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Original Research Article

Covid 19 Pandemic: An Overview

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Abstract

In the 1930's the corona virus was first identified as a highly contagious chicken respiratory virus. Two human coronaviruses were later identified, the human coronavirus 229E causing the flu and secondly the human coronavirus OC43. Others are also important as SARS-CoV. In late 2019 the outbreak of Pneumonia occurred in the Chinese city of Wuhan which was investigated as a result of the corona virus, renamed as 2019-nCoV by the World Health Organization (WHO) and. now called as SARS-CoV-2. The WHO has identified the global health problem as an epidemic. Respiratory droplets produced during coughing and sneezing are the main means of transmission of COVID-19. Infection with COVID-19 in an infected person may remain undetected. Common symptoms of fever and dry cough are less common in the production of sputum, fatigue and in some cases may be dyspnoea or shortness of breath.

The COVID-19 virus is a type of RNA virus, the outer envelope containing a lipid bilayer in which various proteins are synthesized such as membrane (M), envelope (E) and spike (S). Hand washing, coughing, social isolation, wearing a face mask in public, disinfection areas, and isolation are various ways to prevent the disease. The diagnosis of COVID-19 can be made on the basis of symptoms and confirmed using reverse transcription polymerase chain reaction (RT-PCR) tests. There are currently no antiretroviral drugs approved for COVID-19, only symptomatic and supportive treatment is used to treat people with this viral infection. Drugs that have been approved for the purpose of treating other viral infections are under investigation. Vaccination is an ultimate prevention and protection; few vaccines are given emergency approval and some are in progressive development phase in various countries to prevent this deadly pandemic.

Keywords: COVID-19, Severe Acute Respiratory Syndrome (SARS-CoV), WHO, Pandemic, Vaccination

Introduction

Corona virus was first identified as a major respiratory disease in domestic chickens in 1930s [1]. These large group of viruses causes infections such as the common cold with mild symptoms and can lead to life-threatening infections e.g. Severe Acute Respiratory Syndrome (SARS-CoV) and Middle East Respiratory Syndrome (MERS-CoV) [1-3].

The outbreak of pneumonia in the city of Wuhan, China in late 2019 was reported to be due to a novel corona virus [2,3]. The World Health Organization (WHO) named it 2019-

nCoV [2] and later renamed SARS-CoV-2. The virus was thought to have originated in the Huanan Seafood Wholesale market in Wuhan, China but it was later thought that it may not be a source of transmission [5]. Till mid of August 2022, 0.589 680 368 billion confirmed cases of COVID-19 have been reported across the world, which caused approximately 6.436519 million confirmed deaths On March 11, 2020. The variants are oftenly named after the location where they are found (e.g. the Delta variant was known as the Indian variant), and is also known as the "variety of concerns". WHO has introduced a new policy of assigning labels to all the variants using the Greek alphabets for a variants of concerns and variants of interest [4-7].

Transmission:

The common method of spread of COVID-19 is respiratory droplets which are produced during coughing and sneezing. Humans can also become infected by touching an infected area and then putting their hands on their eyes, mouth and nose. Survival of this virus is possible up to 72 hours on various surfaces.

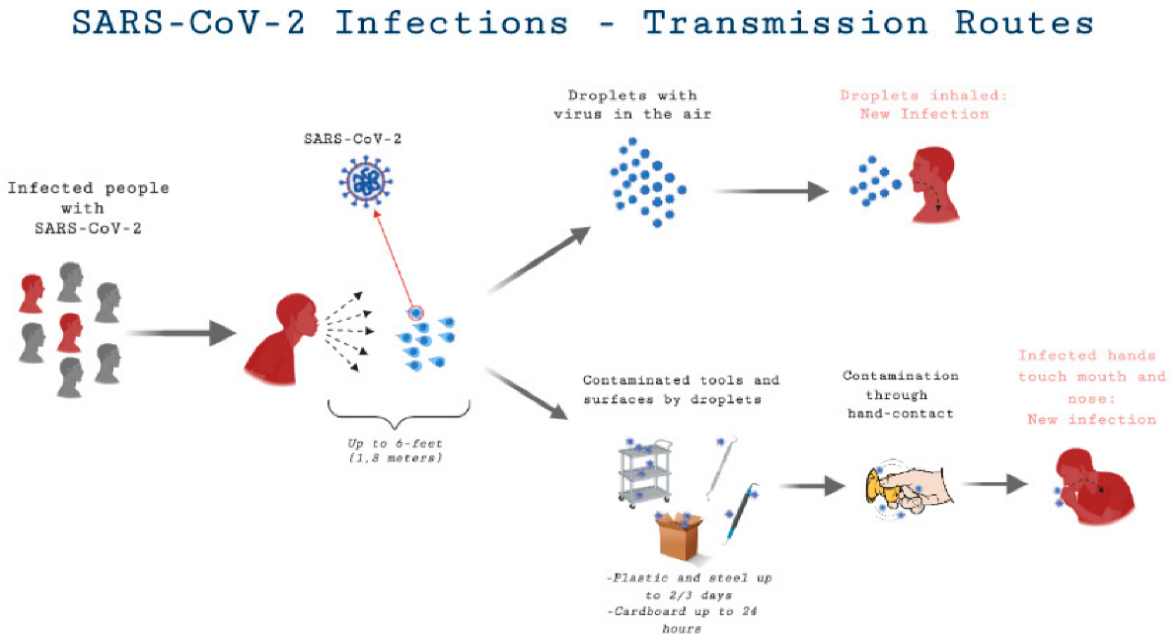

Figure 1
(https://doi.org/10.3390/medicina56120644)

Signs and symptoms:

The symptoms of Covid-19 are vague and the infected person may remain asymptomatic. The most common symptoms are fever and dry cough, uncommonly sputum production, fatigue and in some cases dyspnoea or shortness of breath, sore throat, joint pain and headache can occur. According to the WHO percentage of severe illness and respiratory distress is one in five Acute and severe complications if not relieved can lead to acute respiratory distress syndrome (ARDS) and other organs may get involved [8-10].

A person with this viral infection may remain without any symptoms but if diagnostic test result is positive, it confirms the infection, so it is recommended that a person close to the infected person be monitored closely until the infection is ruled out [6].

COVID-19 - Viral Structure:

The structure of Covid -19 virus consists of a lipid bilayer in which various structural

proteins are present e.g. membrane (M), envelope (E) and spike protein (S). In some coronaviruses a short protein like a spike called hemagglutinin esterase (HE) is also present. At the bottom of the envelope, there is a protein with multiple layers called nucleocapsid (N). They are attached to the positive -sense single-stranded RNA genome that feels like beads in a-string conformation [7-9].

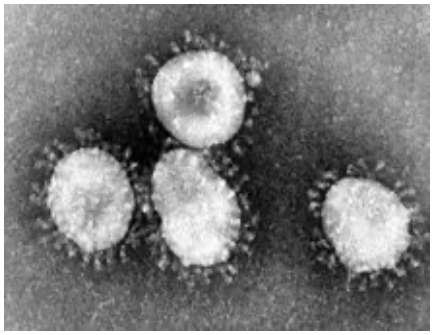

Figure 2
(https://en.wikipedia.org/wiki/Coronavirus)

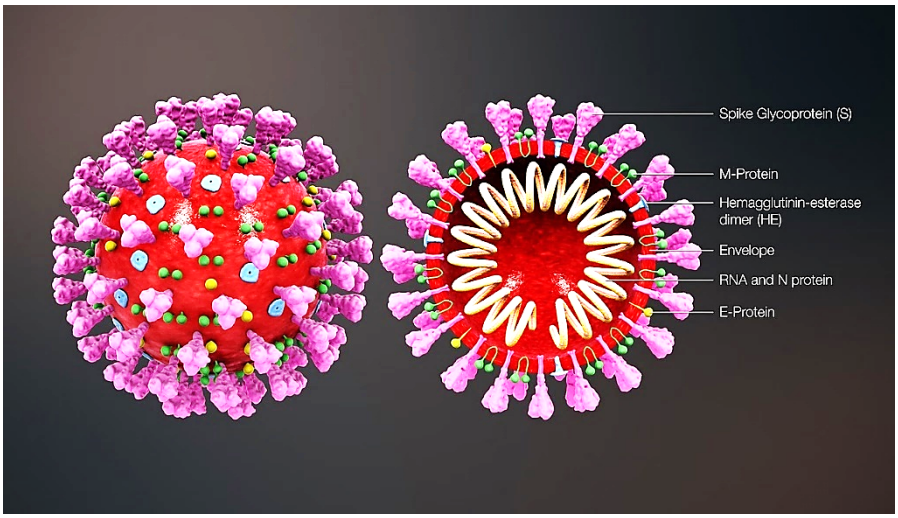

Figure 3
(https://en.wikipedia.org/wiki/Coronavirus_diseases)

Contamination begins, when the virus enters the host cells and attaches itself to the complementary host cell, then the binding cell protease breaks down and activate receptor protein-containing spike. Reliance on Protease detection, cleavage and activation allows cell entry through endocytosis or direct attachment of the virus envelope to the host membrane [15-17]. Once inside the infected cells the virus particles are not blocked, and their genome enters the cellular cytoplasm. The coronavirus RNA genome has a 5′ methylated cap and a 3′ polyadenylated tail, which allows the RNA to attach to the cellular ribosome it holds for translation. The host ribosome translates to a wide open reading genome of the genome and bureaucracy long polyprotein. Polyprotein has its own proteases that divide polyprotein into a few non-structural proteins [7]. The RNA-dependent RNA polymerase (RdRp) is the main replicase-transcriptase protein [18-20].

Some non-structural proteins in the complex assist in replication and transcription. RdRp directly mediates the synthesis of negative-sense genomic RNA without better genomic knowledge [7] and the replicated positive-sense RNA becomes the genome of the progeny virus.

These mRNAs are translated by host ribosomes into structural proteins containing accessory proteins [7]. RNA translation occurs within the endoplasmic reticulum. The viral structural proteins S, E, and M goes along the secretory passage into Golgi intermediate chamber. There, M-proteins direct the many interactions of-proteins needed for assembly of viruses after its binding to the nucleocapsid [8]. Reproductive viruses are then released from the host cell by exocytosis through secretory vesicles [21-24].

Prevention

Recommended preventive measures include hand washing, mouth protection when coughing, isolation from the public /social distancing, wearing face mask in public, disinfecting area, ventilation and air filtering, and monitoring and self-isolation from suspected persons who may have infection. Reducing the spread of disease with various travel restrictions, lockdowns, work place hazard controls and facility closures have been carried out around the world. [10].

Various measures to prevent the spread include solitary confinement /quarantines, curfews, postponing events and cancelling public works and social activities [25-28].

Hand washing

Hand washing is recommended to prevent the spread of infection. Centers for disease control and prevention (CDC) of US encouraged to wash of arms regularly with soap and water for at least 20 seconds, especially after going to the toilet or when their arms look bad; before meals; and after sniffing, coughing, or sneezing, it further recommends the use of an alcohol-based disinfectant primarily containing 60% less alcohol by volume where soap and water are not readily available [10]. The WHO also advises individuals to avoid touching the eyes, nose, or mouth with unwashed hands [11].

Respiratory hygiene

Health companies encouraged people to hold their mouth and nose with their bent elbows or tissue papers or surgical mask by infected persons while coughing or sneezing (tissues should be discarded without delay). as it can limit the volume and distance of the breathing droplets that are dispersed while talking, sneezing and coughing. Instructions for the use of masks when & how have been issued by the WHO and the CDC [11-12].

Personal protective equipment (PPE)

For health professionals who may be exposed to the active bodily fluid of COVID-19 positive persons, using personal protective coverings /PPE on exposed parts improves protection from the virus [13].

Social distancing & Self-isolation

Social segregation/ distancing includes infection management measures aimed at reducing the spread of disease by reducing human contact. Methods include quarantine; travel limitations; and closing colleges, offices, stadiums, theatres, or shopping centres. People can also apply social isolation by restricting travel, avoiding crowded places etc. [14].

Home isolation is permitted for those diagnosed with COVID-19 and those suspected of being infected [15]. Many governments have approved or authorized the segregation of all persons and especially corporate opportunities [16]. A 14-day solitary confinement is recommended for people who have not been exposed to COVID-19 and those who have visited a country or region with a high prevalence [36-38]

Contact Tracing

Contact tracing is an important way for health authorities to determine the source of contamination and prevent further transmission.

Diagnosis

COVID-19 can be temporarily detected on the basis of signs and symptoms and confirmation done with the help of using reverse transcriptase polymerase chain reaction (RT-PCR) testing of contaminated fluid or CT scan imaging of the chest [17].

Viral testing

The standard test for current infection check with SARS-CoV-2 uses RNA testing of respiratory secretions collected using the nasopharyngeal swab, although it is possible to test different samples. This test uses real-time RT-PCR that detects the presence of viral RNA fragments [18].

Imaging

Characteristic imaging features on chest radiographs and computed tomography (CT) of people with symptoms include asymmetric peripheral ground glass opacities without pleural effusion High resolution CT scan (HRCT) becomes a gold standard for Covid patients who have moderate to severe symptoms in treatment programs from day 5 onwards of becoming COVID + ve.

Antibody tests

The framework of human body responds to viral infections by producing antibodies that help eradicate the virus. Blood tests (serology tests) can detect the presence of such antibodies. An antibody test may be used to determine what fraction of a population has once being infected, which may be used to calculate the mortality rate of the disease [44-45].

Rapid Antigen testing for SARS-CoV-2

Rapid antigen testing is often used for the diagnosis analysis of respiratory viruses, including influenza viruses and respiratory syncytial virus (RSV). The FDA has approved the use of emergency medical (EUA) antigen testing that can identify SARS-CoV-2.

Antigen tests are immunoassays that detect the presence of a specific viral antigen, which implies current viral infection. Antigen testing is currently legal to be completed on nasopharyngeal or nasal swab specimens placed directly into the assay's extraction buffer /reagent. without delay in the bait to remove the assay or reagent.

Antigen checks are comparatively cheap and can be used at the point of care.

Management

No specific antibiotic has been approved for COVID-19, but development efforts are underway, which include current drug testing. Attempts to alleviate the signs and symptoms may include taking regular (over-the-counter) medications for cold , drinking fluids, and resting [15].

Many compounds are being studied, which have been approved to treat various bacterial infections. Antibiotics are under investigation for COVID-19 [19]. Here are the complete treatment guidelines:

1. Early supportive treatment: O_2 therapy as immediate treatment for Patients with SARI or Hypoxemia
2. Conservative fluid management
3. Empiric antimicrobial treatment for secondary respiratory infections - most prescribe Azithromycin / Doxycyclines / Amoxiclave / Piperacillin + Tazobactum combination etc.
4. Antipyretics e.g., Paracetamol in case of a cold
5. In moderate to severe patients:

- Systemic / Oral Corticosteroid to combat cytokine storm
- Heparin with a low molecular weight resistance to counter the increased

tendency of clot formation mainly in vascular supply to respiratory system.

- If O_2 saturation of haemoglobin level in arterial blood (SpO_2) using a pulse oximeter is <90, then O_2 treatment using a face mask / high flow nasal cannula or through Ventilator in critically ill patients who do not respond to mechanical ventilation is given.
- Vasopressors when shock persists
- Inj. Dexamethasone / Tab Prednisone / Methyl prednisolone became a game changer in moderate to severe patients around the world to reduce the severity of the illness.

Specific Drugs used against COVID-19 Virus (SARS-CoV-2)

1. Ramdesivir:

Ebola medicine developed by Gilead Sciences. Ramdesivir is a 1′-cyano-substituted adenosine nucleotide analogue with a high anti-viral spectrum against various RNA viruses. The compound undergoes a metabolic metabolism, activating the nucleoside triphosphate metabolite to inhibit viral RNA polymerase [46,47].

The first COVID-19 treatment which got FDA approval. This authorization does not include the entire population authorized to use Veklury (Ramdesivir) under the Emergency Use Authorization (EUA) originally issued on May 1, 2020. The FDA has approved and re-issued a revised EUA to Gilead Sciences Inc. On October 22, 2020, the FDA approved Veklury (remdesivir) for use in adults and children (12 years of age and older, weighing at least 40 pounds) for the treatment of COVID-19 requiring hospitalization.

2. Convalescent Plasma:

It is plasma from recovered patients that has been used for over a hundred years to treat outbreaks of measles and mumps, polio, and SARS. A plasma antibody from a recovered patient is given by transfusion to a person affected by COVID-19. The donor antibodies, possibly shorten the duration or reduce the severity of the disease . Not much is known about how effective it is in treating COVID-19 [48-49].

3. Chloroquine and Hydroxychloroquine

More recently, there has been much debate on whether or not the related pills - chloroquine and hydroxychloroquine - that have been available for the treatment of various other diseases for decades might also be effective in treating COVID-19.

The drug is primarily used to treat malaria and many other inflammatory diseases, including systemic lupus erythematosus (lupus) and rheumatoid arthritis and those pills are very safe when used for many days as they might be needed to treat COVID-19. They also have a reasonable price, available at our neighbouring drug stores, and relatively free of side effects.

The drug seems to work through two mechanisms ,first, they make it very difficult for the virus to attach to the cells, prevent the virus from entering the cells and multiplying inside them and secondly, if the virus is able to enter the cells, the drug kills it before it causes damage.

The various proposed mechanisms of HCQ against SARS-CoV-2 are, 1. Inhibition through disruption within the Endocytic Pathway 2. Inhibition through Sialic acid receptor blockade 3. Inhibition through restriction of PH Mediated S Protein Cleavage Limitations on the ACE2 binding site 4. Inhibition through Cytokine storm prevention

In Lancet Rheumatology, Christopher Rentsch and colleagues address whether the use of hydroxychloroquine prior to SARS-CoV-2 infection could prevent mortality from COVID-19 [20].

- No differences have been observed in non-COVID-19 deaths related to the use of hydroxychloroquine.
- -The results from this study are consistent with two randomized clinical trials of hydroxychloroquine pre-exposure prophylaxis in health care workers at risk of SARS-CoV-2 infection [21,22].

It has been used by many countries as a preventive measure and in addition to treating Covid-19 infection. For prevention, Tab. Hydroxychloroquine (400mg) BD on day 1 followed by 200 mg BD for 4 days. (after ECG assessment) [23]. For treatment, the recommended regimen is 400 mg twice daily for the first day, with 400 mg once a week for the next 3 or seven weeks depending on the class .

4. Ivermectin:

Although several scientific experiments in the form of clinical trials are currently underway to test effective therapies, the global response to the COVID-19 outbreak is largely limited on monitoring / containment. Ivermectin is an FDA-approved antiparasitic agent that in recent years we, along with other organizations, have shown that it has antiviral activity for a variety of in vitro viruses [24-26].

Ivermectin has since been confirmed to inhibit IN nuclear import and HIV-1 replication [27]. Ivermectin has been shown to Inhibit the nuclear import of host [28-29] and other viral proteins, including simian virus SV40 big tumour antigen (T-ag) and dengue virus (DENV) non-structural protein 5. The cause of the modern COVID-19 epidemic, SARS-CoV-2, is one of the single stranded positive sense RNA virus that is closely related to acute respiratory syndrome coronavirus (SARS-CoV). SARS-CoV protein studies have revealed a potential role for IMPα/β1 in the course of infection in signal-dependent nucleocytoplasmic shutting of the SARS-CoV Nucleocapsid protein [29-31] that may affect host cell division .

In addition, the SARS-CoV accessory protein ORF6 has been shown to counteract the antiviral activity of the STAT1 transcription factor by sequestering IMPα / β1 on a rough ER / Golgi membrane [32].Taken together, these reports suggested that Ivermectin's nuclear transport inhibitory activity may be effective against SARS-CoV-2. Ivermectin has an established safety profile for human use [33-35] and is approved by the FDA for a number of parasitic infections [33, 35]

5. Favipiravir – a repurposed drug for COVID-19

To repurpose the potential antiviral drugs is a pragmatic way to speed up the drug approval process. Favipiravir, an oral, broad spectrum RdRp inhibitor, an already approved drug for new and re-emerging pandemic influenza in Japan and has an established and well-characterized safety profile. Favipiravir was discovered through the screening of a chemical library for antiviral activity against the influenza virus by the Toyama Chemical Co., Ltd. [36-37].

In-vitro study have demonstrated that favipiravir can have an effective concentration against the SARS-CoV-2 infection within a safe therapeutic dose. Additionally, favipiravir, being an oral formulation and considering 80% burden of patients with mild to moderate COVID-19, is hence likely to address the unmet clinical needs of a sizeable majority of the population of COVID-19, which mostly can be treated on an outpatient basis [47,48].

6. Teicoplanin

It is a glycopeptide antibiotic which has routinely been used clinically to treat bacterial infections with low toxicity, significantly preventing cellular invasion by Ebola virus, SARS-CoV and MERS-CoV [38].Teicoplanin, a routinely used clinical glycopeptide antibiotics, significantly block

the cellular entry of Ebola virus , SARS-CoV, and MERS-CoV.

Repositioning of old drugs for use as an antiviral treatment is an interesting strategy because knowledge on safety profile, side effects, posology and drug interactions are well known

7. Tocilizumab

SARS-CoV-2, SARS and MERS are coronaviruses, and cytokine release syndrome (CRS) of various stages has occurred in more severe patients with SARS and MERS. They all had a high expression of IL- 6. At present, a small sample of scientific experiments in China (Clinical trial test registry ID: ChiCTR20 0 zero 029765) showed good efficacy of tocilizumab.

Tocilizumab is a recombinant humanized monoclonal anti-body against human interleukin 6 (IL-6) receptor of immunoglobulin IgG1 subtype. Tocilizumab mainly binds to soluble and membrane bound IL-6 receptors (sIL-6R and mIL-6R) and inhibits signal transduction mediated by sIL-6R and mIL-6R [39].

8. HIV Drugs for Coronavirus treatment

HIV protease inhibitor, lopinavir is being studied along with ritonavir to treat MERS and SARS coronaviruses. The repurposed drug has already been approved for a cure for treatment of HIV infection under the trade name Kaletra® .

The combination is included in the WHO's list of essential medicines. Lopinavir is believed to act on the intracellular processes of coronavirus replication and demonstrated a reduction in mortality within the non-human primates model (NHP) of the MERS.

Lopinavir / ritonavir combined with ribavirin confirmed a decrease fatality rate and milder disease course during an open clinical trial in patients in the 2003 SARS outbreak.

Cipla also reportedly plans to repurpose its HIV drug LOPIMUNE, a combination of protease inhibitors Lopinavir and Ritonavir, to treat coronavirus [47,48].

9. Molnupiravir

Merck's and Ridgeback's Molnupiravir Receive U.S. Emergency Use Authorization of FDA for the treatment of High-Risk adults with mild to moderate COVID-19 around the world including India.

Mainly based on the strong science behind molnupiravir - a single oral drug that disrupts the replication of SARS-CoV-2 virus, and statistics showing significant reduction in the risk of hospitalization and mortality - molnupiravir has the potential to emerge as an important tool for health care professionals and appropriate patients, said. Dr. Dean Y. Li, president, Merck Research Laboratories.

Molnupiravir needs to be administered as soon as possible after the diagnosis of COVID-19, and within five days of onset of symptoms. The recommended dose of molnupiravir is 800 mg taken orally every 12 hours for 5 days, with or without food. The total of 5 days treatment is important to maximise viral clearance and minimize transmission of SARS-CoV-2.

The following are the New / Re-purposed Drugs on Trial basis:

Deoxy D glucose:

An anti-covid -19 therapeutic application of the drug 2-deoxy-D-glucose (2DG) was developed by DRDO in collaboration with Dr. Reddy's Laboratories, Hyderabad in India.

In India, it is authorized for emergency use. It inhibits Glycolysis, a series of enzymatic reactions that produce energy from glucose, and upon which the cells with increased metabolic demand are overly dependent.

Infected cells up-regulate their metabolic demand, usually by taking high glucose uptake and glycolysis to replicate the virus faster and better.

This change in the metabolic state allows selective collection of 2-DG in virally infected cells. 2-DG also inhibits the synthesis of anabolic intermediates required by the viral replication process.

Virafin (Pegylated Interferon Alpha 2b) [40]

Zydus Cadila (3rd May 2021) said, it had sought permission from the Indian government to use his viral hepatitis drug in the treatment of Covid-19 after phase three clinical trials. clinical trials have shown promising results. Zydus says the drug will reduce the dependence of Covid-19 patients on oxygen supplementation and improve recovery time.

Cocktail

Sold under the brand name REGEN-COV (Casirivimab / imdevimab) [41]. The trial drug was developed with the help of the American biotechnology company, Regeneron pharmaceuticals.

It is an artificial (Neutralizing) "antibody cocktail" designed to produce resistance to SARS-CoV-2 coronavirus responsible for COVID-19 pandemic. It consists of two monoclonal antibodies, casirivimab (REGN10933) and imdevimab (REGN10978) to be combined together. The combination of the two antibodies is intended to prevent the mutational escape. Casirivimab and Imdevimab are human immunoglobulin G-1 (IgG1) monoclonal antibodies produced by recombinant DNA technology. FDA approved it for emergency use [42].

The manufacturing process of this biologic medicine is very complex and Roche was selected by Regeneron to increase international production capacity.

Intra Nasal spray –Nitric oxide [43]

The self-administered nitric oxide nasal spray (NONS) made by Vancouver-based biotech company. SaNOtize has been found to dramatically reduce Covid-19 viral load in infected patients after completing early stage clinical trials in Canadian and, most recently, in the United Kingdom.

COVID-19 vaccine

The world is in the middle of the COVID-19 epidemic. As the WHO and its partners work together on the response - to monitor the pandemic, to provide critical interventions, to disseminate scientific information to those in need ,resulted in development and deploy of safer and effective vaccines.

Hundreds of thousands of lives have been saved with vaccines. Vaccines work by training and preparing the body's natural defences - the protective gadget i.e. immune system - to recognize, target and fight off the germs/viruses and microorganisms. When the body becomes infected with the germs that cause disease later on, the body is ready to destroy them, preventing infections.

Many different technology platforms are under research and development to create a potent vaccine against COVID 19 [44]. Most of the platforms of people who will be vaccinated in clinical trials focus on the coronavirus spike protein and its variants as the main antigen for COVID infection 19. The platforms developed by 2020 involve nucleic acid technologies (nucleoside-modified messenger RNA and DNA), Non-replicating viral vectors, peptides, recombinant proteins, live attenuated viruses, and inactivated viruses. [44-47]. Vaccines usually require years of research and testing before reaching a medical facility, but in 2020, scientists began the race to produce safer and effective vaccines for coronavirus in record time.

Coronavirus Vaccine Update [48]

PHASE 1 35 Vaccines testing safety and dosage

PHASE 2	34	Vaccines in expanded safety trials
PHASE 3	28	Vaccines in large scale efficacy trials
LIMITED	05	Vaccines in initial or restricted use
APPROVED	10	Vaccines are approved for full use in accordance with WHO with functional subunits which are as follows: (https://covid19.trackvaccines.org/agency/who/)

Protein subunit:

1. Novavax
   NVX-CoV2373
2. Serum Institute of India
   COVOVAX (Novavax formula)

RNA:

3. Pfizer / BioNTech
   BNT162b2
4. Modern
   mRNA-1273

Non-replicating Viral vector:

5. Janssen (Johnson & Johnson)
   Ad26.COV2. S
6. Oxford / AstraZeneca
   AZD1222
7. Serum Institute of India
   Covishield (Oxford / AstraZeneca formulation)

Inactivated:

8. Bharat Biotech
   Covaxin
9. Sinopharm (Beijing)
   BBIBP-CorV (Vero Cells)
10. Sinovac
    CoronaVac

Worldwide

Dosage given	Fully vaccinated	% Of people completely vaccinated
1223 Crore (Cr)	388Cr	49.8%
12,23,00,00,000	3,88.00,00,000	

India

Dosage provided	Fully vaccinated	% Of people completely vaccinated
146Cr	61.2Cr	44.3%
1,46,00,00,000	61,20,00,000	

(Information is provided by the health government authorities which includes the Centers for Disease Control and Prevention (CDC), and other authorized sources, as mentioned.)

The Indian government on Christmas Eve introduced a reduction in the age of vaccination from 18 to 15 years and a vigilant dose of health workers and senior staff, as well as senior citizens who were concerned about the spread of the Omicron COVID-19 (Sars CoV2) virus contamination.

Mass vaccination of young people will also provide relief for participating fathers and mothers regarding the fact that their children are the most infected. Pfizer-BioNTech has requested approval to use its COVID-19 vaccine for children aged 12 to 15 years in the United States.

Conclusion

Nearly a hundred years after the Spanish flu epidemic in the 19th century, the COVID-19 epidemic is most deadly epidemic. As of in 3rd week of April 2020, more than 2.62 million cases of Covid-19 have been reported in 185 countries and territories and areas, resulting in the deaths of more than 183,000 people. Till August 21 in total cases recorded are estimated to be approximately 211, 364, 677 with 4, 423, 507 deaths worldwide. The pandemic has caused major social and financial disruption, including major global economic downturns since the Nineteen Thirties' Great Depression. It has resulted in widespread supply shortages, which has been exacerbated by panic buying, agricultural disruption, food shortages, and favourably reduced emissions of pollutants. Many educational institutions and community centres have been partially or completely closed, and many events have been cancelled or postponed. As of now there may be no definitive remedy for this lethal SARS- CoV-2 virus. Many repurposed pills had been tried for this infection but of no avail, except the 1. Repurposing of Corticosteroids in moderate to severe cases 2. Oxygen supplementation in severe instances in which O_2 saturation came to below 94% and 3. Anticoagulants that have proven decreasing the mortality rate in each age group of infected persons. Vaccination is the ultimate solution for stopping this pandemic and the good news is that many non-public pharmaceutical companies and govt. organizations have succeeded in developing the vaccines in very less time and receiving the Emergency use authorization from concerned authorities of various nations e.g. Covishield of ASTRAZENECA/university of OXFORD (united kingdom)/ Serum Institute of India, PFIZER/BIONTECH (GERMANY) -RNA VACCINE, Pfizer and the German company BioNTech RNA vaccine –(U.S./Germany), Sputnik from Russia, Covaxin from Bharat Biotech, India and so forth, which are currently in emergency use all over the world, moreover vaccines for kids also are emerging after final stages of scientific trials and many countries have started giving the vaccination to kids as well. Vaccine is the only hope to prevent this pandemic until some definitive / precise remedy come for which diverse laboratories and research agencies are working day and night all over the globe.

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