COVID-19 Vaccines and Vaccination Report: The Nigeria Perspective

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Review Article

ABSTRACT

COVID-19 vaccine like other vaccines is developed to produce acquired immunity against the virus which causes coronavirus disease. The spread of the virus led to quick study by various science laboratories all over the world on the preventive role and the mortality rate reduction potential of covid vaccines. Celebration has been witnessed in different part of the world for the role the vaccines played against various cases arising from coronavirus infection. This review focused on the adverse event of coronavirus vaccines with perspective to the Nigerian populace. The type of vaccines approved for use by the WHO include; viral vector vaccines which has the Oxford-Astrazenca in its class, RNA vaccines, whole virus vaccines (having the Sinopharm, and Sinovac in it class), and protein subunit vaccines (with Novavax COVID-19 vaccines and (ESI, 2021), EpiVacCorona in it class). In Nigeria, about 8,439 mild adverse reactions have been reported by the National Health Care Development Agency (NPHCDA), following the administration of the first doses of the Oxford-AstraZeneca COVID-19 vaccine. The report showed that out of over a million persons who received the vaccine, 8,439 persons showed mild adverse effects, while 52 persons suffered moderate to severe adverse events on receiving the jab. Generally, the vaccine has proven to be effective in combating and limiting infection and spread of covid-19 among the citizenry.

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1. INTRODUCTION

The need for COVID-19 vaccine arose as a response to provide immunity to the world population from the infection of SARS-CoV-2 virus. A COVID-19 vaccine in itself is aimed at giving acquired immunity against the virus which causes coronavirus disease. In different part of the world, the COVID-19 vaccination has lowered the spread, severity and even death from COVID-19. Existing knowledge from coronavirus causing diseases provided information on the structure and function of the virus, a detail which assisted and accelerated the development of different technologies of vaccine in early 2020 year [1]. Subbarao in his work noted that the COVID-19 vaccine was initially developed to prevent severe illness [2]. The COVID-19 vaccines however are reported of lowering the spread, severity, and even death from COVID-19 [3].

1.1 COVID-19 Vaccines Types and Mode of Function

Towards the end of 2020, several vaccine candidates were being developed, but of the vast number of as high as about 200 candidate vaccines, at least about a quarter will attain human trails [4]. It is worthy to note that many vaccine candidates will be thoroughly evaluated before they can be found to be both safe and effective. The idea behind the development of vast number of vaccines is to increase the chances of having successful vaccines that will be safe and effective for the intended population.

In the development of vaccines, three main approaches are considered. They only differ in whether they employ a whole virus bacterium; a portion of the virus that triggers immune response; or only the genetic material which provides the instructions for making a particular proteins and not the entire virus [4].

Vaccines function by training the human immune systems with a harmless or immobilized form of SARS-CoV-2. They stimulate responses from the immune system without causing harm to the body. Each vaccine type has a different mechanism of function. Some work by introducing antigens into the body, which are unique characters of COVID-19, which triggers a particular immune response. This response in turn builds what is called immune memory, a type of programming which positions and prepares the body to fight SARS-CoV-2 in the future (Immunology, 2021).

1.2 Viral Vector Vaccines

These vaccines are used to train the immune system. They contain a segment of genetic material of SARS-CoV-2 virus, which causes COVID-19. The genetic material codes for a specific protein of the virus [[5]. The genetic material introduced is known as the vector and is a spike protein found on the surface of the coronavirus [6]. Once the body cells are infected, they are signaled to produce a large amount of antigens, which in turn trigger immune response.

An example of these vaccines includes the Oxford-AstraZenca COVID-19 vaccine [7], the Sputnik V COVID-19 vaccine [8], the Janssen COVID-19 vaccine and Convidecia [9].

The viral vector based vaccine has the benefit of triggering a strong immune response because it involves both B and T cells [6]. Its disadvantage on the other hand rests on the fact that the effectiveness of the vaccine could where the individual has a history of previous exposure to the vector.

1.3 RNA Vaccines

They are also known as **mRNA** vaccines and are vaccines which when introduced into the body tissue, causes the body to produce foreign proteins and in turn stimulates adaptive response from the immune system which instructs the body on how to recognize and destroy the corresponding pathogen or cells. RNA vaccines mostly employ nucleoside-modified messenger RNA. According to the study carried out by a team of researchers, it was found that the mRNA delivery is achieved by a conformation of molecule into lipid nanoparticles which protect the RNA strands and help their intake into the body cells [10,11,12,13]. This approach is a new way of developing vaccines [4].

1.4 Whole Virus Vaccines

The whole virus vaccines employ weakened, deactivated or inactivated form of the virus that causes COVID-19, to stimulate protective immunity in the body cells [6,14]. The viral particles may have been grown in a culture and

then are killed using heat or chemical such as formaldehyde. This procedure eliminates the disease causing ability of the pathogen and at the same time stimulates immune response in the body cells [14]. Vaccines in this class are the Sinopharm, and Sinovac and are administered intramuscularly in two doses [6]. According to *Gavi,* this vaccine type is beneficial because it is a well-established technology, produces strong immune response, involves the B cells and T cells response, relatively simple to make, suitable for people whose immune systems have been compromised, does not triggers disease, and relatively stable (*gavi.org*). The only disadvantage is that booster shorts may be needed [6].

1.5 Protein Subunit Vaccines

This vaccine contains purified particles of SARS-Cov-2 virus rather than the whole pathogen. Antigens involved are usually any molecule that is a fragment of the pathogen's protein subunits [4] and the aim is to trigger an immune response in the cells. The idea of limiting the exposure to particles of the virus is to minimize the risk of side effects.

The advantage of subunit vaccines lies in its suitability to persons with compromised immune system [6], whereas, the challenges encountered with it is that they are relatively expensive and complex to make, and may require booster shots. An example of Protein subunit vaccines includes Novavax COVID-19 vaccines and (ESI, 2021), EpiVacCorona.

2. EFFECTIVENESS OF COVID-19 VACCINES

Efficacy is the extent to which a vaccine can give protection against disease. It is determined under an ideal and controlled circumstance, whereas its effectiveness focuses on its activity in real life situation or application [15]. However, COVID-19 vaccines have proven to be safe, effective and life-saving. As is expected from all vaccines, they do not fully offer protection to those who have been vaccinated, and also may be limited or perform better than anticipated in their ability to prevent disease transmission from previously infected patients to healthy persons. Therefore, while the vaccines continue to be administered, the population must continue to take all measures laid out by the World Health Organization and local health care providers to keep fighting the pandemic [4].

The study conducted by Linda, Geddes revealed that some of the COVID-19 vaccines showed efficacy as high as 90% in the clinical trial, and those approved by the World Health Organization for use in emergency in the larger population under supervision, have reported efficacies above 50% in cases of prevention of symptomatic disease and greater result in instances of preventing hospitalizations or even death [15]. It was found that the precision of effectiveness varied with respect to the country under investigation, and this could be attributed to the class of the population given preference during the different campaign and the way countries identify, administer treatment, or group the cases of COVID-19 [15].

3. ADVERSE EVENT OF COVID-19 VACCINE IN NIGERIA

As seen in all medicines, the COVID-19 vaccine may cause side effects in some persons. These adverse reactions can range from mild to severe ones, but are often mild and do not last long. With respect to Nigeria, about 8,439 mild adverse reactions have been reported by the National Health Care Development Agency (NPHCDA), following the administration of the first doses of the Oxford-AstraZeneca COVID-19 vaccine (m.guardian.ng). This was reported by the executive director of NPHCDA in a conference organized by NPHCDA and WHO on the status of the COVID-19 vaccination in the country. It was noted in the report that out of over a million persons who received the vaccine, 8,439 persons showed mild adverse effects, while 52 persons suffered moderate to severe adverse events on receiving the jab.

The mild effect recorded includes body pains and swellings, while the moderate to severe adverse effect registered were fever, vomiting, diarrhea, headaches, dizziness, and allergic reactions. The case of abdominal pains was also reported by the agency (NPHCDA) via vanguardngr.com (vanguardngr.com). No case of death or blood clots relating to the vaccination has been recorded from the vaccination so far.

4. CONCLUSION

At the time of this review, COVID-19 vaccines have proven to be safe, effective and life-saving although full protection is not guaranteed and adverse effects following administration of the

vaccines may be present in various degrees but in few individuals.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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