

Original Research Article

Community perception and determinants of willingness to uptake COVID-19 vaccines among residents of Osun State, South-West Nigeria

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ABSTRACT

Background: Vaccine has been identified as the most cost-effective way of fighting COVID-19 pandemic. As most countries await the COVID-19 vaccine for mass administration amidst numerous misconceptions, it is imperative to assess willingness of the masses to take the vaccine. This study aimed to assess the determinants of willingness to uptake COVID-19 vaccines among residents of Osun State.

Methods: A descriptive cross-sectional study design was employed. Seven hundred and forty-four respondents were enrolled from three selected local government areas using a multistage sampling method. Interviewer administered questionnaire, structured based on the health belief model and social cognitive theory, in electronic format (Kobo Collect) was used for data collection. Determinants of willingness to take COVID-19 vaccine were assessed using binary logistic regression.

Results: About three-quarters (59.1%) of the respondents were willing to take the vaccine. There was a significant association between positive perception and willingness to take COVID-19 vaccine, $p < 0.001$. Being a healthcare worker, having good knowledge of the disease, and willingness-to-pay for the vaccine were significant determinants of willingness to uptake COVID-19 vaccine. Presence of misconception had a negative effect on the uptake of COVID-19 vaccine.

Conclusions: To achieve high COVID-19 vaccine coverage, there is a need for health promotion interventions to correct misconceptions about COVID-19. Government and private donor interventions may be required to subsidize the vaccine to care for the populace who are willing to uptake but unable to pay for the vaccine.

Keywords: Community perception, COVID-19, Osun State, Vaccine, Willingness-to-uptake

INTRODUCTION

COVID-19 pandemic has disrupted every sphere of human life. The disruption spans from local to international level, thus necessitating its declaration as a public health emergency of international concern by the World Health Organisation.¹ The virulence of the virus coupled with non-availability of highly efficacious antiviral drugs has further heightened the global concern about the disease. Efforts have been geared towards the primary prevention of the disease via health promotion

and development of vaccines to build herd immunity against the disease.²⁻⁴

The COVID-19 pandemic has been met with varying perceptions ranging from negative to positive perceptions. The overabundance of information about the disease which comprises both right and wrong information has contributed to varying perceptions in the community which may have either positive or negative effects on the willingness to uptake COVID-19 vaccine.⁵ Many vaccines are on the verge of scaling the third stage of

clinical trials, while some have been given emergency use approval by the World Health Organisation amidst widespread misconceptions about the disease, and some countries have procured the vaccine while others are in the process of procurement of the vaccine.^{6,7}

It is therefore imperative to assess possible COVID-19 vaccine hesitancy and commence necessary mitigation measures to enhance adequate vaccine coverage. This study consequently aimed to assess the perception of citizens about COVID-19 infection and factors that may influence their willingness to uptake the vaccine. The findings could form a basis for health promotion intervention to enhance wide vaccine coverage.

METHODS

The study was conducted in Osun State, a land-locked state in the south-west of Nigeria, 7°30'N 4°30'E. According to the national population census, it has a total population of 3,423,535 million as of 2006, with a 2015 population projection figure of 4,593,999 based on an annual growth rate of 3.2%. Up to 96% are Yoruba while the other major Nigerian tribes – Hausa and Igbo – are also fairly represented.

The state has thirty local government areas with an equal proportion of rural and urban local government areas. Majority of the people speak Yoruba language while English is the official language. Each local government has between 10 and 11 wards with at least a primary health center per ward to ensure access to healthcare.

The state has three major centers for the testing and treatment of COVID-19, located at Osogbo, Ile-Ife, and Ejigbo. These centers served as the referral centers for other adequately sensitised healthcare facilities within their catchment area. The screening and treatment at these centers are free while the option of screening for a fee is also available.

Study design and population

This study was a descriptive cross-sectional study. Participants in the study comprised both males and females above the age of 18 years. Data were collected over three weeks between August and September 2020.

A total of 744 respondents participated in the study across the three local government areas selected via a multistage sampling method. Three out of thirty local government areas in Osun State were selected via simple random sampling technique by balloting.

Each selected local government has eleven wards, out of which three wards were selected per local government by simple random sampling method. Alternate households were selected and a willing eligible adult per household was enrolled in the study.

Data collection

Data were collected using an electronic interviewer-administered questionnaire through Kobo Collect android application. The questionnaire consisted of five sections structured based on both social cognitive theory and the health belief model. The questionnaire, therefore, assesses intrapersonal and environmental determinant of willingness to take COVID-19 vaccine. Section A contained questions on the socio-demographic characteristics of the respondents while section B assessed the awareness and knowledge of COVID-19. Section C contained myths and misconceptions about COVID-19 while section D contained questions on perception of COVID-19. The questions on perception of COVID-19 were structured based on the construct of the Health Belief Model.⁸ The section was rated on a 4-point Likert scale where 1 represented "strongly disagree" and 4 represented "strongly agree". Section E assessed willingness to uptake COVID-19 vaccine by the respondents while the last section assessed the influence of other people in the society on respondents' decision making.

Data analysis

Data were analysed using IBM SPSS version 25 for windows (IBM SPSS Inc., Chicago USA). Categorical variables like sociodemographic variables and willingness to uptake for COVID-19 vaccines were summarised using frequencies and proportions. Association between vaccine factors, sociodemographic variables, perception of COVID-19, and willingness to take the vaccine was assessed using Chi-Square. The perception of COVID-19 was scored based on response to 4-point Likert scaled structured questions. Respondents who scored a median value of the maximum attainable score and above were regarded as having positive perceptions. Each construct of the Health Belief Model, susceptibility, severity, benefits, barriers, and self-efficacy was determined separately. Association between each construct of health belief model and willingness to take COVID-19 vaccines was also assessed using Chi-square. Overall perception was score via summation of scores from all the constructs of the model. Other people in the society that could influence the decision of respondents to take COVID-19 was assessed using multiple response analysis. The determinants of willingness to take COVID-19 vaccine were further assessed using binary logistic regression. A p value of less than 0.05 was considered to be statistically significant.

Ethical Consideration: Ethical approval was obtained from the Research and Ethics Committee of the Institute of Public Health (IPH), Obafemi Awolowo University, Ile-Ife, Nigeria. Verbal and written informed consents were sought from each respondent after an adequate explanation of the objectives of the study.

Confidentiality and data security were assured. Participation was made voluntary as each participant was at liberty to opt-out at any point in the study.

RESULTS

A total of 774 respondents were enrolled and completed the survey. The median age of respondents was 35 years. Both genders were almost equally represented, male (367, 49.3%) and female (377, 50.7%). Most of the respondents had tertiary level of education, (335, 45.1%), followed by the proportion of respondents with secondary level of education, (281, 37.8%). Few respondents had no formal education (13, 1.7%). About one-tenth (88, 11.8%) of the respondents were healthcare workers while 88.2% belong to other professions. Majority of the respondents (370, 49.7%) were self-employed while more than one-quarter (198, 26.6%) were unemployed. Other respondents (176, 23.7%) were employed in the public or private sector.

About 6 out of 10 (440, 59.1%) were willing to take COVID-19 vaccine if it is available, but only 181 (12.6%) will be willing to take the vaccine if it requires payment. Also, few respondents (94, 12.6%) were willing to take the vaccine if the uptake is associated with stigmatization while less than one-fifth (143, 19.2%) will be willing to take COVID-19 vaccine if its uptake is associated with some clinical side effects. Details are as shown in Table 1.

Table 1: Willingness to uptake COVID-19 vaccines.

| Variables | Frequency (%) |
|---|---------------|
| Willingness to uptake COVID-19 vaccines if available | |
| No | 304 (40.9) |
| Yes | 440 (59.1) |
| Willingness to uptake COVID-19 vaccines if it requires payment | |
| No | 563 (75.6) |
| Yes | 181 (24.3) |
| Willingness to uptake COVID-19 vaccines if it is associated with stigmatization or other social side effects | |
| No | 650 (87.4) |
| Yes | 94 (12.6) |
| Willingness to uptake COVID-19 vaccines if it is associated with some side effects | |
| No | 601 (80.8) |
| Yes | 143 (19.2) |

There were significant associations between willingness to take COVID-19 vaccine and vaccine factors like paying out-of-pocket for the vaccine, stigmatization in relation to vaccination, and association with clinical side effects, $p < 0.001$ respectively. Majority of those willing to take COVID-19 vaccine (260, 59.4%) were not willing to pay for the vaccines). Also, majority of the respondents (79.1%) willing to take COVID-19 will only do so if it is

not associated with stigmatization or other social side effects. Besides, most of the respondents (301, 68.4%) will be willing to take COVID-19 vaccine if it is not associated with clinical side effects while 139 (31.6%) were willing to take the vaccine, even when there are side effects. Details are shown in Table 2.

Table 2: Association between vaccine factors and willingness to receive COVID-19 vaccine.

| Variables | Willingness to uptake COVID-19 vaccine | | Statistics |
|--|--|---------------|-----------------------------|
| | No | Yes | |
| | N (%) | N (%) | |
| Willing to pay for the cost of vaccine | | | |
| No | 300 (99.0) | 260 (59.4) | X ² = 152.523 |
| Yes | 3 (1.0) | 178 (40.6) | p<0.001 |
| If the vaccine is associated with stigma and other negative social effects | | | |
| No | 302 (99.3) | 348 (79.1) | X ² = 66.797 |
| Yes | 2 (0.7) | 92 (20.9) | p<0.001 |
| Association of vaccine with side effects | | | |
| No | 300 (98.7) | 301 (68.4) | X ² = 106.135 |
| Yes | 4 (1.3) | 139 (31.6) | p<0.001 |

Being a healthcare worker was significantly associated with willingness to take COVID-19 vaccine, $p < 0.001$. Majority of respondents that are healthcare workers (72, 81.8%) were willing to take the vaccine relative to the proportion of other professions willing to uptake the vaccine, (269, 41.0%). Also, there was a significant association between level of education and willingness to take COVID-19 vaccine, $p < 0.001$. The proportion of respondents willing to take the vaccine was observed to increase from the primary to tertiary level of education. The proportion of females (179, 47.5%) willing to take the vaccine was more than that of males (162, 44.1%); the difference in the proportion was however not statistically significant. Religion and marital status were also not significantly associated with willingness to take COVID-19 vaccine.

Perception of COVID-19 assessed based on the constructs of health belief model showed a statistically significant association between all the constructs and willingness to uptake COVID-19 vaccine, except perception of barriers to uptake of the vaccine, $p = 0.073$. Higher proportions of respondents who perceived themselves to be susceptible to the disease (306, 49.2%) were willing to take the vaccine relative to proportion of participants with poorly perceived susceptibility willing to take the COVID-19 vaccine, (35, 28.7%). Also, a higher proportion of those that perceived the vaccine to be beneficial (323, 47.9%)

were willing to take the vaccine compared with proportion of respondents willing to take the vaccine among those with poor perceptions of the benefit of COVID-19 vaccine (18, 26.1%). There was also a significant association between having a good perception of severity, cue to action, and willingness to take COVID-19 vaccine. Details are as shown in Table 4.

Table 3: Association between sociodemographic characteristics and willingness to uptake COVID-19 vaccine.

| Variables | Willingness to uptake COVID-19 vaccine | | Statistics |
|--------------------------------------|--|---------------|----------------------------|
| | Yes | No | |
| | N (%) | N (%) | |
| Sex | | | |
| Male | 162 (44.1) | 205 (55.9) | X ² = 0.835 |
| Female | 179 (47.5) | 198 (52.5) | p=0.361 |
| Marital Status | | | |
| Single | 83 (42.3) | 113 (57.7) | |
| Married | 237 (46.4) | 274 (53.6) | X ² = 2.744 |
| Divorced | 4 (66.7) | 2 (33.3) | P=0.433 |
| Widowed/widower | 15 (53.6) | 13 (46.4) | |
| Occupation | | | |
| Healthcare workers | 72 (81.8) | 16 (18.2) | X ² = 52.057 |
| Others | 269 (41.0) | 387 (59.0) | p<0.001 |
| Level of Education | | | |
| None | 7 (53.8) | 6 (46.2) | |
| Primary | 24 (20.9) | 91 (79.1) | X ² = 49.177 |
| Secondary | 121 (43.1) | 160 (56.9) | p<0.001 |
| Tertiary (polytechnic or university) | 150 (54.0) | 128 (46.0) | |
| Postgraduate | 39 (68.4) | 18 (31.6) | |
| Religion | | | |
| Christianity | 233 (47.7) | 255 (52.3) | X ² = 2.241 |
| Islam | 102 (42.5) | 138 (57.5) | p=0.326 |
| Traditional Religion | 6 (37.5) | 10 (62.5) | |

About one-third of the respondents (361, 32.3%) felt they can decide on whether to take the COVID-19 vaccine on their own, without the influence of others in society. Also, about one-fifth of the respondents (245, 22.0%)

showed that advice from doctors will make them uptake COVID-19 vaccine. Advice from political leaders accounted for the least of the response (5, 0.4%) as a source that can motivate the uptake of COVID-19 vaccine. Details are as shown in Table 5.

Table 4: Association between intra-personal factors and willingness to uptake COVID-19 vaccine.

| Variables | Willingness to uptake COVID-19 vaccine | | Statistics |
|--------------------------|--|------------|-------------------------|
| | Yes | No | |
| | N (%) | N (%) | |
| Perceived Susceptibility | | | |
| Poor | 35 (28.7) | 87 (71.3) | X ² = 17.278 |
| Good | 306 (49.2) | 316 (50.8) | p<0.001 |
| Perceived Severity | | | |
| Poor | 1 (11.1) | 8 (88.9) | X ² = 4.424 |
| Good | 340 (46.3) | 395 (53.7) | p=0.035 |
| Perceived Benefit | | | |
| Poor | 18 (26.1) | 51 (73.9) | X ² = 11.945 |
| Good | 323 (47.9) | 352 (52.1) | p=0.001 |
| Perceived Barrier | | | |
| Low | 18 (62.1) | 11 (37.9) | X ² = 3.204 |
| High | 323 (45.2) | 392 (54.8) | p=0.073 |
| Cue to Action | | | |
| Poor | 14 (9.6) | 132 (90.4) | X ² = 96.115 |
| Good | 327 (54.7) | 271 (45.3) | p<0.001 |
| Overall Perception | | | |
| Poor | 1 (3.8) | 25 (96.2) | X ² = 19.131 |
| Good | 340 (47.4) | 378 (52.6) | p<0.001 |

Respondents that are willing to pay for COVID-19 vaccine are 69.9 times more likely to take the vaccine, $p<0.001$. Healthcare workers are twice more likely to take COVID-19 vaccine relative to respondents from other professions (Odds ratio=2.1, $p=0.041$).

Respondents with a good level of knowledge of COVID-19 are more likely to take the COVID-19 vaccine (Odds ratio =4.6, $p=0.001$), while those with at least one misconception about COVID-19 are less likely to take the vaccine, (Odds ratio =0.3, $p<0.001$).

The level of education was not a significant determinant of willingness to uptake COVID-19. Details are as shown in Table 6 below.

Table 5: Significant others in decision making to uptake COVID-19 vaccine.

| Variables | N (% of responses) |
|-----------------------------------|--------------------|
| I can make my own decision | 361 (32.3) |
| My doctor | 245 (22.0) |
| Other health workers | 143 (12.8) |
| Religious leaders | 102 (9.1) |
| Spouse | 94 (8.4) |
| Government | 58 (5.2) |
| Friends | 52 (4.7) |
| TV, radio, etc | 20 (1.8) |
| Employers | 13 (1.2) |
| social media | 9 (0.8) |
| Traditional leaders | 7 (0.6) |
| Social leader | 7 (0.6) |
| Political leaders | 5 (0.4) |

Multiple Response Analysis

Table 6: Binary logistic regression of association between respondents' characteristics and willingness to uptake COVID-19 vaccine.

| Variables | Odds Ratio | P value | 95% CI |
|---------------------------------------|------------|---------|--------------|
| Willingness to Pay for vaccine | | | |
| No | Ref | <0.001 | 21.9 – 223.7 |
| Yes | 69.9 | | |
| Occupation | | | |
| Other professions | Ref | 0.041 | 1.0 – 4.1 |
| Healthcare workers | 2.1 | | |
| Level of education | | | |
| No formal education | Ref | | |
| Primary | 0.3 | 0.122 | 0.1– 1.3 |
| Secondary | 0.4 | 0.212 | 0.1 – 1.6 |
| Tertiary | 0.3 | 0.101 | 0.1 – 1.2 |
| Knowledge of COVID-19 | | | |
| Poor | Ref | | |
| Good | 4.6 | 0.001 | 1.9 – 11.0 |
| Presence of misconceptions | | | |
| No | Ref | | |
| Yes | 0.3 | < 0.001 | 0.1 – 0.5 |

DISCUSSION

About three-quarters of the respondents were willing to take COVID-19 vaccine. There was a sharp decline in the proportion of respondents willing to take the vaccine if it will require payment. It thus showed that majority of the respondents will be willing to take the vaccine only if it is free. This could be due to the socio-economic status of average individuals in the study area as a significant

proportion of the citizens in the study area live on less than 1.9 dollars per day.⁹ The decline in the proportion of respondents willing to take the vaccine if there are users fee charges could be due to the long-term existence of free immunization programme. Most common vaccines in the study area are under donor-funded programmes, hence, available for citizens free of charge. This may have limited the felt need of respondents to pay for the COVID-19 vaccine. The finding from this study was similar to the result of a similar study conducted in Saudi Arabia and the United Kingdom where about three-quarters were willing to take COVID-19 vaccine. The studies, however, did not assess willingness to uptake vaccine if it requires charges.^{10,11} The proportion of respondents willing to take the vaccine was within the range of findings from a global survey of potential acceptance of COVID-19 vaccine. China had the highest proportion of respondents willing to take the vaccine while Russia recorded the lowest proportion. The proportion of Russian respondents willing to take the vaccine was about 14% lower than the finding from this study.¹²

The fear of potential side effects of COVID-19 vaccine was also a significant factor that affects the willingness to uptake the vaccine among respondents. This could be due to a lot of misconceptions about the disease and its vaccine.^{6,7} This was in agreement with the findings of a study among Americans where fear of future unforeseen side effects of the vaccine was an important determinant of the unwillingness to uptake COVID-19 vaccine.¹³ Fear of side effect was also observed to be a significant factor affecting willingness to uptake COVID-19 vaccine in the United Kingdom.¹¹

Other identified factors affecting willingness to take COVID-19 vaccine were level of education and being a healthcare worker. The willingness of people with higher levels of education to take the vaccine relative to respondents with lower levels of education could be due to the ability of the former to access more information about the disease independently to make informed decisions. Healthcare workers have been identified to be more at risk of contracting the disease. The higher proportion of health care workers willing to take the vaccine relative to respondents from other professions could be due to increased perceived susceptibility and more in-depth knowledge of the disease compared to the non-healthcare workers. This finding is in agreement with most studies that compared willingness to uptake COVID-19 vaccine among health care workers compared with willingness among people from other professions.¹⁴⁻¹⁶ Higher level of education was also a significant factor affecting positively the willingness to uptake the vaccine in other similar studies.^{13,17,18} There was however contrary findings in the studies conducted in Jordan and an international survey where higher levels of education were not associated with willingness to uptake COVID-19 vaccine.^{19,20}

Perceptions of COVID-19 and its vaccine were important factors affecting willingness to uptake COVID-19 vaccine. More respondents with good perceptions were willing to take the vaccine. All the constructs of perception based on the health belief model have positive significant association with willingness to take COVID-19 vaccine, with the exception of perceived barriers. These findings were in agreement with results from other studies that were positive links between willingness to uptake vaccines and perceptions of the disease.^{15,21-23}

The subjective norm assessment showed that most of the respondents felt that they will decide to take COVID-19 vaccine on their own, while healthcare workers and to an extent, the religious leaders could influence the COVID-19 vaccine uptake decision making among few respondents. The findings that about 2 out of 10 respondents felt that doctor can influence their decision to take COVID-19 vaccine was low compared with the result from similar studies conducted in South Carolina where 8 out of 10 respondents were willing to take the vaccine if it is recommended by doctor or school.²⁴

CONCLUSION

As most countries await the receipt of the COVID-19 vaccine, it is imperative to identify and address barriers to the uptake of COVID-19 vaccine. Only about half of the respondents were willing to take the vaccine, even when it is free and lower proportion of respondents were willing to take the vaccine if users fee charges will be applicable. There is high vaccine hesitancy in the survey population which might delay the ability to curb the spread of the diseases. Good level of knowledge about COVID-19 and addressing common misconceptions about the disease might improve the willingness to uptake the vaccine. Health promotion programmes to improve knowledge and address misconceptions will be a key measure to improve willingness to uptake the vaccine. Interventions by the government and non-governmental organisations to ensure availability of the vaccine free of charge or at a subsidized rate, coupled with the health promotion intervention, will ensure high vaccine coverage.

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