OPEN ACCESS

Saudi Journal of Medical and Pharmaceutical Sciences
Abbreviated Key Title: Saudi J Med Pharm Sci
ISSN 2413-4929 (Print) | ISSN 2413-4910 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article **Internal Medicine**

Factors Associated with COVID 19 Vaccine Hesitancy among Residents of a Semi-Urban Setting in Bayelsa State, Nigeria

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DOI: 10.36348/sjmps.2022.v08i07.002 | **Received:** 02.06.2022 | **Accepted:** 05.07.2022 | **Published:** 12.07.2022

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Abstract

Although COVID-19 vaccines are now widely available in Bayelsa State, adequate immunization of the population is hampered by vaccine hesitancy. This study aimed to identify factors associated with COVID-19 vaccine hesitancy. One thousand and a hundred (1,100) adults aged ≥ 18 years were selected from 300 randomly selected households in two semi-urban communities in Bayelsa State and were interviewed in this descriptive cross-sectional survey. Willingness to receive COVID- 19 vaccines and the associated factors were assessed using an interviewer-administered structured questionnaire. A slim majority of the 1,100 participants were women (51.1%) and single (72.6%). About half of the participants were university undergraduates (52.2%). Awareness of COVID-19 among the participants was 67.1%, and less than a third of respondents were unwilling to take the COVID-19 testing. However, the unwillingness to accept the COVID-19 vaccine was high in the population (45.5%). On bivariate analysis, willingness to take the COVID-19 vaccine was associated with having ever heard of the vaccine (p<.001), willingness to take COVID-19 testing (p<.001), and educational qualification (p<.001). On regression analysis, only willingness to take testing (p=0.000, CI=0.267, 0.446) and prior vaccine awareness (p= 0.049, CI = 0.592, 0.446) independently related to a willingness to take the vaccine. Common reasons for unwillingness to take COVID-19 vaccines included possible side effects, safety, and efficacy concerns. The willingness to receive the COVID-19 vaccine in this mostly educated and youthful populace was relatively poor. Public health education concerning the safety and efficacy of the vaccine should be intensified to improve the community's willingness.

Keywords: COVID-19, testing, vaccine, willingness, associated factors.

INTRODUCTION

With the recent increase in the supply of vaccines against the COVID-19 virus in Nigeria, and free vaccination currently available to anyone who wants it, preventing COVID-19–associated mortality may become easier [1]. Although COVID-19 vaccines are now widely available in Bayelsa State, Nigeria, adequate immunization of the population is hampered by vaccine hesitancy. Widespread use of safe and effective vaccines could significantly reduce the morbidity and mortality associated with the COVID-19 pandemic [2]. Community engagement (CE) has been shown to improve vaccination uptake and reduce the burden of vaccine-preventable diseases [3].

Vaccines are essential in the battle against the COVID-19 virus, but their effectiveness may be limited by vaccine hesitancy driven by poor public health messaging, ignorance, misinformation, and politics. Vaccine hesitancy is a delayed acceptance, reluctance, or refusal of vaccination despite the availability of vaccines and vaccination services [4]. Drivers of vaccine hesitancy include disinformation from communication and media, historical influences, cultural practices, religious beliefs, educational and socioeconomic status (commoner in poorly educated and socioeconomically disadvantaged groups), geographic barriers, previous bad experience with vaccination, high-risk perception, and poorly designed vaccination programs [4]. There are several reports of suboptimal acceptance of the COVID-19 vaccine in some countries and communities [5]. WHO lists access to COVID-19 tests, medicines, and vaccines as among its ten top priorities in 2021 [6].

The WHO reported a 40% surge in COVID-19 deaths in Africa since 14 February 2020, when the virus was first reported. This is in addition to reports of outbreaks of new and more transmissible variants,

including the delta variant [7] Africa is already hampered by slow vaccine rollout due to logistic problems, structural issues, and financial and supply constraints [7]. The addition of vaccine hesitancy thus becomes double jeopardy. The public, including healthcare personnel, has expressed fears concerning the effectiveness, safety, and side effects. Failure to address these fears may result in low vaccination rates in communities and worsen the pandemic [7]. Public trust is crucial for the success of public health interventions [8]. Compliance with public health interventions, including vaccination programs, highly depends on public perception and belief. Lack of trust may lead to rumors and fear-mongering, resulting in public boycotts of public health programs. Vaccine hesitancy is not a new phenomenon in Africa [7]. Fear of vaccines has grown exponentially over the past years before the advent of the COVID-19 pandemic [8]. Delays and refusals of vaccination by communities can hinder the achievement of herd immunity and increase the possibility of vaccine-preventable disease outbreaks. One striking example of vaccine hesitancy and its consequences was the polio vaccine boycott in northern Nigeria from 2003–to 2004 [9].

Conspiracy theories about the Polio vaccine in the 1990s led to a boycott of the polio vaccine in three states in Northern Nigeria [10]. The consequence was a fivefold increase in the incidence of polio in Nigeria between 2002 and 2006, which contributed to outbreaks of wild poliovirus in eight polio-free countries in West and Central Africa (Benin, Cameroon, the Central African Republic, Chad, Ghana, Ivory Coast, Burkina Faso, and Togo) [11]. Fortunately, the crisis was eventually resolved in 2004 through dialogue between the Federal Government of Nigeria and political and religious leaders of the affected northern Nigerian states, together with the WHO and UNICEF [12].

Presently, conspiracy theories, disinformation, the accelerated development of several COVID-19 vaccines, social media propaganda, the belief that they are immune from the COVID-19 virus, and mistrust of public health recommendations from global health organizations are driving vaccine hesitancy [13]. COVID 19 vaccination rates in Africa include 0.9% in Nigeria, 1.3% in Ghana, 2.2% in Angola, 2.6% in Guinea, 10.5% in Tunisia, 30.5% in Morocco and 68.1% in Seychelles [14]. It's vital that public health officials learn from the past and actively engage communities in combating the current COVID-19 crisis using vaccines [15]. COVID-19 vaccine hesitancy is receiving global attention and is a priority issue for the World Health Organization. The 5C model (drivers of vaccine hesitancy being: confidence, complacency, convenience, risk calculation, and collective responsibility) was previously developed by the WHO based on research predominantly conducted in western, educated, industrialized, rich, and prosperous societies. Empirical data are needed to test, adapt and potentially apply these models to the African continent. There is also a need to understand specific causes/determinants and implications of vaccine hesitancy in Africa in their full context. Also, there is a need to differentiate COVID-19 vaccine hesitancy from other reasons responsible for poor vaccination rates in the region to develop more effective and targeted interventions for African countries. There is also a need to assess community engagement to break down barriers to the success of COVID-19 vaccination. To reduce COVID-19 vaccine hesitancy and improve vaccine uptake, there is a need for context-specific research to identify factors associated with the phenomenon [16].

There is a lack of studies in Nigeria examining factors associated with vaccine hesitancy and the use of community engagement as a possible solution. Therefore, we aimed to investigate factors associated with vaccine hesitancy in Bayelsa state, Nigeria.

Experimental Section/Material and Methods

Study Area

Bayelsa State is in the South-South region of Nigeria, and its boundaries are Delta State (north), Rivers State (east), and the Atlantic Ocean (western and southern). The state has eight local government areas (LGA), with its administrative headquarters being Yenagoa LGA. Yenagoa LGA occupies an area of 706 km²land has a population of 353,344 (187,791 males and 165,553 females) and an estimated annual exponential growth rate of 2.9 as of the 2006 National Census. The State is mainly inhabited by the Ijaw tribe but is also home to other Nigerian tribes and foreign citizens. The study was carried out in Okolobiri and Obunagha communities in Yenagoa LGA. Both are oil-producing communities and have their source of livelihood as fishing and farming.

Study duration

October and November 2020 (two months)

Study design

The study was a descriptive cross-sectional study assessing factors associated with vaccine hesitancy in Bayelsa state, Nigeria.

Study population

The study population comprised adults aged 18 years and above in Yenagoa LGA.

Sample Size

We calculated the sample size using the formula for estimation of a single proportion in a population greater than 10,000 stated below [17]:

$$N = \frac{Z^2 PQ}{d^2} \; X \; DEFF$$

Where N = number of participants, Z = 1.96, P= prevalence (11% or 0.11), Q=1−P, d =0.05, *DEFF* is the design effect to account for the clustering effect

usually associated with community surveys. A design effect of 1.5 was employed in the sample size estimation. Using a prevalence of 10% for COVID-19 previously reported in Bayelsa State, a minimum sample size of 225 participants was obtained [18]. Adjusting for non-response with a non-response rate of 10%, the sample size was further increased to 248 participants. However, we eventually sampled a total of 1,100 participants persons aged 18 years and above.

Sampling Technique

Yenagoa LGA comprises 15 administrative, six urban, and nine rural wards. Of the nine rural wards, one ward (Okolobiri) was selected by simple random sampling (balloting). Okolobiri ward has four communities, out of which 2 (Okolobiri and Obunagha) were chosen for the study using a simple random sample (balloting).

After a community mapping exercise in the selected communities, we used systematic random sampling to select houses/households for the study in the two communities. Appropriate intervals were determined in the two communities to ensure 150 homes were selected from each community. Two or more households inhabited some houses; in such cases, balloting was used to determine the household. One adult aged 18 years and above was chosen from each household. Where the selected participant was unwilling to participate in the study or there was no eligible adult in the household, the selection criteria were applied in the next house before returning to the sequence of the systematic sampling.

Study instrument (Questionnaire)

The study used an interviewer-administered questionnaire developed by the researchers based on a validated vaccine hesitancy scale by the World Health Organization (WHO) Strategic Advisory Group of Experts on Immunization (SAGE) [19, 20]. The questionnaire was in English and underwent face and content validation by an expert panel of physicians. It was pilot tested on ten of the community members for face validity. The sample used for the pilot was excluded from the main study. The questionnaire gathered information on selected demographic characteristics, including gender, age, marital status, education, and occupation. Respondents were asked if they were aware of the COVID-19 vaccine and their willingness to take COVID-1 19 test and to take it when it is available. They were also asked for reasons for not wanting to take COVID-19 vaccines.

Study procedures

The study's objectives, procedures, and benefits were explained to respondents using an information sheet. Written informed consent was obtained from all the study participants. And after that, the questionnaire was administered. Research assistants (RAs) were three house officers and a resident doctor trained by the investigators on how to fill out the questionnaires. Training of RAs was for two days and lasted 1 hour daily, during which the study's objectives were emphasized. The questionnaire was then pretested before making the final draft was completed. The data collection exercise was done over one month between October and November 2020.

Data Analysis

Collected data was checked for completeness at the end of each research day and entered into a Microsoft Excel sheet for cleaning. This was then imported into SPSS version 25 for analysis. Descriptive statistics were calculated. Association between variables was tested using chi-square. Regression analysis was also done to explore the relationship between willingness to take the vaccine and sociodemographic variables in the study. A p-value of 0.05 or less was used as the threshold for statistical significance.

Ethical issues

The study was conducted per the Helsinki declaration and ethical clearance was obtained from the Research and Ethics committee of the Niger Delta University Teaching Hospital, Okolobiri, Bayelsa State [21]. Voluntary written informed consent was obtained from the study participants, and only those who accepted consent participated. All data was handled with strict confidentiality.

RESULTS AND DISCUSSION

Table 1: Socio-demographic Profile of Respondents

Variable	Frequency	Percentage (%)
Age Group (years)		
<35	810	73.6
35-59	163	14.9
≥60	127	11.5
Total	1100	100.0
Sex		
Male	538	48.9
Female	562	51.1
Total	1100	100.0

Highest Education Received		
None	35	3.2
Primary	62	5.6
Secondary	210	19.1
Tertiary	793	72.1
Total	1100	100.0
Marital status		
Single	799	72.6
Married	240	21.8
Separated/Divorced/Widowed	39	3.6
Living as married	22	2.0
Total	1100	100.0
Profession		
Student/Undergraduate	574	52.2
Healthcare worker	175	15.9
Public sector worker	160	14.5
Private sector	75	6.8
Others/retired	116	10.6
Total	1100	100.0

The median age for the participants was 25 years (range: 22-31 years), with most of the population under 59 years of age (87.5%). Male participants were slightly more frequent than female participants (51.1% versus 48.9%), while most study participants had completed a secondary level of education or higher (91.1%). Most participants were single (799; 72.6%), or married (240; 21.8%); and over one-half were students/undergraduates (574; 52.2%), healthcare workers (175; 15.9%), or public sector workers (160; 14.5%). See table 1. The awareness on COVID-19 among the participants was 67.1%, however 30% of the participants were unwilling to take the COVID-19 testing. Unwillingness to take the COVID-19 vaccine when made available was high in the population, at 45.5% See Table 2.

Table 2: Awareness of and Willingness to take COVID-19 Vaccine

Variable	No	Percentage (%)
Awareness of COVID-19 Vaccine		
Yes	772	67.1
No	328	32.9
Willingness to take COVID-19 Vaccine test.		
Yes	645	70.0
No	455	30.0
Total	1100	100.0
Will you take the COVID-19 vaccine when it is available in the NPI?		
Yes	599	54.5
No	286	26.0
Not sure	215	19.5
Total	1100	100.0

Table 3: Association between Awareness of COVID-19 vaccine, attitude towards COVID-19 testing, and attitude toward COVID-19 vaccination among the population (n = 1100)

Variable	Will you take the COVID-19 vaccine when it is available in the NPI?		Total n (%)	Chi-square	p-value
	Yes n (%)	No/Not sure n (%)			
Have you ever heard of the COVID-19 vaccine?					
Yes	421 (58.3)	301 (41.7)	722 (100.0)		
No	178 (47.1)	200 (52.9)	378 (100.0)		
Total	599 (54.5)	501 (45.5)	1100 (100.0)	12.594	**<0.001**
Are you willing to do a voluntary test for COVID-19?					
Yes	423 (65.6)	222 (34.4)	645 (100.0)		
No/Not sure	176 (38.7)	279 (61.3)	455 (100.0)	77.841	**<0.001**
Total	599 (54.5)	501 (45.5)	1100 (100.0)		

On bivariate analysis, willingness to take the COVID-19 vaccine was associated with having ever heard of the vaccine and the willingness to take COVID-19 testing as well as educational qualification (p<.001). See tables 3 and 4. However, regression analysis showed that only willingness to take testing and prior awareness of the vaccines independently related to willingness to take the vaccine, See Table 5.

Table 4: Association of Willingness to take COVID-19 vaccines with some sociodemographic characteristics (n = 1100)

Variable	Will you take the COVID-19 vaccine when it is available in the NPI?		Total n (%)	Chi-square	p-value
	Yes n (%)	No/Not sure n (%)			
Age group (years)					
<35	447 (55.2)	363 (44.8)	810 (100.0)		
35-59	93 (57.1)	70 (42.9)	163 (100.0)		
>= 60	59 (46.5)	68 (53.5)	127 (100.0)		
Total	559 (54.5)	501 (45.5)	1100 (100.0)	3.894	.143
Sex					
Male	281 (52.2)	257 (47.8)	538 (100.0)		
Female	318 (56.6)	244 (43.4)	562 (100.0)		
Total	599 (54.5)	501 (45.5)	1100 (100.0)	2.100	.147
Highest education attained					
None	9 (25.7)	26 (74.3)	35 (100.0)		
Primary	27 (43.5)	35 (56.5)	62 (100.0)		
Secondary	111 (52.9)	99 (47.1)	210 (100.0)		
Tertiary	437 (55.1)	356 (44.9)	793 (100.0)		
Total	599 (54.5)	501 (45.5)	1100 (100.0)	16.916	**.001**
Marital status					
Married	121 (50.4)	119 (49.6)	240 (100.0)		
Single	422 (55.3)	357 (44.7)	799 (100.0)		
Divorced/widowed/separated	24 (61.5)	15 (38.5)	39 (100.0)		
Living as married	12 (54.5)	10 (45.5)	32 (100.0)		
Total	599 (54.5)	501 (45.5)	1100 (100.0)	2.077	.556
Occupation					
Student/undergraduate	314 (54.7)	260 (45.3)	574 (100.0)		
Healthcare workers	85 (48.6)	90 (51.4)	175 (100.0)		
Private sector worker	46 (61.3)	29 (38.7)	75 (100.0)		
Public sector worker	89 (55.6)	71 (44.4)	160 (100.0)		
Retired/others	323 (54.0)	275 (46.0)	598 (100.0)		
Total	599 (54.5)	501 (45.5)	1100 (100.0)	8.284	.141

Table 5: Multivariate analysis of Willingness to take COVID-19 Vaccine (n = 1100)

					95% C.I. for Exp Odds ratio	
Predictor	**B**	**Wald**	**Sig.**	**Odds ratio**	**Lower**	**Upper**
Will take COVID-19 Testing						
Yes	-1.063	66.453	**.000**	.345	.267	.446
No	R	-	-	-	-	-
Aware of COVID-19 Vaccine						
Yes	-262	3.862	**.049**	.769	.592	.446
No	R	-	-	-	-	-
Education received						
None	R	5.516	.138	-	-	-
Primary	.787	3.746	.053	2.197	.990	4.876
Secondary	.354	1.638	.201	1.425	.828	2.452
Tertiary	-.045	.077	.782	.956	.693	1.318
Constant	.574	16.312	.000	1.775	-	-

R (Referenced category).

Common emerging themes from the population regarding reasons for not wanting to take COVID-19 vaccines when they were made available included side effects, safety, and efficacy concerns. Less diffuse reasons included trust-gap between the population and the politicians, as well as dishonesty on the part of the latter; concerns about the vaccines being rushed over and not going through all phases of the clinical trials, and the belief that vaccination kills. A number of respondents would rather not share reasons, as they were considered personal

Our study found that most respondents were aware (67.1%) and willing to take the COVID-19 test (70%). Our finding is similar to that of Thunströmet al who found that 70% of their 897 study participants would take a COVID-19 test [22]. They further found that the people most willing to take a test were the extroverts, people who meet and interact with more people daily, and younger people, all of whom were more likely to spread COVID-19 widely. They concluded that people are selfless in their decision to test for COVID-19. Ukwenya et al. also reported that 73.2% of their 691 study participants were willing to be tested for COVID-19 [23]. The top three reasons for this willingness included a desire for appropriate care (76.4%), a belief that testing helps stop the spread of the virus (64.2%), and because they were expected by friends and family to take the test (30.4%).

Our study found that unwillingness to take the COVID-19 vaccine when made available was high in the study population, at 45.5%. On bivariate analysis, willingness to take the COVID-19 vaccine was associated with having ever heard of the vaccine (p<.001), willingness to take COVID-19 testing (p<.001), and educational qualification (p<.001). A study comparing differences in vaccination readiness among Austrian adolescents regarding education status, gender and migration background found that adolescents with lower educational levels were less willing to receive the COVID-19 vaccine [24]. Other factors associated with lower vaccination willingness among these Austrian adolescents were migration background and female gender. In a study among school teachers, assessing the determinants of intention to receive the COVID-19 vaccine, the researchers found that having a bachelor's degree in educational status was associated with increased intention to accept the vaccine [25]. They also found that compared to individuals affiliated with the Orthodox religion, those affiliated with the Catholic and Protestant faith had an increased intention to take the vaccine. Other factors associated with a high willingness to accept the vaccine included perceived susceptibility, perceived benefit, perceived barrier, and cues to action [25]. A review assessing the level of willingness to receive the COVID19 vaccine globally and the factors associated with the willingness to receive the COVID-19 vaccine revealed geographical differences in willingness to accept the COVID-19 vaccine, with over 90 percent level of willingness reported from China and less than 30% level of willingness recorded in Congo [26]. Socio-demographic factors positively associated with the willingness to receive the COVID-19 vaccine from their review include older age, high educational status, gender, high income, urban residency, health care occupation, and marriage [26]. However, only higher education was positively associated with other sociodemographic factors assessed in our study.

Our study found that the most common factors associated with COVID-19 vaccine hesitancy included concerns about side effects, the vaccine's safety profile, efficacy, trust gaps, length of clinical trials for the vaccine and personal reasons some respondents would instead not share. In a study by Adigwe, more than half of the study participants reported concerns that the vaccine's side effects might prevent their engagement [27]. Several studies show willingness to be vaccinated is associated with higher levels of perceived benefits of the COVID-19 vaccine, perceived severity of COVID-19 infection, and cues to action [28, 29]. In our study, willingness to be tested and prior awareness of COVID-19 vaccines independently predicted the willingness to take vaccine jabs when made available. Findings from previous studies show that previous testing for COVID-19 is positively associated with willingness to receive the COVID-19 vaccine [26, 30, 31].

CONCLUSION

This study found that though most people were willing to be tested for the COVID-19 virus infection, they were not so willing to receive the COVID-19 vaccine. Concerns about the safety and side effects of COVID-19 constitute factors contributing to COVID-19 vaccine hesitancy.

RECOMMENDATIONS

Public health officials should launch awareness campaigns to dispel myths and misconceptions regarding the COVID-19 vaccine before the National Immunization days for COVID-19 vaccine immunization in the communities. Such exercise might improve the willingness of persons in these communities to take up vaccine jabs when the same becomes available in the communities.

Limitations: Responses depend on the truthfulness of the respondents.

Data sharing statement

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Authors' Contributions

EE designed the study, and managed the statistical analysis, while TEO and EE both wrote the

protocol, managed the literature research, and contributed to writing the final manuscript. All authors contributed to data analysis, drafting, and revising the paper and agree to be accountable for all aspects of the work.

Conflict of Interests: The authors report no conflicts of interest in this work.

Acknowledgments: The authors are grateful to all the study participants who consented to be part of the study.

Declaration of conflict of interest: None

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