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Knowledge, Perception and Acceptance of COVID-19 Vaccination Amongst Pregnant Women in Adena, Kwara State, Nigeria

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Abstract: Background: COVID-19 is associated with poor pregnancy and maternal outcomes. COVID-19 vaccination is recommended all over the world, yet the vaccination rate during pregnancy in Nigeria is insignificant. The public health response to the global COVID-19 pandemic varies widely in different regions of Nigeria. Aim: To investigate the knowledge, perception and acceptance of COVID-19 vaccination amongst pregnant women in Adena, Kwara State, Nigeria. Materials and Methods: Sample size of this study consisted of two hundred and thirty (230) respondents. Data including biodata and questions relating to the aim of the study were retrieved using a structured questionnaire. These data were analyzed using the Chi-square technique (χ^2) of the SPSS version 23 statistical software. Chi-square tests were used for comparative analysis of the demographic information to perception and acceptance of COVID-19 vaccination amongst pregnant women, and to test the research hypotheses at a level of significance set at $p<0.05$. Results: Mean age of the respondents (pregnant women) was 29.3±6.14 years and the mean parity was 2.3±1.6. 68.7% (n=158) of the women had a tertiary education. 40.9% (94) and 59.1% (136) of the respondents were Christians and Muslims respectively. 73.44% of the respondents had good knowledge about COVID-19 and 57.8% confirmed that they would accept the vaccine against SARS-CoV-2. From the research hypotheses tested, this study found that there was a significant difference in the perception of the pregnant women in Adena to COVID-19 vaccination based on their educational qualification (p=1.56624E-20) and age (p=8.53956E-18), but no significant difference was noticed based on their religion (p=0.05). There was a significant difference in the acceptance of COVID-19 vaccination amongst the pregnant women based on their educational qualification (p=3.22221E-11) and age (p=0.001473), but no significant difference was observed based on their religion (p=0.23). Conclusion: The general public needs to be sensitized on COVID-19 and any related pandemic at every gathering, e.g., churches, mosques, hospitals, etc. Health systems need to develop national surveillance systems to collect up-to-date clinical, virological, and epidemiological information on trends in human infection with seasonal influenza viruses. Health systems are also advised to keep up-to-date on the latest information concerning pandemics from trusted global sources e.g. World Health Organization (WHO), national sources e.g. Nigerian Centre for Disease Control (NCDC).

Keywords: Knowledge, Perception, Acceptance, COVID-19, Pandemic, Vaccination, Pregnancy, Nigeria

1. Introduction

Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in Wuhan, China in November 2019 [23]. On 11th March 2020, COVID-19 was declared a global pandemic by the World Health Organization (WHO) [36]. Since the beginning of the COVID-19 pandemic, globally confirmed cases and associated mortality and morbidity have rapidly

increased, with 761,402,282 confirmed cases, including over 6,887,000 deaths recorded as of 31st March 2023 [35]. In Nigeria, as of 31st March 2023, over 266,660 cases of COVID-19 infection have been reported with 3,558 active cases of the infection, and a total of 3,155 deaths have been recorded [25, 34, 37].

Anemia in pregnancy (a common occurrence in Nigeria) may also predispose pregnant women to susceptible infections like COVID-19 due to weakened immunity [38, 41]. Connected to morbidity of COVID-19 in affected individuals is their health status prior to infection. In patients with underlying health conditions e.g. dyslipidemia, essential hypertension, type 2 diabetes mellitus, etc, the clinical course of COVID-19 will be worse [39, 43-47]. Knowledge, attitude and practice of healthcare workers towards waste management also play a crucial role in the transmissibility of the infection as a sterile, clean environment reduces the chances of transmission [40, 42].

Presently, there are varieties of COVID-19 vaccines produced in several laboratories in the United States of America (USA), Europe, and Asia. A few of the vaccines are: Pfizer BioNTech - produced in Germany by BioNTech; AstraZeneca (Covishield) - produced in Cambridge, United Kingdom by AstraZeneca; Johnson & Johnson's (Janssen) - produced in The Netherlands by Janssen Biologies B. V.; Moderna – produced in Cambridge, Massachusetts, USA by Moderna; Sputnik V (Gamaleya) - produced in Russia by Gamaleya Research Institute of Epidemiology and Microbiology; BBV152 (Covaxin) - produced in India by Indian Council of Medical Research (ICMR) and Bharat Biotech Ltd.; BBIBP-CorV (Sinopharm) - produced in China by China National Pharmaceutical Group Corporation, Beijing Institute of Biological Products, and Wuhan Institute of Biological Product; CoronaVac - produced in China by Sinovac Biotech Ltd [12, 24]. Of all the COVID-19 vaccines produced, the National Agency for Food and Drug Administration and Control (NAFDAC) in Nigeria in February 2021 approved the use of AstraZeneca (Covishield); in April 2021, NAFDAC approved Pfizer for emergency use; and in May 2021, NAFDAC granted conditional emergency use authorization for Janssen [24].

With a total of 13,262,840,500 COVID-19 doses administered globally as of March 2023, the vaccine uptake differs greatly by region [35]. In Africa, uptake has been challenged by limited access during the early phases of the pandemic response, supply chain issues, and low levels of vaccine acceptance [18]. As of February 2022, COVID-19 vaccine uptake in Africa was 29% (12% fully vaccinated and 17% partially vaccinated) with Seychelles (77%) having the highest rates. Current vaccination rates in many countries are very low, <10%, including Cameroon with a rate of 3.2% [11]. Nigeria with a population of over 220,000,000 has a total of 116,606,863 vaccine doses [25, 34].

Pregnant women are at high risk for COVID-19 and its complications such as stress and anxiety, particularly when compared with non-pregnant women. These COVID-19 complications during pregnancy could lead to pregnancy complications such as pre-eclampsia, depression, low birth weight, low Apgar score, preterm, and death [6, 10, 15]. To alleviate these complications of COVID-19, the COVID-19 vaccine is the most promising solution instead of treatment [21]. COVID-19 vaccines are enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry [13] with characteristic club-shaped spikes that project from their surfaces [4]. As the number of new species increased, the genus was split into four general: α, β, δ, and γ coronaviruses in 2019 [9].

Only very few of the existing trials of COVID-19 vaccine included pregnant women [7] in the trials. However, little is known about COVID-19 vaccine hesitancy among pregnant women and there are some levels of uncertainty about the effects of COVID-19 on pregnancy [6]. Moreover, it is observed that pregnant women are not always interested in maternal health talk but only in the well-being of their fetuses. Since the well-being of the fetus is much dependent on the mother's health, and vaccination is perhaps the most promising solution to the pandemic, it is important to examine the knowledge, perception and acceptance of COVID-19 vaccine amongst pregnant women in Adena, Kwara State, Nigeria.

2. Materials and Method

2.1. Study Area

This descriptive study was conducted in Adena, one of the ten political wards and one of the major towns in Kaiama Local Government Area (LGA), Kwara State, Nigeria between September 2022 and January 2023. Kaiama LGA is in Northwestern part of Kwara State, and the population according to the 2006 national census is 124,164. Kaiama LGA is divided into ten political wards, and the languages spoken are Bokobaru, Fulani, Yoruba, and Hausa. The people of Adena predominantly speak Yoruba and Hausa languages, and the majority of the inhabitants are farmers cultivating cassava, guinea corn, soya beans, beans, and yam in commercial quantities.

2.2. Study Population and Sample Size Determination

The study population was made up of only pregnant women residing in Adena town. With an estimated study population of over 10,000, Kish Leslie's formula for cross-sectional studies was used to calculate the sample size [8].

$$n = \frac{Z^2 PQ}{d^2}$$

Where,

n=desired sample size when the total population is greater than 10,000.

Z=standard normal deviate usually set at 1.96 which corresponds to the 95% confidence interval.

P=proportion of acceptance of COVID-19 vaccine during pregnancy, set at 18% from the pilot study conducted among pregnant women in another state in Nigeria.

Q=complementary proportion equivalent to 1-P; that is,

1-0.18 equals to 0.82

d=degree of accuracy desired (absolute precision), which is 5.0% (0.05)

Therefore:

$$n = \frac{1.96^2 \times 0.18 \times 0.82}{0.05^2} = \frac{3.8416 \times 0.18 \times 0.82}{0.0025} = \frac{0.5670201}{0.0025} = 227$$

The minimum sample size for this study was 227. With the addition of a 10% non-response rate to the calculated sample size, 250 was obtained. This means 250 pregnant women (respondents) were selected by a simple random sampling technique, and only the pregnant women who consented voluntarily to participate were included. Moreover, special care was taken to ensure that the respondents were ≥20 years and that there was confirmation of pregnancy by ultrasound scan.

2.3. Study Procedure and Data Analysis

Data were collected by the administration of pre-tested questionnaires by the research team and a few trained research assistants to the participants who met the inclusion criteria. The questionnaire was divided into sections A-D. Section A was on socio-demographic characteristics of the respondents, section B contained questions relating to knowledge of pregnant women on COVID-19, section C consisted of questions relating to perception of pregnant women towards COVID-19 vaccination, and section D contained questions relating to factors associated with acceptance of COVID-19 vaccine. These sections of the questionnaire were structured on close-ended items. Collected data were checked for accuracy, cleaned, hardcoded and analyzed using IBM SPSS version 23.0. Chi-square (X^2) was used to test the null hypotheses formulated. A 95% confidence interval was used in this study and a p-value of ≤0.05 was considered statistically significant.

2.4. Ethical Consideration

Supportive letters were obtained from the Director, National Open University of Nigeria, Ilorin Study Centre, and similar permission from Kwara State Ministry of Health. Also, informed consent was obtained from each respondent and they were assured of confidentiality and anonymity of the information provided.

3. Results

Only 230 out of the expected 250 pregnant women willingly participated or responded. The data from these participants were extracted from the questionnaires, organized into tables and analyzed. Table 1 illustrates the socio-demographic information of these pregnant women. Their mean age and mean parity were 29.3±6.14 years and 2.3±1.6 children respectively. Ninety-four of the women (40.9%) are Christians while the remaining are Muslims. 5.2% (n=12) and 7.8% (n=18) of the women had no formal education and Master's degree respectively.

Table 1. Socio-demographic Analysis of the Respondents.

Socio-demographic characteristics	Options	n	%
Age distribution	<21	6	2.6
	21-25	61	26.5
	26-30	63	27.4
	31-35	59	25.7
	≥36	43	17.8
	Total	230	100
	Mean age=29.3±6.14		
Religious background	Christian	94	40.9
	Muslim	136	59.1
	Total	230	100
Parity	0	34	14.8
	1	41	17.8
	2	52	22.6
	3	49	21.3
	4	42	18.3
	5	1	0.4
	6	3	1.3
	7	8	3.5
	Total	230	100
	Mean parity=2.3±1.6		
Educational level	No formal education	12	5.2
	Primary	31	13.5
	Secondary	29	12.6
	Diploma	24	10.4
	HND/OND/NCE	40	17.4
	BSc	76	33.0
	MSc	18	7.8
	Total	230	100

Table 2 shows the knowledge of COVID-19 amongst the pregnant women. All the women already heard about COVID-19. 83.5% (n=192) knew it is caused by a virus. 49.1% (n=103) knew that the disease could be asymptomatic. 58.3% (n=134) knew that the incubation period for coronavirus is 1-14 days, and almost all the respondents (96.1%, n=221) knew the protective measures against COVID-19. Taking the average of the correct answers to the questions (except question 2) on the knowledge, the average was calculated as 73.44%, which means 169 (73.44%) of the 230 women have good knowledge about COVID-19.

Table 2. Knowledge about COVID-19 Vaccination.

S/No.	Questions		n	%
1	Have you heard of COVID-19?	Yes	230	100
		No	0	0
2	If yes in 1 above, where did you hear of it?	Internet/social media	63	27.4
		Friends/family	26	11.3
		TV/Radio	62	27.0
		Government enlightenment campaigns	76	33.0
		Other sources	3	1.3
3	Is COVID-19 similar to the Flu virus?	Yes	203	88.3

S/No.	Questions		n	%
		No	27	11.7
4	What causes COVID-19?	Virus	192	83.5
		I don't know	38	16.5
5	Does eating or contacting wild animals result in COVID-19 infection?	Yes	88	38.3
		No	142	61.7
		Ebola	51	22
		HIV/AIDS	26	11
	Which of the following diseases is similar to COVID-19?	Malaria	48	21
6		SARS	71	31
		Typhoid	25	11
		All of the above	7	3
		None of the above	2	1
7	Is it possible for a COVID-19-positive person to show no symptoms?	Yes	113	49.1
		No	93	40.4
		I don't know	24	10.4
		Less than 7 days	27	11.7
8	How long does it take from contracting the disease to showing symptoms (incubation period)?	1–14 days	134	58.3
		2–21 days	49	21.3
		I don't know	20	8.7
9	Who can get infected with COVID-19?	Old people only	16	7.0
		Anyone can be infected	214	93.0
10	Do you know the protective measures against COVID-19?	Yes	221	96.1
		No	9	3.9

***Table 3.** Perception of COVID-19 Vaccination.*

S/No.	Questions	Responses	n	%
1	Are you well-informed about COVID-19 vaccination?	Yes	165	71.7
		No	65	28.3
		Not satisfied	60	26.1
	How satisfied are you with your	Partially satisfied	20	8.7
2	country's response to the	Satisfied	51	22.2
	COVID-19 pandemic?	More than satisfied	45	19.5
		Very satisfied	54	23.5
	How satisfied are you with the	Very satisfied/keeps me updated	140	60.9
	news media and social media	Makes me worry more/stressful	52	22.6
3	coverage of the COVID-19	Not enough information	11	4.8
	pandemic?	There are more lies than truth	25	10.9
		I don't follow any media update	2	0.9
		Attending religious gatherings	16	7
		Avoid handshakes and face kissing	206	89.6
	What is to be done to the	Eat healthy/participation in sports	32	13.9
4	communities to reduce the spread	Follow/respect the health recommendations of my country	58	25.2
	of COVID-19?	Social distancing/avoiding crowd	219	95.2
		Volunteer to support whenever possible	27	11.7
		I don't know	5	2.2
		Collaboration between environmental, animal and human health workers	9	3.9
		Establish early alerts and global warning systems for infectious diseases	28	12.2
	What can prevent/help against the	Improve surveillance in the human and animal health sectors	30	13
5	occurrence of such a global	Intensify research on preventive measures such as vaccines/diagnosis	53	23
	pandemic in the future?	Prioritize human life/health welfare over animal or environmental ones	25	10.9
		Raise public awareness of proper hygiene/healthy habits	60	26.1
		Reduce international travels	25	10.9

***Table 4.** Level of Acceptance of COVID-19 Vaccination.*

S/No.	Questions	Responses	n	%
1	Do you think COVID-19 is in Nigeria?	Yes	174	75.7
		No	56	24.3
2	Have you had a COVID-19 test?	Yes	134	58.3
		No	96	41.7
		Positive	13	9.7
3	If Yes, what was the result?	Negative	117	87.3
		Awaiting Result	4	3.0
4	Do you know anyone who has or who had COVID-19 infection?	Yes	85	37.0
		No	145	63.0
5	Do you know anyone who died of COVID-19?	Yes	67	29.1

S/No.	Questions	Responses	n	%
		No	163	70.9
6	Are you worried about getting COVID-19?	Yes	146	63.5
		No	84	36.5
7	Are you worried about your family or friends getting COVID-19?	Yes	155	67.4
		No	75	32.6
8	Have you ever been vaccinated for any type of illness in the past?	Yes	177	77.0
		No	53	23.0
9	Have your children ever received any vaccines for any type of illness?	Yes	156	67.8
		No	74	32.2
10	Do you think the COVID-19 vaccine is effective?	Yes	134	66.5
		No	68	33.5
11	Have you heard of any risks associated with COVID-19 vaccine?	Yes	131	57.0
		No	99	43.0
12	Is COVID-19 vaccine currently available anywhere in your region?	Yes	204	88.7
		No	26	11.3
13	If you were offered a COVID-19 vaccine today, would you take it?	Definitely Yes	133	57.8
		Not sure	91	39.6
		Definitely No	6	2.6
14	If you have children, would you accept a COVID-19 vaccine for them, if it was available today?	Definitely Yes	136	59.1
		Not sure	69	30.0
		Definitely No	25	10.9

Table 3 illustrates the pregnant women's responses to the questions on perception of COVID-19. One hundred and sixty-five (71.7%) of the respondents were well-informed about COVID-19 vaccination. On how satisfied with the government's response to the COVID-19 pandemic, 34.8% were not satisfied while 65.2% were satisfied. Other questions like how satisfied the pregnant women were with the news media and social media coverage of the COVID-19 pandemic and what was to be done to the communities to reduce the spread of COVID-19 were also assessed and the answers are as seen in Table 3.

Table 4 describes the level of acceptance of COVID-19 vaccination amongst the pregnant women. One hundred and thirty-four (58.3%) agreed to have been tested while ninety-six (41.7%) were yet to be tested. Of the 134 tested women, 9.7%, 87.3%, and 3% were positive, negative and awaiting results respectively. One hundred and thirty-four (66.5%) of the women believe that COVID-19 vaccine is effective but 33.5% do not believe that the vaccine is effective. Moreover, one hundred and thirty-three (57.8%) of the pregnant women stated they would definitely take the vaccine if offered on the spot, 91 (39.6%) were not sure if they would take the vaccine, while 6 (2.6%) said that they would definitely not take the vaccine if given at the spot. The average

overall frequency of the responses to questions 1, 2, 10, 13, and 14 can be deduced to mean a holistic COVID-19 vaccination acceptance rate of 63.48% in the study participants (see Table 4).

Tests of Hypotheses

This study focused on testing six (6) research hypotheses. These hypotheses tests were employed to examine the association or the significant difference between two independent variables, at a level of significance less than 0.05 ($p<0.05$).

Hypothesis One

H_0: There is no significant difference in the perception of pregnant women in Adena to COVID-19 vaccination based on educational qualification.

H_1: There is a significant difference in the perception of pregnant women in Adena to COVID-19 vaccination on the basis of educational qualification.

Table 5 shows the test of Hypothesis One where the null hypothesis (H_0) was rejected because the chi-square *p*-value was less than 0.05 ($p=1.56624E-20$). This implies that there is a significant difference in the perception of pregnant women in Adena to COVID-19 vaccination based on their educational qualification.

Table 5. *Association between Educational Qualification and Perception of COVID-19 Vaccination.*

Do you think we can prevent such a global pandemic in the future with proper COVID-19 vaccination?									
		Actual values			Total	Expected values			Total
		Yes	No	Maybe		Yes	No	Maybe	
	No formal education	11	1	0	12	8.30	1.2	2.50	12
	Primary	19	10	2	31	21.43	3.1	6.47	31
	Secondary	6	1	22	29	20.05	2.9	6.05	29
Educational	Diploma	6	7	11	24	16.59	2.4	5.01	24
Qualification	OND/HND	34	4	2	40	27.65	4	8.35	40
	BSc	66	0	10	76	52.54	7.6	15.86	76
	MSc	17	0	1	18	12.44	1.8	3.76	18
	Total	159	23	48	230	159	23	48	230

p=1.56624E-20, df=12, Chi-square (χ^2) =122.987

Hypothesis Two

H_0: There is no significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena based on their educational qualification.

H_1: There is a significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena based on their educational qualification.

Table 6 shows the Hypothesis Two test showing that H_0 was rejected because p was <0.05 (p=3.22221E-11), implying that there is a significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena based on their educational qualification.

Table 6. Association Between Educational Qualification and Acceptance of COVID-19 Vaccination.

If you were offered a COVID-19 vaccine today, would you take it?									
		Actual values			Total	Expected values			Total
		Not sure	Definitely No	Definitely Yes		Definitely Yes	Not sure	Definitely No	
Educational Qualification	No formal edu.	11	1	0	12	6.9	4.7	0.3	12
	Primary	10	21	0	31	17.9	12.3	0.8	31
	Secondary	0	26	3	29	16.8	11.5	0.8	29
	Diploma	14	10	0	24	13.9	9.5	0.6	24
	OND/HND	26	14	0	40	23.1	15.8	1.0	40
	BSc	60	14	2	76	43.9	30.1	2.0	76
	MSc	12	5	1	18	10.4	7.1	0.5	18
	Total	133	91	6	230	133	91	6	230

p=3.22221E-11, df=12, Chi-square (χ^2)=76.184

Hypothesis Three

H_0: There is no significant difference in the perception of pregnant women in Adena to COVID-19 vaccination on the basis of age.

H_1: There is a significant difference in the perception of pregnant women in Adena to COVID-19 vaccination on the basis of age.

Table 7 shows the test of Hypothesis Three where the H_0 was rejected because p was <0.05 (p=8.53956E-18). This means that there is a significant difference in the perception of the pregnant women in Adena to COVID-19 vaccination based on their age.

Table 7. Association between Age and Perception of COVID-19 Vaccination.

Do you think we can prevent such a global pandemic in the future?									
		Actual values			Total	Expected values			Total
		Yes	No	Maybe		Yes	No	Maybe	
Age	<21 years	3	1	2	6	4.1	0.6	1.3	6
	21-25 years	37	18	6	61	42.2	6.1	12.7	61
	26-30 years	46	2	15	63	43.6	6.3	13.1	63
	31-35 years	33	1	25	59	40.8	5.9	12.3	59
	≥36 years	40	1	0	41	28.3	4.1	41	41
	Total	159	23	48	230	159	23	48	230

p=8.53956E-18, df=8, Chi-square (χ^2) =66.094

Hypothesis Four

H_0: There is no significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena based on their age.

H_1: There is a significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena based on their age.

Table 8 shows the test of Hypothesis Four where the H_0 was rejected because p was <0.05 (p=0.001473). This implies that there is a significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena based on their age.

Table 8. Association between Age and Acceptance of COVID-19 Vaccination.

If you were offered a COVID-19 vaccine today, would you take it?									
		Actual values			Total	Expected values			Total
		Definitely Yes	Not sure	Definitely No		Definitely Yes	Not sure	Definitely No	
Age	<21 years	1	5	0	6	3.5	2.4	0.2	6
	21-25 years	30	31	0	61	35.3	24.1	1.6	61
	26-30 years	36	27	0	63	36.4	24.9	1.6	63
	31-35 years	34	22	3	59	34.1	23.3	1.5	59
	≥36 years	32	6	3	41	23.7	16.2	1.1	41
	Total	133	91	6	230	133	91	6	230

p=0.001473, df=8, Chi-square (χ^2) =25.262

Hypothesis Five

H_0: There is no significant difference in the perception of pregnant women in Adena to COVID-19 vaccination based on their religion.

H_1: There is a significant difference in the perception of pregnant women in Adena to COVID-19 vaccination based on their religion.

Table 9 illustrates the test of Hypothesis Five where the H_0 was accepted and H_1 was rejected because p was ≥ 0.05 ($p=0.05$), signifying there is no significant difference in the perception of the pregnant women in Adena to COVID-19 vaccination based on their religion.

Table 9. Association between Religion and Perception of COVID-19 Vaccination.

Do you think we can prevent such a global pandemic in the future?									
		Actual values			Total	Expected values			Total
		Yes	No	Maybe		Yes	No	Maybe	
Religion	Christian	58	9	27	94	65.0	9.4	19.6	94
	Muslim	101	14	21	136	94.0	13.6	28.4	136
	Total	159	23	48	230	159	23	48	230

$p=0.05$, df=2, Chi-square (χ^2) =5.996

Hypothesis Six

H_0: There is no significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena on the basis of religion.

H_1: There is a significant difference in the acceptance of COVID-19 vaccination amongst pregnant women in Adena on the basis of religion.

Table 10 shows the test of the Hypothesis Six where the H_0 was accepted because p was <0.05 ($p=0.23$), meaning that there is no significant difference in the acceptance of COVID-19 vaccination amongst the pregnant women in Adena based on their religion.

Table 10. Association between Religion and Acceptance of COVID-19 Vaccination.

If you were offered a COVID-19 vaccine today, would you take it?									
		Actual values			Total	Expected values			Total
		Definitely Yes	Not sure	Definitely No		Definitely Yes	Not sure	Definitely No	
Religion	Christian	48	43	3	94	54.4	37.2	2.5	94
	Muslim	85	48	3	136	78.6	53.8	3.5	136
	Total	133	91	6	230	133	91	6	230

$p=0.23$, df=2, Chi-square (χ^2) =2.998

4. Discussion

Studying the knowledge, perception, and acceptance of COVID-19 vaccination amongst pregnant women is essential for necessary intervention that will aid maternal and fetal well-being. Several studies on COVID-19 have been done in terms of its impact on children and pregnant women [1, 3, 14, 31, 32], on COVID-19 vaccination [5, 16, 17, 28], and COVID-19 interventions [26, 27]. Pregnancy, an immunocompromised period in mothers, and a sensitive period to both mother and fetuses have been proven to expose fetuses to teratogens such as drugs, chemicals, viruses, etc from the mother, and the resultant effects could range from mild to fatal [29, 30]. Therefore, optimum care of pregnant women is mandatory.

Presently, there is no generally accepted antiviral treatment for COVID-19, although it does not mean the disease cannot be managed [33]. This variation coupled with the severity of the disease postulated the fabrication of COVID-19 vaccines. Of the various vaccines produced, the UK was the first country to approve the administration of a type of the vaccines - Pfizer-BioNTech [16, 19, 20]. With little inclusion of pregnant women in the trials of COVID-19 vaccination, we must update the literature on pregnant women's knowledge, perception, and acceptance of COVID-19 vaccination.

This study achieved three (3) research objectives and six (6) hypotheses. Knowledge of COVID-19 vaccination amongst pregnant women in this study is 73.44% (n=169), meaning more than two-thirds of the pregnant women were well-informed about COVID-19. This study shows that all pregnant women have heard of COVID-19 but only 31% could say that COVID-19 is related to Severe Acute Respiratory Syndrome (SARS) which is also caused by SARS-associated coronavirus (SARS-CoV). It was discovered that 83.5% knew the disease is caused by a virus, although the particular virus was not stated in the questionnaire so as not to introduce an influenced answer. Only 58.3% knew the incubation period of the virus but the number that knew the preventive measures was impressive (96.1%). Relating the present study to a similar work by Jhirwal *et al*, 2022 in Rajasthan, Northern India, the percentage of pregnant women with adequate knowledge of COVID-19 was lesser than in the reference study. Jhirwal *et al* found that 94.5% of the respondents had adequate knowledge of COVID-19. Nevertheless, the average overall frequency score of the correct responses in the study was 71.1% [19]. 57.8% of the women knew that COVID-19 originated from bats, 93.0% knew it is fatal, 78.9% knew COVID-19 is transmitted through close contact and droplets, while 97.2%

knew the symptoms and the protective measures against COVID-19 [19].

The perception of the pregnant women in this study was found to corroborate the results of other studies. This study showed that 71.7% of the pregnant women were familiar with COVID-19 vaccination. A little below 83.0% of pregnant women were aware of COVID-19 maternal vaccines in a study by Marbán-Castro *et al*, in Barcelona, Spain [22]. Surprisingly, in Marbán-Castro *et al*'s study, 14% of healthcare workers (HCWs) were not aware of COVID-19 maternal vaccines [22]. This study gathered that 26.1%, 8.7%, and 65.2% of the respondents were not satisfied, partially satisfied, and satisfied/very satisfied with their country's response to the COVID-19 pandemic. Moreover, on what is perceived to be done to reduce the spread of the disease, 89.6% and 95.2% believed that handshakes or face kissing should be avoided and social distancing should be practised respectively. Furthermore, in Marbán-Castro *et al*'s study, 37%, 12%, and 6% of pregnant women perceived that the vaccine will harm their baby, harm them, and that the vaccine is ineffective respectively, and these factors limited them from getting vaccinated against COVID-19 [22]. On the preventive measures against COVID-19, the pregnant women believed it is paramount to raise awareness on proper hygiene and healthy habits, and intensify research on preventive measures such as vaccines/diagnosis.

Previously, a 50.7% acceptance rate of the COVID-19 vaccine has been documented by Al-Mustapha *et al* in a similar study done among 3,076 Nigerians irrespective of gender [2]. In Africa, the acceptance rate is averaged at 29% with Seychelles (77%) having the highest rate, and other countries having very low (<10%) acceptance rates including Cameroon with a rate of 3.2% [11]. This index study identified the acceptance of COVID-19 vaccine amongst pregnant women to be 57.8% as 133 out of the 230 respondents stated that they would definitely take the vaccine if offered on the spot. A study in France presented a far lower acceptance rate of 29.5%. The main reason for that low acceptance was that the women were more afraid of potential side effects of the vaccine on the fetus than of COVID-19 [16].

Ayhan*et al* documented that 37% of the pregnant women who visited Ankara City Hospital, Turkey, said that they would accept the vaccine if only it is recommended for pregnant women [5]. Another survey by Skjefte*et al*, 2021, on the acceptance of COVID-19 vaccine among 5,294 pregnant women and mothers of young children in sixteen countries showed that the acceptance rate amongst pregnant women was highest in Mexico and India (>80%), then Colombia, Philippines, and Brazil (70% - <80%), Peru, Argentina, and South Africa (>60% -<70%), Italy and Spain (a little above 50%), United Kingdom, Chile, and New Zealand (>40% - <50%), United States of America (~41%), Australia (~40%), and Russia had the least acceptance rate (~30%) [28]. Chakraborty *et al*'s study on the acceptance of COVID-19 vaccines of Asian origin in ten Asian countries (*n*=8,708) showed that Malaysians had the highest acceptance rate (94.3%), then Indonesians (93.3%), then

Chinese (88.6%), South Koreans (79.8%), Indians (74.5%), Singaporeans (67.9%), Hong Kongers (63.0%), Russians (54.9%), Saudi Arabians (50.52%), and Kuwaitis with the least acceptance rate (23.6%) [12]. Marbán-Castro *et al*'s study showed that 85%, 63%, 54%, 12%, 11%, and 1% of the pregnant women suggested that they would take (accept) the vaccine if recommended by HCW, for self-protection, to protect their baby, if recommended by friends, other pregnant women get the vaccine, and if it is free respectively [22].

Finally, this study proved that there exists amongst the pregnant women in Adena, an association between the perception of COVID-19 vaccination and their educational qualifications (*p*=1.56624E-20) and their age (*p*=8.53956E-18) but no association with their religion (*p*=0.05). There also exists an association between acceptance of COVID-19 vaccination amongst the pregnant women and their educational qualifications (*p*=3.22221E-11) and their age (*p*=0.001473), but no association was found with their religion (*p*=0.23). These tests of hypotheses can be interpreted as an obvious variation in the respondents' perception and acceptance in relation to their educational qualifications and age, but they all tended to respond in the same manner from the perspective of religion.

5. Conclusion

Pregnant women in Adena, Kaiama Local Government Area, Kwara State, Nigeria have good knowledge of COVID-19 vaccination. Their perception of COVID-19 vaccination was encouraging and associated with their education qualifications and age, but not with their religion. The acceptance of COVID-19 vaccination was just a little above average, and is associated with their educational qualifications and age, but not with their religion. Following health recommendations of the country on the COVID-19, vaccination would go a long way in reducing the spread of the virus amongst pregnant women. On May 5th, 2023, the World Health Organization declared that the COVID-19 pandemic is no longer global public health emergency. Efforts by relevant health authorities all over the world should be geared towards prompt diagnosis and prevention of a reoccurrence of this pandemic.

Conflict of Interest

All the authors do not have any possible conflicts of interest.

Acknowledgements

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