

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
 ISSN Online: 2617-4707
 IJABR 2022; 6(2): 01-11
www.biochemjournal.com
 Received: 03-04-2022
 Accepted: 04-05-2022

OTOBO D Daniel
 Department of Paediatrics,
 Abubakar Tafawa Balewa
 University Teaching Hospital,
 Bauchi, Nigeria

OKORO I Ngozi
 Department of Chemical
 Pathology, Enugu State
 University of Technology,
 Enugu, Nigeria

Knowledge and acceptance of the COVID-19 vaccine amongst pregnant women in Jos, Plateau State, Nigeria: A quantitative analysis

OTOBO D Daniel and OKORO I Ngozi

DOI: <https://doi.org/10.33545/26174693.2022.v6.i1b.127>

Abstract

The aim of this study is to quantitatively evaluate the knowledge and acceptance of the corona virus vaccine amongst pregnant women in Jos, Plateau state; Nigeria. This was done utilizing a cross-sectional study that utilized a validated data tool with over 250 participants. Many (96.4%) of the respondents had heard about the corona virus, a few (3.6%) of them had not heard about the pathologic effects the virus may have if contacted. Furthermore, majority (92.8%) of the respondents had good knowledge about the means via which the infection in spread.

Keywords: Knowledge, acceptance, COVID-19, vaccination, Nigeria, pregnancy

Introduction

Since the COVID-19 outbreak in December of 2019, more than 80 million people have been symptomatically infected and at least 1.7 million people have died as a result of its complications [1]. As at the time it was declared a global pandemic by the World Health Organization (WHO) on the 11th of March, 2020 Africa already had a total of 113 confirmed COVID-19 cases, with no deaths across 9 African Nations: Egypt (59), Algeria (20), South Africa (13), Tunisia (5), Senegal (5), Nigeria (2), Cameroon (2), Burkina Faso (2), Morocco (2), Cote d'Ivoire (1), Democratic Republic of the Congo (1), and Togo (1) [1-2].

The SARS-CoV2 Originated from Wuhan in China as a national epidemic and was later confirmed as a pandemic in March of 2020. The first African country to report an incidence of the virus was Egypt. Although, it came into Nigeria by the first week in March, it was localized to Lagos state in western Nigeria. Though the nation took some steps to control the spread of the virus, this were often poorly implemented amongst the high-class citizens. This led to a pathologic spread in the disease amongst this class and thus gave the false impression that it was a disease of the rich and the elderly. With little, changing and false information on the virus, the nation went into a lock down that was rigged with both uncertainty and frustration [3].

The COVAX vaccines arrived Africa this year and the first doses were administered in Africa on the 1st of March, 2021 at the Treichville vaccination Centre, in Abidjan, Cote d'Ivoire [4]. By the 2nd of March 2021, the first batch of COVID-19 vaccines shipped by COVAX arrived Nigeria, containing nearly 4 million, specifically 3.94 million doses of the AstraZeneca/Oxford vaccines. The nation has long begun distribution on voluntary grounds [5]. Although the country plans to vaccinate 40% of her populace by the end of 2021, many critics and analysts see this as unfeasible [6].

The COVID-19 Vaccination has been met with a variation in acceptability for various reasons, ranging from spiritual to physical perception of the vaccines, false information and lack of information. Although the anti-vaccine movement continues to grow, a larger variant is willing to take the vaccine [7-8].

Now most importantly is the fact that these vaccines were brought into the human faster than any other vaccine in history. That as regards disease-to-vaccine production time ratio. This was due to the necessity from morbidities and mortalities, especially in the western countries [9]. Critical groups such as babies and pregnant women were omitted in the trial. To avoid such catastrophic incidence as such seen with the drug Thalidomide which resulted in high

Corresponding Author:
OTOBO D Daniel
 Department of Paediatrics,
 Abubakar Tafawa Balewa
 University Teaching Hospital,
 Bauchi, Nigeria

incidences of Phocomelia, it is important to study and understand the effect of this vaccine on pregnant women and new nursing mothers ^[10].

However, the need for an informed populace in making health decision is to some extent based on the amount of information they get from health professionals concerning a particular disease or mode of treatment. As regards the corona virus vaccine, there have been a lot of dwindling information regarding its efficacy, safety, potency, pharmacodynamics and genicity even amongst the health professionals.

The debate as to whether or not pregnant women can receive the corona virus vaccine has been on amongst health workers. However, in a Q and A session online, the Johns Hopkins hospital stated that people who were pregnant could receive the vaccine, this was due to the fact that the CDC had included pregnant women in the list of high-risk groups, but not based on available safety studies at the time. They also referenced data made available from CDC that concluded that completion of the mRNA vaccines in pregnancy may help in prevention of hospitalization due to COVID-19 in infants born to these mothers, up to 6 months of age or younger ^[11]. Thereafter, the CDC in August of 2021 released a statement stating that the COVID-19 vaccine was safe for pregnant and breastfeeding women ^[12]. The aim of this study is to quantitatively evaluate the knowledge and acceptance of the corona virus vaccine amongst pregnant women in Jos, Plateau State, Nigeria.

Methodology

Study Area

Plateau is the twelfth-largest state in Nigeria. Approximately at the center of the country. It is geographically unique in Nigeria due to its boundaries of elevated hills surrounding the Jos plateau its capital, and the entire plateau itself. Plateau state is celebrated as “The Home of Peace and Tourism”. With natural formations of rocks, hills and waterfalls, it derives its name from the Jos plateau and Jos a population of around 4.2 million people.

Bukuru is a city located on the Jos Plateau in Nigeria. It was previously considered separate city from the city of Jos close by, but like every other form of urbanization, the city of Jos merged with the town of Bukuru to form the Jos-Bukuru metropolis. It is the headquarters of Jos South LGA. The major forms of transportation connecting in and out of Bukuru is by road and rail. The rail ways connect Bukuru with Bauchi, Zaria, Lago and Port Harcourt. Mainly used for business, import and export of natural minerals ^[13].

Although it has a mix of Christians and Muslims, there is a Christian majority. There is also a central mosque in Bukuru ^[14].

Study Site

The study sites are three (3) Primary HealthCare Centers (PHCs) in Bukuru. According to data obtained from the Ministry of Health and utilization of scientific tools of remote sensing GPS and GIS for a better update, there are about twenty-one (21) health facilities in Bukuru. Of these, one (1) is a tertiary facility, four (4) are PHCs and the others are health center levels ^[15].

Of these 4 Primary healthcare centers, we conducted our study amongst three (3). They are, Bukuru Express Primary Healthcare Centre, Bukuru Central Primary Healthcare Centre and ECWA Comprehensive Healthcare Centre. Both

Bukuru Express and Bukuru central are Government owned primary healthcare facilities that are equipped with about 8 and 6 bed spaces, respectively. Their healthcare team comprises of a public health nurse, a Midwife and a Community Health Worker (CHEW). However, the ECWA comprehensive Healthcare Centre has 14 bed spaces and a larger facility. They have doctors (consultants) who come to run clinics on some days. It is a privately owned facility, charges more, better kept environment and has less patients visiting. They are all located within a 3-5 minutes Motorcycle or Tricycle ride away from each other, and costs about N50. Bukuru Express is located about 5 minutes from the tertiary facility, Bukuru Specialist Hospital. While Bukuru central and ECWA comprehensive Healthcare Centre is located about 15 minutes from the specialist hospital. Hence, have a longer time to patient transfer in emergency referrals.

Study Population

The study population are the pregnant women currently attending Antenatal. These facilities are PHC Bukuru Central (BC), PHC Bukuru Express (BE), ECWA Comprehensive Health Centre (EHC).

Table 1: A table showing the total number of women registered and attending the ANC at the PHCs in Bukuru being used for this study

	BC	BE	EHC	Total
No currently registered for ANC	56	58	46	160
No of Registered women in ANC this year	376	397	116	889

Inclusion Criteria

1. A Pregnant woman who is registered at a Primary Healthcare facility in Bukuru for her Antenatal care.

Exclusion Criteria

1. Any man.
2. Any woman who does not fall within the inclusion criteria.
3. Any woman who did not consent to participating in the study.

Sample Size Determination

Total number of women currently attending ANC in these facilities = 160

Total Number of women who have registered and attended this year = 889

Sample size determination

Calculation of sample size ^[16]

$$: n = Z^2 pq / d^2$$

Where n= Minimum sample size

Z = Standard normal deviation set at 1.96 (Confidence interval 95%).

P = Proportion of women currently attending ANC clinic amongst those registered this year (18.14%).

Q = Complementary probability (1-p).

D = Degree of precision (0.05).

Sample Size = n + (10% of n)

Where; $n = 1.96^2_{(0.18)(1-0.18)} / (0.05)^2$

N = 227 (Minimum Sample size)

Sample Size; 227 + (10% of 227) = 250.

Sampling technique

Sampling technique was done using a multistage sampling technique.

Stage 1: Using simple random technique, we balloted for 1 Local Government Area, amongst 17 in Plateau state and got Bukuru Jos South Local Government Area. (Speak about how many towns are in Jos south and how you got Bukuru).

Stage 2: Using simple random technique, we balloted for 3 primary health care centers amongst 4 that were in the Bukuru Local Government Area. From this we got, ECWA Comprehensive Health Care, Bukuru Express and Bukuru Central Primary Healthcare Centers.

Stage 3: Using stratified technique we calculated for the respondents under the ANCs in each of the facilities.

S/N	PHC Facility	ANC
1	Bukuru express PHC	100
2	Bukuru Central PHC	100
3	ECWA CHC	50

Stage 4: Using simple random sampling we distributed the questionnaires amongst the women attending the ANCs at the PHCs

Study Design

It is a cross-sectional randomized study design.

Preparation for Data Collection

Prior to data collection, permission was sought and obtained from the ethical committee Bingham University Teaching Hospital. Further consent was verbally sought from heads of each of the Primary Health Care Centers. Informed verbal consent was sought and obtained from each of the respondents after the purpose of the study was clearly explained to them. They were also informed that participation in the study was voluntary and that they could decide to withdraw their participation at any point in the interview. In order to ensure confidentiality, serial numbers instead of names were used to identify respondents.

Data Collection

A pre-tested structured self-administered questionnaire and a focused group discussion was used to obtain the relevant information. Questionnaires were administered to pregnant women at the PHCs until the required sample size was obtained.

Data Analysis

Data will be entered Microsoft Excel package and cleaned. Analysis will be carried out using SPSS (Statistical Package for the Social Sciences) version 20. Socio-demographic variables will be presented on tables using frequencies and proportions. Knowledge, attitude and perception will be scored and graded appropriately. Bivariate analysis will be used to test association between Socio-demographic factors, knowledge and attitude, and perception. Multivariate

logistic regression analysis will be done to determine predictors of good knowledge, attitude, perception, as well as acceptance of the COVID-19 vaccine. The level of significance will be set at a p -value ≤ 0.05 .

Ethical Consideration

Ethical clearance was obtained from the Bingham University ethical committee before the commencement of the study. In addition, informed consent was taken from each study participant after purpose of the study has been clearly explained. Data collected from the study was also kept confidential.

Limitations to study and how they were overcome

1. Language Barriers

We utilized the aid of the public health Nurses, Community Health Workers (CHEWs) and Community Health Officers (CHOs) who were present to help us interpret the questions were asked them. They also helped us with interpretation of the responses the respondents gave. However, some of the women understood some level of English, though mostly vernacular.

2. Financial Constraints

To cut down on transportation costs, we travelled together to the study site. To overcome cost of questionnaire printing, we printed the questions on both pages of an A4 sheet. Data organization and analysis were self-done, to cut down on cost of a statistician. However, these and other cost demanding activities were catered for by in-pocket funding.

Results

Section 1: Sociodemographics

Table 1: Table showing sociodemographic N = 250

Variable	Frequency	Percent (%)
Age Group		
15-19	29	11.6
20-24	94	37.6
25-29	56	22.4
30-34	37	14.8
35-39	19	7.6
40-44	5	2.0
Religion		
Christian	141	56.4
Islam	109	43.6
Wife's Occupation		
None	124	49.6
Self employed	85	34.0
Civil servant	29	11.6
Private sector	12	4.8
Wife's Education		
None	33	13.2
Primary	16	6.4
Secondary	144	57.6
Post-secondary	57	22.8
Husband's Occupation		
None	63	25.2
Self employed	117	46.8
Civil servant	36	14.4
Private sector	34	13.6
Husband's Education		
None	77	30.8
Primary	10	4.0
Secondary	102	40.8
Post-secondary	61	24.4
Total	250	100

Two hundred and fifty questionnaires were administered. The highest number of respondents were from the age group 20-24 (37.6%). Most of the respondents were Christians (56.4%) while the rest were Muslim (43.6%) The majority of the population were unemployed (49.6%), followed by self-employed (34.0%) and the least was the private sector employee (4.8%). Most of the respondents

had attained secondary school (57.6%) level of education while about 22.8% of the respondents had post-secondary level of education, 13.2% of the respondents had no level of education.

Section 2: Knowledge about COVID-19.

Table 2: Table on knowledge of COVID-19, its effect and prevention amongst respondents, N = 250

Variables	Prevalence	Frequency	Percentage (%)
Have you heard about corona virus before	Yes	233	93.2
	No	17	6.8
COVID-19 can make people sick and can kill them	Yes	241	96.4
	No	9	3.6
It can spread via cough and respiratory droplets from infected people	Yes	232	92.8
	No	18	7.2
Preventive methods include avoidance of crowded places, washing of hands and wearing of face masks	Yes	241	96.4
	No	9	3.6

This showed that the respondents all had knowledge about the corona virus pandemic. There was a 93.2% prevalence in knowledge of the disease. Also, many (96.4%) of the respondents had heard about the corona virus, a few (3.6%) of them had not heard about the pathologic effects the virus may have if contacted. Furthermore, majority (92.8%) of the

respondents had good knowledge about the means via which the infection is spread, with a minority (7.2%) lacking in this area. They showed good (96.4%) knowledge on the means of prevention of spread in the practice of social distancing, wearing of face mask and hand washing.

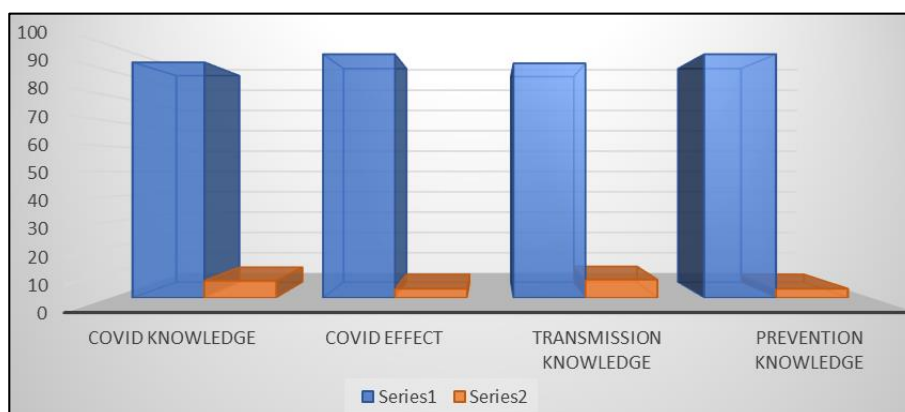


Fig 1: Showing the bar chart representation of the positive responses concerning knowledge of on COVID-19 knowledge, biological effects, transmission and prevention against those who did not have any knowledge on these

Section 3: Knowledge about the COVID-19 vaccine.

Table 3: Table showing knowledge about the vaccine, N = 250

Knowledge about the vaccine	Frequency	Percentage (%)
Are you aware that the corona virus has a vaccine?		
Yes	224	89.6
No	26	10.4
Total	250	100.0
The COVID-19 vaccine protects the receiver from getting the infection?		
Yes	204	81.6
No	46	18.4
Total	250.	100.0
Did you hear that the vaccine is only given to those people who work in the hospital?		
Yes	31	12.4
No	163	65.2
I don't know	56	22.4
Total	250	100.0
Is the vaccine good for children less than 5 years?		
Yes	70	28.0
No	87	34.8
I don't know	93	37.2
Total	250	100.0

Is the vaccine good for women that are pregnant?		
Yes	113	45.2
No	137	54.8
Total	250	100.0

Of the 250 respondents, majority (89.6%) are aware that there is a vaccine for corona virus. Only 10.4% are not aware of it. 81.6% were knowledgeable that the vaccine can protect them from getting infected, while a few (18.4%) had no knowledge about this. Respondents who have heard that the vaccine is only given to those who work in the hospital had the lowest percentage of 31.56% had no idea while the

largest percentage heard it is not only given to them. About 37.2% of the respondents had no idea if the vaccine is good for children less than 5 years of age. 34.8% said no, while the lowest percentage were positive that it is good for children less than 5 years. Finally, only 45.2% indicated that the vaccine is good for women that are pregnant, while the other 54.8% disagreed.

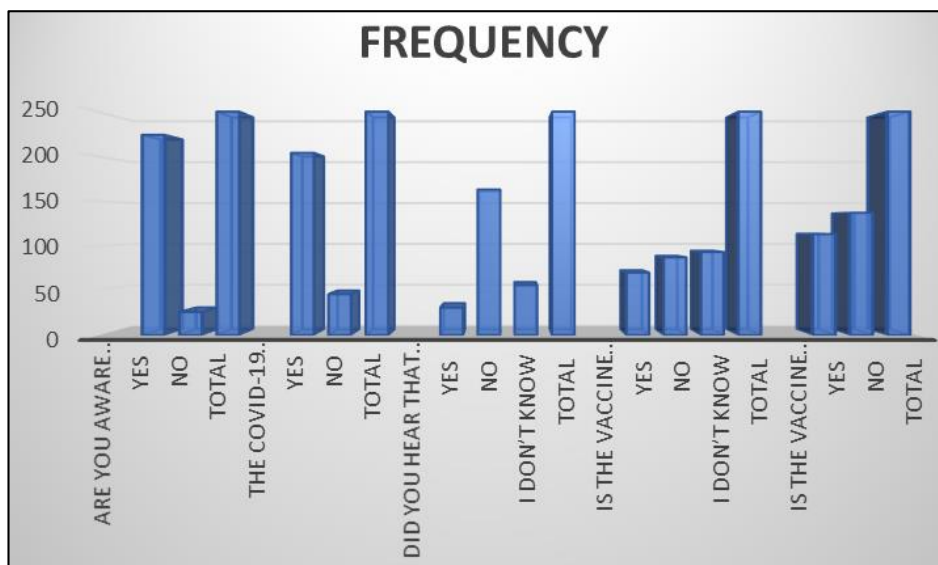


Fig 2: Showing the distribution of respondents' knowledge of the corona virus vaccine

Table 4: Table showing source of information of COVID-19 vaccine, N = 250

Source	Frequency	Percentage (%)
Radio or television media	175	51.6
Health facility	87	25.7
Friend or family	26	7.7
Place of worship	21	6.2
I have not heard about it	13	3.8
Social media	11	3.2
Other	6	

The largest percentage of respondents 51.6% had their source of information from radio or television media. 25.7% from health facility, 7.7% from, friend or family, 6.2% from place of worship, 3.8% have not heard about the vaccine, and 3.2% from social media.

Table 5: General knowledge on corona virus vaccine, N = 250

Knowledge of COVID-19 vaccine	Frequency	Percent (%)
Good	45	18.0
Fair	173	69.2
Poor	32	12.8
Total	250	100.0

Generally, 69.2% of the respondents has a fair knowledge of the vaccine, 18% has good knowledge while 12.8% has poor knowledge.

Section 4: Acceptance of the vaccine

Table 6: The respondents' willingness to accepting the COVID vaccine, N=250

Acceptance of COVID vaccine	Frequency	Percent (%)
If COVID vaccine is made available, will you take it?		
Yes	151	60.4
No	99	39.6
I will only take it if my employer permits me to take it		
Yes	94	37.6
No	156	52.4
I will only take it if my husband permits me to take it?		
Yes	142	56.8
No	108	43.2
Total	250	100
Have you received the vaccine before		
Yes	96	38.4
No	154	61.6
Total	250	100
When did you take it?		
Before pregnancy	46	18.4
In pregnancy: You knew you were pregnant	14	5.6
After pregnancy	36	14.4
I have not taken it	154	61.6
Total	250	100

From 250 respondents who were aware of the COVID vaccine majority of them were willing to take the vaccine (60.4%). 56.4% of the respondents relied on their husband's permission to accept the vaccine and 24.0% of the respondents had taken the vaccine.

Table 7: General Grading of the Acceptance Level of the COVID-19 Vaccine, N = 250

Comments of the general acceptance	Frequency	Percent
Good	76	30.0
Fair	74	29.6
Poor	100	40.0
Total	250	100.0

From the 250 respondents about 59.6% had a generally good acceptance level of the COVID vaccine while 40% of the population had poor acceptance level.

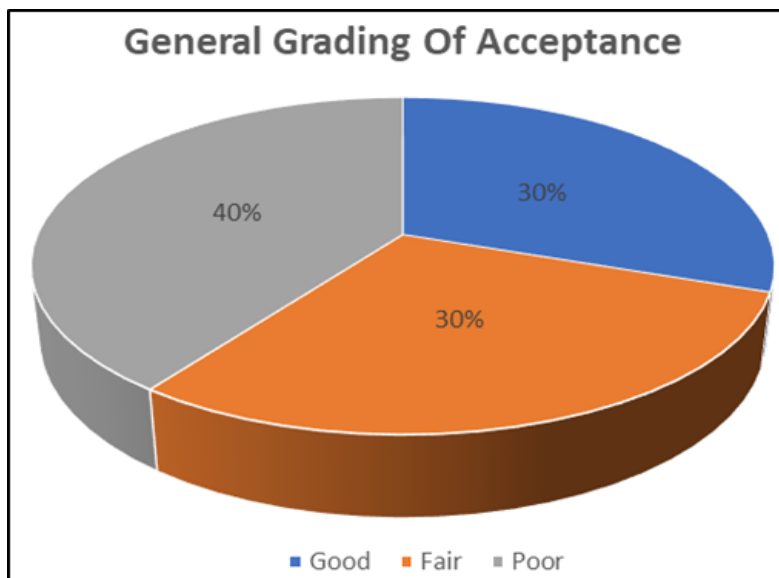


Fig 5: General grading of the willingness to accept the vaccine

The chart above showed that 40% had poor willingness to accept the vaccine. Majority of the respondents that is those

that fairly and those with good willingness to accept the vaccine had better chances of accepting the vaccine.

Table 8: Factors influencing the decision to take the vaccine or not to take the vaccine

Factors that influenced your decision to take or not to take the vaccine	Frequency	Percent (%)
Infection risk	68	23.9
Safety of the vaccine	53	18.6
Pregnancy	53	18.6
Concern because it is a new vaccine	47	19.7
Effectiveness	35	12.3
Adverse Effect	29	10.2
Total	285	100

The 285 responses given on factors that the respondents lookout for to influence their acceptance of the vaccine infection risk was the major factor (23.9%). However other

factors that influenced their decision included, the concern of the new vaccine (19.7%) as well as pregnancy (18.6%) and safety of the vaccine (18.6%).

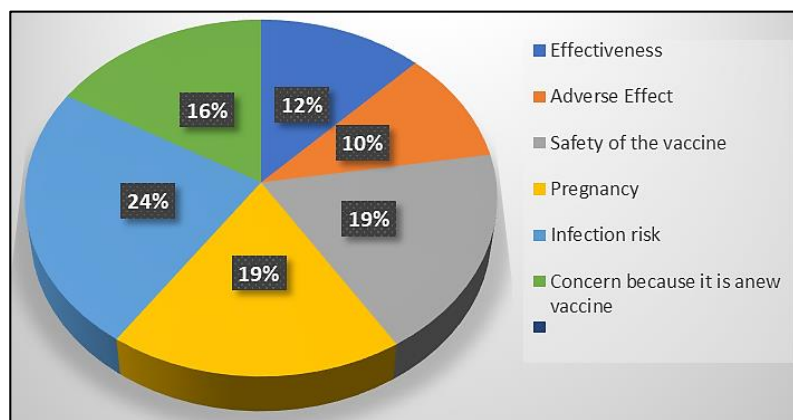


Fig 6: Factors influencing the decision to acceptance of the vaccine

Majority of the population from the chart above had infection of risk as the most important factor for accepting the vaccine (24%).

Table 15: Test of association between age and knowledge of COVID-19 vaccine

		Knowledge of vaccine Frequency (Percent)			Total Frequency (Percent)	X ²	p-value
		Good	Fair	Poor			
Age groups	15-19 years	4(1.7%)	24(10%)	1(0.4%)	29(12.1%)	26.074	.004
	20-24 years	15(6.3%)	66(27.5%)	13(5.4%)	94(39.2%)		
	25-29 years	13(5.4%)	40(16.7%)	3(1.3%)	56(23.3%)		
	30-34 years	6(2.5%)	19(7.9%)	12(5%)	37(15.4%)		
	35-39 years	0(0.0001%)	17(7.1%)	2(0.8%)	19(7.9%)		
	40-44 years	0(0.0001%)	5(2.1%)	0(0.0001%)	5(2.1%)		
Total		38(15.9%)	171(71.3%)	31(12.9%)	240(100%)		

Table 9: Test of association between knowledge of COVID-19 and knowledge of COVID-19 vaccine

		Knowledge of vaccine Frequency/Percent (%)			Total	X ²	p-value
		Good	Fair	Poor			
Knowledge of COVID-19	Good	45(18%)	168(70%)	27(10.8%)	240(96%)	23.610	0.001
	Fair	0(0%)	5(2%)	2(0.8%)	7(2.8%)		
	Poor	0(0.0001%)	0(0.0001%)	3(1.2%)	3(1.2%)		
Total		45(18%)	173(69.2%)	32(12.8%)	250(100%)		

Table 10: Test of association between level of education and knowledge of COVID-19 vaccine

		Knowledge of COVID-19 vaccine Frequency (Percent)			Total Frequency (Percent)	X ²	p-value
		Good	Fair	Poor			
Level of education	None	0(0.0001%)	6(2.7%)	0(0.0001%)	6(2.7%)	16.038	.014
	Primary	4(1.8%)	6(2.7%)	6(2.7%)	16(7.2%)		
	Secondary	25(11.2%)	101(45.3%)	18(8.1%)	144(64.6%)		
	Post-secondary	5(2.2%)	46(20.6%)	6(2.7%)	57(25.6%)		
	Total	34(15.2%)	159(71.3%)	30(13.5%)	223(100%)		

Table 11: Test of association between religion and knowledge of COVID-19 vaccine

		Knowledge of vaccine Frequency/Percent (%)			Total	X ²	p-value
		Good	Fair	Poor			
Religion	Christianity	30/12.4%	84/34.7%	27/11.2%	141/58.3%	23.990	.001
	Islam	8/3.3%	89/36.8%	4/1.7%	101/41.7%		
Total		38/15.7%	173/71.5%	31/12.8%	242/100%		

Table 12: Association between socio demographics and misconception

Misconception	Age Group	Frequency/Percent				X ²	p-value
		SA	A	ID	D		
The vaccine contains microchip to control people	15-19	0(0.0001%)	8(17.4%)	6(14.3%)	5(13.5%)	49.17	0.001
	20-24	16(72.7%)	16(34.8%)	14(33.3%)	17(45.9%)		
	25-29	1(4.5%)	15(32.6%)	6(14.3%)	4(10.8%)		
	30-34	5(22.7%)	6(13.0%)	11(26.2%)	7(18.9%)		
	35-39	0(0.0001%)	1(2.1%)	2(4.8%)	3(8.1%)		
	40-44	0(0.0001%)	0(0.0001%)	37.1	1(2.7%)		
The vaccine is a trick that can infect you with the virus	15-19	0(0.0001)	4(9.1%)	2(6.3%)	7(17.9%)	41.92	0.003
	20-24	12(57.1)	18(40.9)	8(25.0)	16(41.0)		
	25-29	2(9.5)	14(31.8)	5(15.6)	6(15.4)		
	30-34	7(33.3)	7(15.9)	8(25.0)	6(15.4)		
	35-39	0(0.0001)	1(2.3)	6(18.8)	3(7.7)		
	40-44	0(0.0001)	0(0.0001)	3(9.4)	1(2.6)		
The vaccine can cause infertility	15-19	0(0.0001)	3(6.7)	7(14.3)		46.64	0.001
	20-24	10(62.5)	25(55.6)	16(32.7)			
	25-29	1(6.3)	11(24.4)	8(16.3)			
	30-34	5(31.3)	5(11.1)	15(30.6)			
	35-39	0(0.0001)	1(2.0)	2(4.1)			
	40-44	0(0.0001)	0(0.0001)	1(2.0)			

Table 13: Association between sociodemographic and acceptance of the COVID vaccine

Age group	Acceptance (Frequency/Percent)			Total	X ²	p-value
	Good	Fair	Poor			
15-19	13(44.8)	8(27.5)	8(27.5)	29(12.1)	29.23	0.001
20-24	27(28.7)	28(29.7)	39(41.4)	94(39.2)		
25-29	25(44.6)	12(21.4)	19(33.9)	56(23.3)		
30-34	2(0.5)	11(29.7)	24(64.8)	37(15.4)		
35-39	84(2.1)	4(21.0)	7(36.8)	19(7.9)		
40-44	0(0.0001)	4(80.0)	1(20.0)	5(2.1)		
Total	75(31.3)	67(27.9)	98(40.8)	240(100)		
Religion	Good	Fair	Poor	Total	X ²	p-value
Christianity	25(17.7)	26(18.4)	76(53.9)	141(58.3)	33.2	0.001
Islam	51(50.4)	40(39.6)	24(23.7)	101(41.7)		
Total	76(31.4)	66(27.3)	100(41.3)	242(100)		

The respondents within the ages of 20-24year had majority of good willingness to accepting the vaccine (28.7%) due to their population. However, majority of the population with the poor willingness also happen to fall within that age group (29.7%). The respondents however in the 40-44year age group had mainly fair willingness to accept the vaccine

(80%). The youngest age group 15-19year had mainly good willingness to accepting the vaccine (44.8%). Most of the respondents were Christians and they had poor willingness to accepting the vaccine (53.9%), whereas the Muslim had generally good willingness to accepting the vaccine (50.4%).

Table 14: Association between the knowledge of the vaccine and acceptance of the COVID vaccine

Acceptance	Knowledge of the COVID vaccine (frequency / percent)			Total	X ²	p-value
	Good	Fair	Poor			
Good	14(18.4)	60(78.9)	2(2.6)	76(30.4)	14.026	0.007
Fair	18(24.3)	44(59.5)	12(16.2)	74(29.6)		
Poor	13(13.0)	69(69.0)	18(18.0)	100(40.0)		
Total	45(18.0)	173(69.3)	32(12.8)	250(100)		

The relationship between the knowledge of COVID vaccine and the acceptance showed that those with good knowledge were fairly to accept the vaccine (24.3%). However, there was no significant association between the knowledge of the

vaccine and the acceptance with a p-value of 0.007 (x²=14.026). It was seen that those with fair knowledge (69.0%) and poor knowledge (18.0%) of the vaccine had poor acceptance of the vaccine.

Table 15: Association between sociodemographics and willingness to accept the COVID vaccine

Social Demographics	Variable	Frequency / percent		X ²	p-value
		Yes	No		
Age Group	15-19	18(12.0)	11(12.5)	14.940	0.110
	20-24	59(39.3)	33(37.5)		
	25-29	43(28.7)	13(14.8)		
	30-34	14(9.3)	23(26.1)		
	35-39	13(8.7)	6(31.6)		
Religion	Christian	66(43.7)	73(82.0)	33.725	0.001
	Islam	85(56.3)	16(18.0)		
Level of Education	None	3(2.1)	3(3.7)	11.637	0.009
	Primary	4(2.9)	12(14.8)		
	Secondary	95(67.9)	47(58.0)		
	Post-secondary	38(27.1)	19(23.5)		

From the association between the age group and willingness to accept the vaccine respondents between ages group 20-24(%) and 25-29(%) were more willing to accept the vaccine whereas respondents in age group 30-34(%) and 35-39(%) were more unwilling to take the vaccine. However, there was no significance between the age groups and willingness to take the vaccine p-value 0.110. Christian respondents were not as willing to take vaccine (82.0%) while the Muslims respondents were much more (56.3%). Respondents with secondary level of education were more willing to accepting the vaccine (67.9%) although the was no significance between the level of education and the willingness to take the vaccine p-value 0.009.

Discussion

The study sought to quantitatively evaluate the knowledge and acceptance of the corona virus vaccine amongst pregnant women in Jos, Plateau State, Nigeria. To do this, we carried out our study at the Bukuru LGA in Jos; plateau state. Utilizing 3 different primary healthcare centers. From the study we found that almost half of the women attending antenatal care clinics in this region were 24 years and younger, with the youngest being 15 years of age and the oldest being 44 years of age. The religion practiced amongst the respondents was Christianity and Islam, approximately 6 in 10 of the respondents were Christians. As regards the occupation of the women, although majority

of them were unemployed, most of those who were gainfully working were self-employed. With attainment of varying educational levels, 6 in 10 of them had secondary school education, while approximately 1 in 10 had attained no form of formal education.

To evaluate the factors influencing patriarchy in the socio medical life of these women, we made some assessments of their husband's/spouse's educational and occupational status. We found out that approximately half of the men were self-employed, with approximately 3 in 10 being unemployed. While 4 in 10 had attained secondary school level of education and 3 in 10 had had no form of education. Hence, an obvious correlation between level of education and employment amongst the husbands/spouses of these women.

Knowledge on corona virus disease

The respondents displayed good knowledge on the corona virus disease and the pandemic, 9 in 10 of the respondents had heard about the disease. This was similar to a global cross-sectional study done by Mannan DKA and her team that found out that 9 in 10 people had basic knowledge on the corona Virus [31]. With a similar prevalence having good understanding on the fact that the virus could not only just make people sick but also cause death to those who are infected with it. Furthermore, these people were able to display good knowledge on the means via which its spread can be prevented. This they did by identifying the role of respiratory droplets, body fluids and cough as the means via which this virus can be spread. This knowledge of spread was similar to that discovered by Stadnytskiyi V, *et al.* in their study [17]. Preventive measures such as use of face masks, hand washing and social distancing were identified and basic and important ways to stop the spread and transmission of the virus.

Knowledge about COVID-19 vaccine and vaccination

Knowledge about COVID-19 vaccine is a determining factor to whether the vaccine is accepted or not. In this study, 5 questions were used to define the knowledge of COVID-19 vaccine. Our findings showed that majority of the respondents (*i.e.* 9 in 10) were aware of the vaccine. With more than two-third of them being knowledgeable about the vaccine's protection of the receiver from getting the infection. About two-third are aware that the vaccine is not only given to people that work in the hospital. Less than a third of the respondents indicated the vaccine is good for children less than 5 years, while more than half of them said the vaccine is not good for pregnant women. Overall, more than seven in ten of the respondents had a fair knowledge, close to a fifth had a good knowledge and one-eighth had a poor knowledge of the vaccine. This finding is in accordance to what was observed in a global cross sectional study done across 6 continents of the world where about nine in ten of the population had a basic understanding of the corona virus and the vaccine [31]. One fifth of the women heard about the vaccine for the first time from radio and television media. A fourth of them from health facilities, three in ten from social media and another three in ten had not heard about the vaccine. This thus emphasizes the role of television media, healthcare education and social media in health awareness and advocacies.

In the correlation between age and knowledge of the COVID-19 vaccine, we found that though majority of the

respondents in this knowledge were within the age range of 20-24 years, only 2 in 10 amongst the respondents had good knowledge of the vaccine, while 7 in 10 of them were fair. The age ranges of those within 35 to 44 years of age had the least knowledge of the vaccines, followed by those who were within the age ranges of 15-19 years of age. Overall, those within the age ranges of 25-29 years had the best knowledge ($p = 0.004$).

There was a direct positive correlation ($p = 0.001$) between those who had knowledge of the COVID-19 infection and those who had knowledge of the vaccine. Our study showed that the respondents with good knowledge of COVID-19 also had good knowledge of the COVID-19 vaccine this indicate a significant association between knowledge of COVID-19 and that of the vaccine. This is in line with a study concerning knowledge towards COVID-19 vaccine conducted in New York, which reported eight in ten of the respondents had a strong correlation between the knowledge of the corona virus and increased knowledge of the vaccine as well as positive attitude towards the acceptance of the vaccine [18].

In regards to the correlation between the knowledge of the vaccine and the level of education of the respondents, we found that minority of those who had post-secondary educational levels had good knowledge of the vaccine, while majority of those with only primary education had good knowledge of the vaccine, followed by those with secondary education, per their population respectively ($p = 0.014$). This is antagonistic to the findings in a study done that showed that the higher the level of education the more youth knowledge about the COVID-19 vaccine and willingness to accept it [19].

Our study found a good correlation between Christianity and knowledge of the vaccines, while there was a poor correlation between the Muslims and knowledge of the vaccine ($p = 0.001$).

Acceptance of COVID-19 vaccine

In general, there was a good willingness to accept the vaccine, with as much as 6 in 10 of the respondents willing to take the vaccines if it were made available. This same prevalent group, were willing to take the vaccines if permitted by their husbands, and vice versa. This goes to show the important role of patriarchy in the medico social lives of these women. However, the opinion of their employers was not an important factor to be considered, as only 4 in 10 were willing to act on their employers' instructions. That said, about four out of ten of the participants had received the vaccine, with majority of them receiving it before and after pregnancy. This was in keeping with a study done in Colombia university New York City, whereby approximately two-third of 656 respondents took the vaccine when they were non-pregnant (*i.e.* before pregnancy), then about a third took it while they were pregnant and less than a third when they were breast feeding [20].

The factors that were considered important in their deciding whether or not to receive the vaccines ranged from infection risk (23.9%) to fear of adverse effects (10.2%). The others were concern of novelty (19.7%), pregnant state (18.6%), safety of the vaccine (18.6%) and its effectiveness (12.3%). These factors were shown to have significantly influenced their decisions, as pointed out by one of the respondents during the FGD session who said she was afraid to take the

vaccine because she was pregnant, and another who had seen two co-workers experience adverse symptoms after receiving the vaccines. It was also in keeping with a study done at the Ankara city hospital in turkey where 300 women were surveyed and about four in ten of respondents indicated that they will get the vaccine if recommended for pregnant women as lack in data regarding the safety in pregnant women and possible harm to the fetus was a major concern [21].

In regards to the impact of age on acceptance, the respondents within the age range of 20-24 years had a larger population, hence, appeared to seem like the majority with willingness to accept the vaccine? Moreover, within this same population existed the highest prevalence of poor willingness to accept the vaccine? Those within 40-44 years of age had mainly fair willingness to accept the vaccine. The youngest age group, 15-19 years, had mainly good willingness. But the best willingness was seen amongst the 25-29 years age group who had approximately five in ten of them willing to accept the vaccine ($p = 0.001$). This finding is not in keeping with a study done in Ethiopia that showed that maternal age range 34-41 had a higher willingness of vaccine acceptance [42]. Most of the Christians had poor willingness to accept the vaccine, whereas the Muslims had good willingness to accept the vaccine ($p = 0.001$). The relationship between the knowledge of COVID-19 vaccine and the acceptance shows that those with good knowledge were fairly willing to accept the vaccine. It also showed that those with fair and poor knowledge of the COVID-19 vaccine had poor willingness to accept the vaccine. This was in keeping with a study in Ethiopia, as well as Kwadabeka community health center Durban; which both stated that good knowledge is one of the important factors for acceptance [23-24].

Conclusion

In accordance with the main and specific objectives, majority of the respondents were knowledgeable about the corona virus disease (93.2%). They also had knowledge about it being a potential cause of varying degree of morbidity and possible mortality (96.4%). The respondents also showed good knowledge about the means via which it could be spread (92.8%) and prevented (96.4%), respectively. Nevertheless, in regards to knowledge on the COVID-19 vaccine, a good knowledge on the vaccine was shown (89.6%). They about 81.6% of the respondents believed that the vaccine conferred protection on the receiver. Majority of the women who had good knowledge of the disease also displayed good knowledge of the vaccine. Majority of those with knowledge of the vaccines obtained their information from radio and television media. Majority of the respondents were not sure whether they were to receive the vaccine although they knew that the vaccine was not going to cause any infection to them, they however were willing to receive the vaccine if it were made available. Overall, the majority of respondents had a fair (69.2%) perception about the vaccine. However, as regards acceptance majority (60.4%) of the respondents were willing to receive the vaccine if it was made available. While majority (52.4%) of the respondents did not care about their employer's opinion in their decision to or not to take the vaccine, most (56.8%) of them cared about their husband's opinion. Although only about 38.4% had received the vaccine with 85.4% of these not being pregnant at the time.

Recommendations

Based on our findings, we have the following recommendations.

To the Government and PHC-Board

1. The government and the PHC board should as matter of urgency intensify sensitization of communities and patients about the COVID vaccine. Paying attention to
 - a. Hosting community seminars and workshops to make the community aware of the corona virus vaccination scheme, of the objectives and distribution.
 - b. To use the media such as television and radio which seems to be a significant means of awareness amongst the respondents in this study.
 - c. Mobilize the health workers to enlighten the persons who come for Ante Natal Care (ANC) through posters and oral awareness.
 - d. Make available the vaccine to the various PHCs and notify the women so that they can have access to it.
2. Make policy statements to enable pregnant women get the COVID vaccine.
3. Healthcare facility should encourage willingness to accepting the vaccine, through special hospital workshops and clinical counseling.
4. The PHCs should make effort towards sustaining the delivery of the vaccines to the women to attract and encourage acceptance of the vaccine.

To the healthcare workers

1. Healthcare workers should encourage willingness to accepting the COVID vaccine, through health education, workshops and clinical counseling.
2. Should promote informal conversations on the importance of the vaccines at their social gatherings. As seen as one of the sources of knowledge amongst women on FGD in this study.
3. They can also work to reduce and debunk false information in circulation and on social Medias.

To the Pregnant women

1. They should foster establishment of social support groups and discussion avenues where conversations such as corona virus, its vaccines and new (possibly false) information acquired can be discussed and critiqued.
2. The women should be encouraged to accepting the vaccines and not believing false information from unreliable sources.

To prospective researchers

1. More randomized Case-control trials should be done to better ascertain the impact of the vaccine on pregnancy and pregnancy on the vaccine
2. To conduct systematically reviewed studies to create a general stratification of safety criteria for acceptance of the vaccines in pregnancy and prenatal period, especially amongst nursing mothers.
3. To better make available regional data acquired through quantitative and Quantitative studies, information on the safety and possible adverse effects of the vaccine amongst pregnant women.

Conflict of Interest

The authors declare no conflict of interests.

Acknowledgement

To our colleagues for their most invaluable contribution to the completion of this work, Dr. Okafor Kingsley, Dr. Menegbe Cincinsoko and Dr. Osoba Blessing, without who this work would not have been thus refined. To our families, The OTOBOs, OTELEs and the OKOROs, who have been our back bone through the length and breadth of this research work? To our friends, who are always there in many precious ways, and to God who gives all? To Us. And a special one to Mrs. Vivian Otele Aladegbami... for everything and more, thank you (from DD Otobo, MD).

Authors Contribution

Conceptualization, Data collection and Writing = Otobo Daniel David.

Data analysis and Final editing = Okoro Ngozi Ijeoma.

Funding: The authors have received not external funding in cash or in kind for any part of this work.

References

1. Coronavirus confirmed as pandemic by World Health Organization - BBC News [Internet], [Cited 2022 Jan 14]. Available from: <https://www.bbc.com/news/world-51839944>
2. COVID-19 Situation update for the WHO African Region, External Situation Report 2 (11 March 2020) - Nigeria | Relief Web [Internet], [Cited 2022 Jan 14]. Available from: <https://reliefweb.int/report/nigeria/covid-19-situation-update-who-african-region-external-situation-report-2-11-march>
3. David OD, Ngozi OI. The COVID-19 and the Nigerian Pandemic: A review on COVID-19 in the inequitable world of Nigerians. *International Journal of Advanced Community Medicine*. 2021;4(3):17-22. <https://doi/10.33545/comed.2021.v4.i3a.200>
4. First COVID-19 COVAX vaccine doses administered in Africa [Internet], [Cited 2022 Jan 14]. Available from: <https://www.unicef.org/press-releases/first-covid-19-covax-vaccine-doses-administered-africa>
5. COVID-19 vaccines shipped by COVAX arrive in Nigeria | WHO | Regional Office for Africa [Internet], [Cited 2022 Jan 14]. Available from: <https://www.afro.who.int/news/covid-19-vaccines-shipped-covax-arrive-nigeria>
6. Africa News: Nigeria Plans COVID-19 Vaccination For 40% of Population in 2021-Bloomberg [Internet], [Cited 2022 Jan 14]. Available from: <https://www.bloomberg.com/news/articles/2021-01-14/nigeria-plans-covid-19-vaccination-for-40-of-population-in-2021>
7. SS E, AO O, RY A, KA O, EO O, AJ N, *et al.* Assessment of Knowledge, Perception and Readiness of Nigerians to Participate in the COVID-19 Vaccine Trial. *Vaccines and Immunization Journal*. 2020;4:1. [Internet], [Cited 2022 Jan 4] Available from: <https://www.comminit.com/africa/content/assessment-knowledge-perception-and-readiness-nigerians-participate-covid-19-vaccine-tri>
8. Nigeria: Attitudes towards COVID-19 vaccination | Statista [Internet], [Cited 2022 Jan 14]. Available from: <https://www.statista.com/statistics/1195373/attitudes-towards-covid-19-vaccination-in-nigeria/>
9. Otobo DD, Mesak D, Okoro NI. The Hygiene Hypothesis: Understanding the Low Rate of Spread and Virulence of the SARS-CoV2 Virus in Africa, 2021, May 27, [Cited 2022 Jan 14], Available from: <https://zenodo.org/record/4824363>
10. Davis DD, Kane SM. Phocomelia. *Stat Pearls* [Internet]; c2021. [Cited 2022 Jan 14], Available from: <https://www.ncbi.nlm.nih.gov/books/NBK559212/>
11. Satin A, Sheffield J. The COVID-19 vaccine and pregnancy: what you need to know. *Johns Hopkins Medicine*. c2022. <https://hopkinsmedicine.org>
12. Centre for Disease Control (CDC). Recommends pregnant women get COVID-19 vaccine – Reuters. <https://www.reuters.com>
13. Adejumo AA. Still on Nigeria's railway history - Narrow gauge in Nigeria. *Nigerians in America*, Published 17 October, 2008.
14. Google Maps [Internet], [Cited 2022 Jan 15], Available from: <https://www.google.com/maps/contrib/117110303450661788409/reviews/@9.8802085,10.0008013,9z/data=!3m1!4b1!4m3!8m2!3m1!1e1>
15. Ayuba I, Wash PM. An Assessment of the Provision and Distribution of Health Facilities in Bukuru Town, Plateau State, Nigeria. *Journal of Health, Medicine and Nursing*. 2016;24:99-110.
16. Bolarinwa OA. Sample size estimation for health and social science researchers: The principles and considerations for different study designs. *Nigerian Postgraduate Medical Journal*. 2020;27(2):67-75. [Internet], [Cited 2022 Jan 15], Available from: <https://pubmed.ncbi.nlm.nih.gov/32295935/>
17. Stadnytskyi V, Bax CE, Bax A, Anfinrud P. The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission. *Proceedings of the National Academy of Sciences of the United States of America*. 2020;117:22.
18. Ciardi F, Menon V, Jensen JL, Shariff MA, Pillai A, Venugopal U, *et al.* Knowledge, Attitudes and Perceptions of COVID-19 vaccination among healthcare Workers of an inner - city hospital in New York. *Vaccines*. 2021;9(5):516. [Internet]. <https://www.mdpi.com/2076-393X/9/5/516/htm>
19. Ward JK, Alleaume C, Coconel Group. The French public's attitudes to a future COVID-19 vaccine: The Politicization of a public health issue. *Social Science & Medicine*. 2020 Nov;265:113414.
20. Sutton D, D'Alton M, Zhang Y, Kahe K, Cepin A, Goffman D, *et al.* COVID-19 vaccine acceptance among pregnant, breastfeeding, and non-pregnant reproductive-aged women. *American Journal of Obstetrics and Gynecology*. MFM. 2021;3:5.
21. Gongu AS, Oluklu D, Atalay A, Menekse BD, Tanacan A, Moraloglu TO, *et al.* COVID-19 vaccine acceptance in pregnant women. *International Journal of Gynecology & Obstetrics*. 2021;154(2):291-296.
22. Hoque AM, Buckus S, Hoque M, Hoque ME, Van Hal G. COVID-19 Vaccine acceptability among pregnant women at a primary health care facility in Durban, South Africa. *European Journal of Medical and Health Sciences*. 2020;2:5.
23. Mose A, Yeshaneh A. COVID-19 vaccine acceptance and its associated factors among pregnant women attending antenatal care clinic in southwest Ethiopia: Institutional-Based cross-sectional study. *International Journal of General Medicine*. 2021;14:2385-95. <https://pubmed.ncbi.nlm.nih.gov/34135622>