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Analysis of Social Factors Influencing Covid-19 Vaccine Acceptance Level in Akanu Ibiam Federal Polytechnic, Unwana Nigeria

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Abstract

In this paper, the social factors affecting the level of acceptance of covid-19 vaccine in Akanu Ibiam federal polytechnic Unwana was studied. A stratified random sampling was employed to draw samples of staff and students of the polytechnic. The schools were used as strata to make the sample representative. A structured questionnaire was administered to the sample points, their responses were analyzed using a percentages, cross-tabulation chi square test and probit regression model using the following variables: age, sex, religion, tribe, education status and work status to ascertain if any or all of the factors have influence on the level of acceptance of the covid-19 vaccine. From the result obtained, that the acceptance level of Covid-19 vaccine by the respondents is 47.89% a little below average, and the goodness of fit test =219.568 at 5 percent level of significance showed that age, education and work status of respondents influenced the acceptance level of covid-19 positively, which implies that they increase the acceptance level covid-19 vaccine. While sex, religion and tribe affect acceptance of covid-19 vaccine negatively, that is, decreases its acceptance level in the study area. It is therefore recommended that scarcity of the vaccine should be addressed, to make it easily accessible to citizens even to the remote and rural areas.

Keywords: Covid-19 • Probit • Acceptance • Goodness of fit • Vaccine

Introduction

The outbreak of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV-2), the virus that causes coronavirus disease 2019 (COVID-19) in Wuhan, Hubei, China and subsequently in 2020 was declared a pandemic by WHO due to the alarming levels of spread and the severity of the infection [1]. SARS-COV-2 infection has been associated with wild spectrum of illness that ranges from asymptomatic mild to severe or fatal conditions [2]. Common clinical symptoms of covid-19 include fever, fatigue, dry cough, shortness of breath, pneumonia, lack of sense of smell, etc. In Nigeria the first confirmed case was on 27th February, 2020 when an Italian national in Lagos tested positive for the virus and on 9th March, 2020 a second case of the virus was reported in Ewekoro, Ogun State a Nigerian citizen who came in contact with the Italian national. To slow the spread of the virus and mitigate its health effects, nations around the world implemented different control measures, such as social distancing, lockdown, wearing of face mask in public, washing of hands and the use of sanitizers.

Vaccine plays an important role in ensuring that children regardless of where they live can have a healthy start to life [3]. Given the elevated morbidity and mortality associated with covid-19 the development of a safe and effective covid-19 vaccine is critical step to reduce the pandemic. Since there is no specific treatment for covid-19, vaccine remains one of the most effective means of preventing the disease. Vaccination began in Nigeria on 5th march 2021 as of 28th February 2022, 17,914,944 persons have received their first dose (8.4%) of covid-19 vaccine and 8,197,832 have received their second dose (3.8%).

Despite the progress made by the development of safe and effective vaccine, there are still cogent issues that need to be addressed regarding covid-19 vaccine. Apart from misinformation and anti-vaccine sentiments, there are numerous carefully designed conspiracy theories surrounding covid-19 virus. Besides, vaccine development is constantly challenged by political considerations and religions. This in turn fuels the seemingly retractable non-acceptance of the vaccine. Across the globe, it has been reported that people who were fully vaccinated died of covid-19 associated symptoms, which has also deepened the public uncertainty about the safety and effectiveness of the vaccines [4]. Despite also the urgent and compelling need for the covid-19 vaccination, considerable apathy and profound hesitancy are still ingrained in communities.

Vaccine acceptance among a large population of people can determine the success control of the covid-19 pandemic but unfortunately, the level of acceptance of the vaccine remains low in Nigeria even globally. The majority of the populations are nay sayers, vaccine doubters and so many conspiracy theories circulating that have led to non-acceptance of the vaccine. Hence, to improve vaccine acceptance in Nigeria, context specific research that is aimed at identifying factors associated with vaccine hesitance which include the prevailing cultural, tribal and religious tendencies is urgently needed. This is to ensure a healthy population protected from the deadly virus and this will bring numerous social and economic benefits.

The whole world is looking forward to the arrival of a safe and effective vaccine, Janssen, Sputnik V, Sinovac, Pfizer-BioNTech, Johnson & Johnson and Sinopharm BIBP. The two most commonly available in Nigeria are the Oxford-Astra Zeneca and Pfizer-BioNTech. The Pfizer-BioNTech jab is one of two mRNA vaccines along with Moderna's and it was found to be 95% effective in Phase III trials.

McCarthy N [5] observed that 61 counties are using the Pfizer-BioNTech vaccine with the list including the Israel, USA, EU and Saudi Arabia, the other mRNA vaccine produced by Moderna used in 27 countries while the Oxford-AstraZeneca shot due to its low cost and ease of storage, is used in 41

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countries. He also observed that China's Sinopharm and Sinovac are used in 10 and 6 countries respectively.

Holder J [6] reported that more than 5.45% billion people worldwide have received a dose of covid-19 vaccine, equal to about 71.1% of the world population. He also observed that vaccine doses remain relatively scarce globally as such countries like USA and Israel are administering additional doses that's is booster doses given to fully vaccinated individuals when the protection from the original shots has begun to decline, as well as extra shots given to people, such as the immune compromised, who did not have a strong immune response from their initial doses. More than 2.57 billion additional doses have been administered worldwide, with many more countries expected to start administering soon. Holder J [6] also found in his study that less wealthy countries are relying on a vaccine-sharing arrangement called COVAX, which originally aimed to provide 2 billion doses by the end of 2021 but repeatedly cut its forecasts because of production problems, export bans and vaccine hoarding by wealthy nations. According to him, this has led to a striking divide between regions of the world. Africa has the slowest vaccination rate of any continent, with just 32.9% of the population receiving at least one dose of a vaccine. Vaccination rates continue to lag in low-income countries, where only 26% of the population has received at least one dose of a vaccine. In high- and upper-middle-income countries, 82% of the population has received at least one dose.

Ozawa S and Stack ML [3] in their conclusion advised that measuring and monitoring trust levels and focusing on deliberate efforts to build trust in vaccines are important steps to reducing vaccine confidence gaps when they occur. Laine C, et al. [2] outlined some measures to increase acceptance level to include

1. That there's need to battle misinformation with aggressive dissemination of accurate information about the realities of covid-19 and risks and benefits of the vaccine.
2. To acknowledge rather than dismiss people's concerns about the covid-19 vaccine.
3. To manage public's expectations.
4. That when people are skeptical of the vaccine's effectiveness and safety, there's need to let them know that the trials leading to emergency use authorization included participant with a range of ages, racial and ethnic backgrounds and comorbidity.

Adedeji-Adenola H, et al. [7], studied the factors influencing Covid-19 vaccine uptake among adult in Nigeria. Their study revealed a high level of awareness, willingness to receive the vaccine and moderate perception towards the vaccination activities. Also that influencing factor that significantly affect awareness were religion, occupation and education level and prior diagnosis of Covid-19 and for perception and willingness were occupation and prior diagnosis of Covid-19 were influencing factors.

According to Olu-Abiodun O, et al. [8] in their review on covid-19 vaccine acceptance rate show that acceptance level in Nigeria ranged from 20.0% to 58.2% among adults across the six geographical zones of Nigeria. Non-acceptance of the vaccine was found to be a result of propaganda, adverse effect concerns and conspiracy theories. They advised among others that national, community and individual-level interventions need to be developed to improve the covid-19 vaccine acceptance rate in Nigeria [9].

This research is aimed at revealing major factors affecting the level Covid-19 vaccine acceptance and hesitance among staff and students of Akanu Ibiam Federal Polytechnic Unwana. Specifically, it determines the social status of the staff and students, examines the factors influencing the staff and students' perception and acceptance of covid-19 vaccine; identifies the major factors affecting the acceptance of vaccine; and determines the combined influences of two or more factors; and recommends how vaccine acceptance can be improve thereby leading to wellbeing of staff and students of Akanu Ibiam federal polytechnic, Unwana [10,11].

Method

Polytechnic, Unwana were divided into strata $N= N_2+.... +N_L$ and samples $n= n_1+n_2+...+n_l$ drawn from each stratum (that is, Schools and Divisions). The data collected were analyzed using statistical methods which include percentages, cross tabulation and probit regression model.

Probit regression model

Probit regression is a type of regression where the dependent variable can only take two values. It is a popular specification for an ordinal or a binary response model that employs a probit link function. This model is mostly estimated using standard maximum likelihood procedure.

Suppose response variable Y is binary, that is it can have only two possible outcomes which we will denote as 1 and 0. For example Y may represent presence/absence of a certain condition, success/failure of some device, answer yes/no on a survey, etc. and there is a vector of repressors X, which are assumed to influence the outcome Y. Specifically, the model takes form

$$\Pr(Y = 1 / X) = \Phi(X'\beta)$$

where, Pr denotes probability, Φ is the Cumulative Distribution Function (CDF) of the standard normal distribution, and the parameters β are coefficients typically estimated by maximum likelihood. The probit model can be written as a latent variable model.

Suppose there exists an auxiliary random variable

$$Y^* = X'\beta + \varepsilon$$

where ε ~ N(0, 1). Then Y can be viewed as an indicator for the latent variable model

$$Y = 1_{\{Y^*>0\}} = \begin{cases} 1, & f\ Y^* > 0 \\ 0, & Otherwise \end{cases}$$

Results and Discussion

The result of the analysis are interpreted and discussed in this section. The result presented on Table 1 shows the distribution of the social factors

Table 1. Distribution of social factors of staff and students of AIFPU.

S. No	Variables	Frequency	Percentages
1.	**Age group (in years)**		
	20–29	64	33.68
	30–39	61	32.11
	40–49	51	26.84
	50+	14	7.37
2.	**Sex**		
	Male	120	63.16
	Female	70	36.84
3.	**Religion**		
	Christianity	182	95.79
	Islam/ traditional	8	4.21
4.	**Tribe**		
	Igbo	156	82.11
	Yoruba/ Hausa	34	17.89
5.	**Education**		
	Higher degree (HND/ BSc/MSc/PhD)	120	63.16
	Lower degree (O'level/ NCE/ ND)	70	36.84
6.	**Work Status**		
	Employed	127	66.84
	Unemployed	63	33.16

Source: Field survey, 2023

which include age group (in years), sex, religion, tribe, education attainment and work status of the respondents (staff and students of Akanu Ibiam Federal Polytechnic Unwana Nigeria).

The result shows that 33.68% of the respondents were within the age group 20–29 years, 32.11% within the age group 30–39 years, 26.84% within the age group 40–49 years, and 7.37% within the age group 50 and above years. Also, the result shows that majority of the respondents were males (63.16%), Christians (95.79%), and Igbo tribes (82.11%) while females, Islam/ traditionalist, and Hausa/ Yoruba were 36.84%, 4.21% and 17.89% respectively. 63.16% of the respondents possess higher degrees while 36.84% possess lower degrees, and the work status distribution of the respondents shows that 66.84% were employed while 33.16 were unemployed.

The result of Table 2 shows the perception and acceptance level of COVID 19 vaccination by the respondents (Staff and students of Akanu Ibiam Federal Polytechnic Unwana Nigeria). The acceptance levels of COVID 19 vaccine were determined by the responses from respondents on item 1, 2, 3, and 4. While, their perceptions were determined by their responses from item 6 and 7.

The result shows that 47.89% of the respondent have vaccine card while 52.11% have no vaccine card. Among those that have vaccine card, only 74.73% have been vaccinated while 25.27% have not. Also those that have been vaccinated 42.65% received only one jab, 45.59% received two jabs and 11.76% received three jabs. Those who have received full or complete vaccination were 55.88% while 44.12% have not. 48.53% were given Oxford Astra Zeneca, 39.71% Pfizer BioNTech, and 11.76% both. On the perception of the respondents about the vaccine usage, 76.47% indicated that the vaccine has no effect, 7.35% experienced headache as side effect, 11.76% experienced weakness, 1.47% rashes and 2.95% fever. Others that have not been vaccinated have the following reasons for non-compliance. 35.35% attributed it to fear, 11.84% no benefit, 3.95% personal belief, 11.18% not a COVID 19 patient, 5.92% not aware, 14.47% no trust.

The result of Table 3 shows the cross tabulation of acceptance of COVID 19 vaccine and the social factors of the respondents. The associated chi-square test of independence was performed to determine whether the acceptance level of COVID 19 vaccine by the respondents is in relation to their social factor. The null hypothesis of dependence against the alternative hypothesis of independence was tested at five percent level of significance.

From the result, it could be observed that the acceptance level of COVID 19 vaccine is independent of the age group, sex, education and work status of respondents at five percent level of significance, but dependent on religion and tribe of respondents at five percent level of significance. This implies that the subset of age group, sex, education and work status of the respondents actually does not influenced the acceptance level of the vaccine unlike religion and tribe which does. Consequently, it is observed that the acceptance level of the vaccines by the respondents as it relates to age group has 19.12% of 20–29 years, 41.18% of 30–39 years, 32.35% of 40–49 years and 7.35% of 50+ of the respondents. As for gender, male is 52.94% and female is 47.06%, for education attainment higher degree has 73.53% and lower degree 26.47%, for working status employed is 80.88% and unemployed is 19.12%. And for the religion, 92.65% were Christians and 7.35% were Islamic/traditionalist, and for the tribe, 79.41% were Igbo and 21.59% were Hausa/Yoruba.

The result of Table 4 shows the probit regression model for the estimate of relationship between acceptance level of COVID 19 vaccine and social factors

Table 2. Perception and acceptance level of COVID 19 vaccination by respondents.

S. No	Perception and Acceptance Level	Frequency	Percentage
1.	**Do you have vaccine card?**		
	Yes	91	47.89
	No	99	52.11
2.	**Have you been vaccinated?**		
	Yes	68	74.73
	No	23	25.27
3.	**Have you been fully vaccinated?**		
	Yes	38	55.88
	No	30	44.12
4.	**How many jabs of vaccine received?**		
	One	29	42.65
	Two	31	45.59
	Three	8	11.76
5.	**Name of vaccine received**		
	AstraZeneca	33	48.53
	Pfizer	27	39.71
	AstraZeneca & Pfizer	8	11.76
6.	**Side effect**		
	None	52	76.47
	Headache	5	7.35
	Weakness	8	11.76
	Rashes	1	1.47
	Fever	2	2.95
7.	**Reason for non-compliance**		
	Fear	54	35.53
	No benefit	18	11.84
	Personal	6	3.95
	Not a COVID 19 patient	17	11.18
	Not aware	9	5.92
	Not available & accessible	22	14.47
	No trust	26	17.11

Source: Field survey, 2023

Table 3. Cross tabulation showing influence of social factors on acceptance of COVID 19 vaccination.

		Vaccinated		Statistic
S. No	**Variables**	**Yes**	**No**	χ^2
1.	**Age group (in years)**			
	20–29	13(19.12)	51 (41.80)	10.583*
	30–39	28 (41.18)	33 (27.05)	-
	40–49	22 (32.35)	29 (23.77)	-
	50+	5 (7.35)	9 (7.38)	-
2.	**Sex**			
	Male	36 (52.94)	84 (68.85)	4.751*
	Female	32 (47.06)	38 (31.15)	-
3.	**Religion**			
	Christianity	63 (92.65)	119 (97.54)	2.593
	Islam/ traditional	5 (7.35)	3 (2.46)	-
4.	**Tribe**			
	Igbo	54 (79.41)	102 (83.61)	0.532
	Yoruba/ Hausa	14 (20.59)	20 (16.39)	-
5.	**Education**			
	Higher degree (HND/BSc/MSc/ PhD)	50 (73.53)	70 (57.38)	4.896*
	Lower degree (O'level/ NCE/ ND)	18 (26.47)	52 (42.62)	-
6.	**Work status**			
	Employed	55 (80.88)	72 (59.02)	9.419**
	Unemployed	13 (19.12)	50 (40.98)	-

Source: Field survey, 2023
*: Indicates significance at 0.05 level

Table 4. Probit regression model result.

Factors	Estimate	Standard Error	Z Statistic Value ($Z_{0.05}$ = 1.96)
Constant	-2.766	0.227	-12.185**
Age	0.013	0.006	2.167*
Sex	-0.152	0.079	-1.924
Religion	-0.047	0.168	-0.279
Tribe	-0.069	0.097	-0.711
Education	0.287	0.122	2.353*
Work status	0.275	0.138	1.993*

Goodness of fit test χ^2 = 219.568**
Source: Field survey, 2023

of the respondents. The goodness of fit test=219.568 shows that the probit regression model is significant at 5 percent level. The result shows that age, education and work status of respondents which are significant at 5 percent level influences the acceptance level of COVID 19 vaccination positively. This implies that as age, education and work status tends to increase the level of acceptance of COVID 19 vaccination increases. While, Sex, religion and tribe of the respondents influences the acceptance level of COVID 19 vaccinations negatively.

Conclusion

This study is based on analyzing the social factors influencing COVID 19 vaccine acceptance level in Akanu Ibiam Federal Polytechnic Unwana Nigeria. The social factors of respondents used were examined to ascertain the distribution of the respondents. The acceptance level and perception of respondents to COVID 19 vaccine were investigated and found that majority of the respondents were not interested in the vaccination for obvious reasons which include fear of side effects especially. The social factors influencing the acceptance level of COVID 19 vaccine were observed to be age group, sex, education and work status of respondents at five percent level of significance, implying that the subset of age group, sex, education and work status of the respondents actually influences the acceptance level of the vaccine. The extent at which the factors influence the acceptance of the vaccine was also determined and reveals that age, education and work status were significant at 1-percent level of significance, while sex was significant at 5-percent level of significance. The relationship between the social factors and the acceptance level of COVID 19 were determined and shows that age, education and work status of respondents are positive and significantly influences the acceptance level of COVID 19 vaccination in the area while, sex, religion and tribe of the respondents influences the acceptance level of COVID 19 vaccinations negatively.. Therefore, this study concludes that age, education and work status tends to increase the level of acceptance of COVID 19 vaccination increases.

Recommendation

The work recommends openness on the part of government and health workers to citizens on the benefits and side effects of the vaccine. Health workers should abide by the ethics in carrying out the duty of administering the vaccine because from the findings out of 49.87% that have vaccine cards 25.27% that possess the card were not vaccinated, this is misleading and highly condemnable. Adequate reorientation should be carried out by National orientation agency nationwide carried out in English, Pidgin English and the three major languages to drive home the message. Scarcity of the vaccine

should be addressed too, to make it easily accessible to citizens even to the remote and rural areas.

Acknowledgement

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Conflict of Interest

None.

References

1. https://www.who.int/emergencies/diseases/novel-coronavirus-2019
2. Laine, Christine, Deborah Cotton and Darilyn V. Moyer. "COVID-19 vaccine: Promoting vaccine acceptance." *Ann Intern Med* 174 (2021): 252-253.
3. Ozawa, Sachiko and Meghan L. Stack. "Public trust and vaccine acceptance-international perspectives." *Hum Vaccines Immunother* 9 (2013): 1774-1778.
4. Ogundele, Olorunfemi Akinbode, Tolulope Ogundele and Omolola Beloved. "Vaccine hesitancy in Nigeria: Contributing factors–way forward." *Niger J Clin Pract* 18 (2020): 1-4.
5. McCarthy, N. "Which covid-19 vaccines are most widely used?" Statista Delivered by Google (2021).
6. Holder, Josh. "Tracking coronavirus vaccinations around the world." N.Y. Times 30 (2021).
7. Adedeji-Adenola, Halimat, Olubusola A. Olugbake and Shakirat A. Adeosun. "Factors influencing COVID-19 vaccine uptake among adults in Nigeria." PLoS One 17 (2022): e0264371.
8. Olu-Abiodun, Oluwatosin, Olumide Abiodun and Ngozi Okafor. "COVID-19 vaccination in Nigeria: A rapid review of vaccine acceptance rate and the associated factors." PloS One 17 (2022): e0267691.
9. Marti, Melanie, Monica de Cola, Noni E. MacDonald and Laure Dumolard, et al. "Assessments of global drivers of vaccine hesitancy in 2014—Looking beyond safety concerns." PloS one 12 (2017): e0172310.
10. Sheikh, Knvul and Roni Caryn Rabin. "The coronavirus: what scientists have learned so far." N.Y. Times 22 (2020).
11. Jiang, Shibo, Shuai Xia, Tianlei Ying and Lu Lu. "A novel coronavirus (2019-nCoV) causing pneumonia-associated respiratory syndrome." *Cell Mol Immunol* 17 (2020): 554-554.

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