PERCEPTION OF COVID-19 AND ACCEPTANCE OF VACCINATION IN DELTA STATE NIGERIA

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ABSTRACT

Background: *With more than 80million recorded cases and over 1.7million deaths at the time of this research, providing safe effective vaccine to curb the ravaging COVID-19 has emerged a global priority. Public attitude towards COVID-19 and interventions like vaccination varies considerably as does the access to knowledge. This study looked at knowledge of COVID-19 and its impact on acceptance of the upcoming vaccination in Delta State, Nigeria.*

Method: *Cross-sectional survey of 401 participants from three Local Government Areas in Delta North, Central, and South Senatorial Districts taken in December 2020. Data collected by Google forms was analyzed using Microsoft Excel and SPSS.*

Results: *For COVID-19 knowledge, 75.6% of respondents were aware of the cause and 81.2% had knowledge of mode of transmission. For preventive measures, 77.6% practice social distancing, 65.6% hand washing, 61.6% use of hand sanitizers and 67.6% wearing of masks. Also, 76.6% knew about the vaccines in development, 53.9% were aware of Nigeria's interest in rolling out the vaccine and 48.6% were willing to accept the vaccine. A statistically significant relationship at $p < 0.05$ was observed between vaccine acceptance and gender, religious affiliation, education, employment status, income, knew a person with COVID-19, self-reported susceptibility to COVID-19, and individual agreement with effectiveness of government COVID-19 interventions.*

Conclusion: *The population had a good knowledge of COVID-19 and the vaccine, although more than half were not willing to accept it. This calls for interventions to encourage trust and compliance as the government sets out to invest in vaccine rollout.*

Keywords: *COVID-19, Vaccine, Perception, Acceptance, Factors, Delta State.*

INTRODUCTION

The advent of the novel coronavirus disease (COVID-19) in 2019 has met a matchless global effort to control and curb its spread.[1] Beside the prescribed preventive measures, the determination to provide the vaccine has been tireless with significant progress.[2-4] Despite these fights and successes by the World Health Organization (WHO) and other key players, there have been challenges of conceptual variability among populations, toward the disease and emerging vaccines. This has generated tensions that appeared more among certain races, especially blacks, where the subjective ideologies (conspiracy theories) about the disease and the vaccines, such as the suspicion of vaccines as having a built-in microchip for massive control of people, and some others; like the belief that the vaccination would be a planned tactical and targeted inoculation of actual virus (the real infection) for mischievous and unjust reasons.[1,5-11] A closer look identifies justifying reasons for fears about the virus and the vaccine, based on historical records of exposure to several alleged and verified relative ill-treatments, such as sterilization of Namibians in early 1900s, Tuskegee syphilis experiment of 1932, azidothymidine test in Zimbabwe in 1994, Pfizer's clinical drug trial in Nigeria in 1996, and Pakistan vaccination issues of 2011 and so on.[12-14] Recently, more thought provoking attitudes have been observed among some global health key players such as Melinda Gates who stated that; "the first people that need this vaccine are the 60 million health care workers around the world" and "In the US ... black people next, quite honestly, and many other people of color ...".[15-17] These have inadvertently strengthened the existing wariness among the "people of colour" and black all over the globe; Africans, Caribbean and other Americans[10-13,17,18].

Meanwhile, the challenge of implementing vaccination is widespread in Africa, with Nigeria being a focal point as one of the leading nations with declining rates of vaccination against vaccine preventable diseases[19-21].A decline from 81.5% in 1990s to 25% in 2013, attributable to misinformation, fear and lack of trust[22-26]might affect COVID-19 vaccination if these factors are not assessed and addressed. Having put these and various global concerns about the efficacy and safety of the vaccine into consideration[1,27,28], it became imperative to carry out this study.

REVIEW OF LITERATURE

Overview of COVID-19 in Nigeria and Delta State

Nigeria recorded the first case of COVID-19 on 27th of February 2020. The Federal Government responded by implementing public health protocols. Over time these have showed mixed results with varying criticisms.[5,6,8,29-31] Delta state, which is among the most affected, confirmed its first case on 7th of April 2020 and similarly instituted lockdowns and various control protocols that resulted in stalling the spread, but created chaos and conflicts between the people and law enforcement agencies.[32-34] By the 27th December, 2020 Delta State already had 1869 confirmed cases and Nigeria had 84,414.[30]

COVID-19 Awareness, Perception and Safety Practices

A high awareness of COVID-19 had been reported in Nigeria; Oleribe *et al.*[31] and Hedima, Michael and David [35,36]reported 95.4% and 95.9% awareness respectively, which is similar to Ilesanmi and Afolabi[37] which reported that 95% knew about the dangers of COVID-19 and Elnadi *et al.*[38] which stated also that 61.6% had satisfactory knowledge of the virus. South-South Zone had reported 54% awareness and according to Ogolodom *et al.*[39],healthcare officials in Delta and other South-South States of Nigeria in May 2020 had only 46% awareness of COVID-19 pandemic after three months of its existence in Nigeria and one month in Delta State. The low awareness in the rural areas was attributed to the lack of access to quality understandable information.[40] There was an observed difference between knowledge of COVID-19 and the practise of prevention.[41] Elnadi *et al.*[38] stated that despite 61.6% awareness, only 36% of their research respondents followed all COVID-19 health recommendations. Likewise, Oyeyemi *et al.*[45,46] and Enitan *et al.*[41] report respectively that 84.1% and 60.6% of people thought they couldn't get infected. These differences were also linked to prevalent wrong perceptions regarding self-proclaimed immunity and management strategies that are tied to various factors such as religious influence[43] More practices were observed for measures where adherence could be directly supervised, such as mandatory wearing of facemask[37] and according to Ilesanmi and Afolabi[37] this was practiced by 64.5% of respondents; as opposed to hand washing which was only practiced by 20.8%.[42]

Attitude towards COVID-19 Vaccine

There is a high prevalence of low acceptance of vaccines, even in developed countries, like France, Australia, the United Kingdom, and the United States.[44,47-52] In Nigeria, pertussis, measles, mumps, varicella, influenza, yellow fever and meningitis are on the rise due to the decreasing vaccination rate mainly as a result of lack of compliance from the people, poor access to certain vaccines, and problems associated with vaccination strategies and programs.[53-58] Perceptions and attitude toward vaccines are dynamic and impacts on acceptance, thereby affecting the distribution of vaccine preventable diseases.[3,54,59]

The quest to understand widespread COVID-19 vaccine acceptability showed that Malaysia, China, and Indonesia had acceptance values above 90%, but France had 59%. Hungary 56%, Russia 54%, and South Africa 64%.[7,60] Reuben *et al.*[35] showed that in North-Central Nigeria, only 29% of respondents said they would accept COVID-19 vaccine when available, and Enitan *et al.*[41] reported that 80% of respondents said they would not accept COVID-19 vaccine trials. Although no survey on the real vaccine has been done in Delta State, a study of perception and acceptance of hypothetical COVID-19 vaccine among Nigerians reported that 74% of them would accept a COVID-19 vaccine when available. Meanwhile, evidence shows that people that initially received vaccines were usually less than those who during the promotions claimed they would.[3,52,63] This therefore necessitates continuous monitoring of the population to ensure plans are tailored towards addressing

compliance.

Factors Affecting Vaccine Acceptance in the region

The voluntary nature of healthcare behavior and the wide allowance of personal choices with healthcare interventions create room for many factors which influence people's health seeking behavior, for vaccination[64]. The most important ones among these relate to:

a) **Conspiracy theories**; the overall impact of conspiracy theories about the pandemic may likely apply to the vaccine.[11,65]

b) **Safety Concerns**; safety considerations have also been implicated as a factor in vaccine acceptance and the difference between pre-distribution vaccine acceptance and actual vaccine uptake.[2,66-69]

c) **Trust and sources of information;** information and sensitizations about COVID-19 are being ignored largely on the lack of trust[70,71] and people in Nigeria subscribe to unverified sources on social media instead of government channels.

d) **Religious and cultural factors;** Enitan *et al.*[41] reported that Christians demonstrated better levels of knowledge about COVID-19 vaccine trials than Muslims. This religious influence has also been utilized negatively to spread misinformation about the polio vaccine as sterilization tool among Muslims; COVID-19 as a weapon against the church; or that the disease is as a result of 5G network. .[72-75]Traditional rulers have also played key roles in influencing community behaviors; Oku *et al.*[76] stated that engaging traditional and religious leaders in the vaccination process significantly increases the rate of vaccine acceptance.

e) **Political Influence;** vaccination programs have been affected significantly by political leadership in the past and would play a part in COVID-19 vaccine.[72,77]

f) **Higher risk for infection;** it has been reported that older people are more likely to adopt prescribed COVID-19 safety practices than young people; maybe because the former has been reported to be more vulnerable.[43,78] On the flipside, younger persons are less interested in safety, which may be due to misunderstandings that they are totally immune to the virus.[37,42] Also, despite the statistics showing that males are relatively more vulnerable to COVID-19 than females, the latter has been observed to practice precautionary measures more than males in Nigeria, and this may have accounted for the lower diseases among females, who perceive they are more vulnerable.[36,37,42,74]

g) **Socioeconomic impacts;** Several other factors such as vaccine price, accessibility, availability, and people's socio-demographics influence the acceptance of vaccines.[50,52,79] Raude *et al.*[52]explained that people's socio-demography is a strong influence of health decisions, especially preventive steps like vaccination.[2]

h) **Increasing vaccine acceptance;**

Nigeria has attempted to increase vaccine acceptance through nationwide health sensitization using the press and other media communications.[62,80] The use of media, press and traditional means of sensitization alone have not been sufficiently effective.[18,56,81,82] Studies show that interventions worked better if they are targeted at the hesitant groups.[67,80] And acceptance of vaccine is higher if issues with compliance are addressed early in the program to build trust[3,4,82-89] and interventions are more successful when they are all-encompassing and employ multiple strategies, such as recipient-centered approach, price subsidy, community compliant routines, and multi-sectorial planning.[67,80] Good access to vaccine, involvement of influential role models, community engagements, in addition to other sensitization are key ways to enhance vaccine compliance and reduce the potential for boycott.[9,70,90-92] This can be done by first understanding the group and the factors influencing their attitude towards the vaccine[19]; which should bring better outcomes.

Theoretical Framework

According to Wong and Chow[93], health-related behaviors are largely connected to attitude. This study attempts to link respondents' perception to their intentions in line with the Theory of Reasoned Action (TRA) developed by Fishbein and Icek Ajzen[93], which states that a person's perception towards an action forms their intention to perform it and the intention regulates the actual behavior.[12,18,70,93-95] It has been applied on vaccine hesitancy of parents, condom use prediction and sexual behavior among different age groups.[49,93,96,97]

COVID-19 vaccine acceptance rate varies across the globe; above 90% in Malaysia, China and Indonesia, 74% in Nigeria, 64% in South Africa, 59% in France, 56% in Hungary and 54% in Russia[60,61]. The latest study describing Nigerians' perception and acceptance of COVID-19 vaccine was conducted in August 2020[61] and there are no studies on vaccine perception and acceptance in Delta State. Since knowledge is not evenly distributed in the country, it became crucial to specifically assess the perception of Deltans towards COVID-19 and the vaccine to help better alignment of the sensitization campaigns.

Research Aim and Objectives

The aim of this study is to assess the perception of COVID-19 and acceptance of the vaccine in Delta State, Nigeria.

Objectives

The specific objectives are:

- To determine the level of knowledge among people about COVID-19 in Delta State, Nigeria.
- To identify the perceptions of people about COVID-19 vaccine in Delta State, Nigeria.
- To find the determinants of acceptance of COVID-19 vaccine in Delta State, Nigeria.

Research Questions

The questions answered by this research are:

- Do people in Delta State currently have adequate knowledge about COVID-19 and COVID-19 vaccine?
- Are people in Delta State willing to accept COVID-19 vaccination?
- What factors influence acceptance of COVID-19 vaccine among people in Delta State Nigeria?

The research is to assist in bridging the information gap, through an understanding of the current trends in the perception of people in Delta State Nigeria about COVID-19 and the vaccine, to better inform stakeholders in creating structured policies and campaigns that will enhance collaboration and voluntary acceptance of a safe vaccine by the people.

METHODOLOGY

Design and Study Population

A ccross-sectional survey was carried out in Delta State in South Southern Nigeria as shown in figure 1; with 25 Local Government Areas (LGAs) which are geopolitically grouped into Delta North, Delta Central, and Delta South Senatorial Districts with total population of 5,663,362.[8] To reduce variance and make the sampling process easier, the LGAs were first stratified using this existing senatorial groups, then Ika South, Ughelli North and Warri South were respectively selected randomly from Delta North, Delta Central and Delta Sout to represent the state population.

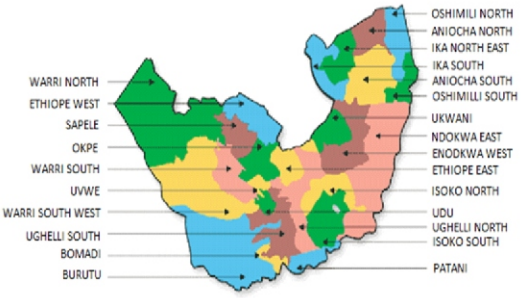

Figure 1: Map of Delta State Nigeria, Showing the Local Governments[99]

Sample Size Determination

The sample size was calculated using Yamane's sample calculation formula for descriptive cross-sectional studies. With the state's population of 5,663,362 people, the sample was deduced as $n=N/1+N(e)^2$. Where N is the population size, *n* is sample size, and **e** is the confidence level (applied at 0.05). We had $n=5,663,362/1+5,663,362(0.05)^2$. n = 400 (approximated value).

Sampling Technique

A non-probability sampling involving purposive and snowballing techniques was used. This involved the sharing of e-survey questionnaire to participants of social media groups in the selected LGAs. This was as done in similar studies.[29,61] The questionnaire contained instructions for respondents to further share it with only adult users of social media within the study population who were willing to participate. Two questions were also added to the beginning to identify and exclude participants who completed the survey but did not reside in the desired LGAs. Major social media platforms (WhatsApp, Telegram, Twitter, LinkedIn, Instagram and Facebook) were reached in a total of 14 days

from December 9 to 23, 2020. This is more rapid than other similar studies[61,77], due to the simultaneous reinforced approach to multiple platforms until desired minimum of 400 responses was achieved.

Data Collection Tool

A self-administered e-questionnaire was used in data collection. This was developed based on WHO recommended 2020 standardized COVID-19 survey tool. Questions were developed and validated with similar studies.[35,61,77] The questionnaire contained 25 closed ended multiple choice questions, 1 number scale, and 1 open ended question which was set up in Google forms and compared existing survey tools on related platforms like Zoho and Survey monkey for coherence. It had 3 sections: respondents' socio-demography, knowledge and perception about COVID-19 and the acceptance of COVID-19 vaccination.

Validity and Reliability of Questionnaire

The instrument was constructed and presented to an expert researcher to review for relevance to research objectives, compliance with existing research and available guidelines, as well as for face and content validity. Due to limited time for this research and the pressing nature of required data, a standard pilot study was not conducted, however, experienced researchers reviewed the questionnaire for validity. Also, 5 neutral persons initially filled it and provided additional feedback on readability, comprehensibility, and answerability. Feedback from all sources was collated to ensure quality and consistency. An e-questionnaire was adopted due to success in previous studies[61,77], lower cost, and time reduction.

Data Analysis

The initial stage involved monitoring incoming responses from shared digital forms to ensure they are registering in the spreadsheets as needed. 427 questionnaires were completed and returned by consenting participants then the link was turned off to allow time for data analysis. A total of 26 questionnaires were not correctly completed as they were entered by individuals not residing within the designated LGAs and/or state, and were therefore excluded from analysis. The valid 401 forms were exported from Google spreadsheet to Microsoft® excel then coded into IBM® SPSS for analysis. A descriptive analysis was carried out on various questions and sections and the results presented in tables, charts, and graphs. Inferential statistics, Chi-square test, was applied in testing the relationships between certain variables and acceptance of vaccine at 0.05 confidence level.

Ethical Considerations

To ensure anonymity, each form was submitted directly from participants into the database with no collection of personal identifying information such as user email, phone number, name, or IP address. Importantly, respondents were assured of confidentiality in the introductory note and had options to consent to continue or opt out if they so desired. Major group administrators took charge of sharing links to the members after being informed of the process and permissions received. No secondary database was accessed for

contacts and no physical community requiring ethical committee was included in the study.

Challenges

Challenges experienced during this research were mainly finance and data collection process. Respondents were quite scattered across the state in the three senatorial districts and therefore finance for travelling was not available. These were resolved by simultaneous survey of multiple platforms to accelerate data collection using an e-questionnaire which saved cost of travels, papers and printing.

RESULTS

Most of the respondents were aged 20 - 29 (54.4%) and 30 - 39 (22.6%) as represented in **Table 1**. There were more males (53.9%) than female (46.1%) respondents, most of the respondents were either single (63.5%) or married (26.7%). Three LGAs responded as desired; Ika South (44.4%), Warri North (26.0%) and Ughelli South (29.6%).

Social and Demographic Data of Respondents

Majority of respondents were Christians (73.8%), while Muslims accounted for 18.0%. A total of 81.3% had diploma or higher degrees, 17.0% reported Secondary or less and 2.7% had no formal education. Also, 63.6% of the respondents were employed, 18.0% were students and 18.4% were unemployed. Most of the respondents (55.4%) earned less than 50,000 naira ($125) monthly, and 2.7% earned more than 1,000,000 naira

Respondents' Perception of COVID-19

While 73.6% reported that they have seen a COVID-19 case only 36.16% of respondents believed they were susceptible to the virus. Self-assessed risk on a scale of 1 - 10 was slightly skewed to the left with majority of respondents reporting 6 or less. Meanwhile, only 17% of respondents approved the government's handling of the pandemic, as 61.6% discredited it according.

Table 1: Social and demographic data of respondents (n = 401).

Social and Demographic Features		Frequency	Percentage
Sex	Female	185	46.1
	Male	216	53.9
	Total	**401**	**100.0**
Marital status	Single	255	63.5
	Divorced	29	7.2
	Married	107	26.7
	Relationship	2	0.5
	Widowed	10	2.5
	Total	**401**	**100.0**
Local Government	Ika South	178	44.4
	Warri North	106	26.0
	Ughelli South	119	29.6
	Total	**401**	**100.0**
Age bracket	20 - 29	222	55.4
	30 - 39	91	22.6
	40 - 49	37	9.2
	50 - 59	20	5.0
	60 and above	9	2.2
	Less than 20 years	22	5.5
	Total	**401**	**100.0**
Religious Affiliation	African Traditional Worship	19	4.7
	Christianity	296	73.8
	Islam	72	18.0
	Others	14	3.5
	Total	**401**	**100.0**

Social and Demographic Features *(continued)*		Frequency	Percentage
Highest Education	No formal education	11	2.7
	Primary	15	3.7
	Secondary	49	12.2
	Diploma (including OND/HND)	79	19.7
	Bachelor's degree	215	53.6
	Masters/PhD	32	8.0
	Total	**401**	**100.0**
Employment status	Non-Governmental Organization (NGO)	20	5.0
	Private Organization Employee	58	14.5
	Public Government Service	73	18.2
	Self Employed	104	25.9
	Student	72	18.0
	Unemployed	74	18.4
	Total	**401**	**100.0**
Income(N) per month	Less than 50,000	222	55.4
	100,000 to 1,000,000	71	17.7
	50,000 to 100,000	97	24.2
	Above 1,000,000	11	2.7
	Total	**401**	**100.0**

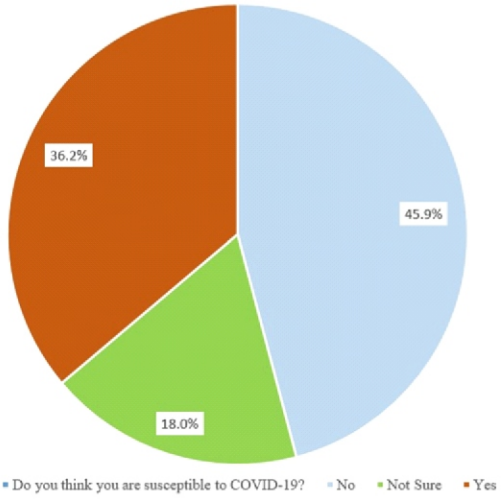

Figure 2: Perception of COVID-19 Susceptibility among Respondents

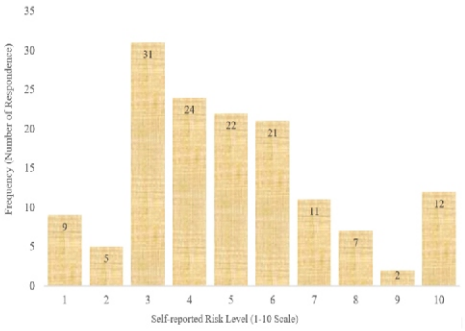

Figure 3: Respondents' Self COVID-19 Risk Assessment of between 0 (no risk) and 10 (highest risk)

Table 2: Perception about Government Interventions among Respondents.

Do you think the government in all sincerity has handled COVID-19 effectively?	Frequency	Percentage
No	247	61.6
No Idea	86	21.4
Yes	68	17.0
Total	**401**	**100.0**

Respondent's Knowledge of COVID-19

75.6% had knowledge of the cause of COVID-19. Forty two respondents (10.5%) did not believe COVID-19 exists, 41(10.2%) saw it as a means of world control, 13(3.2%) attributed it to bacteria, and 2(0.5%) said it was caused by mosquitoes as shown below in table 3.

Table 3: Prevalent Beliefs about the cause of COVID-19 among Respondents.

What is your belief about the cause of COVID-19?	Frequency	Percentage
A disease caused by a virus	303	75.6
A disease caused by bacteria	13	3.2
A disease caused by mosquito	2	0.5
A means of world control	41	10.2
There is no COVID-19	42	10.5
Total	**401**	**100.0**

About mode of transmission, table 4 shows that 325(81.2%) respondents had accurate knowledge of the transmission mode of COVID-19, 12(3%) think it is through 5G network, 7(1.7%) spiritually, and 56(13.9%) had no idea of the mode of transmission.

Table 4: Knowledge of COVID-19 Mode of Transmission among Respondents.

How is COVID-19 transmitted?	Frequency	Percentage
Airborne and through close contact with people with the virus	326	81.2
I don't know	56	13.9
Spiritually	7	1.7
Through 5G network	12	3.0
Total	**401**	**100.0**

Table 5 shows that majority of the respondents had accurate knowledge of preventive measures of COVID-19; social distancing (77.6%), hand-washing (65.6%), use of hand sanitizers, (61.6%), and wearing of masks (67.6%).

Table 5: Knowledge/Practice of COVID-19 Preventive Measures among Respondents.

How do you protect yourself from the virus?		Frequency	Percent
	Yes	311	77.6
Social distancing	No	90	22.4
	Total	**401**	**100.0**
	Yes	56	14.0
I don't believe it exists	No	345	86.0
	Total	**401**	**100.0**
	Yes	247	61.6
Use of hand sanitizers	No	154	38.4
	Total	**401**	**100.0**
	Yes	83	20.7
Prayer	No	318	79.3
	Total	**401**	**100.0**
	Yes	263	65.6
Hand washing	No	138	34.4
	Total	**401**	**100.0**
	Yes	35	8.7
Herbs and drugs	No	366	91.3
	Total	**401**	**100.0**
	Yes	271	67.6
Wearing of mask	No	130	32.4
	Total	**401**	**100.0**

Table 5: Knowledge of COVID-19 Self-protection among Respondents (*continued)*

Other Ways to Protect from COVID-19*	Frequency	Percentage
Stop 5G network	15	68.3
Good Diet	1	4.5
Respiratory Hygiene	6	27.2
Total	**22**	**100.0***

(5.5% of grand total)*

Meanwhile, some respondents believe that the virus can be prevented by prayer (20.7%), by herbs/drugs (8.7%), or that preventive measure does not exist (14.0%). Additionally, 5.5% of respondents inputted other prevention means including stopping the use of 5G, good diet and respiratory hygiene as reflected about in table 5 continuation.

Awareness, Perception and Acceptance of COVID-19 Vaccine

Majority (76.1%) of the respondents know that several COVID-19 vaccines are being developed, but 23.4% of the respondents are not in support of it. Almost half (46.9%) of the respondents do not know that Nigeria has declared interest in the vaccines being developed and only 33.67% are in support of the move as represented in table 6.

Table 6: Awareness and Agreement with COVID-19 Vaccine Development among Respondents.

Question	Response	Frequency	Percentage
Are you aware that there are several COVID -19 vaccines being developed and released for public use?	No	96	23.9
	Yes	305	76.1
	Total	**401**	**100.0**
What is your stand on the above?	Good development, keep it up	307	76.6
	Not necessary, it should be stopped	94	23.4
	Total	**401**	**100.0**
Are you aware that Nigeria has declared interest to be one of the first nations to try the approve vaccines?	No	188	46.9
	Yes	213	53.1
	Total	**401**	**100.0**
What is your stand on the above?	Good	135	33.67
	Not sure	109	27.18
	Not welcomed	157	39.15
	Total	**401**	**100.0**

Table 7: Belief about the Efficacy of COVID-19 Vaccine among Respondents

Do you think a vaccine will help in the fight against the pandemic?	Frequency	Percentage
No	107	26.7
Yes	292	73.3
Total	**401**	**100.0**

Of the 359 (99.5%) who believed in the existence of COVID19, although 271 (73.3%) said that the vaccine would help in fighting the virus, 86 (26.7%) do not think so as shown in table 7.

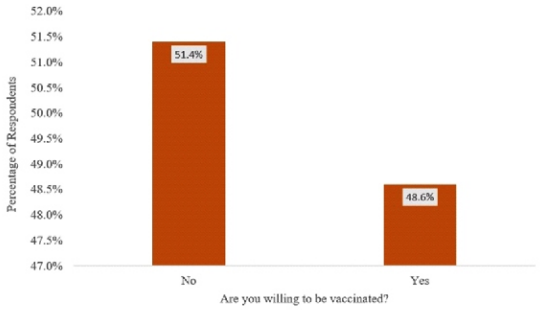

Figure 4: Willingness to get vaccinated in Delta state

On willingness to be vaccinated, figure 5 shows that 206 (51.4%) of the respondents stated that they would not accept a COVID-19 vaccine. Similarly, 10.0% will not accept vaccination because they believe COVID-19 does not exist, 22.0% will not accept from a western nation, 4.0% will only take from an African nation, 2.0% will only take vaccine from a Muslim nation, 5.0% will take COVID-19 vaccine even if it is still undergoing trials, and 57.0% will take vaccine only after they are tested and approved as shown on figure 6.

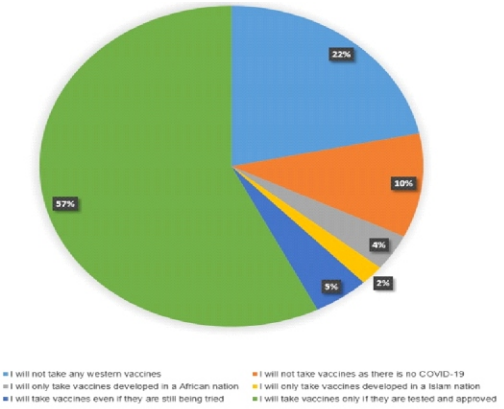

Figure 5: Conditions for Acceptance of COVID-19 vaccine among Respondents

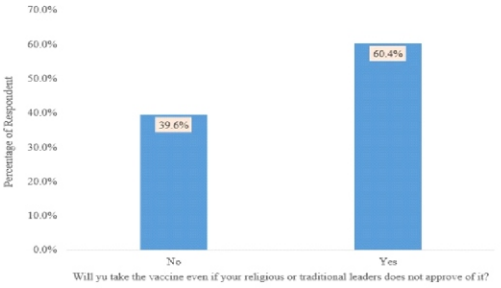

Figure 6: Belief in Religious/Traditional Leaders about Vaccine among Respondents

According to figure 7, 60.3% of respondents agrees to take an approved vaccine even if their religious or traditional leader does not support it, and 39.7% says they will not.

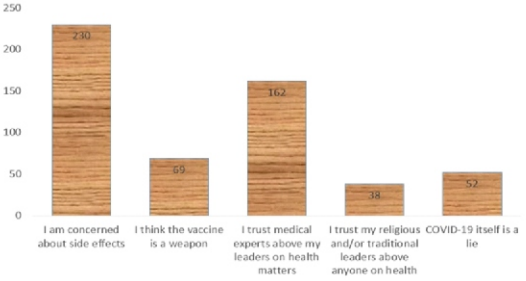

Figure 7: Respondents Healthcare Trust and Authority Affiliation among Respondents

Most (230, 57.4%) of the respondents are concerned about side effects of the vaccine, 69(16.7%) respondents think that COVID-19 vaccine is a weapon and 52(12.9%) believe COVID-19 does not exist, hence no need for a vaccine. However, 162(40.4%) say that they rather trust whatever medical experts suggest to them, while 38(9.5%) ascribed such trust and authority to their religious leaders as shown in figure 8 above.

Table 8: Respondents Preferred Model for Vaccine Implementation by Government.

What approach do you think the government should adopt in enforcing the vaccine when available?	Frequency	Percentage
It should be mandatory	54	13.5
It should be voluntary	212	52.9
It should first be tested on a particular group of people	59	14.7
We do not need any vaccine	76	19.0
Total	**401**	**100.0**

On the approach to be taken by the government in implementing vaccination, most (52.9%) of the respondents want the vaccine to be voluntary, 13.5% say it should be mandatory, 14.7% say it should first be tested on a certain class of people, and 19% say a vaccine is not necessary as shown in table 8 above.

Table 9: Advice to Government on effective Implementation of vaccination.

What do you think the government can do to encourage Nigerians to take the vaccine when ready?	Frequency	Percentage
Awareness creation and public education	115	28.7
Create environment of safety and trust with the vaccine	58	14.5
Allow freewill and personal choices about vaccine	58	14.5
Apply monetary/social incentive	48	12.0
Political leaders should use it first as examples	40	10.0
Make it free/subsidized and accessible	37	9.2
We do not need the vaccine	24	6.0
Use of mandatory vaccination policy	13	3.2
Create a Better Healthcare System	6	1.5
Let other countries use it first	2	0.5
Total	**401**	**100.0**

As shown in table 9, respondents' suggestion to government includes proper sensitization and public awareness (28.7%), assuring citizens of vaccine safety (14.5%), allowing freewill as regards vaccine (14.5%), applying some form of incentives (12%), first use by political leaders (10%), and making it free and accessible (9.2%).

Factors Influencing Acceptance of COVID-19 Vaccine

The following tables represent Chi square tests of relationships among some attributes and acceptance of vaccine.

Table 10a: Determination of Social and Demographic Factors influencing Vaccine Acceptance (*part a*).

		Are you willing to be vaccinated?		Total	DF X^2Value *P-Value
		No	Yes		
Gender	Female	110	75	185	1
	Male	96	120	216	8.993
Total		**206**	**195**	**401**	0.003
Local Government	Ika South	92	86	178	2
	Warri North	53	51	106	4.762
	Ughelli South	61	58	119	0.993
Total		**206**	**195**	**401**	
Marital Status	Divorced	14	15	29	4
	Married	59	48	107	5.531
	Relationship	3	1	3	0.355
	Single	124	128	252	
	Widowed	7	3	10	
Total		**206**	**195**	**401**	

**Significant at p < 0.05*

The chi-square analysis of data displayed in table 10 shows a statistically significant relationship between respondents' willingness to be vaccinated and gender, X^2 (1, N=401) =8.993 P =0.003; education, X^2 (5, N = 401) =24.897 P = 0.036, and religious affiliation X^2 (4, N=401) =10.185 P = 0.037.

Table 10b: Determination of Social and Demographic Factors influencing Vaccine Acceptance (*part b).*

		Are you willing to be vaccinated? No	Yes	Total	DF X^2 Value P-Value
Age bracket	Less than 20 years	8	14	22	5 3.896 0.564
	20 - 29	113	109	222	
	30 - 39	46	45	91	
	40 - 49	21	16	37	
	50 - 59	12	8	20	
	60 and above	6	3	9	
Total		**206**	**195**	**401**	
Religious Affiliation	African Traditional Worship	16	3	19	4 10.185 0.037
	Christianity	150	145	295	
	Islam	33	39	72	
	Others	7	7	14	
Total		**206**	**195**	**401**	
Highest Qualification	No formal education	11	0	11	5 24.897 0.036
	Primary	12	3	15	
	Secondary	41	8	49	
	Diploma (including OND/HND)	43	36	79	
	Bachelor's degree	86	129	215	
	Masters/PhD	13	19	32	
Total		**206**	**195**	**401**	

Table 10c: Determination of Social and Demographic Factors influencing Vaccine Acceptance (*part c)*

		Are you willing to be vaccinated? No	Yes	Total	DF X^2 Value P-Value
Your employment status	Non-Governmental Organization (NGO)	8	12	20	5 33.023 0.000
	Private Organization Employee	26	32	58	
	Public Government Service	19	54	73	
	Self Employed	61	43	104	
	Student	41	31	72	
	Unemployed	51	23	74	
Total		**206**	**195**	**401**	
Monthly Income (Naira)	Less than 50,000	121	101	222	3 13.383 0.004
	100,000 to 1,000,000	23	48	71	
	50,000 to 100,000	57	40	97	
	Above 1,000,000	5	6	11	
Total		**206**	**195**	**401**	

In table 10, there is also a statistically significant relationship between respondents' willingness to be vaccinated and employment status, X^2 (5, N = 401) =33.023 P = 0.000 and monthly income, X^2 (3, N = 401) =13.383 P = 0.004. Table 12 also shows such relationship between willingness to be vaccinated and knowing a COVID-19 case, X^2 (1, N = 401) =12.260 P = 0.000, perceived susceptibility to COVID-19, X^2 (2, N = 401) =50.373 P = 0.000, and belief about past government interventions X^2 (2, N = 401) =28.302P = 0.000.

Table 11: Determination of Association between Exposure, Self-assessed Risk and Vaccine Acceptance

		Are you willing to be vaccinated? No	Yes	Total	DF X^2Value *P-Value
Do you know anyone personally who has tested positive for COVID-19?	No	167	128	295	1 12.260 0.000
	Yes	39	67	106	
Total		**206**	**195**	**401**	
Do you think you are susceptible to COVID-19?	No	127	57	184	2 50.373 0.000
	Not sure	36	36	72	
	Yes	43	102	145	
Total		**206**	**195**	**401**	
If your answer to the above is "Yes", rate your risk of exposure	1-3	11	33	44	2 9.434 0.393
	4-6	27	41	68	
	7-10	5	28	33	
Total		**43**	**102**	**145**	
Do you think the government in all sincerity has handled COVID-19 effectively?	No	122	125	247	2 28.302 0.000
	No Idea	63	23	86	
	Yes	21	47	68	
Total		**206**	**195**	**401**	

**Significant at p < 0.05*

Results show no relationship between willingness to be vaccinated and respondents' age bracket, marital status, Local Government, as well as self-rated risk for infection as reflected on tables 10a, 10b, and 11.

DISCUSSION

Perceptions of COVID-19 and the Vaccine

The findings about the causes of COVID-19differ moderately from Reuben *et al.*[35] who found 99.5% awareness about knowledge of transmission. Also, some misinformation was found as 3.0% of respondents think COVID-19 is a means of world population Control (10.2%), transmitted through the 5G network (3%) or spiritually (1.7%). Similarly, 16.7% of the study population believes that COVID-19 vaccine is a biological weapon. Although the misconception about a weapon virus is losing publicity this study shows that the belief still persists.[61] This is not strange; as such information lingers on social media and other online forums[33] considering that all of our respondents are Internet users.

A significant percentage follow COVID-19 preventive practices such as social/physical distancing (77.6%), hand-washing (65.6%), use of hand sanitizers (61.6%), and wearing of masks (67.6%). However, this was below expectations considering that it was over 9 months into the pandemic and our respondents had access to information on the internet. When compared to Olapegba *et al.*[46] who reported 94% practice of recommended COVID-19 safety measures in April and Reuben *et al.*[35] that reported 82.3% about 6 months ago, the declining practice may suggest that, on one hand Nigerians are getting less concerned about the pandemic and on the other, the reported efforts of NCDC towards public awareness are ineffective.

Vaccine Acceptance

This study shows that 76.6% of respondents were aware of the on-going vaccine developments and 53.1% knew about the procurement. However, only 48.6% were willing to accept the vaccine as against 74% revealed by Adebisi *et al.*[61] Although this closely follows findings in Russia (54%), France (59%), Hungary and Poland (56%), it sharply contrasts the situations in India (87%), Malaysia (93.3%) and China (97%)[60]. The low level of acceptance could be due to inaccurate knowledge among some respondents and various negative news about the vaccine, such as stories of allergic reactions and deaths in the UK and USA, coupled with false positive HIV tests in Australia, which has a tendency to reinforce rejections[27,28]. It may also be explained by the fact that 63.8% of Deltans in the study do not consider themselves at risk of the virus, despite the fact that 73.6% say they have seen a COVID-19 case. In the same view, many of our respondents do not trust the information they receive from health officials and the government. Evidently, 39.6% will not accept even an approved vaccine if their religious or traditional leaders are against it. The fact that 61.6% of respondents discredited government's approach to the pandemic might explain the constant conflicts recorded among the people and the law enforcement authorities.[34] This will affect vaccination, as people who value healthcare provider's recommendations are more likely to accept inoculation faster than others.[69]Which emphasizes the importance of the involvement of traditional and religious leaders in planning programmes.[74]

More respondents (52.9%) stated that taking the vaccine should be voluntary, only 13.5%

think it should be mandatory. Also using a mandatory approach has been shown to instill more fear and distrust.[64] Safety was a major consideration of respondents about the vaccine, just as past evidence[53] connected lack of compliance with polio vaccination to it. Furthermore, only 5% said they would take the vaccine even if it were still under trials, while 57.0% are ready to take the vaccine only after it is tested and approved, expressing concern about the possible side effects. Wang *et al.*[69] clarifies this by stating that actual vaccine intake is mostly higher than pre-distribution vaccine acceptance values due to time-dependent safety verifications.

This study shows that vaccine refusal is a dependent function of poor information, which manifests as lack of trust. This is clearly seen from respondents' advice to the government concerning COVID-19 vaccination programs that more awareness campaigns and public education should be done on safety. Further on increasing trust among people, 10.0% suggested that the vaccine should be taken first by political leaders as examples to encourage people to take it. This can be seen as expression of hidden fears caused by false speculations about the disease and vaccine in line with Enitan *et al.*[41] Others (22.0%) opted not to receive any western nations' vaccine, similar to Falade[69] that reported rejection of western vaccines by Muslims. Meanwhile, 12.0% want some form of incentives such as money, food, or other forms of rewards to take vaccine.

Determinants of Vaccine Acceptance

The results show a statistically significant relationship between gender and acceptance of vaccine; in slight disagreement with Adebisi *et al.*[61] who reported that difference in acceptance between genders was below a level of significance. This corresponds with an international survey in Europe that showed a significant association between these variables, and a Chinese survey, which stated that males are more likely to accept vaccination.[69] A statistically significant association was also seen between religious affiliation and vaccine acceptance. Evidently, African Traditional Worshipers were about 5 times more likely to reject the vaccine than accept it, implying again the importance of involving religious and traditional rulers in vaccination sensitization.

Similarly, the study revealed that education influenced vaccine acceptance. Below diploma level was more likely to reject the vaccine; with zero acceptance among respondents without formal education, and a contrary observation among those with Bachelor's degree and above. This pointed to the influence of education on people's ability to evaluate information about the pandemic and vaccine.[125] Results presented no correlation between age group, LGA of respondents, marital status and vaccine acceptance, against the notion that older people are more likely to adopt COVID-19 interventions.[43,78] Moreover, Deltans share lots of common political and social attributes, hence acceptance is not expected to differ significantly across Local Government Areas, unlike findings of Adebisi *et al.*[61] who studied the whole country.

There was also a relationship between employment status and willingness to be vaccinated. Those who were unemployed, self-employed and students were more likely to reject the vaccine than those who were employed by NGOs, private organizations or public services. This could be due to higher exposure to NCDC/WHO sensitizations delivered earlier at places of work about the pandemic, or because of a desire to return to their jobs and normalcy which was disrupted by government restrictions. Respondents who earned 100,000 naira and above were more likely to accept COVID-19 vaccine than others, and this may be attributed to educational level which is a strong determinant of income. It is therefore crucial to put socioeconomic status into consideration when organizing any COVID-19 sensitization and vaccination programs.

The respondents that had past experience of COVID-19 and those who feel susceptible were more willing to accept vaccination. Likewise, vaccine acceptance was higher among respondents that approved of government COVID-19 interventions. These imply that people who do not have convincing evidence to believe COVID-19 and/or lack trust in policy makers for their safety are less likely to adopt vaccination.[42,43] This is in line with the theoretical framework for this study which emphasizes that peoples' choices are based on perceived needs and norms.

Finally, the main concern among 57.4% of respondents about COVID-19 vaccine was side effects, comparable to international surveys that reported that about 50% or more of respondents expressed concern about potential side effects of a COVID-19 vaccine.[60] These must be addressed through increased sensitization to increase trust and acceptance.

Recommendations

The following recommendations have been made based on results of this study.

- Sensitization and collaboration: There is need for the government to work with trusted bodies to reduce misinformation and allay the people' fears by informing and involving religious and community leaders in COVID-19 vaccination
- Affordability and Accessibility: It is important that any vaccination program organized for COVID-19 put accessibility into consideration and for it to be made available at a very affordable rate in line with WHO and as suggested by respondents.
- Directed Interventions: The government should put the social and cultural features of the population into consideration for effective COVID-19 vaccine programs.
- Freewill and Safety: Assurance of safety should be a priority since people receive the vaccine willingly when they feel safe.

Limitations

The researchers wish to ensure that readers bear these in mind while attempting to generalize the findings of this research. Stratification and random selection were used in obtaining the sample population. The data collection prioritized convenience only

internet users were sampled and this may induce certain bias with regards to the representativeness of the whole population. More studies will be required to follow up on actual rates of acceptance as the country starts rolling out the vaccine.

CONCLUSION

The level of COVID-19 vaccine acceptance in Nigeria has continually reduced with every new survey. This study revealed a lower acceptance rate within Delta State. Poor awareness and misinformation remain a challenge nine months after the onset of the pandeic in the country. This and other factors such as socioeconomic status and trust strongly influence people' attitude towards COVID-19 and the vaccine. This study provided insights into the present obtainable level of vaccine acceptance in Delta State, more studies are needed to assess actual reception of the vaccine and the onward variability of this acceptance. The study therefore provides data that can aid in designing vaccination and sensitization programs for Delta State population to reduce acceptance challenges with COVID-19 vaccination. As the program starts rolling out, more research should assess if th knowledge has further improved over time, if people' perception is becoming more positive or negative, and if they are actually taking the vaccines as they have indicated.

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