Original Research Article

HERD IMMUNITY, THE BEST WAY OUT OF SARS COV-2 PANDEMIC. PREACHING THE GOOD NEWS ABOUT COVID-19 VACCINE AND VACCINE EFFICACY

ABSTRACT

Aims: To investigate vaccine efficacy amongst the vaccinated population and also to investigate the willingness to be vaccinated among the unvaccinated population of Oke-Ogun region of Oyo State, Nigeria.

Study design: A snowball sampling approach was used.

Place and duration of study: Samples were collected randomly from the general populace of Oke-Ogun, Oyo State, between 20th of January to 20th of April, 2022. Analysis of samples was carried out at the medical laboratory unit of Adeniyi Memorial Hospital, Igbope.
Methodology: 500 consenting adults were recruited to participate in the study (250 health workers and 250 non health workers, aged 18 years and above) vaccinated or unvaccinated with SARS-CoV-2 vaccine. A standard questionnaire was administered to the participants and consenting adults were sampled and tested using a SARS-CoV-2 rapid diagnostic test kit. A 2 x 2 contingency table (chi-square method, 2-tailed with 1 degree of freedom test) was used to determine the efficacy of SARS-CoV-2 vaccine.

Results: Among the 500 participants, 328 (65.6%) participants have been vaccinated, although 214 (42.8%) participants accounted for full vaccination. Higher vaccination rate 220 (88%) occurred among the health workers compared to 153 (61.2%) among the other participants. From the non-immunized participants, only 32 (18.6%) are willing to get vaccinated immediately, 95 (55.23%) were not willing to get the vaccination unless they know more about the virus and the vaccines. Infection rate was seen to be higher among the unvaccinated population (10.24%) compared to the vaccinated population (2.6%). Furthermore, infection among the unvaccinated health worker (13.3%) was seen to be higher than the unvaccinated non-health workers participants (9.2%).

Conclusion: Covid-19 vaccine has proved to be efficient with high degree of immunity conferred on fully-immunized individuals. This will help in the reduction of the severity, mortality of the disease and reduction of the impact of the pandemic on the National Health System and economy of countries.

Keywords: [SARS-CoV-2, Vaccination, Covid-19, Infection, Vaccine efficacy, vaccine acceptability, Rapid diagnostic test kit].

1. INTRODUCTION

Coronavirus (SARS-CoV-2) is a pandemic that has destabilized human life, health, family and country's economy. The pandemic was declared in March 2020 (1) after it was first discovered in Wuhan, China. The first confirmed case in

Nigeria was announced on 27 February 2020, when an Italian national in Lagos tested positive for the virus (2,3). On 9 March 2020, a second case of the virus was reported in Ewekoro, Ogun State, a Nigerian citizen who came into contact with the Italian national (4,5). The number of confirmed cases as at 13th of June, 2022 is 256,246. However, there has been far less testing for the virus in Nigeria than other countries (6). In Oyo state, 10,219 cases have been reported (7).
Several measures have been taken against the disease in order to control its transmission these include hand hygiene, physical distancing, avoidance of large gathering and the use of face mask; all these are targeted at reducing the rapid spread of the disease. In response to the pandemic, the global efforts to develop multiple vaccines to protect against COVID-19 disease have been unrivalled in the history of public health. The greatest success will rely on successful vaccination plan against the SARS-CoV-2 virus to bring an end to the epidemic. A herd immunity of the population must be achieved as this can prove greatly successful in the campaign against SARS-CoV-2 outbreak and to further prevent the emergence of new variants of the virus. Until we reach herd immunity, COVID-19 will remain a public threat and the next mutation could be more lethal (8). In a study, vaccine acceptance rate is 74.5% in Nigeria (9). But this high rate is accounted for mostly by the health practitioners.

Covid-19 vaccine has proved to be efficient with high degree of immunity conferred on fully-immunized individuals (10). The vaccine also helps in the reduction of the severity, mortality of the disease and reduction of the impact of the pandemic on the National Health System and economy (11). However, vaccine hesitancy had been a major dilemma in the achievement of SARS-CoV-2 vaccination plan. To date various surveys have been developed to assess individual attitudes as well as concerns around the risks and benefits of immunization (12, 13).

The population's perception of SARS-CoV-2 vaccine has most likely influenced by their knowledge about the health consequences of SARS-CoV-2 infection and the importance of the vaccine to prevent these consequences (14) has really determined the vaccine acceptability by the population. This survey is conducted to investigate vaccine efficacy amongst the vaccinated population and also to investigate the willingness to be vaccinated among the unvaccinated population of Oke-Ogun region of Oyo State, Nigeria as this is important for planning the COVID-19 vaccination campaign and programme. It is also aimed to determine vaccine efficacy among the participants which can serve as a tool to preach the good news about the vaccine.

2. MATERIAL AND METHODS

Study Setting and Design

A cross-sectional study was conducted from 20th of January to 20th of April, 2022 among the general population of Oke-Ogun, Oyo State. A snowball sampling approach was adopted and 500 consenting adults were recruited (250 health workers and 250 non health workers) were tested using a SARS-CoV-2 rapid diagnostic test kit.

Data Collection

Individuals aged 18 years and above who gave consent participated in the survey. We collected socio-demographic data, information about underlying health conditions, acceptability of the COVID-19 vaccine and a consent on SARS-CoV-2 test. Other information collected includes major reasons for vaccine hesitancy. All responses were collected and collated anonymously both manually and, on a password-protected laptop until the day for analysis.

Data analysis

Age, being a continuous variable was categorized into age groups. For all categorical variables, descriptive statistics were presented as percentages (%). Age and gender were introduced into the model to account for the population's demographics. 2 x 2 contingency table (chi-square method, 2-tailed with 1 degree of freedom test) was used to determine the efficacy of SARS-CoV-2 vaccine (15).

3. RESULTS AND DISCUSSION

RESULTS

Socio-Demographic Characteristics of the Participants

The responses of 500 participants were included in the analysis. Most respondents were male (65%), the majority were in the 30-50 age group (58.3%), also major respondents are into agriculture (18.2%) other than health workers which was planned to include 50% of respondents and also most respondents have tertiary education (60%).

Socio demographic characteristics	**Number of sample (%) N=500**
Age group	
18-30	104 (20.8%)

31-50	298 (59.6%)
51-65	84 (16.8%)
>65	14 (2.8%)
Gender	
Male	323 (64.6%)
Female	177 (35.4%)
Educational status	
Secondary education	93 (18.6%)
Tertiary education	300 (60%)
No education	107 (21.4%)
Employment industry	
Agriculture	91 (18.2%)
Construction	9 (1.8%)
Manufacturing	27 (5.4%)
Trading	67 (13.4%)
Health care	250 (50%)
Art and Entertainment	22 (4.4%)
Finance	6 (1.2%)
Education	10 (2%)
Not working	18 (3.6%)

Table 1. Socio-demographic characteristics of the participants

PARTICIPANTS' health status

Of the 500 participants, 163 (32.6%) participants reported to have a chronic disease. The number of positive SARS-CoV-2 test was 21 (4.2%) overall. In the immunized health workers, 5 (2.27%) results were positive while 4 (13.3%) was positive from the non-immunized health workers. In other participants, 3 (1.96%) results were positive from the immunized while 9 (9.2%) results were positive from the non-immunized participants.

PARTICIPANTS' health characteristics		
Health worker		
Immunized	Positive	5 (2.27%)
	Negative	215 (97.73%)
Non-immunized	Positive	4 (13.33%)
	Negative	26 (86.67%)
Other participants		
Immunized	Positive	3 (1.96%)
	Negative	150 (98.04%)
Non-immunized	Positive	9 (9.2%)
	Negative	88 (90.72%)
Co-morbidity	Cancer	9 (1.8%)
	Obesity	22 (4.4%)
	Diabetes	28 (5.6%)
	Hypertension	43 (8.6%)
	Others	61 (12.2%)

Table 2: Health history of participants; COVID-19 vaccination status and COVID-19 infection status.

SARS-CoV-2 vaccine acceptability

Overall, 328 (65.6%) participants have been vaccinated, although 214 (42.8%) participants accounted for full vaccination. There is higher vaccination rate 220 (88%) among the health workers compared to 153 (61.2%) among the other participants. From the non-immunized participants, only 32 (18.6%) are willing to get vaccinated immediately if made readily available while others, 95 (55.23%) were not willing to get the vaccination unless they know more about the virus and the vaccines. The reason for vaccine hesitancy include: the vaccine is not safe and was made to depopulate human, religious belief, past experiences with other vaccines and some believed there is nothing true about SARS-CoV-2 outbreak. Another vital reason for vaccine hesitancy is 'older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness' (16) if given the vaccine. It was observed that some participants (from the group who wouldn't get vaccinated even if vaccine is

made available would reconsider getting vaccinated if they can be ascertained of getting maximal protection from the vaccine and wouldn't be liable to contracting other diseases from the vaccine.

SARS-CoV-2 vaccine efficacy

Covid-19 infection prevention was seen to be high among the vaccinated population as only 2.14% are positive. Statistical analysis has a *P* value > .0001 and hence association of vaccine and COVID-19 status is considered to be extremely statistically significant. Also, among the health workers, 5 (2.27%) was seen to test positive among the vaccinated population compared to 4 (13.3%) in the unvaccinated population. Statistically, *P* = .002 and hence, the association between vaccinated population among the health workers and their COVID-19 status is considered also to be statistically significant. 3(1.96%) non-health workers were positive. Statistically, *P* = .008 and association between vaccine status and Covid-19 status was considered very statistically significant. The results also support several reports such as Covid-19 tests carried out in the middle-east (15) further helps to boast population trust in SARS-CoV-2 vaccine.

DISCUSSION

"Herd immunity" is essential as this would help to prevent the spread COVID-19 virus. As seen from the results above, infection rate among the vaccinated population was reduced as compared to unvaccinated population. 50% efficacy threshold was set for COVID-19 vaccines because COVID-19 was deemed such a severe disease, that if a vaccine is only 50% effective, it's still worth using (16). Fortunately, the emerging data on COVID-19 vaccines suggests that the vaccines are very safe with high efficacy, at least against some of the variants. Acceptance of the vaccine was relatively high among healthcare workers (88%) but lower in the other participant group (61.2%). This high vaccine acceptance among healthcare workers has also been reported in Somalia (18), Mozambique (14) and South Africa (19), but a contrasting report was obtained from Democratic Republic of Congo (19).

From our study, it was shown that more participants would reconsider getting vaccinated if they can be ascertained of getting maximal protection from the vaccine and wouldn't be liable to contracting other diseases from the vaccine. Also, if vaccine efficacy is high and proven statistically, most would get vaccinated. This suggests that the more people are educated about the importance and efficacy of vaccination against COVID-19, their willingness to be vaccinated will increase. This was also reported in a study in Mozambique (14).

From our study, age is also a major factor affecting the population decision to accept COVID-19 vaccine. The actively working group who considered their day-to-day activities necessary especially with physical meetings is the highest vaccinated group, aged 31-50 (59.6%) who are majorly traders (13.4%) and farmers (18.2%), the elderly, >65 years of age (2.8%) are the least vaccinated group. This is because of their believe that they are less prone to contacting the disease as they are majorly indoor and also because of the statement 'older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness' (14) if given the vaccine. However, in a study in Ghana, populations with 36–45 years of age were less likely to accept being vaccinated compared to those aged 18–25 years (20). In a study in Mozambique (14), it was shown that the lower the age, the lower the vaccine acceptability. This was also found in Saudi Arabia (21) and South Africa (22). These results show that acceptability varies based on country, region, culture, and believe of different age-group bracket as to how important is COVID-19 vaccine.

Education also plays a major role in vaccination. From our report, Participants who have fore-knowledge and considered vaccination important for their own health or for the health of the community were more willing to accept vaccination. This was proved as the highest population of those vaccinated has tertiary education, 300 (60%). This suggests that if more people are educated about the importance of vaccination against COVID-19, their willingness to be vaccinated will increase.

To reach the greater population of Nigeria at large, a cultural and believe barrier would have to be broken as this is another major dilemma against COVID-19 vaccination plan. Some participants believe that COVID-19 pandemic isn't real while some believed that the vaccine was made to reduce human population.

4. CONCLUSION

SARS-CoV-2 vaccine can confer great immunity on fully vaccinated individuals. Once herd immunity is attained in a population, this will help to minimize the rapid spread of the disease and prevent the occurrence of other variants of the virus

CONSENT

"All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal."

ETHICAL APPROVAL

"All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki."

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