

Covid-19 Vaccine Benefits and Concerns: Nigerian Perspectives

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Abstract

The World Health Organization reported 162,184,263 cases of COVID-19 and about 3,364,446 deaths globally with Nigeria statistics at 165,709 reported cases and 2,066 deaths as of May 16 2021. This increase in reported cases and deaths globally can be drastically reduced when significant number of the population of the world becomes vaccinated. Researchers have developed different COVID-19 vaccines in a bid to control the morbidity and mortality rate as well as mitigate disease severity. Popular concerns about the vaccine in Nigeria and Africa ranges from effectiveness and side effects, poor understanding of the virus, lack of trust in the government, fear of the vaccine being used as a bioweapon designed by advanced countries to reduce the population of the poor ones by causing infertility, and lack of appropriate infrastructure for safe storage of the vaccine. Howbeit, the vaccine has been proven to be safe and effective. Nationwide delivery and acceptance will confer herd immunity and curb the menace of drug resistance.

Keywords: COVID-19; SARS-CoV-2; COVID-19 vaccine; Hesitancy; Nigeria.

Introduction

COVID-19 is a viral disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a novel enveloped RNA betacoronavirus which has a phylogenetic similarity to SARS-CoV. It was first discovered in Wuhan, the capital city of Hubei province, China in 2019 and has spread all over the world [1,2].

SARS-CoV-2 can be transmitted directly and indirectly; through close contact with infected persons through infected respiratory secretions, droplets and saliva when they cough, sneeze and talk. Once the droplets from infected persons come in contact with the eye, nose and mouth of another person, infection can occur. Contact with

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Accepted Date: 07-05-2021

Published Date: 08-05-2021

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contaminated surfaces is responsible for the indirect mode of transmission [1,3,4].

The World Health Organization reported 162,184,263 cases of COVID-19 and about 3,364,446 deaths globally with Nigeria statistics at 165,709 reported cases and 2,066 deaths as of May 16 2021 [5,6]. The first case in Nigeria was reported on 27th February, 2020 with the index case being an Italian citizen who arrived The Muritala Mohammed International Airport, Lagos from Milan, Italy and was diagnosed of the disease [7].

This increase in reported cases and deaths globally can be drastically reduced when significant number of the population of the world becomes vaccinated. Hence, the need for safe and effective COVID-19 vaccines [8]. Researchers have developed different COVID-19 vaccines in a bid to control the morbidity and mortality rate as well as mitigate disease severity [9,10]. Therefore, this review focuses on the benefits and concerns of the COVID-19 vaccine in Nigeria.

Covid-19 vaccines till date

COVID-19 vaccine types till date includes; RNA vaccine, viral vector vaccine, inactivated vaccine, and protein sub unit vaccine. Upon desirable efficacy outcome most of these vaccines have been approved.

Pfizer-BioNTech (BNT162b2) and Moderna (mRNA-1273) COVID-19 vaccines are produced with encapsulated mRNA technology. They are composed of nucleoside-modified mRNA encoding for the spike protein of SARS-CoV-2, which is encapsulated in lipid nanoparticles [11]. The lipid nanoparticles serve as a carrier system

that arrests the rapid enzymatic degradation of mRNA and enhances its delivery in-vivo [12-14]. These vaccines are administered intramuscularly and require two doses given in 21 days apart (15-17). The BNT162b2 vaccine was developed by BioNTech, a German company that collaborated with Pfizer, an American company for support with clinical trial, logistics and production [18]. Moderna and the Vaccine Research Center developed the Moderna (mRNA-1273) COVID-19 vaccine [18,19]. The clinical trials of both BNT162b2 and mRNA-1273 vaccines have progressed to the third phase with the analysis of the study data showing vaccine efficacy of 94% and 95% against COVID-19 of any severity respectively [15,14].

Oxford-AstraZeneca (ChAdOx1 nCoV-19) COVID-19 vaccine is a viral vector vaccine. The DNA for the spike protein on the surface of the coronavirus is put in a harmless virus (Adenovirus) which is a common type of virus that only causes mild cold symptoms. When injected intramuscularly the spike protein DNA are expressed and are found on cell's surface which will then trigger an immune response. It was developed by Oxford University and AstraZeneca [20,21].

The Johnson and Johnson (Ad.26.COV2.S) COVID-19 vaccine is made of a recombinant, replication-incompetent Ad26, human adenovirus type 26 vector encoding a full length membrane-bound severe acute respiratory syndrome coronavirus 2 spike protein in a prefusion-stabilized conformation [22,23]. It is administered in a single dose. The peculiarity of the Ad.26.COV2.S vaccine is that it can be stored for up to two years at -20°C and up to three

months at 2-8°C as opposed to other types of COVID-19 vaccines which are stored for lesser number of days at the same temperatures [23]. This vaccine was developed by Janssen Research and Development, an affiliate of Janssen Vaccines and Prevention and a part of the Janssen Pharmaceutical Companies of Johnson and Johnson [23].

Gamaleya (Gam-COVID-Vac/Sputnik V) is a combined vector vaccine, based on two vector components, rAd type 26 (rAd26) and rAd type 5 (rAd5). The gene for SARS-CoV-2 full length glycoprotein S is carried as rAd26-S and rAd5-S respectively and is administered intramuscularly 21 days apart. The Gam-COVID-Vac vaccine was developed by Gamaleya NRCEM in Moscow, Russia [24].

Oxford-AstraZeneca (ChAdOx1 nCoV-19), Johnson and Johnson (Ad26.COV2.S) and Gamaleya (Gam-COVID-Vac/Sputnik V) are all vector-based vaccines and their efficacies have been found to be 70%, 67% and 92% respectively [25,24,26]. Novavax (NVX-CoV2373) is another COVID-19 vaccine still under development. It is a recombinant SARS-CoV-2 nanoparticle vaccine. Nanoparticles are coated with synthetic spike protein produced by the recombinant baculovirus to which the gene encoding for the virus spike glycoprotein has been introduced [27,28]. Two doses of the vaccine are administered in 21 days apart [29] and have shown a significant vaccine efficacy of 49.4% in preventing symptomatic COVID-19 B.1.351 variant in South Africa [30,31]. Nigeria received 3.94 million doses of the Oxford-AstraZeneca COVID-19 vaccine shipped by COVAX on 2nd March, 2021 [32]. The World Health Organization in collaboration with

the European Commission and France launched COVAX as a global response strategy to the COVID-19 pandemic to facilitate prompt and equitable access to the COVID-19 vaccine across the globe [33,2]. In the fight against COVID-19, vaccination remains a very powerful tool in preventing the infection [34].

Benefits of Covid-19 vaccine

The World Health Organization estimates that vaccination currently prevents 2-3 million deaths every year with disease such as smallpox which claimed approximately 300 million lives in the 20th century alone being fully eradicated due to the development and worldwide delivery of safe and effective vaccines. Following the development of COVID-19 vaccines, a lot of questions concerning the safety and effectiveness of the vaccines emanated due to the short time of production alongside the technology employed when compared with other vaccines and perhaps due to the fact that SARS-CoV-2 is a novel virus [35]. However, the world health governing bodies have approved only few of the more than 300 COVID-19 vaccine projects after several clinical trials. Just as other vaccines have proven their efficacy over time at clinical trial, the evaluation of the COVID-19 vaccine has shown satisfactory effectiveness in its ability to reduce the rate of contracting the virus and coming down with the disease [36].

In a research conducted in the US between January and March of 2021 among hospitalized adults aged ≥ 65 years infected with the COVID-19, it was reported that Pfizer-BioNTech or Moderna COVID-19 vaccine was 94% effective against COVID-19

hospitalization among fully vaccinated adults and 64% effective among partially vaccinated adults aged ≥ 65 years [37].

In another research carried out between December 2020 to March 2021 on effectiveness of BNT 162b2 and mRNA-1273 COVID-19 vaccines in preventing SARS-CoV-2 infection among other health care personnel, first responders and other essential and frontline workers in eight (8) US locations, it was observed that upon full and partial immunization, the vaccines were 90% and 80% effective against SARS-CoV-2 respectively (i.e., ≥ 14 days after the first dose but before the second dose). A total of 3950 health care personnel, first responders and other essential workers involved in this research were tested for SARS-CoV-2 infection for 13 consecutive weeks [38].

From these studies, we could infer that complete vaccination with the authorized vaccines against SARS-CoV-2 is quite effective for protection against COVID-19 and can, to a significant level reduce the risk of COVID-19 associated hospitalization in the elderly and might even lead to a proportionate reduction in post-COVID conditions and deaths. While there is ongoing continuous safety monitoring of COVID-19 vaccines by the United States of American Centre for Disease Control (CDC) and Food and Drug Administration (FDA), most of the side effects recorded after vaccination are not severe and as such the benefits of the vaccine outweighs the risks it poses [39]. Upon the authorization of the use of COVID-19 vaccine, safety monitoring systems were also put in place which includes Vaccine Adverse Event Reporting System (VAERS), Vaccine Safety

Datalink (VSD) and Clinical Immunization Safety Assessment (CISA) Project. In a research published by Gee et al., in February 2021, it was recorded that 91% of VAERS were non-serious ones, with symptoms being headache, fatigue, injection-site pain, nausea and dizziness. Deaths were reported to VAERS, however the documentations available was not sufficient to link these deaths to the vaccination.

Another approved vaccine, Johnson & Johnson's Janssen COVID-19 vaccine given between March 2 and April 12, 2021 recorded 12 reports of cerebral venous sinus thrombosis (CVST) with thrombocytopenia out of the millions of doses administered. Three (3) of the 12 cases died while the remaining 9 were eventually discharged after adequate treatment. Investigation on the relationship between the vaccine and CVST with thrombocytopenia is still ongoing [40].

Nationwide delivery and acceptance of the COVID-19 vaccines will confer herd immunity as vaccinating a large member of the society extends protection to the most vulnerable in the population such as people with severe allergic reactions who cannot be vaccinated or the elderly with a low level of immune response [35].

A notable benefit of the COVID-19 vaccine is its potential to curb the menace of drug resistance and as well limit the emergence of the drug resistant strain of the virus as established by World Health Organization, antimicrobial resistance results from continuous abuse of antibiotics and antiviral drugs, making bacterial and viral infection become untreatable [41].

Concerns about Covid-19 vaccination in Nigeria

Examining data on general vaccine acceptance worldwide, a large-scale retrospective study carried out between 2015 and 2019 by The Vaccine Confidence Project in 149 countries to determine the extent of vaccine acceptance revealed significant vaccine hesitancy due to strong anti-vaccine movement among six “politically unstable countries affected by religious extremism”, these countries include Afghanistan (2-3%), Azerbaijan (2-17%), Pakistan (2-4%), Indonesia (1-3%), Serbia (4-7%) and Nigeria (1-2%) [42]. Studies have shown that in low-to-middle income countries, concerns about healthcare quality, unpleasant historical experiences, lack of trust in government and weak support from traditional leaders have contributed to low vaccine uptake [43]. According to a study carried out by The Wellcome Trust’s Global Monitor, there was a mild or strong disagreement that vaccines are effective among 16% of participants from Nigeria [42].

Nigeria’s population and her history of vaccine reluctance are the major reasons for her vaccine hesitancy [44].

Unfounded rumours play a major role in raising concerns and doubts about vaccines and COVID-19 vaccine is no exception. In 2003, a rumour about polio vaccine causing infertility resulted in a boycott of polio vaccination in northern Nigeria and more recently, such concern has contributed to hesitance in accepting the human papilloma virus vaccine [45]. Since the COVID-19 vaccine has been made available, a lot of myths, doubts, conspiracy theories and

misconceptions have been spread through social media and the internet causing reluctance toward vaccination, especially in developing countries. Denial of the existence of COVID-19 has influenced COVID-19 vaccine hesitancy [9]. In a recent study carried out in Ethiopia, some participants expressed doubts about the effectiveness as well as the side effects of the vaccine as there was not enough time to study it, some believed the vaccine is a bioweapon designed by advanced countries to reduce the population of the poor ones by causing infertility; it was also said that the vaccine might be a way of inserting microchips bearing the mark of the beast “666” into peoples’ body as against their faith while a few felt they have God’s protection so, they do not need the vaccine [46]. Lack of trust in the government and lack of expertise among health professionals were also reasons for vaccine hesitancy in the study [46]. 32.3% of participants in a study carried out in Nigeria expressed lack of confidence in the ability of the Nigeria Centre for Disease Control (NCDC) to coordinate and implement the COVID-19 vaccine trial [47].

In a cross-sectional online survey carried out among 589 educated men living in north central region of Nigeria, 29% agreed to accept the COVID-19 vaccine [44]. From a social media analysis carried out by the BBC media action in December 2020, it was gathered that vaccine reluctance was due to faith-based protection and erroneous misconception that vaccine is meant for those that are infected with the virus [42].

A recent study in Nigeria also showed that even though a large percentage (74%) of the

study participants were willing to accept a COVID-19 vaccine, the top three reasons for refusal or hesitancy on the part of the others were unreliability of clinical trials, belief that the immune system is enough to combat COVID-19, and worry about safety of the vaccine. There exists a probability of these individuals sharing their negative perception of the COVID-19 vaccine with other people, eroding public trust and ultimately resulting in a widespread vaccine refusal and hesitancy [48].

According to a very recent survey on COVID-19 acceptance in low-to-middle income countries (LMICs) like Nigeria, the most common reason for vaccine refusal is worry about the side effects of the vaccine. Mild and transient side effects such as headache, fatigue, muscle pain and joint pain have been reported [43]. Prominent media coverage of these side effects and the recent report about the rare but severe cases of thrombosis (blood clotting) associated with the AstraZeneca vaccine might have exacerbated the concerns especially in LMICs that rely on the AstraZeneca vaccine in their immunization campaigns made possible by COVAX [9,43].

Apart from vaccine hesitancy, another reason for concern about the success of COVID-19 vaccination in Nigeria is the deficient Nigerian cold-chain system. Poor training of health workers on cold chain management, lack of appropriate infrastructure, insufficient capacity and little to no integration of recent technology are problems afflicting the cold-chain system in Nigeria. Peculiarities of the storage conditions of COVID-19 vaccines

“Pfizer and Moderna” accentuate these problems [49].

Pfizer and Moderna were designed with mRNA technology, thus, they should be stored at ultra-low temperatures to elongate their shelf-life. However, the Oxford-AstraZeneca vaccine was designed with double-stranded DNA, its chances of degrading at lower temperatures is low and can be stored at regular refrigerator temperature (2-8°C) with a shelf-life of six (6) months, hence its acquisition by the Nigerian government [50]. Though the Oxford-AstraZeneca vaccine is stable at regular refrigerator temperature, unstable power supply in Nigeria might affect the cold storage, reduce the shelf-life of the vaccine and ultimately its efficacy.

Conclusion

There is clearly a high perception among the Nigerian population that the COVID-19 vaccine is not safe majorly because it is a novel virus, lack of adequate storage facilities and perhaps lack of trust in the government. Despite these public impressions, it is also paramount to keep in mind the risks of COVID-19 infection, as long as the vaccines are safe and effective. The risk of non-vaccination against COVID-19 which could result in serious disease, hospitalization or even death far outweighs the risk of the fleeting common and rare side effects to vaccination.

Conflict of interest

None.

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