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DIVING INTO DIVERSITY: A COMPREHENSIVE REVIEW OF COVID-19 VACCINE VARITIES.

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ABSTRACT: COVID-19, a highly transmissible respiratory ailment, was initially identified in December 2019 in Wuhan, China. It swiftly spread worldwide and is attributed to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Notable variants such as Alpha, Beta, Delta, and Omicron have emerged, resulting in symptoms such as fever, cough, and breathing difficulties. As of 2023, approximately 770 million cases have been documented, with a tragic death toll of 6.9 million. Several factors contribute to increased COVID-19 morbidity among adults, including advanced age, male gender, pre-existing health conditions, and racial/ethnic disparities. Protective measures against SARS-CoV-2 infection encompass a adequate nutrition, COVID-19 vaccination, and the management of atopic conditions. The arsenal of tools to combat COVID-19 includes antiviral medications, steroids, chloroquine, convalescent plasma, vaccines, and monoclonal antibody treatments aimed at preventing severe illness. Broadly, there are six main categories into which potential vaccine candidates can be organized, each offering unique approaches to vaccination. These categories encompass viral vector-based vaccines, DNA vaccines, subunit vaccines, nanoparticle-based vaccines, inactivated-whole virus vaccines, and live-attenuated vaccines. Severe cases of COVID-19 are marked by rest-related shortness of breath and respiratory distress. A combination of techniques, such as genome sequencing, nucleic acid molecular testing, antigen/antibody detection, and computed tomography imaging, are employed to diagnose and screen for COVID-19 infection.

This review delves into the current state of knowledge, prevention strategies, treatment options, and the analysis of extensive vaccines related to COVID-19.

Keyword: Covid-19, Corona virus, Vaccines, Monoclonal antibody**,** DNA

INTRODUCTION:

The severe acute respiratory syndrome coronavirus 2 is the new beta coronavirus that causes COVID-19 (SARS-CoV2). Since the first case was identified in Wuhan, China, in December 2019, the coronavirus disease 2019 (COVID-19) has spread rapidly throughout the world. The causative agent of COVID-19 is severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1]. Because of its resemblance to SARS-CoV-1, it was discovered to be a coronavirus and was initially known as nCoV (new coronavirus). Later, it was dubbed SARS-CoV-2, or severe acute respiratory syndrome coronavirus 2 [2].

On March 11, 2020 (COVID-19), the World Health Organization classified the epidemic as a coronavirus disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Globally, the pandemic has had a severe impact on social cohesiveness, economic advancement, and medical care systems. The Middle Eastern respiratory sickness (MERS) coronavirus was initially identified in Saudi Arabia in 2012 . Rigid non-pharmaceutical treatments were again used to contain a significant MERS-CoV outbreak that occurred in South Korea in 2015 [3].

Vaccination against COVID-19 not only shields susceptible people from SARS-CoV-2 infection, but it may also lessen the risk of developing a serious illness and death from COVID-19. According to available data, adult COVID-19 risk factors include demographic characteristics like age, gender, and ethnicity; they can also include the existence of underlying medical conditions including hypertension, cardiovascular disease, and chronic obstructive pulmonary disease (COPD). Similarly, it has been noted that younger children and certain comorbidities, such as obesity, are more likely to contract COVID-19 and may experience more serious side effects as a result [4] .

"A SARS-like cluster of circulating bat coronaviruses reveals potential for human emergence" was the exact title of one 2016 publication. Therefore, it should come as no surprise that scientists have been working on vaccine formulations against these viruses. A DNA vaccine developed in the USA and an inactivated whole-virus vaccine created in China are the two SARS-CoV-1 vaccines that have advanced to human clinical trials. But since SARS-CoV-1 had been eradicated from the human population and there had been no more zoonotic spillovers, these vaccines were not developed any further [5].

Although various vaccines against SARS and MERS have been developed and tested in a few human phase 1 clinical studies, no coronavirus vaccines have been granted a licence as of yet [6].

The COVID-19 vaccine has become available at a rate that is unthinkable in vaccine history. At the moment, 104 potential vaccines are in the clinical phases of development and 184 are in the preclinical stages. COVID-19 vaccines fall into four main kinds, each utilising a distinct platform: [7]

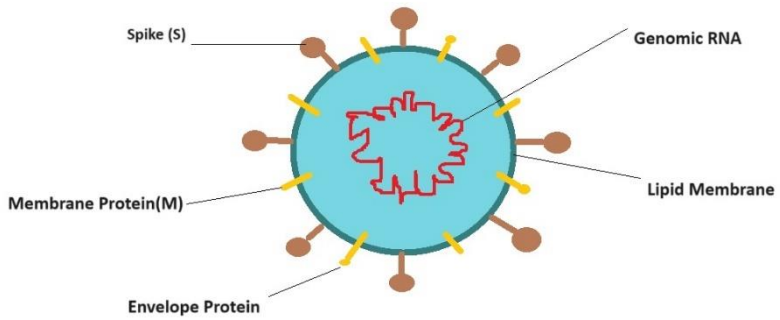
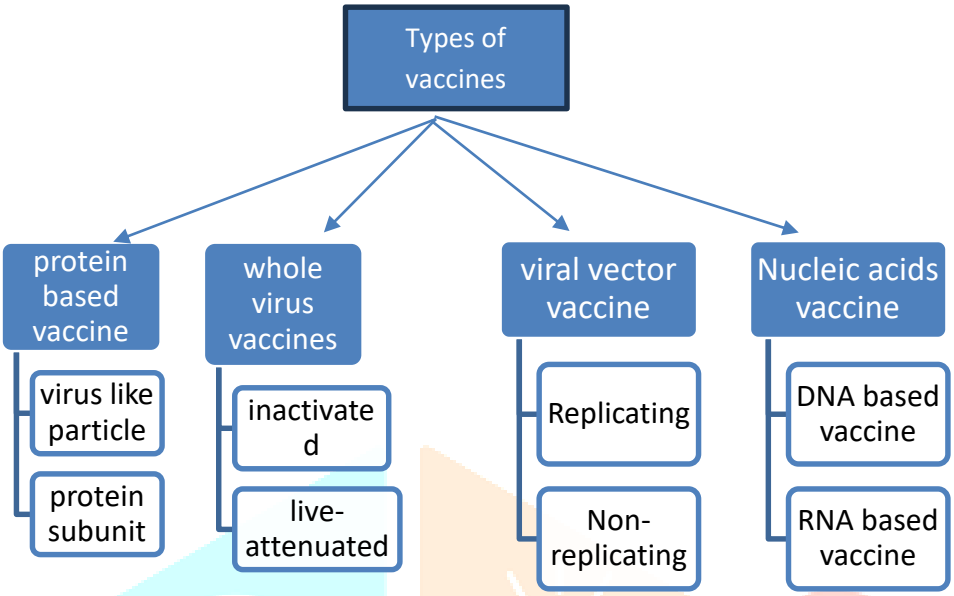


Fig 1: covid 19 viral structure [12]

Overview of vaccines:

A vaccine is a biological substance that confers acquired immunity, offering protection against a specific infectious disease. Typically administered intravenously, orally, or through the nose, it strengthens the body's defenses against harmful pathogenic microorganisms. There are various types of covid-19 vaccines including: (1) proteins based, (2) whole virus vaccine (3) viral vectors , and (4) nucleic acids [8] .



1. **Vaccinations based on the proteins:**

Protein-based vaccines are classified into two types i.e virus-like particle vaccines and subunit. Viral antigenic fragments created by recombinant protein methods make up protein subunit vaccines.. They are easy to produce, and relatively safe and well-tolerated compared to whole virus vaccines with less side effects. The disadvantages of protein subunit vaccines is their low immunogenicity, therefore required adjuvants and multiple dosing. Other protein-based SARSCoV-2 potential vaccines employ "virus like particles," which are empty virus shells that resemble the structure of coronaviruses but are genetically inert. It might be thought of as a particular class of vaccines made of protein subunits. There are five vaccinations against virus-like particles under clinical development at the moment e.g Triple-Antigen Vaccine, by Premas Biotech [3,5,9].

2. **Vaccinations based on the whole virus vaccine.**

Whole virus vaccines are two types, inactivated and live-attenuated vaccines that are the well accepted and oldest types of vaccine [9]. “Live attenuated vaccines consist weakned virus. Live attenuated vaccines have the genetical ability to trigger toll-like receptors (TLRs) such as TLR 3, TLR 7/8, and TLR 9 of the immune elict. BCG, smallpox, polio, mumps, rubella, and chickenpox are some examples but in case of COVID-19, DelNS1-SARS-CoV2-RBD, given by university of Hong Kong [5,10].

Inactivated vaccine, which contain inactivated viruses that are obtained from β-propiolactone, ultraviolet and formaldehyde. These vaccine are safer, noninfectious, and stable. This vaccine contain inherited material which damaged by chemicals, radiation and heat. Such vaccine can be used along with adjuvants to enhance immune response that don’t replicate itself, examples: Vero cells [5,8,10].

3. **Vaccinations based on the viral vectors:**
   Viral vectors are instruments which are used to deliver gene into cell. Contagions are modified to adroitly which manufacture several coronavirus protein in their part as viral vectors [11]. Chemical decaying of the contagion used as a vector renders it unable of causing illness. Viral vector vaccine orders into two form replicating and non-replicating viral vaccine. Adenovirus, measles contagion and vaccinia contagion are used as vector. These vaccines are developed by Recombinant DNA technology. illustration, Ebola (EUA) [5,8,10]. Adenovirus vector also known as nonreplicating viral vector, which are applied in the quickly development of COVID-19 vaccine [11]. examples, Ad5-nCoV, d ChAdOx-nCoV-19 [8].

4. **Vaccinations based on the nucleic acids.**
   DNA and RNA vaccines are examples of nucleic acid vaccines; they are simple and safe to create using the genetic sequence of the virus as a guide. These vaccinations have demonstrated protective effects in animal models and have the ability to elicit both humoral and cellular immunity. This platform is not presently being used by any licenced vaccinations. BioNTech and Pfizer quickly started developing messenger RNA-based vaccines (mRNA) [11,12]. When used alone, they may result in adverse events (ADE). some examples of nucleic acids vaccines are INO4800, mRNA-1273, BNT162 (a1, b1, b2, c2) [8].

CONCLUSION: Prevention strategies emphasize adequate nutrition, COVID-19 vaccination, and managing atopic conditions. The medical arsenal against severe illness includes antiviral medications, steroids, chloroquine, convalescent plasma, vaccines, and monoclonal antibody treatments. Vaccination not only protects against infection but also reduces the risk of severe illness and death. The review explores the current state of knowledge, prevention strategies, treatment options, and analysis of extensive medical data related to COVID-19, shedding light on the multifaceted aspects of this global health crisis.

REFRENCES:

1. Tzenios N, Chahine M, Tazanios M. Better Strategies For Coronavirus (COVID-19) Vaccination. Special journal of the Medical Academy and other Life Sciences. 2023 Feb 9;1(2).
2. Krammer F. The role of vaccines in the COVID-19 pandemic: what have we learned? Seminars in Immunopathology. Springer Science and Business Media Deutschland GmbH; 2023.
3. Yuan Y, Jiao B, Qu L, Yang D, Liu R. The development of COVID-19 treatment. Vol. 14, Frontiers in Immunology. Frontiers Media S.A.; 2023.
4. Panchal U, Salazar de Pablo G, Franco M, Moreno C, Parellada M, Arango C, et al. The impact of COVID-19 lockdown on child and adolescent mental health: systematic review. Vol. 32, European Child and Adolescent Psychiatry. Springer Science and Business Media Deutschland GmbH; 2023. p. 1151–77.
5. Zhang J jin, Dong X, Liu G hui, Gao Y dong. Risk and Protective Factors for COVID-19 Morbidity, Severity, and Mortality. Vol. 64, Clinical Reviews in Allergy and Immunology. Springer; 2023. p. 90–107.
6. Koirala A, Joo YJ, Khatami A, Chiu C, Britton PN. Vaccines for COVID-19: The current state of play. Vol. 35, Paediatric Respiratory Reviews. W.B. Saunders Ltd; 2020. p. 43–9.
7. Vasireddy D, Atluri P, Malayala SV, Vanaparthy R, Mohan G. Review of COVID-19 Vaccines Approved in the United States of America for Emergency Use. J Clin Med Res. 2021 Apr 1;13(4):204–13.
8. Ndwandwe D, Wiysonge CS. COVID-19 vaccines. Vol. 71, Current Opinion in Immunology. Elsevier Ltd; 2021. p. 111–6.
9. Li Y, Tenchov R, Smoot J, Liu C, Watkins S, Zhou Q. A Comprehensive Review of the Global Efforts on COVID-19 Vaccine Development. Vol. 7, ACS Central Science. American Chemical Society; 2021. p. 512–33.
10. Han X, Xu P, Ye Q. Analysis of COVID-19 vaccines: Types, thoughts, and application. Vol. 35, Journal of Clinical Laboratory Analysis. John Wiley and Sons Inc; 2021.
11. Nakagami H. Development of COVID-19 vaccines utilizing gene therapy technology. Int Immunol. 2021 Oct 1;33(10):521–7.
12. Li L, Guo P, Zhang X, Yu Z, Zhang W, Sun H. SARS-CoV-2 vaccine candidates in rapid development. Vol. 17, Human Vaccines and Immunotherapeutics. Bellwether Publishing, Ltd.; 2021. p. 644–53.