

# Seroprevalence of SARS-CoV-2 in Niger State: the Implications of the Findings and COVID-19 Vaccines Choices for the Sub-Sharan Africa

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## ABSTRACT

The pilot cross sectional seroprevalence of SARS CoV-2 study conducted in Niger State, Nigeria, by June of 2020, reveals high asymptomatic rate of COVID-19 and prevalence of 25.41% despite the lockdown enforced in the State three (3) months prior to the study when the lockdown ended. The observed SARS-CoV-2 seroprevalence and infection patterns means that the virus is widely spread, far more SARS CoV-2 infections occurred than the official reported cases. The study also revealed lack of full compliance to some of the COVID-19 control measures especially the social distancing, even during the lockdown. It is expected that SARS CoV-2 infections will continue in the State with the people either not experiencing symptoms or experiencing mild symptoms in some cases and very low COVID-19 fatality. The information about SARS CoV-2 prevalence, asymptomatic rate and fatality, geography and demography, vaccine hesitancy, myths and disbelief, and availability or lack of power infrastructures and cold chain storage facilities for vaccines, can ultimately determine what type of COVID-19 vaccine that is rolled out in a country or region. This review is focused on the implication of the findings of the study- "Seroprevalence of SARS-CoV-2 in Niger State". It also highlighted COVID-19 vaccines choices for the Sub-Sharan Africa.

## INTRODUCTION

The first case of COVID-19 in Niger State, Nigeria, was announced by the Nigeria Center for Disease Control (NCDC) on 10th April 2020 after six (6) weeks when the first confirmed case (index case) of COVID-19 in Nigeria was announced on 27th February 2020 [1]. As part of the measures to curtail the spread of SARS CoV-2, strict lockdown (restriction of people to their homes except for essential needs-medicine and food) was enforced in the State as from 25th March 2020 to 9th June 2020. However, full compliance to the strict lockdown by the citizens of the State may not have been achieved or possible, due socio-economic and cultural reasons, disbeliefs, and conspiracy theories.

Niger State (with a population of about 5,556,247 people) is one of the thirty-six (36) states in Nigeria-a country in the sub-Saharan Africa where daily average temperature throughout the year is 30–35°C and power supply is inadequate or lacking in

most of its rural areas. The total reported COVID-19 cases in the State as of 6th March 2021 is 917 with 17 deaths while for Nigeria (with a population of about 206,630,269) is 158,042 COVID-19 cases and 1,954 deaths [1-4]. It is believed that the reported COVID-19 cases in the state and Nigeria are very far below the actual SARS CoV-2 infections in the populations. This may be due to Polymerase Chain Reaction (PCR) based SARS CoV-2 test limitations in many states of Nigeria and unknown proportion of mild or asymptomatic COVI-19 cases that may not be diagnosed and not reported. Presence and detection of antibodies to SARS-CoV-2 in the blood of sampled participants will likely indicates they were infected at some point since the start of the pandemic. Therefore, serologic assays can be used to determine population-based estimates of SARS CoV-2 infection, including those who had mild or asymptomatic infection or who were never tested despite symptoms [5-8].

One of the aims of the study- "Seroprevalence of SARS-CoV-2 in Niger State" was to assess the knowledge, attitude, and practice

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of people with regards to the COVID-19 and its control measures in the State [9]. This can give clues about possible COVID-19 vaccine hesitancy level expected from the people in addition to the control measures compliance. The second aim of the study was to determine the SARS CoV-2 seroprevalence, patterns and dynamics and risk factors for contracting COVID-19 in Niger State, Nigeria [9]. This is a review of implications of the findings of the study. It also highlighted COVID-19 vaccines choices for the Sub-Sharan Africa.

### Findings and implications

#### Knowledge, Attitude and Compliance to COVID-19 Prevention Guidelines

In addition to COVID-19 vaccines, other ways of preventing the transmission of SARS-CoV-2 are social/physical distancing and good sanitation and hygiene practices. Adherence to these COVID-19 preventive measures can be impacted by the knowledge and beliefs of people about the disease since the measures involve some behavioural changes and practice. People can only believe what they know (aware of) and can practice when they believe. Majority of the study participants (81.62%) were aware and know about COVID-19 pandemic [9]. However, only 58.92% of the participants believed that the disease is in Niger State [9]. More than half (54.59%) of the participants in this study did not practice social distancing at any time since the pandemic started (January 2020 to June 2020) even as the lockdown was once enforced in the state [9]. Majority (61.62) of the participants practiced hand and face hygiene.

There are three main reasons why it is difficult for people to observe social distancing. The first is poverty. Many people would have to go out on daily basis to work in order to eat and cater for their families. Markets are usually open spaces bustling with large crowds of people and where most transactions are done with the physical exchange of cash [9, 10].

The second reason is the prevalence of disbeliefs, myths and conspiracy theories. Many people did not believe in the existence of COVID-19 and especially about the highly contagious nature of the disease. This may be the chief reason why many people did not care to observe social/physical distancing even when not enforced on them at the ATMs, markets, religious gatherings, motor parks, shops, supermarkets etc. Also, myths and conspiracy theories such as COVID-19 does not affect black people, that high environmental temperature and weather will kill off the virus, or that COVID-19 is for rich people and elites are some of the reasons why people are slow in accepting the enormity of the pandemic and therefore usually takes observance of social and physical distancing lightly [9, 10]. It is expected to have high hesitancy to COVID-19 vaccines among people that did not believe with the existence of the disease in the first place.

Thirdly, no efficient and robust housing and biometric data management systems where everyone is accounted for, especially for the purposes of employment, health, security and social welfare. If these are available, foods and other goods purchased online can be sent to houses with ease. In addition, utilities such as power, water, internet etc, are in most cases not provided or

grossly inadequately supplied. It is difficult for people to stay back at home and observe social/physical distancing in such situations [9, 10]. Also, under these situations and given the urgent need for COVID-19 vaccines roll out and owing to the available cold chain vaccines storage facilities and logistics, single dose COVID-19 vaccines with long time storage at normal refrigeration (Table 1) are most suitable.

S.No	Develo per	Candi date Vaccin e Name	Techn ology/ Metho d Used for Produ ction	Emerg ency Use Autho risation	Sched ule	Long Durati on Storag e Condi tion	Refere nce
1	Johnso n & Johnso n	JNJ-78 43673 5	Non-replica ting viral vector	Appro ved	Single dose	Norma l refrigeration temper atures (2- 8 °C (36- 46 °F)	[24-26]
		(Other names; Ad26. COV2. S; Ad26 COVS 1)					
2	Gamal eya Resear ch Institu te	Sputni k V	Non-replica ting viral vector	Appro ved	2 doses per person is necess ary	Refrige ration condi tion at 2-8 °C (36- 46 °F)	[27,28]
3	Pfizer, BioNT ech	BNT1 62b2	mRNA based vaccin e	Appro ved	2-dose series separat ed by 21 days	Ultra-cold freezer betwee n -80°C and -60°C (-112°F and -76°F) up to the expirat ion date	[29]
		(Anoth er					



					ed by temper 14 days atures (2- 8 °C (36- 46 °F)	
	(Anoth er name; BBV15 2)					
12	Zydu s Cadila	ZyCoV -D	DNA Vaccin e	Phase 3	3- dose vaccin e regime ns	Norma l refriger ation temper atures (2- 8 °C (36- 46 °F)

**Table 1:** Characteristics and Status of available COVID-19 vaccines as of 6th March 2021

Seroprevalence of SARS CoV-2

The seroprevalence of SARS-CoV-2 in Niger State was found to be 25.41% [9]. The observed seroprevalence is higher than most of the SARS CoV-2 sero-surveys carried out almost at the same time in other parts of the world [11-13] except the reports from South Africa and India that showed similar or higher seroprevalence of 23.7% and 54.1% respectively [14,15]. However, by this 25.41% SARS CoV-2 seroprevalence observed in Niger state and also considering the COVID-19 reported cases for Niger State and Nigeria as of 30th June 2020 (when this study was conducted) and 6th March 2021, it means SARS CoV-2 infections occurred very far more than the reported cases in the State and Nigeria [1]. The data suggest that >2,700 times more SARS-CoV-2 infections occurred than the number of reported cases in Niger State or about 570 times more SARS-CoV-2 infections occurred than the number of reported cases in Nigeria. The high SARS CoV-2 seroprevalence observed may be due to many factors including high COVID-19 asymptomatic rate and high lack of observance of social distancing in the State. Unknown high proportion of asymptomatic COVI-19 cases will not be diagnosed and not reported, and therefore, the observed SARS CoV-2 seroprevalence in the State will be more reliable and closer to the actual true prevalence of the disease in the State than the official reported cases. As of 6th March 2021, and based on the COVID-19 reported cases and deaths, the fatality rates for COVID-19 in Niger state and Nigeria stood at 1.85% and 1.24% respectively [1]. However, when the observed 25.41% SARS CoV-2 seroprevalence was considered, the fatality rates drastically reduced to 0.0012% and 0.004% for Niger state and Nigeria, respectively.

Asymptomatic rate of COVID-19

In the study-“ Seroprevalence of SARS-CoV-2 in Niger State”, the participants were asked whether they have had flu-like experience in the last 6 months (January 2020 to June 2020) since when the COVID-19 index case was announced in Nigeria; this helped to deduce the rate of COVID-19 asymptomatic rate in Niger State which was 47% [9]. A study in South Africa also reported similar COVID-19 asymptomatic rate of 47.9% [14]. Other SARS CoV-2 sero-surveys across the world reported similar high asymptomatic rate of COVID-19 [11,12,16]. It has been reported that majority of infected people with SARS-CoV-2 (about 50-75%) are usually asymptomatic [17,18]. So far, only low burdens of COVID-19 pandemic are reported in sub-Saharan African countries compared to other global regions; this may be due to high COVID-19 asymptomatic rate attributable to their younger populations.

Risk factors for COVID-19

Less likely odds of contracting COVID-19 among females compared to the males was observed [9]. The less risk of infection for the females in the study maybe due to physical attributes such as the less mobility and activity of the females compared to that of males in the State [9]. Generally, around the world, the case fatality of COVID-19 varied widely (1-20%) with more cases and fatalities observed in males compared to females [19,20].

High SARS CoV-2 seroprevalence (37%) and double odd of contracting COVID-19 among health care workers were observed [9]. It is expected for the health care workers to have higher COVID-19 prevalence compared to the non-health care workers because they are the frontline workers responsible for the diagnosis, treatment, and management of patients including symptomatic and asymptomatic COVID-19 patients [21-23]. These enormous essential tasks for controlling the COVID-19 Pandemic coupled with the inadequate or lack of PPE in some instances and high asymptomatic rate of COVID-19 among people put the health care workers at greater risk of contracting and transmitting the disease.

Double odd of being positive for SARS CoV-2 was also observed for the participants that experienced flu-like symptoms and did social distancing since when pandemic started (January 2020 to June 2020)[9]. The double odd for the flu-like symptoms was expected and in line with the findings that about 50% of the SARS CoV-2 infections in the state was asymptomatic [9]. However, the double odd for the social distancing may not be correct due to other confounding factors.

COVID-19 vaccines choices for the Sub-Sharan Africa

COVID-19 pandemic continues to impact health and socio-economic activities of humans. However, fortunately, COVID-19 vaccines are now available (Table 1) and have received approval for emergency use authorisation by the national and multinational regulatory agencies of the countries where they are presently been rolled out. Presently, all available vaccines (Table 1) have achieved minimum 50% efficacy in preventing symptomatic COVID-19 in phase 3 clinical trials as required by the WHO. All these vaccines (Table 1) are good and any type available to you should be accepted without hesitance.

Biologics including vaccines have required storage temperature which must be adhered to in order to protect them and ensure their quality remains consistent. As the world grapple with the COVID-19 mass vaccination, countries and regions would have to make intelligent choices of most suitable vaccines for them considering many factors including the availability of transport and storage facilities. Sub-Saharan Africa has high infectious diseases burdens and therefore facilities and logistics including normal refrigeration cold chain for vaccines are in place for routine immunizations for the killer diseases, especially in children. This has been largely successful due to the perfect collaborations of the national health agencies with the WHO and UNICEF. Even in situations of lack or inadequate power supply in most rural areas in sub-Saharan Africa, it is easy to improvise for a normal refrigeration storage conditions for the vaccines by using cold ice boxes. These facilities can be easily and quickly improved upon, expanded, and harnessed for mass COVID-19 vaccinations in Sub-Saharan Africa. COVID-19 vaccines (Table 1) that can be stored for a long time at normal refrigeration condition and that are especially for single dose schedule are most suitable and sustainable for the facilities and logistics in the sub-Saharan Africa. However, ultra-low freezing facilities are conspicuously lacking and can take ages to be put in place due financial cost implications involved and epileptic power supply that cannot support and sustain such facilities.

## Conclusion

The observed Niger State SARS-CoV-2 seroprevalence and infection patterns means that the virus is widely spread, far more SARS CoV-2 infections occurred than the reported cases and high asymptomatic COVID-19 across the State. However, the COVID-19 fatality and burden in Nigeria and Sub-Saharan Africa is very low, to the surprise of the world. Given the different required long time storage temperatures, COVID-19 vaccines (Table 1) that can be stored at normal refrigeration condition and that are especially for single dose schedules are most suitable and sustainable for the facilities and logistics in the sub-Saharan Africa.

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