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COVID-19 Vaccine Refusal and Hesitancy in Riverine Communities of Asari-Toru and Degema Local Government Areas, Rivers State, Nigeria

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ABSTRACT

The outbreak of Coronavirus (COVID-19) caused significant economic and social impacts, leading to the rollout of the COVID-19 vaccine. However, COVID-19 vaccination uptake has been low across Nigeria; therefore, this study investigated the impact of COVID-19 vaccine refusal in Riverine areas (Asari-Toru and Degema LGAs) in Rivers State. This study adopted a sample size of 400 respondents, to whom well-structured questionnaires were shared, and the collected data were analysed and presented using frequency, percentage, and mean. Result of the study showed that 5705% of the respondents were female, while 42.95 were male; majority of the respondents were: aged 46 – 55 (35.9%), married (52.56%), civil servant (39.74%), Christians (76.92%), educated (42.31% had tertiary education while 32.05% had secondary education), and had received at least one dose of any of the available COVID-19 vaccines (71.15%) while 28.85% were not vaccinated. Unvaccinated respondents cited belief that COVID-19 is not real or serious, fear of side effects/infertility/death, vaccine not being readily available and preference for herbal/traditional medicine, respectively, religious belief and distrust in Government, and attitude of community leaders as main reasons for COVID-19 vaccine refusal/hesitancy; perceived impact of vaccine refusal in the community included negative impacts on the health of people in the community, continued fear of outbreak, restriction of movement/trade, loss of income, school closure, and death of family members. The study concluded that COVID-19 vaccine refusal/hesitancy has a negative impact on communities in riverine areas.

Keywords: *COVID-19, Vaccine refusal, Asari-Toru, Degema.*

Introduction

Coronavirus (COVID-19) is a disease that is highly contagious, and it is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was discovered in Wuhan, Hubei Province, China, in December 2019 [1]. On March 11, 2020, the World Health Organisation (WHO) declared coronavirus (COVID-19) a global health emergency, which is the highest level of health emergency globally [2]. The disease, since January 2020, has spread to almost all countries and all continents of the World (Mapping the Spread of the COVID-19, 2020).

In late February, Nigeria, which is a country with the largest population in Sub-Saharan Africa and long-standing travel and trade links within Africa and to the rest of the world, recorded the subcontinent's first confirmed case, after which it began to spread throughout states like Lagos, Ogun, Rivers, Abuja, etc., in the country [3].

The arrival of the coronavirus pandemic in Nigeria triggered a chain of policy actions, including public health and education campaigns, fiscal and monetary measures, restrictions on large parts of the economy, and compensatory measures in the form of social protection for poor and vulnerable people [4].

According to Onyekwena and Ekeruche [5], the sudden onset of the pandemic and the scale of policy responses imposed high economic costs on Nigeria's population. Apart from negative impacts on global economic growth, coronavirus (COVID-19) also had negative implications on food security, as regions, countries, or households with high levels of food insecurity were generally more vulnerable and less prepared for an epidemic outbreak [6]. As the coronavirus persisted, it created food supply hitches and a threat to food security, especially for vulnerable groups [7]. Restrictions on transportation and people movement also triggered some food logistics challenges across continents around the world [8].

In Nigeria, similar to many other countries, global best practices such as hand washing, mask wearing, social distancing, and vaccination campaigns were adopted to curb COVID-19 transmission [9]. With the arrival of the COVID-19 vaccine, Nigeria received its first shipment of four million vaccines in March 2021 [10]. The initial limited supply compelled the government to prioritise vaccinating health professionals, people with NCDs, and the elderly [11]. This was soon followed by the supply of more vaccine doses supported by the COVID-19 Vaccines Global Access (COVAX), UNICEF and other organisations, to cater for the rest of the Nigerian population.

Vaccination is a valid tool for containing diseases that can easily spread from one person to another [9]. However, it is common for individuals to refuse vaccine inoculation [9].

Methodology

Study Area

Asari-Toru Local Government Area (ASALGA) is a key riverine LGA in Rivers State, Nigeria, created in 1989 with headquarters in Buguma Town. Predominantly inhabited by the Kalabari people, it is a centre of the Kalabari Kingdom. Degema Local Government Area (LGA) is a significant oil-producing administrative region in Rivers State, Nigeria, within the Niger Delta region. Its headquarters are located in the town of Degema (Atala/Udekaama).

Research Design

In carrying out this research, the descriptive research survey design was employed. This type of research design was used because it involves the collection of data from populations or samples of population through the use of questionnaires, personal interviews, or other data gathering devices, especially when a large number of respondents, who constitute a sample, are involved.

Population of the Study

The population of this study was made up of all residents of Asari-Toru and Degema Local Government Areas of Rivers State. The projected population of Asari-Toru Local Government Area in Rivers State is approximately 316, 100 as of March 2022 [12], while that of Degema is around 358,800 based on 2022 projections. This brings the total population to 674,900.

Sample and Sampling Techniques

Owing to research constraints and the sampling difficulties of using the entire population of residents in Asari-Toru and Degema Local Government Areas of Rivers State, a sample of 400 respondents (200 from Asari-Toru and 200 from Degema) was drawn from the entire population using the quantitative method of sample size determination.

In determining the sample size for the respondents, Taro Yamane's formula, as reported [12], was used. The formula is given as:

Sample Size Formula (Taro Yamane, 1967):

$$n = \frac{N}{1 + N(e)^2}$$

Where: n = *Sample size sought;* N = *Total Population;* e = *Tolerable error at 5% or significance level;* 1 = *Constant Hence.*

Calculation:

$$n = \frac{674{,}900}{1 + 674{,}900\,(0.05)^2}$$

$$n = \frac{674{,}900}{1 + 1{,}687.25} = \frac{674{,}900}{1{,}687.25} = \mathbf{400}$$

Thus, 400 formed the sample size.

Instrument for Data Collection

The instrument for data collection is a self-constructed questionnaire titled "Impact of COVID-19 Vaccine Refusal Questionnaire (ICVRQ)". The questionnaire provided a list of questions and statements for the respondents and spaces in which to record or tick their answers (on a Yes or No basis or level of agreement or disagreement with the statements).

The questionnaire was divided into six sections (A – F) based on the research objectives of this study. Some sections were based on a two-point Likert scale of Yes or No, while in some sections, each item on the questionnaire was based on a four-point Likert scale of strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1. Section A focused on socio-demographic information, section B focused on COVID-19 vaccination status, Section C focused on reasons for vaccine refusal/hesitancy, section D focused on sources of information about COVID-19 and vaccines, section E focused on perceived impact of vaccine refusal in the community, and section F focused on suggestions to improve vaccine uptake in Riverine areas.

Validity of the Instrument

The instrument for data collection was validated by showing it to the research supervisor and reputable lecturers in the Department of Microbiology with vast experience in public health to make necessary corrections, suggestions, and inputs. Their suggestions and inputs were added to the questionnaire before it was distributed to the respondents.

Reliability of the Instrument

The test-retest method was employed to ascertain the reliability of the instrument. Ten (10) copies of the research instrument were administered to a section of the respondents, and another 10 copies were re-administered to the same respondents after a week. The responses from the respondents at the different times were then correlated to verify the consistency of the data.

Procedure for Data Collection

The questionnaire was distributed by the researcher on a hand-to-hand basis. Where and when necessary, interviews were conducted to guide the respondents and provide more clarity. This method was used to ensure a reasonable return rate of the questionnaires. For each of the communities selected, the researcher met with the chairman of the community development committee and with a few chiefs and village heads to obtain permission and explain the importance of the research. Then respondents were randomly selected and handed the questionnaires to fill and return on the spot while the researcher explained every section of the questionnaire to the respondents and assured them of the confidentiality of their responses and participation. However, in Degema Local Government Area, this approach did not work out as most of the respondents insisted and took their questionnaires home.

Method of Data Analysis

Frequency, percentages, Chi-square, mean, and standard deviation were used to provide answers to the research objectives. The analysis was done using the Statistical Package for Social Sciences (SPSS v27).

Results

Response Rate: A total of 400 questionnaires were distributed in the study area, out of which 312 were returned. This marks a response rate of 78%.

Socio-Demographic Information

The results of the socio-demographic information of the respondents are shown in Table 1. The results showed that 61.5% of the respondents were from Asari-Toru LGA, while 38.5% were from Degema LGA.

Among the respondents from Asari-Toru LGA, 39.06 were from Buguma, 18.75 were from Ido, 10.94 were from Abalama, 7.80 were from Okpo, 6.25% were from Tema and Sama, respectively, 4.69% were from Ilelema, and 3.13 were from Angulama and Ifoko, respectively. Among the respondents from Degema LGA, 45.83% were from Bakana, 30.0% were from Tombia, 20.83% were from Harry's Town, and 3.33% were from Usokun. Among the total respondents; 57.05% were female, while 42.95 were male; 35.9% were aged 46 – 55, 26.92% were aged 36 – 45, 19.23% were aged 26 – 35, 12.18% were aged 18 – 25, and 5.77% were above 55 years; 52.56% were married, 29.17% were single, 12.5% were widowed, and 5.77% were divorced/separated; 39.74% were civil servant, 27.56% were engaged in trading, 11.54% were engaged in fishing, 8.97% were unemployed, 5.13% were artisan, 4.49% were self-employed, and 2.56% were engaged in farming; 76.92% practiced Christianity, 11.54% practiced Islam, 8.33% practiced African Traditional Religion, while 3.21% had no religion; 42.31% had tertiary education, 32.05% had secondary education, 11.54% had vocational/apprenticeship education, 7.69% had no formal education, while 6.41% had primary education.

Table 1: Socio-demographic Information of Respondents

Variables	Frequency	Percentage	Mean
Local Government Area (n =312)			
Asari-Toru	192	61.5	
Degema	120	38.5	**156.0**
Community/Village in Asari-Toru LGA (n = 192)			
Tema	12	6.25	
Sama	12	6.25	
Ilelema	9	4.69	
Okpo	15	7.80	
Angulama	6	3.13	**21.3**
Buguma	75	39.06	
Ifoko	6	3.13	
Abalama	21	10.94	
Ido	36	18.75	
Community/Village in Degema LGA (n = 120)			
Harry's Town	25	20.83	
Tombia	36	30.0	**30.0**
Bakana	55	45.83	
Usokun	4	3.33	
Gender (n = 312)			
Male	134	42.95	
Female	178	57.05	**156.0**
Age Group (years) (n = 312)			
18 – 25	38	12.18	
26 – 35	60	19.23	
36 – 45	84	26.92	**62.4**
46 – 55	112	35.9	
Above 55	18	5.77	
Marital status (n = 312)			
Single	91	29.17	
Married	164	52.56	
Widowed	39	12.5	**78.0**
Divorced/Separated	18	5.77	
Main Occupation (n = 312)			
Fishing	36	11.54	
Farming	8	2.56	
Trading	86	27.56	
Civil Servant	124	39.74	**44.57**
Artisan	16	5.13	
Unemployed	28	8.97	
Self-Employed	14	4.49	
Religion (n = 312)			
Christianity	240	76.92	
Islam	36	11.54	
African Traditional Religion	26	8.33	**78.0**
None	10	3.21	
Highest Educational level (n = 312)			
No formal education	24	7.69	
Primary	20	6.41	
Secondary	100	32.05	**62.4**
Tertiary	132	42.31	
Vocational/Apprenticeship	36	11.54	

COVID-19 Vaccination Status

The results of the COVID-19 vaccination status of the respondents showed that 71.15% had received at least one dose of any of the available COVID-19 vaccines, while 28.85% were not vaccinated (Table 2).

Table 2: COVID-19 Vaccination Status

Variables	Frequency	Percentage	Mean
Received at least One Dose of any COVID-19 vaccine (n = 312)			
Yes	222	71.15	
No	90	28.85	**156.0**
If No, Wiliness to Take the COVID-19 Vaccine in the Future (n = 90)			
Yes	31	34.44	
NO	47	52.22	
Not Sure	12	13.33	**30.0**
Members of Immediate Household that have Received at least one Dose (n = 222)			
11	8	3.60	
10	4	1.80	
7	8	3.60	
6	8	3.60	
5	12	5.41	
4	44	19.82	
3	52	23.42	
2	24	10.81	
1	35	15.77	
0	27	12.16	**22.2**

Reasons for COVID-19 Vaccine Refusal/Hesitancy

The results for COVID-19 vaccine refusal/hesitancy are shown in Table 3. The results showed that among respondents who were not vaccinated, 35.56 cited the belief that COVID-19 is not real or serious, 26.67% cited fear of side effects/infertility/death, 8.89% cited the vaccine not being readily available and a preference for herbal/traditional medicine, 7.78% cited religious belief and distrust in government, respectively, while 4.44% cited the attitude of community leaders as their main reasons for COVID-19 vaccine refusal/hesitancy.

Table 3: Reasons for COVID-19 Vaccine Refusal/Hesitancy

Variables/Reasons	Frequency	Percentage	Mean
Main Reason for not taking COVID-19 Vaccine (n = 90)			
Fear of side effects/infertility/death	24	26.67	
Belief that COVID-19 is not real or serious	32	35.56	
Religious belief	7	7.78	
Distrust in Government	7	7.78	
Vaccine not readily available	8	8.89	
Preference for herbal/traditional medicine	8	8.89	
Attitude of community leaders	4	4.44	**12.86**

Sources of Information about COVID-19 and Vaccines

The result for Sources of Information about COVID-19 and Vaccines (Table 4) showed that respondents got their information from Radio (39.74%), Health workers (38.46%), Social media (30.77%), Television and community/town crier (28.21%, respectively), Church/Mosque (17.95%), Traditional ruler/elder (8.97%), and Family/friends (6.41%); 60.26% of the respondents believed that most of the information about the vaccine was trustworthy, 23.72% of the respondents were not sure of the authenticity of the information, while 16.03% of the respondents did not trust the information.

Perceived Impact of Vaccine Refusal in the Community

The results of the perceived impact of vaccine refusal in the community are shown in Table 5. The table showed that 63.46% reported no death in their household or neighborhood from suspected COVID-19, 2.56% reported death, while 33.97% were not sure; refusal of COVID-19 vaccine had no effect on people in the community (51.28%), affected the health of people in the community negatively (12.82%), affected the health of people in

the community positively (7.05%), while 28.85% of the respondents were not sure of the impact of the refusal of COVID-19 vaccine; vaccine refusal resulted in No effect (56.41%), continued fear of outbreak (17.95%), restriction of movement/trade (12.82%), loss of income (6.41%), school closure (5.13%), and death of family members (1.28%); and 50.00% of the respondents will support compulsory COVID-19 vaccination if Government makes it mandatory, 26.92% will not while 23.08% are not sure.

Table 4: Sources of Information about COVID-19 and Vaccines

Variables	Frequency	Percentage	Mean
Main source of information about COVID-19 and the vaccine (Multiple responses)			
Radio	124	39.74	
Television	88	28.21	
Church/Mosque	56	17.95	
Community/town crier	88	28.21	
Health worker	120	38.46	
Social media	96	30.77	
Family/friends	20	6.41	
Traditional ruler/elder	28	8.97	**77.50**
Most of the information about the vaccine was trustworthy (n = 312)			
Yes	188	60.26	
No	50	16.03	
Not sure	74	23.72	**104.0**

Table 5: Perceived Impact of Vaccine Refusal in the Community

Variables	Frequency	Percentage	Mean
Death in Household or Neighbourhood from Suspected COVID-19 (n = 312)			
Yes	8	2.56	
No	198	63.46	
Not Sure	106	33.97	**104.00**
Refusal of COVID-19 Vaccine Affected the Health of People in your Community (n = 312)			
Yes, negatively	40	12.82	
No effect	160	51.28	
Yes, positively	22	7.05	
Not sure	90	28.85	**78.00**
Vaccine Refusal Resulted in (n = 312)			
Continued fear of outbreak	56	17.95	
Restriction of movement/trade	40	12.82	
Loss of income	20	6.41	
School closure	16	5.13	
Death of family members	4	1.28	
None	176	56.41	**44.57**
Support Compulsory COVID-19 Vaccination if Government Makes it mandatory (n = 312)			
Yes	156	50.00	
No	84	26.92	
Not Sure	72	23.08	**104.00**

Suggestions to Improve Vaccine Uptake in Riverine Areas

Some of the suggestions to improve vaccine uptake in Riverine areas include: involvement of traditional rulers and pastors (56.41%), testimony from respected vaccinated persons in the community (53.85%), giving small incentives like soap, food items and cash (46.15%), house-to-house sensitisation by health workers (16.67%), and bringing vaccines to the waterfront/jetty with speedboats (11.54%) (Table 6)

Table 6: Suggestions to Improve Vaccine Uptake in Riverine Areas

Variables	Frequency	Percentage	Mean
What can be done to encourage more people to accept COVID-19 Vaccine (multiple responses)			
Involvement of traditional rulers and pastors	176	56.41	
Bringing vaccines to the waterfront/jetty with speedboats	36	11.54	
Giving small incentives (soap, food items, cash)	144	46.15	
Testimony from respected vaccinated persons in the community	168	53.85	
House-to-house sensitization by health workers	52	16.67	**115.20**

DISCUSSION

Vaccine refusal/hesitancy is a significant global concern, particularly during pandemics, because the reluctance of one person to get vaccinated can lead to negative attitudes towards vaccination by others and result in a lot of problems [9].

This study investigated the impact of COVID-19 vaccine refusal in two local government areas located in the riverine areas of Rivers State, Nigeria. In this study, the majority of the respondents (61.5%) were from Asari-Toru LGA, especially Buguma, Ido, and Abalama communities, while in Degema LGA, most of the respondents were from Bakana, Tombia, and Harry's Town. Arguably, these communities are recognised by many as major commercial and residential hubs in these L.G.As due to their proximity to the Atlantic Ocean and the capital of Rivers State. Also, the majority of the respondents falling within 46 – 55 years (35.9%) is understandable. Arguably, in most communities in the riverine areas of Rivers State, most youths, especially those aged between 18 – 35 years, do not reside in their communities as they prefer the cities where most of them school, work, learn a trade or engage in other socioeconomic activities. Similarly, the study by Ojewale and Mukumbang [13], which investigated COVID-19 vaccine hesitancy among Nigerians living with non-communicable diseases, reported that the majority of the respondents were aged 41 – 70. However, men participated more in this study than women.

Furthermore, in this study, the majority of the respondents were married (52.56%), most of them were civil servants (39.74%), while others engaged in trading (27.56%) and fishing (11.54%). Christianity was widely practised among them (76.92%), and most of them were educated (42.31% had tertiary education while 32.05% had secondary education). These findings agree to a large extent with the study by Ojewale and Mukumbang [13] in which most of the respondents were married, practised Christianity, and were educated. However, the majority of the respondents in the study by Ojewale and Mukumbang [13] were more into trading than civil service.

The results of the COVID-19 vaccination status of the respondents showed that the majority (71.15%) had received at least one dose of any of the available COVID-19 vaccines, while 28.85% were not vaccinated. Of the respondents who had received at least one dose of the COVID-19 vaccine, 23.42% reported that 3 members of their household were vaccinated, 19.82% reported that 4 members were vaccinated, while 15.77% reported that 1 member of their household was vaccinated. This could be part of the 8% of Nigeria's total population that the NPHCDA reported in 2022 were vaccinated with the first dose, while only 45% of the latter received the second vaccine dose [14]. For those who were not vaccinated, 52.22% were not willing to take the COVID-19 vaccine in the future, which indicates a high level of refusal/hesitancy. This finding corroborates the findings of a study conducted in Nigeria, which revealed that only 10.5% were willing to be vaccinated, while the majority, 57.8% (148/256), were not willing to be vaccinated, and 31.7% (81/256) of the respondents were uncertain, thus resulting in a hesitancy rate of 89.45% [15]. Similarly, acceptance rates ranging from 24.3% to 49.5% were reported across the four studies conducted among high-risk populations in Nigeria, while the acceptance rates among low-risk populations ranged from 26.0% to 86.2%. Conversely, in the study conducted in Delta State, it was reported that 48.6% of the respondents were willing to take COVID-19 vaccines [16]. In the same vein, an online study conducted in Nigeria revealed that 80% of respondents were willing to receive the vaccine [4].

The results for COVID-19 vaccine refusal/hesitancy showed that unvaccinated respondents cited belief that COVID-19 is not real or serious, fear of side effects/infertility/death, vaccine not being readily available and preference for herbal/traditional medicine, religious belief and distrust in Government, and

attitude of community leaders as main reasons for COVID-19 vaccine refusal/hesitancy. In agreement with these findings, in the study by Ojewale *et al.* [17], which explored the drivers of vaccine hesitancy among people with chronic NCDs in Ibadan, Nigeria, it was reported that the COVID-19 vaccine hesitancy of people living with chronic NCDs was influenced by a negative attitude shown in mistrust of government and manufacturers. Their negative attitude towards vaccination was further aggravated by fear of side effects and possible aggravation of their underlying condition (negative outcome evaluation). Furthermore, vaccine hesitancy among people with chronic NCDs was influenced by the attitude of family and friends who fuelled misinformation and misconceptions on social media. There was also a perceived lack of COVID-19 vaccine effectiveness, which affected the 'motivation to comply' among people living with chronic conditions [13]. Even among some Pharmacists in Pakistan, there were misconceptions about the possibility of the vaccine causing infertility [18].

The distrust in the government may have been fuelled by various incidents that took place in Africa both before and during the COVID-19 pandemic era. Nigerians and many Africans generally venerate the Western world as greener pastures. However, the negative experience with the 1996 Pfizer drug trial in Northern Nigeria, which led to the death of eleven children, created doubts about drugs from the West [17]. This antecedent and the belief that the Western world wanted to reduce the Muslim population by contaminating polio vaccines with agents that could cause infertility and HIV led to the polio vaccination boycott in 2002–2004. Furthermore, it has been posited that many Africans harbour a mistrust of the 'whites (drug manufacturers)' due to past exploitation and unethical drug trials; this influences their health-seeking behaviour, particularly towards trials of new vaccines from the West [19].

Similarly, vaccine-hesitant participants in a study conducted in Cameroon expressed fear that pharmaceutical companies in the West took advantage of their unstable political system to test substandard vaccines [20]. Bhopal and Nielsen [21] further suggested that the statement made by some French scientists that the COVID-19 vaccine should first be tested in Africa, although it was followed by an apology, could have caused prejudices against the vaccine among many Africans.

Also, distrust in government could be tied to the context of government officials' medical tourism and failure to use government health facilities available to the general population. Such an observation has given credence to the thinking that a substandard vaccine would be given to the general population while government officials would receive a better one [17]. The onus is, therefore, on the government to increase citizens' trust in public healthcare systems by ensuring those in influential political positions use the available local services. As in our findings, mistrust of the government was cited as one of the reasons for vaccine hesitancy among several UK participants, but this was in the context of the perceived failure of the government to be completely transparent about the COVID-19 vaccine–unusually short timeline to vaccine development, secrecy in its production and granting of legal indemnity to pharmaceutical companies involved in production [22]. Similar to this study, Africans in Ghana and Zimbabwe also felt hesitant about taking the COVID-19 vaccine due to mistrust of the government's ability to secure an effective vaccine [7].

The results for Sources of Information about COVID-19 and Vaccines showed that respondents got their information from radio, health workers, social media, television, community/town crier, church/mosque, traditional ruler/elder, and family/friends. Notably, 60.26% of the respondents believed that most of the information about the vaccine was trustworthy, 23.72% of the respondents were not sure of the authenticity of the information, while 16.03% of the respondents did not trust the information. Similarly, in the study by Ojewale and Mukumbang [13], social media was reported as a major source of information on COVID-19 and vaccines. While most of the respondents in this study trusted most of the information on COVID-19 and vaccines from their source, Ojewale and Mukumbang [13] reported that Information on social media, notably Facebook and WhatsApp platforms, also influences vaccine hesitancy through the formation of negative subjective norms about the COVID-19 vaccine. Such misinformation leads to fear of the vaccine, engendering hesitancy among people living with chronic conditions and among the general population.

Furthermore, in this study the perceived impact of vaccine refusal in the community included negative impacts on the health of people in the community, continued fear of outbreak, restriction of movement/trade, loss of income, school closure, and death of family members. While the impacts were tied to vaccine refusal by respondents in this study, numerous studies linked these impacts to the outbreak of the COVID-19 pandemic without any connection to vaccine refusal/hesitancy [23, 24, 25, 1]

Additionally, some of the suggestions to improve vaccine uptake in Riverine areas include: involvement of traditional rulers and pastors, testimony from respected vaccinated persons in the community, giving small incentives like soap, food items and cash, house-to-house sensitisation by health workers, and bringing vaccines to the waterfront/jetty with speedboats. Community participation through the involvement of traditional rulers and pastors, and house-to-house sensitisation by health workers reported in this study are also widely reported in the literature. Notably, Ilesanmi and Afolabi [26] and [27] reported that community members can be motivated through the involvement of stakeholders in the community, such as traditional heads, chiefs, opinion group leaders, and religious leaders, while Ilesanmi and Afolabi [26] reported that community health workers, community pharmacists, patent medicine dealers, and civil-based groups all have a part to play. Similarly, in line with the suggestion in this study that giving small incentives like soap, food items and cash can be very beneficial, Ajayi *et al*. [6] posited that actively showing appreciation for the community's prior support for health initiatives can significantly increase community involvement in the COVID-19 vaccine program. Additionally, some of the strategies reported in this study have been suggested in other settings with emphasis on curtailing the spread of COVID-19 [28, 29, 30].

Conclusion

The majority of respondents in this study had received at least one dose of any COVID-19 vaccine, while those who were not vaccinated cited belief that COVID-19 is not real or serious, fear of side effects/infertility/death, vaccine not being readily available and preference for herbal/traditional medicine, respectively, religious belief and distrust in Government, and attitude of community leaders as main reasons for COVID-19 vaccine refusal/hesitancy.

The perceived impact of vaccine refusal in the community included negative impacts on the health of people in the community, continued fear of outbreak, restriction of movement/trade, loss of income, school closure, and death of family members. Suggestions to improve vaccine uptake in Riverine areas include: involvement of traditional rulers and pastors, testimony from respected vaccinated persons in the community, giving small incentives like soap, food items and cash, house-to-house sensitisation by health workers, and bringing vaccines to the waterfront/jetty with speedboats.

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