

Original Research Article

Predictors of acceptance of COVID-19 vaccine among patients at a tertiary hospital in South-South Nigeria

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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome corona virus-2 (SARS-CoV-2), which was said to have emerged from a livestock market in Wuhan, China in December 2019. The objective of this study was to determine the predictors and willingness of patients to accept the COVID-19 vaccine.

Methods: This survey was carried out at the federal medical centre, Yenagoa between 4th January and 15 February 2021. It was a descriptive cross-sectional study. The study population consisted of 1,000 consecutive patients that presented to the various out-patients departments of the hospital. Written informed consent was obtained. Data collected with a predesigned questionnaire were analysed using statistical software (SPSS for windows® version 23, SPSS Inc, Chicago, USA).

Results: Out of 1,000 participants, only 246 (24.6%) were willing to receive the COVID-19 vaccine. About 2 in every 5 participants were unwilling to take the vaccine due to trust issues. Lack of trust in the manufacturers and government were the reasons given by 43.4% and 41.8% of participants, respectively. All sociodemographic factors were significant predictors of willingness to receive COVID-19 vaccine. The male participants (OR=2.34; p=0.01) were 2 times more willing than women to receive COVID-19 vaccine.

Conclusions: The willingness to accept COVID-19 vaccine is low here. The highest predictor of willingness to accept the vaccine was the male gender and this is quite significant in our environment where decision-making in the family lies mostly on the man.

Keywords: COVID-19, COVID-19 vaccine, Willingness, Predictor, Wuhan

INTRODUCTION

COVID-19 is a respiratory disease that was first identified in December 2019 in Wuhan, the capital of Hubei province in the people's republic of China.¹ It is caused by SARS-CoV-2 and was said to have emerged from a livestock market in the city of Wuhan in December 2019.

The first case of COVID-19 in Nigeria was discovered on the 27th February 2020, when an Italian in Lagos tested positive for the virus. Since then, the number of cases has steadily increased in Nigeria. The WHO declared COVID-19 a global pandemic on the 11th March 2020.² The case fatality rate in Nigeria is presently 1.2% of the total confirmed cases with 82% recovery rate, while the prevalence is 12.2%.^{3,4}

There is presently no widely accepted or recommended treatment modality for COVID-19. The recommendations of various disease control institutions are geared towards disease prevention in order to control the spread and reduce the burden on healthcare system. Many drugs have been tried for the treatment of COVID-19. These drugs include hydroxychloroquine, chloroquine, azithromycin, ivermectin, doxycycline, cotrimoxazole, remdesivir, ulinastatin and colchicine, but none has been unanimously recommended for the treatment of COVID-19. An inhaler was recently tried in Israel and said to have an efficacy of 96%.⁵ The device is based on exosomes enriched in CD24 that is inhaled directly into the lungs and capable of clearing the virus within 5 days of use. Clinical trials are still ongoing.⁵

Since there is presently no widely recommended effective treatment for COVID-19, vaccination is the biggest hope for the control of the COVID-19 pandemic. Vaccination has been effective in the prevention of infectious diseases thereby reducing associated morbidity and mortality. It is the mainstay of prevention and control of infectious diseases. However, the success of vaccination against COVID-19 will be largely dependent on the willingness of the general populace to accept and receive the vaccine and the subsequent development of herd immunity.⁶

The second wave of the COVID-19 pandemic is presently ongoing. As at 31st December 2020, three new variants of the SARS-CoV-2 have been detected and has spread to about 13 countries worldwide.⁷ In the face of mutations of the SARS-CoV-2, there is increasing concern about the effectiveness of the available vaccines against the present variants of the SARS-CoV-2, as a new variant of the virus first discovered in Nigeria has been found in the United Kingdom.⁸ This variant (B1525) contains the E484K mutation that helps the virus evade antibodies against it, which may render the presently available COVID-19 vaccines ineffective.⁸

The COVID-19 vaccine works by delivering the genetic sequence of the SARS-CoV-2 spike protein to the body's cells.⁹ The body's cells read this genetic code and produce copies of the spike protein, the immune system in turn mounts a response against these proteins and remembers them. If SARS-CoV-2 later enters the body, its spike proteins will immediately flag it to the immune system for destruction.

The WHO has recommended the Oxford/AstraZeneca COVID-19 vaccine for use in all adults.¹⁰ It has recommended two doses of the vaccine to be given 8 to 12 weeks apart.¹⁰ The efficacy of the vaccine is higher when the second dose is administered.¹⁰ The national agency for food and drug administration and control (NAFDAC) has also recommended the Oxford/AstraZeneca COVID-19 vaccine for use in Nigeria.¹¹ A recent study on COVID-19 vaccine efficacy in Israel revealed that Pfizer/BioNTech's vaccine is about 85% effective after the first dose.¹² When the immune

system is not optimal, there may be poor vaccine response especially in the elderly. Therefore, optimising the immune system with nutrition, vitamins and minerals to improve the effectiveness of COVID-19 vaccine has been suggested.¹³

Low uptake of vaccines is a widely recognised rate-limiting factor to achieving successful global vaccination against infectious diseases.¹⁴ Vaccine uptake may be influenced by a number of factors which include understanding, level of education, ethnicity, socio-cultural factors, religious factors, personal risk perception, access to social media, fear of side effects, accessibility to healthcare facility, sources of information and level of trust in the healthcare system. Therefore, introducing a new vaccine to the general populace may be met with a lot of resistance due to the factors mentioned above. The objective of this research was to determine the predictors and willingness of patients at the FMC, Yenagoa to accept the COVID-19 vaccine.

METHODS

This survey was carried out in all the clinical departments of the FMC, Yenagoa, Bayelsa state, south-south, Nigeria between 4th January and 15th February 2021. It was a descriptive cross-sectional study. The study population consisted of 1,000 consecutive patients that presented to the various out-patients departments at the FMC, Yenagoa for management.

Patients who were eligible were counselled and enrolled in the study after giving a written informed consent. An explanation of the nature of the study and the likely benefits to the patient preceded the administration of written consent. Patients that presented for all forms of consultation were included in the study. Critically ill patients at the accident and emergency units and ICU patients on admission at the various wards in the department, mental health patients, members of staff in the non-clinical departments and patients who declined consent or incompletely filled the consent form were excluded from the study.

The sample size for this study was calculated using the formula,¹⁵

$$n = \frac{z^2 pq}{d^2}$$

Therefore, 1,000 patients who met the inclusion criteria were recruited for this study.

Data analysis

Selected patients data were entered into a predesigned questionnaire. Data generated from the survey were entered directly into IBM SPSS 23.0 version which was also used for analysis. Analysis was done to explore sociodemographic features including age, sex, marital

status, religion, occupation and educational attainment, the presence of chronic illnesses, willingness to receive COVID-19 vaccine and previous effects of COVID-19 infection among participants. The reason for unwillingness to receive COVID-19 vaccine was also analysed. Results are summarised in frequencies and percentages for categorical variables and mean and standard deviation for continuous variables.

A binary logistic regression was done to identify factors that predispose participants (predictors) to receiving the vaccine. Participants who showed willingness to receive the COVID-19 vaccine were coded as 1 and those unwilling were coded 0. A bivariate analysis was done to examine how independent variables like sociodemographic features, the presence of chronic illnesses, history of loss of taste and smell and previous positivity for COVID-19 vaccine influenced the willingness to receive the vaccine. Statistical significance level was set at p value <0.05.

RESULTS

Sociodemographic features of participants

Of the 1,000 persons that participated in this study, Table 1 revealed that women (65.1%) were almost twice the population of men (34.9%) in the study. Modal age group was 26-35 years (34.6%), while less than one-tenth of participants were older than 55 year old (7.1%). About three-quarters of participants were married (74.1%) and almost half of participants (48.6%) had tertiary education as their highest educational attainment. Most of the participants were traders (25.8%). About 22.8% were unemployed and 18.4% were professionals.

Pre-existing medical conditions among participants

The most common chronic medical conditions among participants were hypertension (11.9%), diabetes (4.7%), benign prostatic hyperplasia (2.0%) and carcinoma of the prostate gland (2.0%), while the least reported was asthma (0.9%).

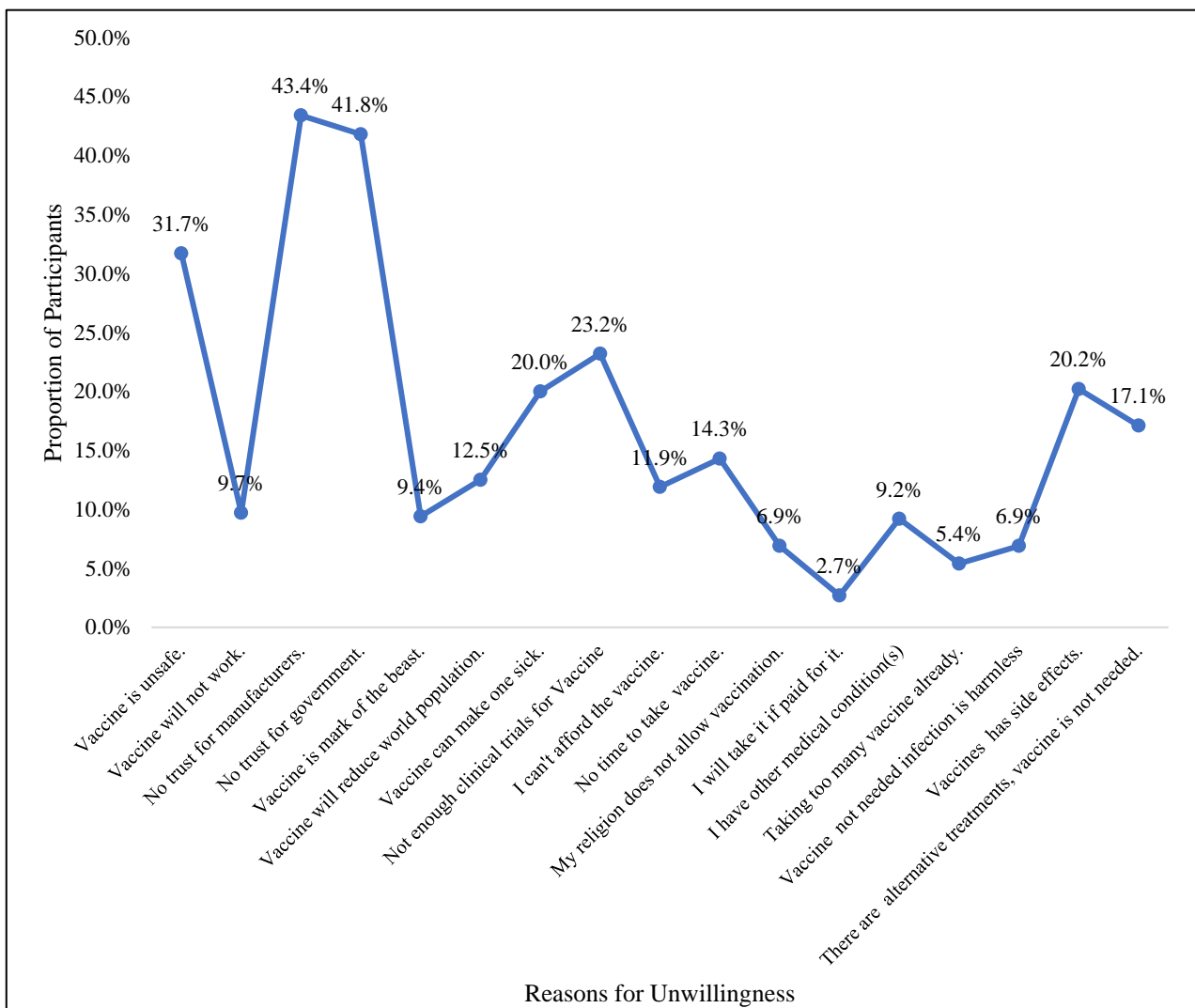


Figure 1: Reasons for unwillingness to receive COVID-19 vaccine.

Table 1: Sociodemographic features of participants (n=1000).

| Characteristics | Frequency (N) | Percent (%) |
|-----------------------------|---------------|-------------|
| Sex | | |
| Male | 349 | 34.9 |
| Female | 651 | 65.1 |
| Age group (in years) | | |
| ≤25 | 168 | 16.8 |
| 26-35 | 346 | 34.6 |
| 36-45 | 312 | 31.2 |
| 46-55 | 103 | 10.3 |
| >55 | 71 | 7.1 |
| Mean age (SD) in years | 35.9 (10.6) | |
| Marital status | | |
| Single | 259 | 25.9 |
| Married | 741 | 74.1 |
| Religion | | |
| Christian | 973 | 97.3 |
| Islam | 18 | 1.8 |
| None | 9 | 0.9 |
| Educational level | | |
| Primary | 40 | 4.0 |
| Secondary | 331 | 33.1 |
| Tertiary | 486 | 48.6 |
| Postgraduate | 143 | 14.3 |
| Occupation | | |
| Trader | 258 | 25.8 |
| Professional | 184 | 18.4 |
| Artisan | 31 | 3.1 |
| Health worker | 107 | 10.7 |
| Security | 41 | 4.1 |
| Agric | 64 | 6.4 |
| Others | 87 | 8.7 |
| Unemployed | 228 | 22.8 |
| Residence | | |
| Bayelsa | 899 | 89.9 |
| Outside Bayelsa | 101 | 10.1 |

SD-standard deviation.

Table 2: Distribution of chronic illnesses among participants (n=1000).

| Chronic illnesses | Frequency (N) | Percent (%) |
|--|---------------|-------------|
| Hypertension | 119 | 11.9 |
| Diabetes | 47 | 4.7 |
| Benign prostatic hyperplasia | 20 | 2.0 |
| Carcinoma of the prostate gland | 20 | 2.0 |
| Peptic ulcer disease | 19 | 1.9 |
| Breast lump | 11 | 1.1 |
| Tuberculosis | 11 | 1.1 |
| Growth on the forehead | 10 | 1.0 |
| Asthma | 9 | 0.9 |

Table 3: Willingness to receive COVID-19 vaccine (n=1000).

| Characteristics | Frequency (N) | Percent (%) |
|---|---------------|-------------|
| Willingness to accept COVID-19 vaccine | | |
| Willing | 246 | 24.6 |
| Unwilling | 754 | 75.4 |

Table 4: Preferred route of COVID-19 vaccine (n=246).

| Preferred route of administration of COVID-19 vaccine | Frequency (N) | Percent (%) |
|---|---------------|-------------|
| Oral | 71 | 28.9 |
| Intranasal | 9 | 3.7 |
| Injection | 125 | 50.8 |
| Any route | 41 | 16.6 |

Table 5: Factors influencing willingness to take COVID-19 vaccine.

| Characteristics (reference group) | B | OR | 95% CI | | P value |
|---|--------|------|--------|-------|---------|
| Sex | | | Min | Max | |
| Female | | | | | |
| Male | 0.85 | 2.34 | 1.74 | 3.14 | 0.001 |
| Age group (≤25 years) | | | | | |
| 26-35 | -0.97 | 0.38 | 0.25 | 0.58 | 0.001 |
| 36-45 | -0.58 | 0.56 | 0.37 | 0.84 | 0.005 |
| 46-55 | -0.26 | 0.78 | 0.46 | 1.31 | 0.342 |
| >55 | -0.28 | 0.76 | 0.42 | 1.38 | 0.360 |
| Marital status (married) | | | | | |
| Single | 0.44 | 1.55 | 1.13 | 2.12 | 0.007 |
| Educational attainment (postgraduate) | | | | | |
| Primary | 0.07 | 1.07 | 0.53 | 2.16 | 0.853 |
| Secondary | -2.04 | 0.13 | 0.08 | 0.22 | 0.001 |
| Tertiary | -0.68 | 0.51 | 0.35 | 0.75 | 0.001 |
| Occupation (others) | | | | | |
| Unemployed | 0.74 | 2.09 | 1.04 | 4.23 | 0.040 |
| Trader | 0.43 | 1.54 | 0.76 | 3.12 | 0.232 |
| Professional | 0.83 | 2.30 | 1.13 | 4.71 | 0.022 |
| Artisan | -19.27 | 0.00 | 0.00 | . | 0.998 |
| Health worker | 1.61 | 5.02 | 2.39 | 10.51 | 0.001 |
| Security | 1.98 | 7.26 | 3.01 | 17.49 | 0.001 |
| Agric | 1.36 | 3.88 | 1.72 | 8.74 | 0.001 |
| Residential location (outside Bayelsa) | | | | | |
| Bayelsa | 0.31 | 1.36 | 0.82 | 2.27 | 0.239 |
| Chronic illnesses (absent) | | | | | |
| Present | 0.92 | 2.51 | 1.83 | 3.44 | 0.001 |
| Positive for COVID-19 (no) | | | | | |
| Yes | 0.82 | 2.27 | 0.90 | 5.71 | 0.081 |
| Possible infection (no) | | | | | |
| Yes | 0.32 | 1.38 | 0.89 | 2.14 | 0.149 |
| Loss smell and taste (no) | | | | | |
| Yes | 1.09 | 2.96 | 1.99 | 4.41 | 0.001 |
| Contact with COVID positive persons (no) | | | | | |
| Yes | 0.54 | 1.71 | 1.01 | 2.93 | 0.049 |
| Lost a relative to COVID-19 (no) | | | | | |
| Yes | 1.18 | 3.27 | 1.78 | 6.01 | 0.001 |

Willingness to receive COVID-19 vaccine and COVID-19 related information

Out of the 1,000 participants, only 246 (24.6%) were willing to receive the COVID-19 vaccine (Table 3).

Reasons for unwillingness to receive COVID-19 vaccine

As shown in Figure 1, about 2 in every 5 participants were unwilling to take the vaccine due to concerns bordering on trust. Lack of trust in the manufacturers and government were the reasons given by 43.4% and 41.8% of participants, respectively. Other reasons were concerns of safety expressed as the vaccine is unsafe (31.7%), the vaccine has not gone through enough clinical trials (23.2%) and the vaccines will have side effects (20.2%). Sentiments influenced by religious beliefs such as the vaccine is a mark of the beast and My religion does not allow vaccination were expressed by 9.4% and 6.9% of participants, respectively.

Preferred route of administration of COVID-19 vaccine

Out of the two hundred and forty six participants who are willing to receive the vaccine, about half would prefer intramuscular injection (50.8%), while just above one-quarter of participants would like the oral route of administration for the vaccine (Table 5).

Predictors (influencing factors) of willingness to receive the COVID-19 vaccine

As presented in Table 5, all the sociodemographic factors among participants were significant predictors of willingness to receive the COVID-19 vaccine. The male participants (OR=2.34; p=0.001) in this study were 2 times more willing than women to receive the COVID-19 vaccine. Participants who were single (OR=1.55; p=0.007) also expressed a higher likelihood of receiving the vaccine than married people. Participants who had secondary (OR=0.13; p=0.001) and tertiary education (OR=0.51; p=0.001) were significantly less likely to receive the COVID-19 vaccine than those who had a post graduate qualification.

Furthermore, Table 6 revealed that the presence of a chronic illness (OR=2.51; p=0.001) increased the willingness to receive the vaccine. Participants who have had loss of sense of taste and smell (OR=2.96; p=0.001), had contact with COVID-19 positive persons (OR=1.71; p=0.049) and who had lost a relative to COVID-19 infection (OR=3.27; p=0.001) were more likely to receive COVID-19 vaccines.

DISCUSSION

Historically, vaccines have been shown to be a cost-effective public health tool for disease prevention and have also been highly successful in this regard.¹⁶ With the on-going pandemic, it is not surprising that the race to

develop a vaccine is on with over a hundred COVID-19 vaccine candidates having been developed and at various levels of investigations, with some ready and approved for use.¹⁷ However, for a vaccine to be termed effective depends on the level of uptake in the population and the eventual development of herd immunity. It has been suggested that herd immunity can be achieved when about 70% of the population has immunity either from previous infection or vaccine.¹⁸ If there is a large prevalence of people refusing to take the vaccine, then the development of herd immunity becomes difficult.¹⁹

In this study, we found that 75.4% would decline a COVID-19 vaccine with only 24.6% willing to take the vaccine. This result is quite different from findings from a multi-national survey in Europe which showed that the willingness to receive the vaccine was as high as 62.6% in Sweden and 88.1% in Mexico.²⁰ It was however shown that this willingness to accept the vaccine decreased over time in the same countries. Example in Mexico, the vaccine acceptance among respondents was 88.1% by March 2020 and by May 2020 the acceptance level had reduced to 73.9% and in US the vaccine acceptance fell from 74.7% to 62.6% between May and September 2020.²⁰ Various other studies have shown COVID-19 vaccine acceptance level as high as 54% to 80%.^{8,21-23} Countries such as China, Brazil, Australia, India, Malaysia and Indonesia had very high levels of acceptance (87%-97%).²¹⁻²⁴

The main reason given for this high level of non-acceptance of the COVID-19 vaccine borders on trust; lack of trust in the vaccine manufacturers and the government (43.4% and 41.8% respectively). A similar finding was shown in a study by Malik et al in the US who suggested that mistrust in the healthcare system and misinformation about the vaccine from the government may be responsible for the refusal of vaccine acceptance which was noted more among the black Americans and those of low socio-economic status.²³

This high level of non-acceptance of the COVID-19 vaccine is also at variance with two studies done in Nigeria that showed 74.47% and 58.2% of the respondents were willing to take the vaccine when available.^{23,24} The main reason given for refusal was due to unreliability of clinical trials and the belief that their innate immunity was sufficient to combat the virus.²⁴ As opposed to our study, these studies had more male respondents (56.8% and 58.1% versus 34.9%) and this may be a reason for the higher acceptance level as it has been suggested that the male gender is a positive determinant for acceptance of the vaccine.^{22,26,25} This was also a finding in our study which showed that men were twice as likely to accept the vaccine than women. This factor was at variance with studies done in Nigeria and Saudi Arabia that found no significant association between COVID-19 vaccine acceptance and gender.^{25,26}

Other reasons for vaccine refusal that were given were unsafe vaccine and fear of side effects. These reasons are actually not surprising as they have been cited in various studies as reasons for vaccine refusal.²⁷ In our study, reasons bordering on religion account for about 17% of refusal to accept the vaccine. This reflects the high level of religiosity in our environment and the role the churches, mosques and other places of worship may play in influencing the populations decision on vaccine acceptance. Surprisingly, a highly religious country like Mexico had a high acceptance rate for COVID-19 vaccine.²⁰

A global survey carried out on the potential acceptance of the COVID-19 vaccine found that there was a high heterogeneity in the figures from the different countries assessed, with China giving the highest number of positive responses (88.6%) and Poland giving the highest number of negative responses (27.3%) when asked if they would take a proven, safe and effective vaccine.²⁸

Aside the male gender, other potential positive predictive factors for willingness to accept the vaccine include the presence of chronic illnesses, previous history of loss of smell and/or taste (with a high suspicion of having contacted the corona virus infection), contact with COVID-19 patient or loss of someone from COVID-19 disease. These above factors seem to either make the respondents feel at higher risk of developing the disease or makes the disease a more real entity as opposed to those that feel COVID-19 is a scam and not worth bothering about.

Regarding the route of administration of the vaccine, most of the respondents preferred the intramuscular followed by the oral route over other routes of administration. This is somewhat similar to the study by Olomofe et al in Nigeria who reported the oral and parenteral routes as preferable.²⁴ The intranasal route seems to be the least preferred in both studies. This is particularly important for policy makers and vaccine manufacturers so as to improve uptake and compliance of the vaccine.

Even though the answers from this study may not 100% reflect the final decisions, the population will make in real-life when the vaccine is present and ready for use, it is still important that policymakers, healthcare workers and other stakeholders do more with regards to information dissemination and health education and promotion especially on the misconceptions about the COVID-19 vaccine.

Limitation

The main limitation of this study was that this was a hospital-based study. The results that were obtained here may not reflect what is obtainable in other tertiary hospitals in Nigeria and around the globe.

CONCLUSION

This study, domiciled in south-south Nigeria, showed that the willingness to accept the COVID-19 vaccine is low, only 24.6%. The highest predictor of willingness to accept the vaccine was the male gender and this is quite significant in our environment where decision-making in the family lies mostly on the man. More attention needs to be focused on health education and promotion to change the misconceptions about the COVID-19 vaccine. If this is achieved and the uptake of the vaccine improves to about 70%, then the possibility of herd immunity and ultimately disease prevention can be a reality.

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