-7.860) and OR: 0.696; 95%CI (0.048-10.047) based on religion, the occurrence of diabetes, pulmonary disease, and Hypertension, respectively. **Conclusion:** The results of this research indicate that vaccine acceptance rates are negatively correlated with participants' ages.

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[DOI: 10.52547/vacres.8.2.93]

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) which was first identified in December 2019 by the Chinese health authorities following an outbreak epidemic of unusual pneumonia with an unknown etiology in Wuhan, Hubei Province, was caused by the severe acute respiratory syndrome virus 2 (SARS-CoV-2) [2-4]. SARS-CoV-2, like SARS and Middle East Respiratory Syndrome (MERS), most likely began in animals. Spores and droplets in the air disseminate it from person to person. It has rapidly expanded over the globe since its inception[5]. The COVID-19 outbreak has killed a significant number of individuals and has had a significant effect on public health, food security, and the economy. The societal and economic consequences have been disastrous [6]. Around the globe, over 3.3 billion people were at risk of losing their employment, and tens of millions more are at risk of sliding into severe poverty [7]. This has led to difficulties in the medical supply chain, blood transfusion services, and the

identification and treatment of chronic disorders [8]. Nigeria, like other African nations, has seen the consequences of the pandemic with more than 188,880 confirmed cases and 2,288 fatalities, as of August 26, 2021, according to epidemiological statistics [2]. The epidemic and subsequent border closures have had an impact on Nigeria's food system, economy, and level of poverty[6].

Despite several nations' efforts to restrict travel, keep people separate, and issue recommendations to remain at home, many people have been infected and died due to the COVID-19 pandemic. However, the great majority of individuals on the globe may still be affected by COVID-19, emphasizing the need for an effective vaccination. As COVID-19 becomes a greater concern, a record number of vaccines are being produced [9]. As of December 31, 2020, several vaccination safety and efficacy data have been disclosed [10].

Vaccination programs which have been proposed are likely to take a long time to create, depending on how soon clinics can be established and how secure each state's vaccine supply is. In order to estimate the impacts of vaccination and rollout during current outbreaks, an approach in which the vaccine would be given to medical professionals and high-risk patients first, such as those with comorbidities associated with severe COVID-19 [11] and those 65 years and older, is recommended. This is because those with COVID-19 comorbidities, such as diabetes and hypertension, are 2-4 times more likely to have a serious disease than those who do not have comorbidities. Furthermore, as individuals become older, the severity of their symptoms and their chances of dying swiftly increase [12]. Nations throughout the globe enacted lockdowns and quarantines, erected social barriers, mandated everyone to wear face masks at all times, and placed travel restrictions, because there was no vaccine or viable treatment for COVID-19 at the onset of the pandemic [13].

Consequently, the world economy, as well as people's physical and mental health suffered significantly. Since the COVID-19 pandemic had so many devastating repercussions in so many diverse ways, the worldwide community is working harder than ever to find a solution to prevent future outbreaks. The desire of people to get immunized against an infectious illness is the most important factor influencing the efficiency of vaccination programs. Refusing to get vaccinated is a major public health issue in poor nations such as Nigeria. People's desire to get vaccinations and faith in the country's immunization program has declined in the previous ten years as a consequence of vaccine controversies and revelations of vaccines' harmful side-effects [14, 15]. A person's choice to get vaccinated is influenced by a range of factors. The Health Belief Model (HBM), which explains and predicts a variety of human behaviors, is one of the most prominent ways for predicting whether a person will get a vaccine [16]. Previous research has shown the accuracy of utilizing HBM structures to predict the number of persons who will get a flu vaccine [17]. The HBM is comprised of several critical components, including signals to act, perceived vulnerability, severity, benefits, and roadblocks[1]. While perceived severity refers to how unwell individuals believe they would feel as a consequence of the illness, perceived susceptibility refers to how probable people believe they will be infected. A person's "perceived benefits" are their ideas about vaccination, but their "perceived obstacles" are their perceptions that vaccination is difficult due to psychological, physical, or economic concerns. Information, people, or events that persuade someone to be vaccinated are referred to as action cues[1, 4].

According to previous researches [15, 18, 19], the acceptability of COVID-19 vaccinations varies widely around the globe. People's willingness or reluctance to receive the COVID-19 vaccine is heavily influenced by sociodemographic factors such as age, race, occupation, education level, and income, as well as beliefs and attitudes about COVID-19 infection, lack of trust in the government, doubt or mistrust in vaccine safety, employer mandates or recommendations, belief in conspiracy theories, vaccine effectiveness, and the dissemination of false vaccine information [19, 20]. In poor and semi-rich countries, only few studies of this kind have been done [21]. Furthermore, although HICs have a high vaccination rate, low-middle income countries (LMICs) are believed to have a low vaccination rate [22]. Given that vaccination rates remain low in many LMICs, including Nigeria, a developing country. With a greater knowledge of how various vaccine components impact how individuals feel about obtaining a vaccination, public health authorities may be able to identify what type of endorsements, incentives, or messaging are necessary to boost vaccination rates.

Despite the fact that the number of reported cases in Nigeria is increasing by the day, there is overwhelming evidence that many Nigerians do not believe in the pandemic. This is mostly due to a lack of trust in the government and a number of ludicrous remarks made regarding the virus and its immunizations by important Nigerian political and religious leaders [23]. Although relatively few patients who got the virus died, Nigerians and other Africans may have had differing views on it.

Vaccination is one of the most effective strategies to prevent contracting an infectious disease. Acceptance and coverage, on the other hand, are required for a vaccination program to be effective [24, 40]. Following the licensing and dissemination of many safe and effective vaccines against SARS-CoV-2, a deluge of bogus information about the certified COVID-19 vaccines has surfaced. False information is not only a Nigerian issue. Numerous news outlets report that widespread mistrust of the US and EU is a key impediment to growing vaccination rates [25]. As of September 2021, about 1.5% of Nigerians have received vaccines [26]. Despite these views, an online poll conducted in Nigeria before the first vaccine was authorized indicated that 58.2% of participants would obtain the vaccine once it was available, while 19.2% and 22.2%, respectively, were hesitant or doubtful [23, 27].

The rapid development and distribution of COVID-19 vaccine, as well as its authorization for sale without product responsibility, powered and escalated conspiracy theories globally. And as was shown with the Ebola outbreak in 2014, the little to no active community participation throughout West Africa, including Nigeria, on how to employ this new intervention best made things worse. To that extent, this work was designed to determine the acceptance of COVID-19 vaccine at different hypothetical efficacy and safety levels among Nigerian populace with the view to understand the determinants and perceive risk of vaccine acceptance among the study participants.

MATERIALS AND METHODS

Ethics Statement

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[DOI: 10.52547/vacres.8.2.93]

This study was approved by the Institutional Review Board of the Universitas Syiah Kuala - Zainoel Abidin Hospital and National Health Research and Development Ethics Commission (KEPPKN) of the Ministry of Health of the Republic of Indonesia (#1171012P). All authors declared that informed consent was obtained from the participants with assurance of anonymity and confidentiality before the commencement of the study.

Survey Design

A self-administered online survey was carried out from February to May of 2021 in Nigeria. The Survey Monkey platform was used to host the survey. Invitations to do the survey were posted on three social media and instant messaging websites, including Facebook, Twitter, and WhatsApp, in order to find participants. There were various sections in the survey. Information on the study and a page asking for informed consent before participants could proceed with the survey, were included in the first section of the introduction. The questions in the following sections were designed to gather data on socio-demographic traits, current health status, perceptions of COVID-19 risk, impact of the pandemic on the economy, vaccine hesitancy, and attitudes toward social isolation. A few of the questions were taken from earlier research [19, 28, 29].

The survey took between 10 and 15 minutes to finish.

The study's response variable was Nigerians' perceptions of acceptance COVID-19 immunizations with varying degrees of efficiency and safety. A scenario was developed to test people's reactions to the COVID-19 immunization. "Consider that a new COVID-19 vaccine has recently been developed. It has undergone similar testing to the adult flu vaccine. People may choose to receive a free government vaccine." Participants were asked whether they would have a COVID-19 vaccine if it was effective [95%, 75%, or 50% of the time] and had a [5%, 20% or 50%] chance of causing adverse effects, like rise in temperature or pain in the injection site. There were five possible combinations of vaccination efficacy and danger of adverse effects. Vaccine A was 95% effective with a 5% chance of adverse effects; Vaccine B was 50% effective with a 50% chance of adverse effects; Vaccine C was 50% effective with a 5% chance of adverse effects; Vaccine D was 75% effective with a 5% chance of adverse effects and Vaccine E was 75% effective with a 20% chance of adverse effects. Every potential combination has two responses: Yes or No. "Not Sure" was out of the question. Variables that are explicit were collected and considered a variety of plausible reasons for what had occurred. Data on sex, age, location of settlement, religion, nature of occupation, and monthly income, (were collected and classified for statistical purposes. Respondents were also questioned about flu vaccination and COVID-19 comorbid diseases such as hypertension, diabetes, heart difficulties, and lung disorders.

We also enquired about the respondents' experiences with economic disruption by posing two questions: “How much your work changed as a result of the COVID-19 pandemic?” and “How much your salary changed as a result of the COVID-19 pandemic?” The likely responses for the first question were: “No change or not applicable (not working)”, “I work fewer hours”, “I work more hours“ and “I was let go from my job”, while for the last question, three possible responses were: “No change”, “I am getting paid less“, or “I am getting paid more“. Additionally, participants’ attitude regarding the advantage of vaccination and social exclusion was evaluated.

Five (5) questions from the WHO SAGE Vaccine Hesitancy Scale [30] that are part of the lack of vaccination benefits construct were used to measure vaccine hesitancy: [1]“All routine vaccines recommended by the healthcare workers are beneficial”; [2] “New vaccines carry more risks than older vaccines”; [3] “The information I receive about vaccines from the government is reliable and trustworthy; and [4] “Getting vaccines is a good way to protect me from disease” and [5] “Vaccines are important for my health”.

The extent to which the respondents agreed or disagreed with the following three statements was used to gauge their perceptions of the advantages of social isolation: [1]“Social distancing can protect your child or children from COVID-19 (if any)”; [2] “Social distancing can protect your parents from COVID-19”; and [3] “Social distancing can protect you from COVID-19”. Each statement had five potential responses: "Strongly agree," "Agree," "Neither agree nor disagree," "Disagree," and "Strongly disagree." The respondent's responses were categorized as "Agree" (those who responded agree or strongly agree), "Neutral" (those who neither agreed nor disagreed), and "Disagree" (those who disagreed and strongly disagreed) for statistical purposes.

Statistical Analysis

Data collected were analyzed using Statistical Package for Social Sciences Version 25. $P < 0.05$ was considered to be significant. The relevant explanatory factors were identified using a two-step logistic regression for each type of hypothetical COVID-19 vaccination. The odds ratios (ORs), 95% confidence interval (95%CI) and univariate analysis were estimated individually during the initial first phase of the analysis (*i.e.*, known as crude OR). All explanatory variables with a *p*-value were calculated in the later step.

RESULTS

Acceptance Pattern of COVID-19 Vaccination among the Nigerians

A total of 180 respondents were used for this study of which larger proportion were males 97 (53.9%), within the age group of 31-40 years, 83(46.1%), had an average income of less than $500 and most of the respondents 163(90.6%) were living in the urban areas (Table 1). Table 2 presents the clinical updates of health status of the subjects. In the table, less than one fifth of the total subjects knew their current clinical updates on diabetes, heart disease, pulmonary disease and hypertension even though more than one third (48.9%) of the respondents were health care workers (Fig. 1).

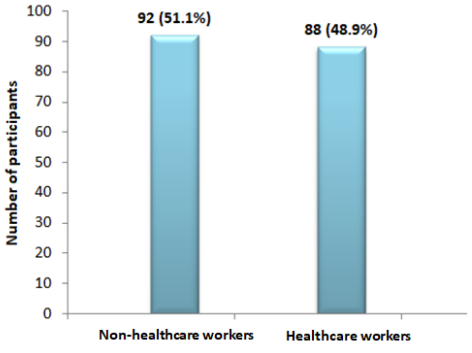

Fig. 1. Nature of occupation of the respondents.

Determinants associated with COVID-19 vaccine acceptance with respect to sociodemographic of the subjects showed that only religion had significant impact on COVID-19 vaccination at different hypothetical

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[DOI: 10.52547/vacres.8.2.93]

efficacy and safety levels in Nigeria, which was more steeper at 75% vaccine efficacy 20% side effect *P* = 0.000(0.000-0.000 CL), categorical variables such as diabetes, pulmonary disease, hypertension, wearing of face mask and vaccination had significant impact on acceptance of COVID-19 vaccination at different hypothetical efficacy and safety levels in Nigeria in varying degrees. Respondents who believed vaccinations are essential for their health had higher chance to accept COVID-19 vaccine with OR: 0.76; 50%CI (0.00-0.00), OR: 6.31; 95%CI (0.000-0.000), OR: 1.23; 95%CI (0.193-7.860) and OR: 0.696; 95%CI (0.048-10.047) based on religion, occurrence of diabetes, pulmonary disease and hypertension, respectively (Table 3).

Table 1. COVID-19 vaccine acceptance rates according to the sociodemographic characteristic of the study participants (n=180).

Variable	Categories	Total n (%)	95% vaccine efficacy 5% side effect (A)	50% vaccine efficacy 50% side effect (B)	50% vaccine efficacy 5% side effect (C)	75% vaccine efficacy 5% side effect (D)	75% vaccine efficacy 20% side effect (E)
Age group (year)	≤20	31(17.2)	22(12.2)	19(10.6)	23(12.8)	27(15.0)	16(8.9)
	21-30	53(29.4)	38(21.1)	30(16.7)	33(18.3)	43(23.9)	23(12.8)
	31-40	46(25.6)	38(21.1)	19(10.6)	34(18.9)	36(20.0)	19(10.6)
	41-50	38(21.1)	31(17.2)	18(10.0)	27(15.0)	26(14.4)	17(9.4)
	>51	12(6.7)	9(5.0)	8(4.4)	8(4.4)	8(4.4)	6(3.3)
Gender	Female	83(46.1)	59(32.8)	48(26.7)	56(31.1)	65(36.1)	39(21.7)
	Male	97(53.9)	79(43.9)	46(25.6)	69(38.3)	75(41.7)	42(23.3)
Location	Rural	17(9.4)	12(6.7)	9(5.0)	11(6.1)	13(7.2)	6(3.3)
	Urban	163(90.6)	126(70.0)	85(47.2)	114(63.3)	127(70.6)	75(41.7)
Average income	$1,000-$1,999 per month	19(10.6)	18(10.0)	12(6.7)	16(8.9)	16(8.9)	8(4.4)
	$10,000-$12,999 per month	3(1.7)	1(0.6)	0(0.0)	1(0.6)	2(1.1)	1(0.6)
	$13,000 per month or more	7(3.9)	7(3.9)	3(1.7)	5(2.8)	4(2.2)	1(0.6)
	$2,000-$2,999 per month	24(13.3)	19(10.6)	11(6.1)	17(9.4)	19(10.6)	10(5.6)
	$3,000-$4,999 per month	11(6.1)	8(4.4)	8(4.4)	5(2.8)	9(5.0)	3(1.7)
	$5,000-$7,999 per month	6(3.3)	5(2.8)	4(2.2)	6(3.3)	6(3.3)	5(2.8)
	$500-$999 per month	28(15.6)	19(10.6)	14(7.8)	19(10.6)	19(10.6)	14(7.8)
	$8,000-$9,999 per month	4(2.2)	2(1.1)	2(1.1)	3(1.7)	3(1.7)	2(1.1)
	Less than $500	78(43.3)	59(32.8)	40(22.2)	53(29.4)	62(34.4)	37(20.6)

Table 2. Clinical updates on health status of the study participants (n=180).

Variable	Categories	Frequency	Percent
Diabetes	Don't know (never been tested or examined by a doctor)	38	21.1
	No (have been tested or examined by a doctor but negative)	127	70.6
	Yes (have been diagnosed by a doctor)	15	8.3
Heart disease	Don't know (never been tested or examined by a doctor)	38	21.1
	No (have been tested or examined by a doctor but negative)	138	76.7
	Yes (have been diagnosed by a doctor)	4	2.2
Pulmonary disease	Don't know (never been tested or examined by a doctor)	74	41.1
	No (have been tested or examined by a doctor but negative)	104	57.8
	Yes (have been diagnosed by a doctor)	2	1.1
Hypertension	Don't know (never been tested or examined by a doctor)	70	38.9
	No (have been tested or examined by a doctor but negative)	110	61.1

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[DOI: 10.52547/vacres.8.2.93]

Table 3. Determinants associated with COVID-19 vaccine acceptance (n=180).

Variable	Categories	95% vaccine efficacy 5% side effect		50% vaccine efficacy 50% side effect		50% vaccine efficacy 5% side effect		75% vaccine efficacy 5% side effect		75% vaccine efficacy 20% side effect	
		P-value	OR(CL)	P-value	OR(CL)	*P*-value	OR	*P*-value	OR CI Lower Bound	*P*-value	OR
Age group (year)	≤20	0.974	0.962(0.10-9.54)	0.997	0.00(0.00-0.00)	0.997	0.000(0.00-0.00)	0.995		0.997	0.000(0.00-0.00)
	21-30	0.891	0.861(0.10-7.40)	0.344	2.747(0.34-22.29)	0.649	0.586(0.05-5.83)	0.074	0.131(0.01-1.22)	0.822	0.800(0.11-5.60)
	31-40	0.745	0.689(0.07-6.55)	0.366	2.399(0.36-16.01)	0.549	1.907(0.23-15.73)	0.263	0.320(0.04-2.36)	0.730	1.367(0.23-8.06)
	41-50	0.917	0.890(0.10-5.33)	0.085	5.488(0.79-37.97)	0.871	1.199(0.13-10.64)	0.401	0.416(0.05-3.23)	0.816	1.241(0.20-7.67)
	>51			0.165	3.953(0.57-27.57)	0.811	1.313(0.14-12.21)	0.528	0.520(0.07-3.97)	0.847	0.833(0.13-5.30)
Gender	Female	0.193	1.949(0.71-5.33)	0.00	0.00(0.00-0.00)		(0.00-0.00)				
	Male			0.076	0.461(0.20-1.08)	0.862	1.079(0.46-2.54)	0.652	0.805(0.31-2.07)	0.370	0.697(0.32-1.53)
Location	Rural	0.449	1.795(0.39-3.73)	0.00	0.00(0.00-0.00)		(0.00-0.00)				0.000(0.00-0.00)
	Urban			0.156	0.361(0.09-1.48)	0.673	1.333(0.35-5.07)	0.948	1.052 (0.23-4.83)	0.754	1.221(0.35-4.26)
Average income	$1,000-$1,999 per month	0.342	0.290(0.02-3.73)	0.00	0.00(0.00-0.00)		(0.00-0.00)				
	$10,000-$12,999 per month	0.122	10.509(0.54-206.53)	0.855	0.878(0.22-3.56)	0.219	0.321(0.05-1.96)	0.962	1.043 (0.18-5.10)	0.238	2.288(0.58-9.05)
	$13,000 per month or more	0.992	4.300(0.00-206.53)	0.993	9.5(0.00- 0.00)	0.384	3.419(0.22-54.46)	0.610	2.158 (0.11-41.41)	0.652	1.866(0.12-28.15)
	$2,000-$2,999 per month	0.943	0.944(0.20-4.50)	0.715	0.700(0.10-4.77)	0.559	1.859(0.23-14.85)	0.318	3.026(0.34-26.60)	0.084	8.104(0.76-86.68)
	$3,000-$4,999 per month	0.690	1.486(0.21-10.40)	0.906	0.924(0.248-3.446)	0.589	1.442(0.383-5.423)	0.817	0.841(0.195-3.624)	0.188	2.378(0.654-8.645)
	$5,000-$7,999 per month	0.841	1.301(0.10-16.92)	0.062	0.207(0.040-1.079)	0.164	3.054(0.635-14.691)	0.550	0.544(0.074-4.007)	0.300	2.359(0.465-11.957)
	$500-$999 per month	0.312	1.987(0.53-7.51)	0.206	0.238(0.026-2.204)	0.991	1.771(0.000-0.000)	0.992	2.366(0.000-0.000)	0.146	0.163(0.014-1.884)
	$8,000-$9,999 per month	0.973	0.959(0.09-10.84)	0.385	0.602(0.191-1.894)	0.744	1.214(0.379-3.886)	0.419	1.669(0.483-5.771)	0.999	1.001(0.337-2.969)
	Less than $500	0.000	0.000(0.00-0.00)	0.433	2.577(0.242-27.484)	0.996	1.007(0.065-15.614	0.996	0.993(0.060-16.538)	0.717	1.558(0.142-17.109)
Religion	Catholic	0.997	4.54(0.00-0.00)	0.000	0.000(0.000-0.000)		(0.000-0.000)	0.000	0.000 (0.000 - 0.000)	0.000	0.000(0.000-0.000)
	Christian/Protestant/Methodist/Lutheran/Baptist	0.997	5.66(0.00-0.00)	0.996	25.32(0.000-0.00)	0.996	1.08(0.000-0.000)	0.997	3.4(0.000-0.000)	0.996	1.745(0.000-0.000)
	Muslim	0.997	31.145(0.00-0.00)	0.996	3.13(0.000-0.00)	0.997	8.310(0.000-0.000)	0.997	0.87(0.000-0.000)	0.996	1.333(0.000-0.000)
	Other	0.000	0.000(0.00-0.00)	0.996	2.2(0.000- 0.00)	0.997	0.76(0.000-0.000)	0.997	0.45(0.000-0.000)	0.996	1.287(0.000-0.000)
Are you a healthcare worker (Nurse, Doctor, Laboratory Staff etc.)	No	0.187	0.00(0.18-1.40)	0.000	0.000(0.000-0.000)	0.000	0.000(0.000-0.000)	0.000	0.000 (0.000 - 0.000)	0.000	0.000(0.000-0.000)
	Yes			0.386	0.696(0.307-1.579)	0.478	1.360(0.581-3.181)	0.233	0.556(0.212-1.459)	0.944	1.028(0.470-2.252)
Diabetes	Don't know	0.994	6.31(0.000-0.000)	0.00	0.00(0.00- 0.00)	0.000	0.000(0.000-0.000)	0.000	0.000 (0.000 - 0.000)	0.000	0.000(0.000-0.000)
	No	0.994	1.20(0.000-0.000)	0.993	1.42(0.000-0.00)	0.993	3.41(0.000-0.000)	0.993	1.45(0.000-0.000)	0.992	1.487(0.000-0.000)
	Yes	0.000	0.000(0.000-0.000)	0.992	5.10(0.000-0.00)	0.993	2.82(0.000-0.000)	0.993	0.17(0.000-0.000)	0.992	2.212(0.000-0.000)
Heart disease	Don't know	0.537	0.247(0.003-20.779)	0.00	0.00(0.00- 0.00)	0.000	0.000(0.000-0.000)	0.000	0.000 (0.000 - 0.000)	0.000	0.000(0.000-0.000)
	No	0.494	0.221(0.003-16.807)	0.994	1.40(0.000-0.00)	0.994	4.062(0.000-0.000)	0.979	1.052(0.022-50.722)	0.000	8.693(2.204-3.429)
	Yes	0.000	0.000(0.000-0.000)	0.994	2.14(0.000-0.00)	0.994	3.86(0.000-0.000)	0.932	1.180(0.026-52.815)		2.084(2.084-2.084)
Pulmonary disease	No	0.825	1.233(0.193-7.860)	0.00	0.00(0.00- 0.00)	0.000	0.000(0.000-0.000)	0.000	0.000 (0.000 - 0.000)	0.000	0.000(0.000-0.000)
	Yes	0.000	0.000(0.000-0.000)	0.150	3.100(0.664-14.471)	0.974	0.975(0.207-4.589)	0.811	0.826(0.172-3.956)	0.115	3.131(0.759-12.923)
	Don't know	0.790	0.696(0.048-10.047)	0.00	0.00(0.00- 0.00)	0.000	0.000(0.000-0.000)	0.000	0.000 (0.000 - 0.000)	0.000	0.000(0.000-0.000)

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Hypertension	No	0.746	0.678(0.065-7.071)	0.700	0.665(0.083-5.307)	0.629	1.814(0.162-20.350)	0.444	0.399(0.038-4.197)	0.944	0.933(0.134-6.476)
	Yes	0.000	0.000(0.000-0.000)	0.969	0.967(0.172-5.419)	0.410	2.437(0.293-20.297)	0.659	0.668(0.111-4.027)	0.992	0.991(0.196-5.001)
	Not applicable (not going out a whole week)	0.995	1.151(0.000-0.000)	0.054	0.146(0.021-1.030)	0.608	0.603(0.087-4.164)	0.810	1.290(0.162-10.251)	0.331	0.414(0.070-2.452)
	Yes, during my whole time at work/school	0.042	5.679(1.066-30.251)	0.855	0.749(0.034-16.593)	0.993	4.115(0.000-0.000)	0.912	1.207(0.044-33.363)	0.618	0.458(0.021-9.848)
	Yes, for part of the time at work/school	0.424	0.434(0.056-3.351)	0.030	0.177(0.037-0.842)	0.590	0.666(0.152-2.921)	0.789	0.788(0.137-4.534)	0.763	0.804(0.194-3.335)
In the past week, how often have you gone to a grocery store or other food vendor	0 days	0.790	1.294(0.193-8.667)	0.134	0.315(0.069-1.429)	0.237	0.398(0.086-1.835)	0.563	0.595(0.103-3.449)	0.691	0.755(0.189-3.012)
	1 day	0.704	0.758(0.182-3.153)	0.017	0.135(0.026-0.701)	0.376	0.489(0.100-2.389)	0.568	0.561(0.077-4.074)	0.020	0.155(0.033-0.741)
	2 days	0.409	0.404(0.047-3.475)	0.261	0.518(0.164-1.633)	0.090	0.365(0.114-1.169)	0.263	0.476(0.130-1.746)	0.554	0.720(0.243-2.135)
	3 days			0.034	0.172(0.034-0.872)	0.370	0.499(0.109-2.283)	0.850	1.162(0.244-5.536)	0.350	0.509(0.124-2.098)
	4 days	0.996	59.800(0.000-0.000)	0.000	0.00(0.00-0.00)	0.000	0.000(0.000-0.000)			0.000	0.000(0.000-0.000)
	5 days	0.892	0.848(0.078-9.273)	0.992	1.512(0.000-0.00)	0.993	4.092(0.000-0.000)	0.453	4.816(0.080-291.146)	0.991	6.637(0.000-0.000)
	6 days	0.348	1.696(0.563-5.113)	0.209	3.818(0.473-30.851)	0.525	0.501(0.060-4.212)	0.616	1.762(0.192-16.166)	0.794	1.294(0.188-8.924)
	7 days	0.000	0.000(0.000-0.000)	0.654	1.207(0.530-2.752)	0.205	0.566(0.235-1.365)	0.495	1.433(0.510-4.029)	0.178	0.573(0.255-1.288)
Did you wear a mask at the grocery store or other food vendor	No	0.000	4.601(1.311-1.615)	0.00	0.00(0.00-0.00)			0.000	0.000 (0.000 -0.000)	0.000	0.000(0.000-0.000)
	Not applicable (not going out to grocery store or other food vendor whole week)	0.993	3.890(0.000-0.000)	0.993	1.23(0.000-0.00)	0.994	1.11(0.000-0.000)	0.000	1.64(0.57-0.47)	0.993	2.432(0.000-0.000)
	Yes, during my whole time at the store	0.000	5.18(1.10-2.44)	0.993	61.000(0.000-0.00)	0.994	2.40(0.000-0.000)	0.995	2.123(0.000-0.000)	0.993	1.905(0.000-0.000)
	Yes, for part of the time at the store	0.000	4.55(1.53-1.44)	0.993	8.1(0.000-0.00)	0.994	1.11(0.000-0.000)	0.000	1.913(0.47-0.77)	0.993	2.333(0.000-0.000)
Vaccines are important for my health	Agree			0.993	2.8(0.000-0.00)	0.994	1.01(0.000-0.000)	0.000	2.000(0.79-0.53)	0.993	2.766(0.000-0.000)
	Disagree	0.000	0.54(4.660000-19.88)	0.00	0.00(0.00-0.00)		(0.000-0.000)	0.000	0.000 (0.000 -0.000)	0.000	0.000(0.000-0.000)
	Neither agree nor disagree	0.994	1.550(0.000-0.000)	0.000	2.914(1.044-8.137)	0.000	4.161(1.44-1.199)	0.000	7.770(2.394-2.522)	0.000	1.562(5.984-4.077)
	Strongly agree	0.000	84.66(13.700-15.78)	0.986	3.598(0.000-0.00)	0.988	1.64(0.000-0.000)	0.994	2.095(0.000-0.000)	0.986	1.207(0.000-0.000)
	Strongly disagree	0.000	0.36(29.500-29.521)	0.000	3.738(7.899-1.769)	0.000	8.039(1.65-3.77)	0.000	6.924(1.079-4.444)	0.000	2.010(4.659-8.676)

DISCUSSION

In order to contain a pandemic, access to a potent and secure vaccine is a requirement for global public health security and assurance. However, vaccination reluctance caused by worries about the effectiveness and safety can seriously delay immunization roll-out. A typical Nigerian who is worried about the immunization expresses fears about its side effects, probable mutations, disruptions of daily routine, and dread of mortality, among other things [15, 31]. This current study assessed willingness to receive the COVID-19 vaccination at different hypothetical efficacy and safety levels. Results indicate that the COVID-19 vaccine acceptance rate is inversely proportional to the age of the participants, which increases the acceptance rate to 27(15.0) 50% vaccine efficacy among those aged 41–50 years, 27(15.0) 75% vaccine efficacy among ≤20 years, 43(23.9) 75% vaccine efficacy among those aged 21–30 years, 38(21.1) 95% vaccine efficacy among those aged 31–40 years, and 9(5.0) at 95% vaccine efficacy among those above 51 years. According to a study by Syan *et al* [31], people's opinions of the safety and efficacy of the COVID-19 vaccine both changed with education and with age.

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Willingness to accept the vaccine does not vary by age; however, perceptions of vaccine safety did in line with our findings and in contrast to the submission of Olanipekun *et al*. [32], who claimed that older age (>50 years) was associated with a higher vaccination rate. A higher acceptance rate of the COVID-19 vaccine among the aged population may be because they are in the high-risk group for severe COVID-19 infection and adverse outcomes. Chances are that they may have received routine vaccinations against other illnesses like influenza and pneumonia and are aware of the advantages of immunization. Only 39.4% of the study participants who were healthcare professionals were willing to embrace the COVID-19 immunization according to Fojnica *et al*. [33], while the rest were either hesitant or outright against it.

In this study, the gender of the respondents was significantly associated with COVID-19 vaccine acceptance at 50% vaccine efficacy 50% side effects. This was consistent with previous studies that had shown men are more likely to accept the COVID-19 vaccine [19, 21, 34]. According to research by Marzo *et al.* [35], males were significantly more likely than females to agree that vaccines could effectively prevent and control COVID-19. Women, especially the pregnant ones, were more likely to decline vaccination due to the fear of potential adverse effect of vaccination on pregnancy. Some adverse effects seen after the vaccination seems to be more common among women than in men. This partly explains one reason why more men agree to take the vaccine than women in this current study. The opinions of medical professionals and the cost of the vaccines in particular are also crucial factors in deciding whether to accept COVID-19 vaccines or not.

People with heart disease, high blood pressure, or diabetes were considered more prone to developing a severe or fatal case of COVID-19, because SARS-CoV-2 interacts with its target cells through ACE-2 [36]. In this study, the clinical updates on the health status of the subjects show that less than one fifth of the total subjects know their current clinical updates on diabetes, heart disease, pulmonary disease, and hypertension even though more than one third (48.9%) of the respondents were healthcare workers. Although all groups recognized almost the same fundamental facts about the illness, there were significant disparities in their awareness of the disease's impacts, high-risk demographics, personal safety measures, and therapy. The odd ratio of vaccine acceptance was high based on awareness of clinical status at 6.31, 0.24, 1.23, and 0.7 for diabetes, heart disease, pulmonary disease, and hypertension at 95% vaccine efficacy 5% side effects based on clinical status. This finding is corroborated by the submission of Pal *et al.* [37], who reported there were gaps in their knowledge on COVID-19 and that the majority of patients were able to continue with their regular meals and therapies. Self-monitored capillary blood glucose readings, on the other hand, revealed that 72% of individuals had elevated blood sugar. This was most likely because the great majority of participants (almost 90%) reported being less active.

Understanding a link between religion and the COVID-19 vaccination is anticipated to have a significant impact on how individuals behave and what they accept [38]. In this study, respondents' religious affiliation had a significant impact on their perceptions of the COVID-19 vaccination, which had 95% vaccine effectiveness and 5% side effects and 50% vaccine efficacy and 5% unfavorable effects. Religion and COVID-19 vaccination rates, according to Simpson *et al*. (2016) [39], are associated in a manner that is equal to people's willingness to obtain the vaccine. This is because religious individuals often have faith in both God and the holy books. In contrast to the results of this research, a study that was conducted in Italy and Indonesia indicated that there was no correlation between religious affiliation and the number of young people who received the COVID-19 vaccination [40]. In this study the odds of accepting COVID-19 shows a significant association to the location of the respondents as this is similar to the submission of [41] who reported that more rural families acquire COVID-19 than urban residents. Residents in cities are less likely to have had a COVID-19 immunization. Despite social media conspiracy theories about the manufactured COVID-19 vaccines, city residents seem to understand the health benefits of immunization better than their rural counterparts. More than two thirds of the respondents were aware of social distancing, hand hygiene, using face masks, and avoiding traveling as some of the preventive measures against COVID-19, These are some the things that should be done to stop the disease from spreading, which support the submission of Vincent and Taccone [42]; WHO [27], as well as Akther and Nur[43].

The strength of this present study can be attributed to an analysis of the relationships between various COVID-19 vaccine efficacy and safety scenarios and intents to receive COVID-19 immunization on a national scale. This idea of using different hypothetical efficacy and safety levels follows the frontier of current research in Public Health and may reflect some underlying real attitudes. On the other hand, the current study has inherent limitations, such as a small sample size (fueled by conspiracy theories); however, the findings are supported by the discovery of comparable trends in COVID-19 vaccination acceptance rates compared to larger national studies. The possibility for sampling bias in favor of persons who are active users of social media platforms and who have reliable internet connection is another drawback of online survey studies.

In conclusion, to better understand the actual pattern of acceptance rates of COVID-19 among the Nigeria Populace, a more robust study with a large sample size should be undertaken by future researchers, with special focus on level of education, awareness, trust/reservations on the use of foreign drugs, and potency of local medicines as possible variables of significant interest. The findings from this study show that the acceptance rate of COVID-19 vaccine among selected Nigeria population (particularly among urban dwellers with access to mobile phone and internet facility), appears to be inversely proportional to the age of the study participants. Majority of the respondents were aware of the knowledge, preventive measures

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and are well prepared to fight against the virus. It was evident that the respondent's clinical updates on the health status of the subjects were fairly satisfactory. This research demonstrates that knowledge and preparation improve the effectiveness of COVID-19 prevention practices. To totally eradicate COVID-19, it would be prudent to invest in various COVID-19 preventive interventions, such as health education and cutting-edge tactics based on local evidence, to improve public understanding of the disorder and improve health practices.

ACKNOWLEDGMENTS

We are incredibly appreciative of the assistance from collators. This study was funded by Universitas Syiah Kuala (The Ministry of Education, Culture, Research, and Technology) - H-Index Research Scheme Financial Year 2021 (169/UN11/SPK/PNBP/2021). Derived data supporting the findings of this study are available from the corresponding author on request.

CONFLICT OF INTEREST

The authors declare they have no conflict of interests.

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