



Review

Insight into the biological impact of COVID-19 and its vaccines on human health



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ABSTRACT

COVID-19 (coronavirus disease-2019) is a contagious illness that has been declared a global epidemic by the World Health Organization (WHO). The coronavirus causes diseases ranging in severity from the common cold to severe respiratory diseases and death. Coronavirus primarily affects blood pressure by attaching to the angiotensin converting enzyme 2 (ACE 2) receptor. This virus has an impact on multiple organ systems, including the central nervous system, immune system, cardiovascular system, peripheral nervous system, gastrointestinal tract, endocrine system, urinary system, skin, and pregnancy. For the prevention of COVID-19, various vaccines such as viral-like particle vaccines, entire inactivated virus vaccines, viral vector vaccines, live attenuated virus vaccines, subunit vaccines, RNA vaccines, and DNA vaccines are now available. Some of the COVID-19 vaccines are reported to cause a variety of adverse effects that range from mild to severe in nature. SARS-CoV-2 replication is controlled by the RNA-Dependent RNA-Polymerase enzyme (RdRp). The availability of FDA-approved anti-RdRp drugs (Ribavirin, Remdesivir, Sofosbuvir, Galidesivir, and Tenofovir) as potent drugs against SARS-CoV-2 that tightly bind to its RdRp may aid in the treatment of patients and reduce the risk of the mysterious new form of COVID-19 viral infection. RdRp inhibitors, such as remdesivir (an anti-Ebola virus experimental drug) and favipiravir (an anti-influenza drug), inhibit RdRp and thus slow the progression of COVID-19 and associated clinical symptoms, as well as significantly shorten recovery time. Molnupiravir, an orally active RdRp inhibitor and novel broad spectrum antiviral agent, is an isopropyl pro-drug of EIDD-1931 for emergency use. Galidesivir's in vitro and in vivo activities are limited to RNA of human public health concern. Top seeds for antiviral treatments with high potential to combat the SARS-CoV-2 strain include guanosine derivatives (IDX-184), setrobuvir, and YAK. The goal of this review is to compile scattered information on available COVID-19 vaccines and other treatments for protecting the human body from their harmful effects and to provide options for making better choices in a timely manner.

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1. Introduction

In 2019 Dec, COVID-19 (a novel coronavirus disease) pestilence was accounted for in Wuhan, China, which is brought about by SARS - CoV-2 (Ma et al., 2020). Covid has a place with the Coronaviridae family. The genus of the virus is “corona” which means Crown, the crown-like projections appear on the surface of the virus. In the last part of 1960s, it was first separated from patients experiencing regular cold, named as B814 and imagined under an electron magnifying instrument (Mahalmani et al., 2020). All CoVs (coronaviruses) have pleomorphic RNA typically consisting of crown-shape peplomers with 80–160 nM dimensions and 27–32 kb positive polarity. With its excessive change rate, CoVs are zoonotic microorganisms which are available in people and different creatures with a vast scope of clinical highlights from non-symptomatic manner to necessity of hospitalization in the emergency unit; generate infections in neurologic, hepatic, gastrointestinal and respiratory systems. CoVs were not evaluated as more infectious for people till, they were diagnosed with SARS earliest in China’s Guangdong territory in 2002 and 2003. Novel Coronavirus (nCoV), a common medical condition, was discovered in the Huanan Seafood Market in Wuhan, Hubei Province, China where livestock brutes are moreover sold and has been the hub of international attention due to pneumonia pestilence of unspecified source, in 2019 Dec.

In the beginning, an unspecified pneumonia patient was recognized on 12th Dec 2019, and probable influenza and other CoVs

were ruledout by lab diagnosis. The government of China reported on 7th Jan 2020 that different kind of Coronavirus was separated. On 12th Jan 2020, this virus was designated as Novel Coronavirus and on 11th Feb 2020, it was designated as COVID-19 by World Health Organization (Sahin et al., 2020). On 29th Sep 2021, there have been 232,636,622 approved patients of coronavirus disease, and 6,136,962,861 vaccine doses have been given overall (<https://www.deccanherald.com/international/world-trending/coronavirus-world-o-meter-update-live-country-wise-total-number-of-cases-deaths-may-1-827195.html>).

The sickness is passed on from one person to another by inward breath or contact with air droplets of infected person and the maturation time goes from two to fourteen days. The indications are generally pyrexia, sore throat, cough, shortness of breath, tiredness, restlessness and the rest. The sickness is not strong in many persons; in a few (generally old and individual having various disease symptoms), it might advance to wet lungs, pneumonia, and impairment of multiple body parts. Numerous individuals are symptomless. Basic lab discoveries incorporate usual/poor WBC’s count with raised C-reactive protein. The computed tomographic chest examination is generally uncommon however in those without any manifestations otherwise moderate infection. Therapy is basically protective. The infection spreads quicker in comparison to 2 precursors SARS-CoV and MERS-CoV, however has lower fatality (Singhal, 2020).

The objective of the study is to spread awareness about available COVID-19 Vaccines and other treatments for protecting the

human body from their dangerous effects and to give option for selecting better choice timely.

2. Microbiology

Coronavirus has positive-sense RNA, possess a broad and indiscriminate limit of natural host and influence various arrangements (Dhama et al., 2020). Coronavirus has spherical shape or pleomorphic, solitary stranded, wrapped RNA and shield with clavate form glycoprotein. Coronavirus have 4 sub kinds, for example, α , β , γ , and δ Coronavirus (Kumar et al., 2020). Coronavirus could produce clinical illness in people that might convert from the normal flu to more serious respiratory illness such as MERS and SARS. Coronaviruses have non-segmented, solitary stranded, positive-sense RNA genome of nearby 30 kb, encased by a 5'-cap and 3'-poly (A) tail. SARS-CoV-2 has a genomic length of 29,891 bp and a GC substance of 38 percent. A covering consisting viral nucleocapsid surrounds these viruses. In coronavirus, the nucleocapsids are organized in helical symmetricalness, which ruminates an untypical trait in positive sense RNA viruses. Spike (S), Membrane (M), Envelope (E), and Nucleocapsid (N) are 4 significant basic proteins encoded by Coronavirus.

Coronavirus S protein has an enormous, multifunctional type I viral transmembrane protein. S protein is located in a trimer on the virion surface, providing the looks to the virion like a crown. S protein is needed for the entry of the infectious virion particles into the cell by interacting with various cellular receptors present on the host cell. By engaging with different cellular receptors on the host cell, S protein is required for the entrance of contagious virus pieces into the cell.

The M protein is the more bountiful viral protein existing in the virus piece, providing a positive structure to the viral covering.

The E protein is the more perplexing and most little of the significant structural proteins. E protein takes a multifaceted part in the pathogenicity, assembly, and liberation of the virus.

Coronavirus's N protein has multifunction. Among a few activities, N protein takes a part in compound synthesis with the virus genome, facilitates M protein interaction required for virion construction, and increase virus transcription efficiency (Dhama et al., 2020).

3. Pathogenesis of Covid-19

SARS-CoV2 has single strand RNA. SARS-CoV2 enters in human cells through attaching to ACE-2, which is mostly found in cardiovascular myocytes, lung alveolar cells, the vascular endothelium, and different cells. SARS-CoV2 is mainly circulated through inhalation of virus particle and passes into the respiratory system. Apart from this, the virus can stay on the surface for 24–72 h, contingent upon the sort of surface, which facilitates fomite transmission (Bikdeli et al., 2020). COVID-19 may only infect the lungs in most individuals because it is mostly a respiratory disorder (Prompetchara et al., 2020).

Within the patient, the virus's life cycle is divided into five stages: attachment, penetration, biosynthesis, maturation, and release. Firstly, virus attaches to the receptor site in the host body, it is called attachment. By membrane fusion or endocytosis process, the virus enters the patient cells, it is called penetration. Then the virus releases its content in inner part of host cells, the RNA of virus invades into the nucleus for reproduction. The mRNA of virus is utilized to synthesize viral proteins; this process is called biosynthesis. After that, the new particles of virus have produced, it is called maturation. The functioning receptor for SARS-CoV has been recognized as ACE2. The spike for SARS-CoV-2 also bound to ACE2, it was determined in the structural and functional analysis. ACE2

was found in kidney, heart, lungs, ileum, and bladder in more amount. The lungs epithelial cells were extremely expressed by ACE2 (Yuki et al., 2020). COVID-19 may be separated into 3 stages depending on the cells which are probably infected, which relate to various clinical phases of the illness.

3.1. Phase I: Non-symptomatic phase (beginning one – two days of disease)

When a patient inhales, the virus (SARS-CoV-2), it attaches to the epithelial cells in the nasal cavity and begins reproducing. SARS-CoV and SARS-CoV2 both has the same fundamental receptor which is ACE2. According to an *in-vitro* study, it was found that ciliated cells were more infected by SARS-CoV in the conducting airways. Nonetheless, this idea may require certain update, since small amount of ACE2 expression were showed by the single-cell RNA in conducting airway cells and no conspicuous cell type preference. The virus has limited multiplication of however a restricted innate immune response. Nasal swabs can be used to identify the virus at this stage. Even though the viral load might be minimal, these people are contagious. The RT-PCR result for RNA of virus may be valuable to anticipate the viral burden and the ensuing infectivity and clinical course.

3.2. Phase II: Response of conducting airway and upper airway (next hardly any days)

The infection spreads and relocates through the respiratory system ahead the conducting airway, and much strong and healthy innate immune reactions are activated. Nasal swabs or sputum should reveal the infection (SARS-CoV-2) just as early indicators of the innate immune response. COVID-19 is now causing clinical signs and symptoms. The amount of CXCL10 (or another innate response cytokine) might be prescient of the resulting clinical outcome. Viral infected epithelial cells are important source of beta and lambda interferons. CXCL10 is an interferon responsive gene with a high signal-to-noise ratio in the response of alveolar type II cells SARS-CoV and influenza. CXCL10 has likewise been accounted for to be helpful as illness marker in severe acute respiratory syndrome.

3.3. Phase III: Hypoxia, ground glass infiltrates, and development to acute respiratory distress syndrome

Unluckily, phase 3 of illness will be developed by approximately 20% of the infected patients and will pulmonary infiltrate and a portion of these will progress to extremely serious infection. Now, the virus infects the alveolar type II cells after entering in the gas exchange unit of the lungs. After comparing the type I cells with type II cells, both SARS-CoV and influenza specially infect the type II cells. The result is that a self-reproducing pulmonary toxin is produced by the viral particles which infect type II cells in nearby units. Regions of the lung will probably lose most of their type II cells, and secondary pathway for epithelial recovery will be activated. Generally, type II cells are the forerunner cells for type I cells. This hypothesized series of events have appeared in the murine model of influenza pneumonia. After pathology of SARS and COVID-19, it was found that SARS and COVID-19 diffuse alveolar damage with fibrin rich hyaline membranes and a small number of multinucleated giant cells. A robust innate and acquired immunity and epithelial regeneration will be needed for the recuperation. The apical cilia present in the respiratory tract and microvilli on type II cells might be essential for facilitating viral entry (Mason, 2020).

3.4. Spread & transmission of Covid-19

It was found that SARS-CoV in 2003 and MERS-CoV in 2012 were discovered from *Chiroptera* and *Camelus dromedarius* sequentially. In this sequence, SARS-CoV-2 which is ninety-six percent identical to SARS-CoV is also supposed to be developed from the bats and spread through creature human contact in Wuhan meat market, Hubei area, China (Mohan and Nambiar, 2020). Although, it had obtained the ability to move from human to human because of mutation change (Rajendran et al., 2020). In Dec 2019, mature persons in Wuhan, metropolis town of Hubei territory and an utmost transportation centre of China commenced transpiring to nearby medical centre with serious pneumonia of unspecified source. The large number of starting patients possessed a normal exposure to the market where alive animals were sold that was Huanan wholesale seafood market. The monitoring system was initiated, and respiratory samples of sick persons were conveyed to the reference laboratory for aetiologic analysis. China informed to the WHO about epidemic on 31st Dec 2019, and the Huanan Sea food market was shut on 1st Jan 2020. The virus was recognized as a Coronavirus on seventh January. The samples were taken from the atmosphere of Huanan Sea food market and found to be positive after testing, meaning that the virus was developed from that point. A lot of cases started growing speedily, some of which didn't have introduction to the alive animal market, proved to be true that person-to-person spreading was going on. On 11th Jan 2020, death cases were announced. The epidemic was fuelled by the massive migration of Chinese over the Chinese New Year. People returning from Wuhan had cases in various regions of China and from numerous countries (consistently Thailand, Japan, and South Korea). Spreading of virus to health care persons who were caring for sufferers reported on Jan 20, 2020. By 23rd of Jan, Wuhan's eleven million people were put down under lock down with limitations of ingress and egress from the territory. This curfew was quickly extended to several cities in the Hubei area. COVID-19 outbreaks in countries outside of China were reported in people who had no previous travel history to China, implying that local person-to-person spreading was occurring in these countries. Airports of various countries had screening instruments including India for the detection of symptomatic persons returning from China and put them in quarantine and testing them for COVID-19. After a short time, it was clear that the infection can be spreaded from asymptomatic person and besides prior to beginning of symptoms. Thus, nations such as India which move out their inhabitants from Wuhan via a particular flight or had tourists coming back from China, put down all symptomatic person or else in quarantine for fourteen days and diagnosed them for the infection. India, which had declared only 3 cases till 2nd Mar 2020, has additionally observed a sudden shower in cases. On 5th Mar 2020, 29 instances of Italian travellers and their relations were reported, mostly in Delhi, Agra and Jaipur. All ages of people are acquiescent. The studies indicate that higher viral burden in the nasal cavity when appeared differently in relation to the throat with no differentiation in viral burden between symptomatic and non-symptomatic persons. The driblets from infected person can transmit up to one to two meters and stick-on surfaces. The virus can stay viable on surfaces for a serious long time in great beneficial weather conditions, but the virus can be destructed within seconds by using essential disinfectants such as hydrogen peroxide, sodium hypochlorite, etc. Disease is picked up either by breathing-in of these driblets or by contacting the infected surfaces and touching the eyes, nose and mouth afterwards. The virus has also been found in the faecal matter and contamination of the water supply and resulting spreading by aerosolization/feco oral route is a possibility (Unhale et al., 2020). After entering the infection in the human body its essential targets are enterocytes and pneumocytes,

where in this way initiate a pattern of disease and reproduction. Coronavirus has other target point which contains epithelial renal tubules, cylindrical epithelial cells of kidney, cerebral neuronal cells, and immune cells (Agrawal et al., 2020).

3.5. Symptoms of Covid-19

The manifestations of COVID-19 are different with individual person. It might induce not many or no manifestations. Notwithstanding, it can cause serious sickness and might be life threatening. After sickness, it might take 2–14 days for an individual person to induce manifestations. Cold-or influenza like indications generally set in from 2 to 4 days after COVID-19 and which are generally not severe. Symptoms include Rhinorrhoea, watery diarrhoea, pharyngitis, tiredness, dry cough, pyrexia and shortness of breath (Unhale et al., 2020).

Extra manifestations involve, frailty, tiredness, spewing, loose bowels, variation in taste and scent. The most widely recognized manifestations in hospitalized sufferers are pyrexia (up to ninety percent of sick persons), dry hack (60–86%), windedness (53–80%), tiredness (38%), queasiness/regurgitating or looseness of the bowels (15–39%), and muscular pain (15–44%). Patients can additionally give nonclassical manifestations, for example, isolated gastrointestinal side effects. Olfactory or potentially taste defectiveness has been accounted for in sixty-four percent to eighty percent of sufferers. Loss of smell or loss of taste might be the only introducing side effect in around 3% of patients. Intricate with COVID-19 cause vitiated physiology of the cardiac, cerebrum, respiratory, hepatic, renal, and coagulation system. Coronavirus can cause cardiomyopathy, myocarditis, ventricular arrhythmias, and hemodynamic precariousness (Wiersinga et al., 2020).

3.6. Diagnosis of Covid-19

Since the World Health Organization as of late declared COVID-19 an epidemic on 11 March 2020 (Nardo et al., 2020). Polymerase chain reaction (PCR) analysing through nasal swab is generally used for detection of COVID-19. PCR analysing of nasal swabs gives false negative results. Due to this clinical, laboratory, and tomography testing might also be utilized for the diagnosis of SARS-CoV2 (Wiersinga et al., 2020). SARS-CoV2 can be additionally diagonized on faeces (Sharma et al., 2020).

3.7. RT-PCR (real-time reverse-transcription polymerase chain reaction) under-diagnosis of COVID-19

A standard is set for the diagnosis of SARS-CoV2, sample is taken from the respiratory tract (mainly from nasopharynx) and reverse transcription polymerase chain reaction-based SARS-CoV2 RNA diagnosis is done. Nonetheless, the sensitivity of testing changes with timing of testing comparative with subjection. The components which give the false-negative test results are sufficiency of the sample collection method, time from subjection, and source of sample. The specimen which is taken from lower respiratory tract, are more sensitive than upper respiratory tract for example, bronchoalveolar lavage fluid.

3.8. Serology

A few serological assays can be helpful in the detection and estimation of reactions to new vaccines. Accessible serological tests contain high throughput enzyme immunoassays and point-of-care tests. Nonetheless, assay production, precision, and viability are changeable.

3.9. Laboratory findings

An orderly survey of nineteen investigations of 2874 sufferers who generally belonged to China (52 years was average age), of whom eighty-eight percent were admitted in hospitals, revealed the normal scope of research facility anomalies appeared in COVID-19, containing raised serum C-reactive protein (elevated in > sixty percent of sufferers), lactate dehydrogenase (elevated in about fifty percent to sixty percent of patients), alanine aminotransferase (increased in about twenty-five percent of patients), and aspartate aminotransferase (roughly thirty-three percent). The albumin protein was found to be less or lower in about 75% of patients. The most well-known haematological anomaly is lymphopenia (total lymphocyte count five percent of sufferers), mild thrombocytopenia (found in around thirty percent of sufferers) and raised D-dimer values (found in 43–60% of sufferers) were normal.

3.10. Radiology

Diffusion and peripheral ground-glass opacities were the properties of chest computed tomographic imaging variations for COVID-19. Ground-glass opacities had not well-defined edges, air bronchograms, glossy or not regular interlobular or septal stiffening, and stiffening of the vicinal pleura. Initially in the illness, chest computed tomographic imaging detection in around fifteen percent of people and chest tomogram detection in around forty percent of people could be ordinary (Wiersinga et al., 2020).

4. Prevention of Covid-19

It was reported that person-to-person transmission in SARS-CoV-2 disease happens essentially via droplets or personal exposure with the infected person. Because of this observation, front medical services laborers ought to follow severe disease control and preventive measures, for example, the utilization of personal protective equipment (PPE), to stop transmission of coronavirus. The WHO affirmed that the reasonable, right, and regular utilization of PPE additionally diminishes the transmission of coronavirus. Visage covers shield from irresistible droplets as well as forestall the spread of virus to more vulnerable people going via mass transit. Hand cleanliness will lessen ailment transmission just if the infection is circulated through the generation of enormous dribbles. Even though transmission through air has not been accounted for SARS-CoV-2 virus, spreading can happen via dribbles and contaminated objects, particularly at that point there is direct, uncovered exposure among the people having infection and vulnerable. Thus, hand cleanliness is similarly significant like utilization of proper PPE, such as visage covers, to disturb the chain of coronavirus circulation; the duo hand cleanliness and visage covers aid to reduce threat of COVID-19 spreading. Hand cleanliness ought to be done with the help of alcohol-based hand rubs (ABHRs) which contains 60–80 percent ethyl alcohol. Cleaning of the hands should be done with the help of soap and water in well manner is sufficient (Sharma et al., 2020). Clinical personnel are among the most vulnerable to coronavirus infection. Since the medical staff has direct contact with the tainted patients. Thus, appropriate preparing must be given to all clinical staff on techniques for avoidance and safety, so they become capable to shield themselves as well as other people from this fatal illness. As a preventive measure, medical care assistants which take care of the tainted patients should keep it safe against both exposure and airborne transmission. Health care workers should utilize personal protective equipment (PPE), for example, visage covers, eyes safety, outfits, and

hand cover to negate the danger of disease (Dhama et al., 2020). The other safety measures for sufferers, sick persons should have detached isolate areas; everybody who comes in the contact of sick persons, regardless of whether family, friends, or relatives, should be isolated and farness should be maintained between the isolated persons. At the time of sneezing the sick person should have shielded their nose and mouth by using masks or sanitary paper. The people who are suspected of coronavirus disease should utilize good quality face masks in community and closed rooms. The sick person should lave their hands rigorously after sneezing (Ouassou et al., 2020).

5. Treatment for Covid-19

Previously, no powerful antiviral treatment or immunization was accessible for coronavirus disease. Notwithstanding, a randomized multicentre controlled clinical trial is in progress to evaluate the efficiency of abidole and wellbeing in sick persons having coronavirus disease. Antipyretic treatment like paracetamol, are the primary therapy for pyrexia while expectorants, for example, guaifenesin might be utilized for dry cough. Patients which have extreme serious respiratory illness, respiratory misery, hypoxaemia or trauma require the management of quick oxygen treatment (Sohrabiet al., 2020). Quarantine and supportive care which include oxygen treatment, fluid administration, and antibiotics therapy for secondary bacterial diseases is suggested. Not either is a treatment accessible. Along these lines, the management of the illness has been generally strong and supportive alluding to the ailment seriousness which has been presented by WHO. It was clinically proved that corticosteroid treatment was not supported (Harapana et al., 2020). The therapy that has been used till now revealed that seventy-five sick persons were treated with already existed antiviral medicaments. The regimen of therapy contained “Bis in die” oral organization of ritonavir 500 mg, lopinavir 500 mg, oseltamivir 75 mg, and the intravenous management of ganciclovir 0.25 g for three to fourteen days. A second record revealed that the broad-spectrum antiviral drug like chloroquine and remdesivir are extremely efficacious in the management of 2019 novel coronavirus disease in vitro. Human patients with a similar history have been treated with a combination of these antiviral medicines. Subsequently, these curative agents can be considered to treat coronavirus disease. In this way, till further particular curatives become accessible, it is sensible to consider more wide range of antivirals that give drug therapy choices to coronavirus illness which include Ritonavir or Lopinavir, peptide (EK1), RNA synthesis inhibitors, Neuraminidase inhibitors. It is completely understood that extra study is essentially required to find out new chemotherapeutic medicines for the treatment of coronavirus diseases (Rothan and Byrareddy, 2020).

Proof has indicated that plasma from recuperated sufferers can be a successful therapy for SARS and MERS and can aid lessen the death rate overall. The body induces immune reactions in response to SARS-CoV-2 disease, resulting in production of specific antibodies. Prior to treatment with nonspecific antiviral medications, plasma from recuperated sick persons can be utilized to cure sufferers with serious coronavirus disease (Xie et al., 2020).

Azithromycin is a macrolide antibiotic that has been broadly utilized in patients with persistent pulmonary inflammatory disorders or publicly gained pneumonia because azithromycin has anti-inflammatory effect.

Vitamin C possesses antioxidant effects. It takes a part in decreasing the inflammatory reaction. After the study it was found that ascorbic acid down-regulates the generation of pro-inflammatory cytokines. A randomized controlled trial is in

Table 1
Vaccines available for COVID-19.

Covishield (Serum Institute of India, Pune with Oxford, and AstraZeneca)	Ad26.COV2. S (Janssen Pharmaceuticals)	Covishield vaccine (ChAdOx1 nCoV 19), marked as AZD1222, is a viral vector vaccine manufactured at Oxford University/AstraZeneca with Serum Institute of India (SII) giving a platform to generate a vaccine in India
Covaxin (Bharat Biotech, Hyderabad with ICMR)	Novavax	Covaxin (BBV152) is an entire virion inactivated SARS-CoV-2 vaccine and is the earliest vaccine which has been natively developed. Covaxin has been prepared by Bharat Biotech as a team with the Indian Council of Medical Research
Moderna	ZF2001	The Moderna vaccine is a lipid nanoparticle enclosed mRNA-based vaccine that encodes the prefusion balanced out full length spike protein of the SARS-CoV-2. This is interesting that mRNA platform has been utilized and there have been numerous hypotheses regarding this vaccine
Pfizer + BioNTech	Zorecimeran (CVnCoV)	Pfizer and BioNTech have developed BNT162b2, a lipid-soluble nano particle-based mRNA vaccine. The vaccine comprises of perfusion conformity of the full-length S gene
Zyudus Cadila (Zyudus Biotech, Ahmedabad)	CoVLP	The Beijing Institute of Biological Products developed the inactivated BBIBP CorV vaccine. Deactivated with β -propyl lactone, this vaccine, prompted significant titres of counteracting antibodies in mice and Rhesus monkeys
Sputnik-V (Gamaleya Research Institute Vaccine, Russia)	IIBR-100	The Gamaleya Research Institute, Russia prepared its human adenovirus (Ad) vector-based vaccine, the Sputnik-V, which has a full-length S-gene. The unconventional property of this vaccine is that it uses 2 adenovirus (Ad) vectors-Ad5 and Ad-26
CanSinoBIO (Beijing Institute of Biotechnology)	GRAd-COV2	CanSino Biological's vaccine candidate for Ebola into phase 2 trials after preliminary safety data showed efficacy against Covid-19
CoronaVac (Sinovac Life Sciences, China)	INO-4800	A multivalent deactivated vaccine that attacks on SARS-CoV-2 strains spreading in various areas, CoronaVac, was prepared by SinoVac Life Sciences, Beijing, China. β -propyl lactone was used to deactivate the viral seed which was cultured in Vero cells
EpiVacCorona (Vektor State Research Center of Virology and Biotechnology in Russia)		The peptide-based COVID-19 preventive vaccine is the second to be licensed for use in Russia
Zyudus cadila vaccine		ZyCoV-D is another natively prepared plasmid DNA third-era vaccine where DNA, the functional segment of virus is introduced into the plasmid that is non-replicating and non-incorporating. This recombinant plasmid is then accessible in vaccine form which develops antigen-antibody reaction and cell mediated immunity (Kakar et al., 2021)

progress and in stage 2 to examine the clinical efficacy and safety margin of vitamin C infusion therapy to treat pneumonia occurs in coronavirus illness.

It had been discussed that high amount of the zinc in the inner part of the cell can cause efficaciously weaken replication of various RNA virus, for example, flu and polioviruses. During a study it was found that zinc-ionophores combined with zinc like pyrithione impeded the reproduction of SARS-CoV in cell cultures.

Montelukast produces anti-inflammatory effects, and it suppresses the oxidative stress. Montelukast has been used in the treatment of acute asthma at high dose. Because of inordinate inflammatory reaction, there is a lot of morbidity and death rate from coronavirus disease. It is imagined that montelukast takes part in restricting the development of illness (Chams et al., 2020). A few surveys consider the manners by which vitamin D decreases the chance of viral diseases. Vitamin D has various mode of actions by which it decreases the threat of microbial disease and demise (Grant et al., 2020). Vitamin D aids to preserve occluding junctions, adherens junctions and gap junctions (Schwalfenberg, 2011). Vitamin D additionally boosts cellular immunity, to some extent by decreasing the cytokine storm persuaded by the innate immune system. Both pro-inflammatory and anti-inflammatory cytokines are produced by the innate immune system in response to the viral and bacterial diseases, as seen in COVID-19 sufferers (Huang et al., 2020).

However, now-a-days vaccines are available. The first immunization program began towards the beginning of December 2020 ([https://www.who.int/news-room/q-a-detail/coronavirus-disease-\(covid-19\)-vaccines?](https://www.who.int/news-room/q-a-detail/coronavirus-disease-(covid-19)-vaccines?)). The advancement of an immunization against a specific microbe is a tedious and monotonous procedure. In the current situation, a vaccine as protection from SARS-CoV-2 seems to be only desire to control the epidemic and the vaccine was accessible in around 10 months for the use of community health.

As of now, 166 vaccines in pre-clinical stage and 56 vaccines in clinical trials (stage 1–3) and some have additionally gotten crisis authorisation for their utilization. Nine diverse innovation stages

for COVID-19 vaccine are under investigation and development, these incorporate the protein subunit, virus like molecule, inactivated virus, live attenuated virus, DNA based, mRNA based, chimpanzee adenovirus non duplicating viral vector, human serotype 26 non recreating viral vector and human serotype 5 adenovirus non replicating viral vector. The efficacy of any vaccine relies upon its viability which is signified by the level of decrease of an infection in a vaccinated group of individuals contrasted with an unvaccinated group. The WHO has set a minimum effectiveness criterion of 50% for the vaccine authorization, while an adequacy of < 60% may neglect to acquire population immunity. It is hard to tell how long resistance created by immunization will last, until there is more information on how well the vaccines work. Different type of vaccines is available as given in Table 1 (Alshari et al., 2022).

6. Other treatments for Covid-19

RNA-Dependent RNA-Polymerase enzyme (RdRp) is responsible for replication of SARS-CoV-2. Under emergency use Molnupiravir, an orally active RdRp inhibitor and noval broad spectrum antiviral agent is an isopropyl pro-drug of EIDD-1931. It has better bioavailability, quick onset of action, and a wide therapeutic window, excellent tolerance with a good safety profile, fewer adverse reactions, no accumulative toxicity and good tolerability than EIDD-2801 [isopropylester pro-drug of N4-hydroxycytidine (Imran et al., 2021)]. It has improved COVID-19 patient compliance by making quick clearance of SARS-CoV-2 in adults testing positive for SARS-CoV-2 virus, and who are at high risk for progression to severe (hospitalization or death) COVID-19. *In-vitro* and *in-vivo* activities of Galidesivir are restricted to RNA of human public health concern (Julander et al., 2021). Guanosine derivative (IDX-184), Retrobuvir, and YAK as top seeds for antiviral treatments with high potential to fight the SARS-CoV-2 strain specifically. The availability of FDA-approved anti-RdRp drugs (Ribavirin, Remdesivir, Sofosbuvir, Galidesivir, and Tenofovir) as potent drugs against SARS-CoV-2 tightly bind to its RdRp and may help to treat patients and reduce the danger of the mysterious new form of COVID-19

Table 2
Benefits and drawbacks of different Covid vaccines.

Vaccine	Benefits	Drawbacks
Entire	inactivated virus vaccine	Powerful immune response; Safer than live attenuated virus
Potential epitope	modification by deactivation process	
Live	attenuated virus vaccine	Stronger immune response; Local antigen conservation; Copying natural infection
Threat of	persisting virulence, especially for immunocompromised persons	
Viral vector vaccine	Stronger immune response; Local antigen preservation; Copying natural infection	More intricated manufacturing procedure; Threat of genomic unification; Pre-existing immunity to the vector diminished the response
Subunit vaccine	Safe and well-tolerated	Reduce immunogenicity: To improve immunogenicity, an adjuvant or conjugate is required to reduce immunogenicity
Vaccine with viral-like particles	Safe and well-tolerated; copying native virus conformation	Reduce immunogenicity; More intricated development process
DNA vaccine	Safe and very much endured; Stable under room temperature; Extremely versatile to new microbe; Native antigen expression	Reduce immunogenicity; Difficult introduction route; Threat of genomic integration
RNA vaccine	Safe and very much endured; Extremely versatile to new microorganism; Native antigen expression	Reduce immunogenicity; Need of low temperature storage and shipping; Potential threat of RNA-incited interferon reaction (Li et al., 2020a,b,c)
Some common adverse effects of COVID-19 vaccines		
Local side effects	Redness, Inflammation, Pain at injection site	
Systemic side effects	Pyrexia, Headache, Chills, Vomiting, Loose motions, New or worsening joint pain, Lymphadenopathy, Bell's palsy	
Serious side effects	Appendicitis, Myocardial infarction, Cerebrovascular accident, Shoulder injury, Lymphadenopathy on contralateral side	

viral infection (Elfiky, 2020). RdRp inhibitors: remdesivir (anti-Ebola virus experimental drug) and favipiravir (anti-influenza drug) inhibit RdRp and consequently reduce the progression of COVID-19 and associated clinical symptoms along with a substantial decrease in recovery time (Imran et al., 2021) Table 3.

7. Impact of Covid-19 on health

7.1. Impact on heart

ACE2 takes part in the immune and cardiovascular system which is a membrane bound aminopeptidase (Turner et al., 2004). ACE2 is associated with cardiovascular functions and also participates in the generation of diabetes mellitus and high blood pressure (Table 2). Likewise, ACE2 has been recognized as a useful receptor for coronavirus, incorporating SARS-CoV-2 and SARS-CoV. The S protein of the virus binds to ACE2 and activates the SARS-CoV-2 infection. ACE2 is vastly present in the lungs and heart (Zheng et al., 2020). SARS-CoV-2 mostly attacks on alveolar epithelial cells, bringing about respiratory side effects. These manifesta-

tions are much extreme in sufferers which have CVD, which may be related with highly discharge of ACE2 in these sick persons contrasted with fit people. The use of renin-angiotensin-aldosterone system inhibitors may help to raise ACE2 levels. Reports insinuate that myocarditis and heart failure produced by the MERS-CoV (Alhoggani, 2016). SARS-CoV-2-related myocardial damage happened in five of the first forty-one sufferers diagnosed with COVID-19 in Wuhan, which principally showed as rise in high-sensitivity cardiac troponin I levels. According to this research, 4 out of 5 sufferers which have myocardial injury were hospitalized and bedded into the ICU, which manifests the critical condition of the myocardial injury in sick persons who have coronavirus disease (Table 4). The sick person who was treated in the ICU had remarkably elevated blood pressure (BP) in comparison to those who were not treated in the ICU (Zheng et al., 2020).

7.2. Impact on immunity

Local immune reactions are activated by the demolition of cells in the lungs and SARS-CoV-2 disease, enlisting macrophages and monocytes that react to the infection, liberate cytokines and stimulate adaptive T and B cell immune reactions. In several sufferers, this procedure has ability to rectify the infection. Notwithstanding, in a few cases, an impaired immune reaction happens, which may produce serious lungs and even systemic pathological disorders (Tay et al., 2020). Pyroptosis is a type of programmed cell death that is extremely inflammatory which is ordinarily observed in cytopathic infections (Fink and Cookson, 2005). The immune cells drawn into pulmonary from the blood and the penetration of lymphocytes into the respiratory tract may clarify the lymphocytopenia and elevated neutrophil-lymphocyte proportion observed in about eighty percent of sufferers having SARS-CoV-2 disease. In many people, selected cells clean the virus from the lungs, the immune reactions subside, and sick person recuperate. Notwithstanding, in certain sufferers, a defected immune reaction happens, which activates a cytokine blast that intervenes extensive lungs inflammation. Unconstrained inflammatory cell aggression would itself be able to injure the lung through immoderate discharge of proteases and reactive oxygen species, additionally the immediate injury happens because of the infection. These factors combine to cause diffuse alveolar injury, containing hyaline layer development, desquamation of alveolar cells, and pulmonary oedema. This reduces the lung's ability to exchange gases, lower blood oxygen levels and create problems in respiration. The lungs additionally turn out to be more defenceless against another infection (Tay et al., 2020).

7.3. Impact on CNS (central nervous system)

Currently procurable proof recommends that the SARS-CoV-2 infection can penetrate the brain and disrupt the BBB. A hematogenous pathway might allow the virus to potentially, penetrate into the cerebrum. The virus can likewise penetrate the cerebrum trans-neuronally by means of the olfactory system, over the cribriform plate (Natoli et al., 2020). The endothelial cells of cerebral vasculature have ACE-2 receptors which work as cell penetration site for the virus (Li et al., 2020a,b,c). In coronavirus disease, an assortment of neurological problems has been described. The starting basic neurological manifestations are muscle pain, headache, and general discomfort (Garg, 2020). Adjusted sensorium, in serious coronavirus disease, ranges from unsureness, dementia, stupor to coma. Delirium is commonly associated with long term hypoxia and systemic inflammation (Mao et al., 2020). The SARS-CoV-2 virus has capability to penetrate inside the human brain. In Beijing, China, Xiang and collaborators, professed to separate the primary SARS-CoV-2 virus from cerebrospinal fluid (Xiang et al., 2020).

Table 3
Other antiviral treatment for Covid-19.

Antiviral Drugs	Dosage forms	Dose	Indications	Benefits	Drawbacks
Remdesivir	Solution/ Powder	Intravenous/200 mg loading dose, followed by 100 mg once daily for 5–10 days for adults	COVID-19 patients of ≥12 years requiring hospitalization	It reduces the requirement of high level of respiratory (oxygen) support. There is no evidence of resistance development upon its long term exposure	Signs of an allergic reaction: hives ; difficult breathing; swelling of your face, lips, tongue, or throat were noticed during or after its injection
Favipiravir	Film-coated tablet	Oral/1800 mg/dose twice a day on the first day; followed by 800 mg/dose twice a day for 7–10 days for adults	COVID-19	Favipiravir provides multiple treatment benefits, demonstrated by faster time to clinical cure, and significantly delayed the need for supportive oxygen therapy	It has poor pharmacokinetic profile
Molnupiravir		800 mg PO q12hr for 5 days	Emergency use authorization issued for treatment of mild-to-moderate (COVID-19) in adults testing positive for severe acute respiratory syndrome (SARS-CoV-2) virus, and who are at high risk for progression to severe COVID-19 (hospitalization or death) after COVID-19	It has quick onset of action, a wide therapeutic window, excellent tolerance with a good safety profile, fewer adverse reactions and good tolerability due to its better bioavailability; quick clearance of SARs-COV-2; & no accumulative toxicity	Emergency use
Galidesivir				Galidesivir an adenosine nucleoside analog phase I clinical trials, including against SARS COV-2 Its IM injection or IV infusion is safe and generally well tolerated	<i>In-vitro</i> and <i>in-vivo</i> activities of Galidesivir are restricted to RNA of human public health concern. Its trial has not been designed or sized to demonstrate clinical efficacy

Spinal cord implication is unusual. Zhao and associates portrayed transverse myelitis in sufferer who was sixty-six years old. The sufferer had acute flaccid paraplegia with urinary incontinence and spinal sensory level at T10. The therapy of intravenous immunoglobulin and corticosteroids was given to the patients, and the patients responded well therapy (Zhao et al., 2020). In coronavirus disease, coagulopathies increase the threat of venous and cerebral arterial thrombosis. In a review study, Li and collaborators, observed that eleven individuals out of 221 suffered with an acute ischemic stroke. Each of the sufferer exhibited cerebral bleeding and cerebral venous thrombosis (Liu et al., 2020). Seizures are not regular symptoms in coronavirus disease. In numerous meta examinations, headache has now been perceived as one of the normal beginning manifestations of COVID-19 (Garg, 2020). The accurate cause of headache has not been explained till now. Higher mental pressure, extreme uneasiness, and changes in way of life are probable cause behind initial headache (Silvestro et al., 2020)²¹. Initial headache reacts well to acetaminophen. Headache showing up during the seventh and tenth day of disease may relate to cytokine storm (Belvis, 2020).

7.4. Impact on PNS (peripheral nervous system)

The most recurrent neurological symptoms of coronavirus disease include a total or incomplete loss of taste sensation and smell sensation. Anosmia and ageusia are normal even not serious to modest cases (Moein et al., 2020). COVID-19 influences smell sensation more seriously in comparison to ageusia. According to a French report, Lechien and collaborators revealed that ageusia and anosmia were reported by eighty-eight percent and eighty-six percent of 417 mild-to-modest coronavirus disease sufferers, respectively. Anosmia was the primary symptom of coronavirus disease in many individuals (Lechien et al., 2020). The ordinary early symptoms of coronavirus infection are tiredness and muscle pain or myalgia. A few meta-analyses observed that up to thirty-

five percent of sufferers have muscle pain, tiredness, and muscular soreness (Jin and Tong, 2020; Xiang et al., 2020).

7.5. Impact on pregnancy

During this quickly evolving COVID-19 epidemic, pregnant ladies' health must be considered. It is essential to give medical care required to pregnant ladies. World Health Organization has revealed that there is no clear distinction in the chance of creating clinical manifestations between pregnant and non-pregnant ladies of childbearing age (Akhtara et al., 2020). Pregnant ladies go through physiological changes, which promote altered immune system (<https://www.rcog.org.uk/globalassets/documents/guidelines/2020-04-17-coronavirus-covid-19-infection-inpregnancy.pdf>). As per an investigation, pregnancy itself doesn't exacerbate the manifestations experienced, nor the detecting on a computerized tomography of coronavirus disease allied pneumonia (Liu et al., 2020a,b). Given in the newness of COVID-19, insufficient proof is accessible to decide the specific impact of this infection during pregnancy. Correlation with different coronavirus infections, for example, MERS and SARS are 2 diseases that might give a potential sign of the result of the coronavirus infection pathway (Mullins et al., 2020; Karami et al., 2020). Three investigations have found no maternal difficulties, for example, postnatal coronavirus infection and premature labour (Akhtara et al., 2020). Notwithstanding, different investigations have announced both foetal and maternal difficulties such as premature birth, foetal misery, respiratory misery, and premature rupture of membranes (Zhu et al., 2020). Furthermore, one mother demise and one intrauterine foetal passing have been linked to coronavirus disease during the third trimester according to a case study issued in Iran (Karami et al., 2020). According to medical research from Iran, nine pregnant ladies were detected to have serious coronavirus infection throughout their later second or third trimester. After the observation it was found that 7 of 9 passed away, 1 of 9 survived captiously sick and depending on ventilator, and 1 of 9 recuperated after

Table 4
Impact of Covid-19 and its vaccines on human health.

Impact on heart	SARS-CoV-2 mostly attacks on alveolar epithelial cells, bringing about respiratory side effects. According to research, 4 out of 5 sufferers which have myocardial injury were hospitalized and bedded into the ICU, which manifests the critical condition of the myocardial injury in sick persons who have coronavirus disease. The sick person also had remarkably elevated blood pressure
Impact on immunity	Local immune reactions are activated by the demolition of cells in the lungs and SARS-CoV-2 disease, enlisting macrophages and monocytes that react to the infection, liberate cytokines and stimulate adaptive T and B cell immune reactions. Local immune reactions are activated by the demolition of cells in the lungs and SARS-CoV-2 disease, enlisting macrophages and monocytes that react to the infection, liberate cytokines and stimulate adaptive T and B cell immune reactions. In many people, selected cells clean the virus from the lungs, the immune reactions subside, and sick person recuperate. In certain sufferers, a defected immune reaction happens, this reduces the lung's ability to exchange gases, lower blood oxygen levels and create problems in respiration. The lungs additionally turn out to be more defenceless against another infection
Impact on CNS	Currently procurable proof recommends that the SARS-CoV-2 infection can penetrate the brain and disrupt the BBB. The virus can likewise penetrate the cerebrum <i>trans</i> -neuronally by means of the olfactory system, over the cribriform plate. In coronavirus disease, the starting basic neurological manifestations are muscle pain, headache, and general discomfort. Adjusted sensorium, in serious coronavirus disease, ranges from unsureness, dementia, stupor to coma. Coagulopathies increase the threat of venous and cerebral arterial thrombosis. In numerous meta examinations, headache has now been perceived as one of the normal beginning manifestations of COVID-19
Impact on PNS	The most recurrent neurological symptoms of coronavirus disease include a total or incomplete loss of taste sensation and smell sensation. COVID-19 influences smell sensation more seriously in comparison to ageusia. The ordinary early symptoms of coronavirus infection are tiredness and muscle pain or myalgia
Impact on pregnancy	Pregnant ladies go through physiological changes, which promote altered immune system. As per an investigation, pregnancy itself doesn't exacerbate the manifestations experienced, nor the detecting on a computerized tomography of coronavirus disease allied pneumonia. Three investigations have found no maternal difficulties, for example, postnatal coronavirus infection and premature labour. Notwithstanding, different investigations have announced both foetal and maternal difficulties such as premature birth, foetal misery, respiratory misery, and premature rupture of membranes. Baud et al. informed about a spontaneous abortion in a lady with coronavirus disease throughout the second trimester of pregnancy, which looked to be connected to SARS-CoV-2 placental disease
Impact on foetus	As per RCOG, there is not sufficient information at present to give a relationship between the Coronavirus disease and chance of spontaneous abortion or that the infection has teratogenicity. Premature birth is because of iatrogenic aetiology or different factors, further research is needed for a decisive result
Impact on new-born	Numerous investigations reported symptomless infants, delivered from COVID-19 infected mothers. An investigation by Zhu et al. has announced new-borns COVID-19 manifestations to incorporate dyspnea, pyrexia, and gastrointestinal manifestations like vomiting and abdominal distension
Impact on GIT	While most Coronavirus disease have respiratory sickness, a few individuals described gastrointestinal manifestations like loose bowels, spewing, and abdominal discomfort throughout the time of the infection
Impact on liver	Patients with coronavirus disease could have liver damage with increased enzymes detected in blood tests. The portion of liver damage was additionally higher in patients which have serious coronavirus disease
Impact on skin	The skin problems in the coronavirus disease were at the beginning because of the hyperhydration impact of PPE, epidermal barrier breakdown, abrasion, and contact responses, all of them may exasperate an earlier skin sickness. Various skin changes have been reported like skin redness, papules, maceration, and scaling by the wearing of personal protective equipment (PPE). Clinical symptoms contain itching, stinging, and burning
Impact on endocrine system	Various endocrine glands have ACE2, to be specific thyroid, pancreas, ovary, testis, pituitary and adrenal glands. Despite the fact that one could anticipate endocrine repercussions because of reaction of SARS-CoV-2 with ACE2 present on these glands, there is no clinical or pre-clinical information till now. There is damage in exocrine pancreas showed as raised serum amylase as well as lipase in seventeen percent and one to two percent of sufferers with serious and non-serious COVID-19 patients, respectively
Impact on blood	In SARS-CoV-2 infection, just as in different contagious sicknesses, for example, flu, varicella, dengue, HIV, MERS-CoV and SARS-CoV, hematological changes can happen. The most widely recognized hematological detection contains lymphocytopenia, neutrophilia, eosinopenia, less frequently thrombocytosis and mild thrombocytopenia
Impact on kidney	Coronavirus disease can produce acute kidney infection and is a distinct threat part for death rate. It additionally affects sufferers having chronic kidney disease, renal relocation, and chronic substitution treatments
Impact of vaccines	The vaccines for COVID-19 have powerful immune response, safe and well-tolerated. But these vaccines have some drawbacks like threat of persisting virulence, especially for immunocompromised persons, reduce immunogenicity and threat of genomic unification; Pre-existing immunity to the vector diminished the response. COVID-19 vaccines have some common adverse effects like Redness, Inflammation, Pain at injection site, Pyrexia, Headache, Chills, Vomiting, Loose motions, New or worsening joint pain, Lymphadenopathy, Bell's palsy, Appendicitis, Myocardial infarction, Cerebrovascular accident, Shoulder injury, Lymphadenopathy on contralateral side

spending a long time in hospital (Hantoushzadeh et al., 2020). Furthermore, Baud et al. informed about a spontaneous abortion in a lady with coronavirus disease throughout the second trimester of pregnancy, which looked to be connected to SARS-CoV-2 placental disease (Baud et al., 2020).

7.6. Impact on foetus

As per RCOG, there is not sufficient information at present to give a relationship between the Coronavirus disease and chance of spontaneous abortion or that the infection has teratogenicity. The chance of perinatal spreading requires extra investigation as there has been clashing outcomes up to this point. When there is confirmation of maternal coronavirus infection, foetal and respiratory suffering for premature rupture of membranes, utero and premature birth has been described (Akhtara et al., 2020). Be that as it may, whether the premature birth is because of iatrogenic aetiol-

ogy or different factors, further research is needed for a decisive result.

7.7. Impact on new-born

Numerous investigations reported symptomless infants, delivered from COVID-19 infected mothers. An investigation by Zhu et al. has announced new-borns COVID-19 manifestations to incorporate dyspnea, pyrexia, and gastrointestinal manifestations like vomiting and abdominal distension (Zhu et al., 2020). A large portion of the manifestations experienced by the infants were frequently observed and managed with moderate treatment from which the infants recuperate well (Akhtara et al., 2020).

7.8. Impact on GIT

While most Coronavirus disease has respiratory sickness, a few individuals described gastrointestinal manifestations like loose

bowels, spewing, and abdominal discomfort throughout the time of the infection. In the initial patients of Covid-19, a 35-years-elderly person from US presented with two days history of queasiness and spewing upon hospitalization, subsequently loose motions, and stomach uneasiness on the II day of hospital admission. On the 7th day of sickness, SARS-CoV-2 RNA was identified in fecal matter of the sick person using RT-PCR (Holshue et al., 2020). Following cohort study has constantly announced gastrointestinal manifestations among Covid-19 patients. In big research the gathered information from 1099 sufferers from 552 medical clinics in China, it announced nausea or spewing in fifty-five (5.0 percent) and looseness of the bowels in 42 (3.8%) COVID-19 patients (Guan et al., 2020). Like elder people, gastrointestinal manifestations were seen in a cohort of 171 pediatric patients with coronavirus disease (Lu et al., 2020). Diarrhea and regurgitation were seen in fifteen (8.8 percent) and eleven (6.4 percent) of these kids, respectively. In additional research that investigated viral shredding in pediatric coronavirus sufferers, looseness of the bowels was seen in 3 out of the 10 infected youngsters (Wong et al., 2020).

7.9. Impact on liver

Aside from gastrointestinal manifestations, patients with coronavirus disease could have liver damage with increased enzymes detected in blood tests. The present information points out that 14.8–53.1 percent of coronavirus disease sufferers have unusual amount of aspartate aminotransferase and alanine aminotransferase over the span of illness, with generally slight increase in bilirubin found in serum (Wong et al., 2020). In a study of 56 sufferers with coronavirus disease, gamma-glutamyl transferase level was found to be raised in fifty-four percent of the patients (Zhang et al., 2020). Even though serious liver damage can happen but mostly the liver damage is negligible and transitory. The portion of liver damage was additionally higher in patients which have serious coronavirus disease (Wong et al., 2020).

7.10. Impact on skin

The skin problems in the coronavirus disease were at the beginning because of the hyperhydration impact of PPE, epidermal barrier breakdown, abrasion, and contact responses, all of them may exasperate an earlier skin sickness. The dermatologic symptoms are not quite the same as those recorded throughout the flu outbreak of 1918 to 1919 (Wang and Parish, 2019). Various skin changes have been reported like skin redness, papules, maceration, and scaling by the wearing of personal protective equipment (PPE). Clinical symptoms contain itching, stinging, and burning. Such detection has been ascribed to the utilization of PPE in 97.0 percent of 542 forefront medical care workers. The nasal bridge (83 percent), forehead, cheeks, and hands were the most often afflicted skin areas (Darlenski and Tsankov, 2020). A previous report indicates that wearing a N95 mask caused acne, face tingling, and even dermatitis in more than 33% of medical care employees (Singhal, 2020). In the matter of contact dermatitis counteraction, we suggest that use a skin defensive cream habitually, particularly after hand cleaning and before wearing personal protective equipment (Yan et al., 2020).

7.11. Impact on endocrine system

In fact, various endocrine glands have ACE2, to be specific thyroid, pancreas, ovary, testis, pituitary and adrenal glands (Liu et al., 2020a,b). Despite the fact that one could anticipate endocrine repercussions because of reaction of SARS-CoV-2 with ACE2 present on these glands, there is no clinical or pre-clinical information

till now (Pal and Banerjee, 2020). The pancreas communicates ACE2, with mRNA levels in the pancreas being greater than in the lungs. The exocrine pancreas shows the expression like the islets. There is damage in exocrine pancreas showed as raised serum amylase as well as lipase in seventeen percent and one to two percent of sufferers with serious and non-serious COVID-19 patients, respectively (Liu et al., 2020a,b). Coronavirus could likewise prompt exacerbating of insulin obstruction in patients which have already Type 2 diabetes mellitus (T2DM) (Pal and Banerjee, 2020). Neurological symptoms take place in coronavirus patients and incorporate, among others, microsmia. Most of these olfactory manifestations might be explained by ACE2 expression by olfactory epithelium supporting cells (Brann et al., 2020).

7.12. Impact on blood

It is studied that in SARS-CoV-2 infection, just as in different contagious sicknesses, for example, flu, varicella, dengue, HIV, MERS-CoV and SARS-CoV, hematological changes can happen and frequently available, the possibility to improve the supervision of contagious disease procedure or to point out the doubt of their seriousness. The most widely recognized hematological detection contains lymphocytopenia, neutrophilia, eosinopenia, less frequently thrombocytosis and mild thrombocytopenia (Toledo et al., 2020). The presence of variant lymphocytes has been accounted for just sometimes (Fan et al., 2020). The leukocyte tally might be normal, decreased or enhances (Toledo et al., 2020). As indicated in a meta-examination, lymphopenia, thrombocytopenia, and leukocytosis are related with more prominent seriousness and even mortality in COVID-19 patients (Henry et al., 2020).

7.13. Impact on kidney

Epidemiological information disclosed the serious sickness rate of coronavirus disease can be as high as twenty percent, and despite the fact that the lungs are the principal parts influenced, the kidney is additionally one of the primary parts influenced in serious sickness (Yang et al., 2020). According to the literature survey, acute kidney injury is found in five to fifteen percent of the sufferers tainted with MERS-CoV and SARS-CoV and have a high death rate of sixty to ninety percent (Naicker et al., 2020). Coronavirus disease can produce acute kidney infection and is a distinct threat part for death rate. It additionally affects sufferers having chronic kidney disease, renal relocation, and chronic substitution treatments (Adapa et al., 2020).

8. Conclusion

COVID-19 is a more contagious disease. According to the study, COVID-19 is transmitted both asymptotically and symptomatically. COVID-19 is spread through human-to-human transmission or contact with an infected person. This disease primarily affects the elders and children. Various diagnosis methods are used for the detection, like RT-PCR, serology, imaging, etc. Different preventive measures are used, like PPE, face masks, and hand hygiene is essential. COVID-19 is treated with a variety of antiviral medicines. Vit-D is also helpful in decreasing the risk of illness and enhancing immunity. Vit-C also helps in the treatment of COVID-19. Plasma from recovered patients is used to treat COVID-19 patients. Nowadays, different viral-like particle vaccines, including entire inactivated virus vaccines, viral vector vaccines, live attenuated virus vaccines, subunit vaccines, RNA vaccines, and DNA vaccines, are available for the treatment of COVID-19. This virus produces different life-threatening situations. Coronavirus will spread and cause outbreaks with different mutant strains in the future. This situa-

tion is very difficult for everyone. We must find a more powerful means of fighting against this virus. As the current epidemic continues, further study is required regarding COVID-19.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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