A Review on Covid 19 Pandemic

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Abstract

The 2019–2020 pandemic is caused by a new coronavirus called SARS-CoV-2 (Severe Acute Respiratory Syndrome Coronavirus 2). We discuss the most recent published studies on the SARS-CoV-2 virus in this in-depth review. We look at the key principles such as history, virology, symptoms, route of transmission, prevention, epidemiology, diagnosis, role of nanotechnology in diagnostics, treatment, vaccine, effect of COVID-19 in pregnant women. We describe and provide insight into conflicts and research gaps for the current pandemic to guide with future research ideas because much of the knowledge has been extrapolated from what is recognised about other coronaviruses, such as Middle East respiratory syndrome coronavirus (MERS-CoV) and severe acute respiratory syndrome coronavirus (SARS-CoV). Finally, we review the worldwide effect to the 2019 COVID-19 coronavirus pandemic and provide conclusions about what we learned from it in the aspects of lessons for pandemics in the future.

Keywords: - covid-19, virology, symptoms, prevention, diagnosis, treatment.

1. Introduction: -

Viruses are microscopic parasite particles that are incapable of self-replication. They can proliferate and spread infection,if they get into the host cell. The recognised elements of a viral structure include genetic material (DNA or RNA strand structure), a capsid protein coat (which protects genetic material), and an outer sheath of lipids. A virion is an essential component of a contagious virus that is made up of nucleic acid and an outer protein shell[1]. In the modern era, the virus has been associated to respiratory infections in both children and adults traced back to the 1960s . Coronaviruses are one of the crucial viruses that might cause respiratory disorders.corona virus belongs to the coronaviridae family. A majority of people contact the coronavirus just once in their lives, which mainly results in infections like pneumonia or bronchitis [2].

2. History: -

Coronaviruses are single-stranded, enclosed RNA viruses with a diameter of 120–80 nm.The four categories of coronaviruses are the Alpha coronaviruses, Beta coronaviruses, Gamma coronaviruses, and Delta coronaviruses. The four strains of coronavirus, HCoV-OC43, HCoV-229E, HCoV-NL63, and HCoVHKU1, are less virulent and only cause minor respiratory illnesses. Unfortunately, the coronaviruses that caused the destructive epidemics were the Middle East respiratory syndrome coronavirus (MERS-CoV) and the severe acute respiratory syndrome coronavirus (SARS-CoV) .Due to the SARS-CoV emergency in southern China in 2003 and the disease's broad incidence, in-depth research was done to prevent and cure the virus. More than 8000 persons were infected, and 774 deaths were documented, according to the World Health Organization [3]. Similarly, in 2012, Saudi Arabia saw a second outbreak of the acute respiratory infection, with MERS-COV being suspected for the pandemic. Published reports indicate that the death rate was around 35%. Market civets and dromedary camels were identified as the main vectors of MERS-CoV and SARS-CoV transmission to humans, respectively [4] .

COVID-19 was identified as a pandemic caused by SARS-CoV-2 on **March 11, 2020**, by the World Health Organization (WHO)[9]. SARS-CoV-2 primarily affects the cells in the human respiratory system However, recent research has shown that the virus can affect the cells of the digestive tract, kidneys, liver, pancreas, eyes, and brain. About 79% and 50%, respectively, of the SARS-CoV-2 virus's similarities to the SARS and MERS viruses have been reported[5]. A global crisis has resulted from the widespread prevalence of COVID-19 due to the high transmission strength and complexity of COVID-19 therapy compared to SARS-CoV and MERS-CoV, and it is essential to stop the disease's spread. This paper gives a comprehensive summary of the disease's virology, transmission mechanisms, and diagnostic procedures. Additionally discussed are new therapy recommendations and vaccinations that the World Health Organization has authorised[6].

3.Virology

Coronaviruses are virions with envelopes that contain viruses. These virion particles have a diameter of 120 nm. Glycoproteins and proteins with cloverleaf structures have given the virus a crown-like appearance on the outside. Because of their crown-shaped, other name for these

viruses is coronaviruses. A genomic genus of RNA exists in the coronavirus. The nucleocapsid of the virus exhibits this genetic material as a spiral or circular structure. A single strand of positive RNA makes up the coronavirus genome (ribonucleic acid). The genomic RNA of this virus contains a methylation warhead in its region 50 and is abundant in adenine nucleotides near the end of its '3'. The genome of coronaviruses contains a protein called the replicase enzyme, which replicates the viral genome and makes new copies of it utilising the capabilities of the host cell. SARS-CoV-2 is a member of the beta-corona virus genus, according to research. Four structural proteins compose the SARS-CoV-2 virus: nucleocapsid (N), spike (S), membrane (M), and envelope (E) (. Protein M is essential for allowing the virus to enter the host and producing envelopes. Protein E is responsible for the proliferation, germination, envelope formation, and spread of the virus.The multifunctional N protein is responsible for increasing viral transcription and replication.The Spike (S) protein is also responsible for the virus attaching to host cells. As a result, it holds a special position in the study of drugs and vaccines. It should be emphasised that proteins N, M, and E are not considered of as therapeutic targets due to the absence of response to neutralising or immunological antibodies[7]. The newly identified SARS-S CoV-2's glycoprotein is made up of two subunits, S1 and S2, and is typically shown as a sword-like spike. However, crystallography may be used to see the protein's true structure. This glycoprotein's Protein Data Bank (PDB) model demonstrates how the subunits are made up of several areas that are essential to the infection process. For the purpose of researching viral targeting, S1 and S2 are connected by a polybasic amino acid bridge. An S-protein helps the virus attach to the host cell and enter the cell. After the process of penetration, the transcript process starts, and the virus multiplies until the host cell is completely infected and killed[8].

Regulating the renin-angiotensin system is one of the key roles of angiotensin-converting enzymes (ACE2) (RAS). The angiotensin-converting enzyme 2 (ACE2), which is found in organs including the heart, kidneys, and lungs, functions generally as a cell surface receptor and allows SARS-CoV-2 to enter host cells and plasma. Moreover, the disruption of the ACE/ACE2 balance and the activation of RAAS by SARS-CoV-2, particularly in individuals with underlying cardiovascular disease problems, hypertension, and diabetes, are factors in the development of COVID-19 . The human lung has much greater levels of ACE2 expression in alveolar epithelial cell types 1 and 2 Compared to other parts of the body, the human lung has much greater levels of ACE2 expression in alveolar epithelial cell types 1 and 2 . According to research, the level of ACE2 expressions in men is much higher than in women in alveolar cells . Likewise, ACE2 expression levels in Asians' alveolar cells are much greater than those in Whites and African-Americans. According to research, SARS-CoV-2 viral binding via spike protein may increase ACE2 expression, which in turn may harm alveolar cells and trigger systemic responses and even death [9]. However, receptor binding is required for coronavirus infection on host cells. Following interaction to the receptor,Cathepsin,TMPRRS2, or Furin Protease cleaves the viral spike protein by acid-dependent proteolysis, which is followed by the fusing of the viral coating with cell membranes. The nS1 terminal unit of the spike protein, which contains a binding site for the ACE 2 receptor in human cells (RBD), and the nS2 terminal section, which contains fusion proteins and transmembrane anchors (T.A.) and an

intercellular tail, are often split structurally into two pieces (I.T.). The varied amino acid sequence of the spike protein makes it more hospitable [10].

4.Symptoms

Each patient experiences the COVID-19 sickness differently. Sometimes it might be asymptomatic(not shown any symptoms). Fever, a dry cough, and fatigue are frequently seen in the early stages of COVID-19 infection. Less frequent signs and symptoms include nauseousness or vomiting, pain in the muscles or joints, sore throat, loss of taste or smell, nasal congestion, conjunctivitis, headache, various skin rashes, diarrhoea, chills, and dizziness. The patient will experience severe shortness of breath, low blood oxygen (hypoxia), lung damage, and multiple organ failure along the disease's progressive phases. Other COVID-19 illness consequences include more severe and uncommon neurological conditions such stroke, encephalitis, delirium, and nerve damage[11]. A cytokine storm is one of the most important elements in the development of ARDS with COVID-19. Lung damage, multiple organ failure, and a poor prognosis for COVID-19 are all strongly correlated with the "cytokine storm," a violent inflammatory response carried on by the host's immunological response to the SARS-CoV-2 virus [12].

Description:-

SARS-CoV-2 gets inside the body through the mouth or nose, then travels to the lungs where it infects alveolar cells with its unique spike proteins. As a result, the immune system targets the diseased region and destroys healthy alveolar cells. Gas exchange is injuries sustained or decreased as a result of decreased surfactant produced by alveolar epithelial type II cells and fluid buildup brought on by the death of alveolar cells. Cytokines, however, can harm cells' reactions to them when they are released continuously, which can also stop the operation of organs. A severe condition, such as COVID19, is mediated by this phenomenon, which is referred to as a cytokine storm[13].

(1) COVID-19 infection of lung cells

(2) Cytokine generation by immune cells' viral recognition (macrophages).

(3) The additional absorption of immune cells (white blood cells) via the cytokine phenomenon results in an ongoing inflammatory cycle in lung cells.

(4) The development of fibrin and further injury.

(5) Lung cavity filling brought on by fluid penetration into fragile blood vessels, followed by respiratory damage.

Patients with minor symptoms had an improvement after one week, while those with severe symptoms described increasing respiratory failure caused on by the virus's destruction to their alveoli, which might result in death. On average, mortality rates have been given between diseased individuals in their middle age and older. According to WHO, recovery times range from three to six weeks for severe infections and around two weeks for moderate illnesses[14]

5.Routes for Transmission: -

Knowing the routes of transmission helps lower the frequency of the disease because there is no particular therapy and because it can be prevented from spreading [39]. Epidemiologically speaking, the wholesale seafood and wet animal markets in Hua Nan, Wuhan, may be connected to the SARS-CoV-2 outbreak. SARS-CoV-2 is mostly spread between people in social environments, medical settings, and families [40]. After infection, SARS-CoV-2 may be found in a number of organs, including the eye, nasopharynx, saliva, alveolar lavage fluid, blood, gut, and faeces [15]. Infection control and prevalence are facing substantial difficulties as a result of the high rate of SARS-CoV-2 transmission and the ambiguity surrounding the primary routes of transmission. Close contact and respiratory droplets are one of the primary means of transmission, according to study. Because of this, the pertinent professionals utilised a mask and highly suggested preserving social distance. Another mechanism of transmission that highlights the need of maintaining good hand hygiene and handwashing is touching the T-zone of the face after coming into contact with contaminated surfaces. Other modes of infection include fecal-oral transfer, airborne transmission, and contaminate surfaces. SARSCoV-2 viral transmission routes have generally been characterised as droplet and contact, airborne, faecal, and oral [16].

Droplets and contact routs:- As previously noted, respiratory droplets and close contact are the major COVID-19 viral transmission pathways . In general, there are two methods to spread the COVID-19 virus through droplets and contact: (1) direct contact with infected persons, and (2) indirect contact with surfaces used by an infected person. If the infected individual disregards the social distance (1 m), they can make a healthy person ill by coughing or sneezing, the virus entering their mouth or nose, or their conjunctiva (eyes). Additionally, fomite can spread through clothing, utensils, and furniture in close proximity to the sick individual . The Centers for Disease Control and Prevention (CDC) regulations in this section indicate that the below following requirements must be followed [17].

(1) Ensure that the patient is at a convenient location.
(2) The significance of using personal protective equipment properly (PPE).
(3) Minimize patient movement and transportation.
(4) Making use of as little permanent or medical equipment as possible.
(5) Make cleaning and disinfecting of rooms a priority.

Transmission via airborne particles:- According to research conducted on COVID-19 disease, one of the primary ways of viral transmission is by airborne particles [48]. According to published studies, the virus will spread if the dispersed particles hang around in the air for a while. The virus may also spread by aerosols in poorly ventilated interior spaces, according to the World Health Organization. When significant dosages of aerosols are breathed in enclosed spaces (such as ICU rooms), airborne droplets or suspended particles in the air may infect the lungs . The following are the key recommendations from the CDC in this area [18]:

- The requirement to maintain the patient in the air infection isolated room (AIIR).
- Restricting the access of medical staff to patients' rooms.
- The necessity of using personal protective equipment correctly (PPE).
- Limit patient mobility and transportation.
- Protecting those with COVID-19 suspicions from unsupervised interaction.

Fecal and oral: As was already noted, COVID-19 illness frequently exhibits gastrointestinal symptoms [19]. The RNA virus is present in the faeces of certain SARS-CoV-2 patients. Recent studies have demonstrated that SARS-CoV-2 in faecal samples from COVID-19 patients might be another route of viral transmission. Contact with food and drink tainted with faecal secretions might result in this transmission. According to Zhang et al findings, . COVID-19's molecular diagnostic value in a stool sample was similar to that of an oropharyngeal swab[19].

6. Prevention

Simple personal hygiene measures may be adequate for the containment and prevention of the illness, according to the WHO. Transmission can be minimised by using techniques like frequently washing dirty hands or sanitising clean hands. It is generally advised to cover your mouth while you cough and sneeze and to clean commonly touched items, such tabletops, doorknobs, and switches, with 70% isopropyl alcohol or another disinfectant. To stop the spread of the illness, it is advised that everyone who has it, including those who care for those who have, wear a mask. As per the guidelines provided by the WHO, healthcare workers are required to use a full set of personal protective equipment. The virus can be eliminated by fumigating dormitories, placing people in quarantine rooms, and washing clothing and other items in warm water with detergent.According to information published by the WHO, the virus is not known to be transmitted through packages or items since it cannot survive long enough in an open, exposed environment.To further stop the spread of the virus, sick people must be quarantined, as must everyone who has come into contact with an infected person. A long-used method of disease containment is quarantine. The topic of the quarantine's effect on everyone's mental health arises since it is administered on such a wide scale in some nations, assuming the shape of a national lockdown. It is important to address this issue, particularly in nations like China and India where it is still mostly taboo to discuss it in public[20].

According to a news release from India's Ministry of Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homeopathy (AYUSH), which deals with complementary and alternative medicine, taking the homoeopathic medication Arsenicum album 30 for three days on an empty stomach can guard against infection. In the same news release, it also published a list of herbal medications from the Ayurvedic and Unani medical systems that can strengthen the immune system to combat the infection. However, these medical systems need to be examined because there is presently no evidence to back up their use in treating COVID-19. A more practical method would be to employ a vaccination to prevent the sickness [21].

7. Epidemiology

When a novel infectious illness is discovered, epidemiologists play a crucial role in working with other scientists to identify the causes of the disease's transmission. The viral observation station (Wuhan, China) saw the first appearance of epidemiologists there . Then, they looked into the cause of the epidemic, how to stop it, and how to monitor the sickness (by tracking new cases, hospitalizations, and fatalities, as well as demographic data including symptoms, age, gender, and race/ethnicity, as well as treatment options). They also carried out clinical

trials . that included data from antibody testing, risk factors for serious sickness, and efficient medicinal interventions. Last but not least, it implements the required steps to prevent the disease's transmission (supporting and aiding persons in high-risk groups like healthcare professionals or the elderly to keep safe in settings like supermarkets, homes, or schools). Clinical studies have shown that COVID-19 is responsive to all ages. It should be remembered that people with and without symptoms can both spread the illness . According to studies, there is no discernible difference in viral load between symptomatic and asymptomatic people [22]. Droplets carrying the SARS-CoV-2 virus can spread up to one to two metres and remain on surfaces for many days in favourable circumstances. However, it is readily removed when exposed to conventional disinfectants like hydrogen peroxide and sodium hypochlorite, etc. According to a study on other COVID-19 characteristics, a person's susceptibility to the disease relies on their age, physical condition, and biological make-up. According to statistics, the majority of adult patients are between the ages of 35 and 55, while newborns and children are far less prevalent. Among them, those with weakened immune systems are at higher risk and more likely to be exposed to the virus . These include older adults, who have an average age of 60 or older, people with kidney and liver dysfunction , hypertension, diabetes, asthma, chronic pulmonary obstruction, heart patients, smokers , pregnant women, and people with disabilities. In other words, persons of any age get the coronavirus infection at this time, and there is a great possibility for epidemics among humans. The average disease-related death rate was greater in older individuals than in younger individuals. There have been no reports of pregnant women having intrauterine or prenatal transplants. The WHO states that while baby COVID-19 infection is often mild or asymptomatic, the effects of not nursing and mother and child separation are more severe than the danger of such an infection. The World Health Organization advises encouraging moms with COVID-19 who have been diagnosed or suspected to start or maintain breastfeeding. The advantages of nursing should be stressed to new mothers, far outweighing any possible transmission concerns [23].

8. Diagnosis

Since there is no known cure for this condition, early detection and isolation of the infections is the most effective strategy after prevention and management. The RT-PCR method, CT-Scan, Serological antibody blood test, and Artificial intelligence are a few techniques for making an early diagnosis of the condition.

RT-PCR Method

The Real-Time Reverse Transcriptase (RT)-PCR Diagnostic Panel is one of the most crucial tools for identifying the SARS-CoV-2 virus in upper and lower respiratory specimens. The RNA and DNA structure of the sample is copied while the PCR works to identify numerous genetic and blood illnesses with infectious origins. Real-time RT-PCR is used for COVID-19 diagnostic testing, as shown in Figure 9. Sample collection, RNA extraction, RTqPCR setup, and test results are the only five stages required to complete the test, which are all customizable to explain this and other RT-qPCR diagnostic techniques. These processes are shown in Figure 9. The RT-qPCR test can be carried out by following these methods [23].

- Nasopharygeal swab <15 MIN: cotton swab is inserted into the nostril to absorb sections

- Collected specimen 0-72 h specimen is stored at 2-8◦c for up to 72 h or proceed to RNA extraction
- RNA extraction-45 min purified RNA is extracted fram the deactivated virus RT-Qpcr, -1 h per primer,set purified RNA is reverse transcribed to CDNA and ampilified by qPCR
- Test reslts real-time positive SARS-CoV-2 patients cross the threshold line within 40.00 cycles(<40.00Ct)

This technique uses the real-time PCR technology to identify the nucleic acid contained in the nasal swab sampling or the respiratory tract. Based on the sample's virus's role for reproduction and genetic makeup, it is proven . The required samples are obtained from the lower and upper respiratory tract since the infectious virus attacks the host's respiratory system. The swab test involves taking a sample from a person's throat and nose using a specialised swab. By injecting a saline solution into the nose, the nasal aspirates and lungs are sampled, and the sample is then collected by suction Finally, the lower respiratory tract is used for bronchoalveolar lavage or chip aspiration, which is sputum sampling, if further sampling is required. The RT-PCR is often employed in the diagnostic sector, and the method's error rate is low [24].

CT-Scan

The diagnosis of diseases at various stages in their development may be made with the use of computed tomography (CT). Chest scans, including X-rays and computed tomography (CT) scans, are one method for examining the morphological patterns of lung lesions linked to COVID-19. It should be mentioned that the accuracy of the diagnosis is highly reliant on specialists. early phases of a pandemic in any nation. Because RT-PCR technology, as well as kits and diagnostic equipment suitable for accurate sampling, are lacking, the utilisation of CT imaging techniques was more crucial than RT-PCR. Additionally, CT scans are a helpful tool for diagnosing interior structures and analysing their dimensions, densities, and textures [25].Additionally, COVID-19-related abnormalities can be made visible using CT imaging. Chest CT in COVID-19 pneumonia cases shows bilateral, peripheral, and basal predominant groundglass opacities (GGOs) and/or consolidation in around 85% of patients with superimposed irregular lines and interfaces . In addition, chest CT scans in patients with coronavirus illness who recovered in 2019 showed that the maximum severity in lung abnormalities occurred after around ten days after the onset symptoms . Patients who are asymptomatic must be closely monitored because, if left unchecked, they can spread the virus relatively quickly. When DNA testing is negative and the patient is asymptomatic, specific characteristics of these individuals' CT imaging can still be seen[26].

The Serological Antibody Blood Test

Antibody-mediated immune responses to infectious pathogens can be found using serology testing as a diagnostic tool. Due to the COVID-19 serological test's inability to identify early stages of infection, the European Center for Disease Control and Prevention (ECDC) has only licenced it for epidemiological and monitoring uses. Rapid serological testing may be used as an alternative to molecular testing to detect COVID-19 patients when availability to PCR testing is restricted or nonexistent. Low prevalence serological tests should not be used since the findings are more likely to be falsely positive than truly positive. The COVID-19 serologic

diagnostic testing using antibody detection is illustrated in this protocol template (Figure 11). It shows sample loading, SARS-CoV-2 antibody-antigen detection, and the results of the qualitative tests. This can be altered as a whole to describe additional serologic diagnostic procedures for other bacterial, viral, or parasitic infections [27]. The procedures for carrying out a serology test are as follows :-

- **Sample loading**: add a drop of blood or serum in the sample well (S).
- **Buffer loading**: add dilution phosphate saline buffer to sample well.
- **Sample incubation**: capillary action moves sample across lateral flow test.
- **Antibody-antigen recognition:** antibodies with specificity for COVID-19 bind to gold COVID-19-antigen conjugates in the conjugate pad.
- **COVID-19 antibody detection**: sample enters testing well (T), and COVID-19 antibody–antigen complex binds to immobilized anti-human lgG/IgM antibodies.
- **Control antibody detection**: rabbit antibody-gold conjugate binds to immobilized anti-rabbit lgG antibodies.
- **Interpreting results:** Positive: one strip each in C well and T well, Negative = one strip in C well.

Artificial Intelligence (AI)

Medical experts have made a huge advancement in the COVID-19 pandemic by creating new technology to track and manage the coronavirus epidemic. Recent developments in diagnostics, biotechnology, and drug manufacture in medicine have been greatly aided by artificial intelligence . For several epidemics (SARS, EBOLA, and HIV), AI technology has shown remarkable potential. The COVID-19 issue and the sharp growth in the number of confirmed and suspected patients have contributed to the advancement of AI technologies used to treat and identify the disease [28]. Artificial intelligence is able to instantly identify illness signs and notify patients and medical authorities. This can speed up decision-making in conventional illness diagnosis processes . In these investigations, artificial intelligence mostly use medical imaging technologies including computed tomography (CT), X-ray imaging (X-ray), and magnetic resonance imaging (MRI) to diagnose infected cases . Moreover, AI may be used to follow the coronavirus's progress, identify high-risk patients, properly analyse patients' previous data, and forecast the probability of mortality [29].

9.The Role of Nanotechnology in Diagnostics and Treatment of COVID-19

Nanotechnology is now used to identify, treat, manage, and prevent illnesses in the medical field. To create safe and high-quality pharmaceuticals, targeted tissue treatments, individualised nanomedicines, and early detection and debarment of illnesses, nanoparticles are employed because of their high solubility, small size, surface adaptability, and flexibility . In locating, treating, and avoiding COVID-19, nanotechnology can play a special role. In the battle against COVID-19, the following fundamental characteristics of nanoparticles might be noted[30]:

- Creating secure personal protective equipment (PPE) will help keep healthcare workers safe and avoid infection.

- The creation of antiviral cleaners and surface coatings that render viruses inactive and stop their propagation.
- Development of highly accurate and sensitive nano-based sensors for the quick identification of an illness or an immune reaction.
- The creation of fresh medications with improved activity, less toxicity, and continuous release.
- Drug delivery targeting.
- Production of vaccines (enhancement of humoral and cellular immune responses).

Table 1 Reported the advantages of nanotechnology in the face of COVID-19.

properties	Advantages
1.Carriers and drug delivery systems	Transfer of the drug to the target organ Enhance the antiviral effects of drugs Very effective antiviral formulation Reduction of side effects and toxicity of the drug Control the cytokine storm . Increase the half-life of the drug[31].
2.Nanoparticles design for virus inhibition	Improve action and reaction with viral particles Interference with their entry into cells Enhance bioactivity and consistency of compounds Release of antiviral agents in a controlled manner Inhibition of the virus in the reproductive stage
3.Development of vaccines	Protects antigens versus precocious demolition Continuous release Increase antigen consistency Targeted immunogenic delivery Increased uptake by antigen-presenting cells(APCs) Use of various materials to produce Nanocarriers such as polysaccharides, polymers, and lipids Protect DNA or RNA versus enzymatic demolition and enhancement cell absorption Release of genetic material in target cells Increasing the compatibility of vaccines by changing the properties of nanoparticles[32]

10.Treatment

There is no specific therapy for a COVID-19 patient's full recovery; instead, the therapies offered to those with the condition are determined by their symptoms. In order to treat COVID19 patients properly, researchers and doctors are working . Numerous potential treatments are now being tested by researchers, including vaccinations, immunosuppressants, monoclonal antibodies, and antiviral drugs . The patient's immune system has a difficulty in

the early stages of the illness in preventing SARS-CoV-2 viral multiplication; yet, in the acute stages, the patient may undergo tissue damage owing to significant immunological/inflammatory responses. Antiviral treatments are most successful in the early stages of the disease, according to clinical data. Contrarily, immunosuppressive/anti-inflammatory therapies are probably most successful when COVID-19 is at its most advanced stages [35]. In the early stages of infection before the patient reaches the acute phase, anti-SARS-CoV-2 antibody-based therapy are more successful, it should be highlighted. Consequently, medical professionals advise obtaining monoclonal antibodies against SARS-CoV-2. Dexamethasone and Remdesivir are the medications that have received FDA approval in the US. It is advised for hospitalised patients who require more oxygen. . Remdesivir is an intravenous nucleotide medication derived from the adenosine analogue. Dexamethasone, a corticosteroid, has a considerable impact on patients' recovery during the acute phase of the disease when they require a ventilator [35-36].

Drugs used in covid treatment:-

Remdesivir :-

Due to its ability to inhibit SARS-CoV-2, one of the promising drugs for COVID-19 .Adults who are hospitalized and pediatric patients (aged ≥12 years and weighing ≥40 kg).Pediatric patients who are hospitalized (aged <12 years and weighing 3.5 kg to <40 kg) .Side effects (gastrointestinal symptoms (e.g., nausea), increased transaminase levels,increased prothrombin time and hypersensitivity reactions, control of renal function, drug interaction with chloroquine or hydroxychloroquine) .Low side effects in pregnant women[37].

Favipiravir :-

Favipiravir is a promising drug for COVID-19 that decreases hospital stay and the need for mechanical ventilation .Favipiravir may emerge as a valuable drug in the treatment of mild to moderate symptomatic SARSCoV-2 infected cases .The recommended dosage of favipiravir for adults is 1800 mg orally twice daily on 1st day, followed by 800 mg orally twice daily, up to a maximum of 14 days. The 14-day course in India costs Rs 10,200 [38].

Chloroquine or Hydroxychloroquine:-

Chloroquine is an antimalarial drug (manufactured in 1934). Hydroxychloroquine, an analogue of chloroquine(manufactured in 1934).Less toxicity of hydroxychloroquine compared to chloroquine Prevents acute coronavirus 2 (SARS-CoV-2) syndrome by increasing endosomal pH .Chloroquine is a suitable inhibitor of Angiotensin-converting enzyme 2 (ACE2) .Inhibits the transfer of SARS-CoV-2 from primary endosomes to end lysosomes and prevents the spread of viral genomes .The COVID-19 Treatment Guidelines Panel recommends against the use of chloroquine or hydroxychloroquine with or without azithromycin for the treatment of COVID-19 in hospitalized patients (AI) .Non-recommendation for use in nonhospitalized patients[39] . high-dose chloroquine (600 mg twice daily for ten days). Side effects: QTc prolongation, Torsade de Pointes, ventricular arrhythmia, and cardiac deaths ,fluoroquinolone antibiotics , Prolongation of QTc interval with concomitant use of hydroxychloroquine and azithromycin , Increased risk of cardiac arrest if concomitant use of hydroxychloroquine with

azithromycin . Drug-Drug Interactions: Caution in concomitant use with drugs metabolized by CYP2D6 (e.g., certain antipsychotics, beta-blockers, selective serotonin reuptake inhibitors, methadone) . Prevent severe acute respiratory syndrome-associated coronavirus (SARS-CoV-2) IN VITRO condition. No recommendation for use by the COVID-19 Treatment Guidelines for the treatment of COVID-19, except in a clinical trial[40].

Lopinavir/ritonavir:-

Side effects (Nausea, vomiting, diarrhea (common), QTc prolongation, Hepatotoxicity) .
Drug and drug interactions (Increased drug concentration with concomitant use of drugs metabolized by cytochrome P450 3A enzyme and increased toxicity)[41] .

Bamlanivimab :-

Bamlanivimab and etesevimab are neutralizing monoclonal antibodies that bind to different but overlapping epitopes in the receptor-binding domain of the spike protein of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The bamlanivimab plus etesevimab combination blocks SARS-CoV-2 entry into host cells and is being evaluated for the treatment of COVID-19 . On 9 February 2021, the Food and Drug Administration (FDA) issued an Emergency Use Authorization (EUA) to make bamlanivimab 700 mg plus etesevimab 1400 mg available for the treatment of outpatients with mild to moderate COVID-19 who are at high risk for progressing to severe disease and/or hospitalization (see the EUA criteria for use of the products below). The issuance of an EUA does not constitute FDA approval of a product[42] .

Adjunctive Therapy:-

Antithrombotic Therapy :- Chronic Anticoagulant and Antiplatelet Therapy. Not used for non-hospitalized patients with COVID-19.Undecomposed heparin, low molecular weight heparin, and warfarin are not contraindicated in children and pregnant women.Prohibition of oral anticoagulants with direct action.

Vitamin C :- The potential designation of high doses of vitamin C in ameliorating inflammation and vascular injury in patients with COVID-19.

Vitamin D :- Increased risk of pneumonia in patients with low levels of vitamin D.Use of vitamin D supplementation to protect against acute respiratory tract infection [43].

Immunomodulatory therapies :- Use of these drugs to treat immune and/or inflammatory syndromes such as corticosteroids (e.g., glucocorticoids).Targeted anti-inflammatory treatments such as interleukin interferons , kinase inhibitors .Tocilizumab is a suggested anti-inflammatory drug to treatment COVID-19[44].

11. Vaccines

An effective acquired active immunity against a particular microbial illness is produced by a vaccination, which is a biological substance . Every year, millions of lives are saved because to vaccinations. The main purpose of vaccinations is to acclimate and prepare the immune system to recognise and combat the harmful germs and viruses [45].

(1) Ingredients in action Antigens from bacteria or viruses that directly trigger the immune system without really causing disease.

(2) Adjuvants Tiny amounts of aluminium salts that support a stronger immunological response to the vaccination.
(3) Antibiotics shield the vaccine production process from bacterial contamination.
(4) Stabilizers The priceless vaccine is preserved in sugar/gelatin until it is given to a patient.
(5) Preservatives Thimerosal, which is solely used in influenza vaccinations, avoids harmful bacterial or fungal contamination.
(6) Locate the components Formaldehyde and other residual inactivating substances as well as remaining cell culture materials (present in small quantities that do not pose a safety concern).
More than 50 COVID-19 vaccine candidates are presently undergoing testing, according to the WHO. Through the COVAX (Working for Global Equitable Access to COVID-19 Vaccines) project, WHO collaborates with researchers, companies, and international health organisations to expedite and distribute the vaccine in an equitable manner (led by WHO, GAVI CEPI). The first COVID-19 vaccine for emergency use to receive EUA approval is BNT162b2 (Pfizer-BioNTech), which was created by BioNTech, produced and sold by Pfizer, and distributed by Fosun Pharmaceutical. There were 44,000 participants in clinical studies, with a stated success rate of more than 95% [46]. In order to avoid COVID-19 disease, it should be remembered that the US Food and Drug Administration (EUA) approved the Moderna vaccine for emergency use on December 18, 2020. Another efficient vaccination that just acquired an emergency licence is the AZD1222 vaccine created by Oxford. More than 65,000 persons have undergone clinical testing of the vaccine, and it has been found to be more than 70% effective against COVID19 Acute Respiratory Syndrome [47]. Table 2 lists the some COVID-19 vaccinations that have been authorised or approved.

Table 2 :- Approved COVID-19 vaccines

Name	Vaccine Type	Country of Origin	Description
Bharat Biotech BBV152	whole-virion β-propiolactone-inactivated	India	COVAXIN is an inactivated vaccine obtained from the SARS-CoV-2 strain isolated at the NIV, Pune, an Indian virology research institute. The vaccine is used along with immune stimulants, commonly known as vaccine adjuvants (Alhydroxiquim-II), to improve immune response and longer-lasting immunity. The vaccine candidate is produced through the formulation of the inactivated virus with Kansas-based ViroVax's Alhydroxiquim-II adjuvant. COVAXIN mainly contains 6 µg of whole-virion inactivated SARS-CoV-2 antigen (Strain: NIV-2020-770), and the other inactive components such as 250 µg aluminium hydroxide gel, 15 µg TLR 7/8 agonist (imidazoquinolinone), 2.5 mg TM 2-

			phenoxyethanol, and phosphate buffer saline up to 0.5 mL.
Johnson and Johnson vaccine (JNJ-78436735)	Viral vector	USA	The J&J/Janssen vaccine was 66.3% effective in clinical trials (efficacy) at preventing laboratory-confirmed COVID-19 illness in people who had no evidence of prior infection 2 weeks after receiving the vaccine. People had the most protection 2 weeks after getting vaccinated. The vaccine had high efficacy at preventing hospitalization and death in people who did get sick. No one who got COVID-19 at least 4 weeks after receiving the J&J/Janssen vaccine had to be hospitalized.

12.COVID-19 Effects on Pregnant Women

Pregnant women are expected to be at higher risk of acquiring severe COVID-19 than non-pregnant women due to the complexities of the disease. It should be highlighted that pregnant women are more susceptible to COVID-19 and need greater medical attention due to the ease with which viral respiratory infections, such as the flu, spread during pregnancy [48]. In general, mechanical and physiological changes during pregnancy made women more susceptible to COVID-19, particularly when it affects the cardiorespiratory system and gravida. This speeds up the course of respiratory failure. Pregnant women are more vulnerable to respiratory infections that cause severe pneumonia because of physiological changes in their immunological and cardiopulmonary systems (such as an enhanced diaphragm, higher oxygen intake, and respiratory mucosal oedema) [49]. Additionally, COVID-19-positive pregnant women may be more likely to experience adverse pregnancy outcomes, such as premature deliveries. An overview of the diagnosis, prevention, and potential therapy for pregnant women with COVID-19 illness is shown in Figure 16. Many vaccinations are often and safely given during pregnancy. Pfizer-BioNTech vaccines are an efficient COVID-19 vaccine, as indicated in the section on vaccinations. The COVID-19 vaccination has not yet been the subject of clinical studies in pregnant women, thus there is not enough data to suggest that pregnant women should have it regularly. But specialists think it is unlikely to endanger pregnant women given the way these vaccinations (mRNA vaccine) work and their method of action. . The COVID-19 vaccination has not yet been the subject of clinical trials in pregnant women, thus there is not enough data to support the recommendation that pregnant women get the shot on a regular basis. But scientists think it is unlikely to endanger pregnant women given the way these vaccinations (mRNA vaccine) work and how they work.Additionally, the breastfed newborn is not anticipated to be at danger from mRNA vaccinations. A person cannot get COVID-19 from an mRNA vaccination since it does not include a live virus that causes the

disease. Additionally, since mRNA does not penetrate the cell nucleus, mRNA vaccinations do not interact with genetic DNA. However, because pregnant women have not been researched for these vaccinations, it is uncertain what dangers there may be for both the mother and the foetus. The CDC advises that pregnant women who are also suffering additional post-vaccination effects be given the option of taking Acetaminophen [50].

There is no information that mothers who gave birth vaginally develop infections in their newborns. Additional research is necessary to understanding the risk of infection, and pregnant women who have COVID-19 infection should follow certain rules about the time and technique of delivery. Previous studies on the SARS virus have shown that it can cause intrauterine foetal death, preterm delivery, and intrauterine growth restriction; as a result, it is crucially vital to test suspected cases and maintain continuous control of the patients and their babies. Similarly, there is no proof that birth by caesarean or delivery section increases the risk of mother-to-child transmission [51].

13.Conclusion: -

There is currently a worldwide health emergency due to the incidence of COVID-19. More than 3 million individuals have unfortunately already died from the disease, which has affected 131 million people to date. Of them, 74.4 million have recovered. The COVID-19 pandemic cannot be stopped just by quarantine, and the effect this virus will have on the world economy is a major worry. No 100% effective medicine has been found for full recovery, despite the fact that researchers are working to identify a completely successful medication for the treatment of COVID-19. Fortunately, a number of efficient vaccinations to stop the spread of this life threatening illness have been licenced by the World Health Organization thanks to the work of researchers and pharmaceutical companies. However, it takes a while for these efficient vaccines to reach everyone in the globe and for everyone to receive their vaccinations. Until then, it is essential to adhere to all of the World Organization's recommendations for reducing the occurrence of this disease.

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