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## **A REVIEW ON NOVEL COVID-19: BACKGROUND, ETIOLOGY, PATHOGENESIS, TRANSMISSION, PREVENTION AND MANAGEMENT**

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### **ABSTRACT**

Mankind's history is watching a bizarre time battling an imperceptible adversary, the novel COVID-19 Coronavirus. At first seen in the Wuhan province of China, presently limitlessly spreading all over world. How the COVID 19 has been made on the globe become Pandemic needs no depiction. The virus has been accounted for affecting the lungs and related respiratory tracts promoting harm of the alveoli. It has been accounted that the respiratory sickness is the prevailing Clinical symptom of COVID-19. This review article discusses an easily understanding of the causes, different type of Human viruses regarded of Coronavirus, clinical diagnosis of RT-PCR, FET, Primary prevention and control of the virus. Therefore, this review article main theme is to provide more reliable and valid information to control and manage public emergency in both acute and chronic conditions of coronavirus

### **INTRODUCTION**

In late December 2019, a bunch of pneumonia cases, caused about by a recently distinguished beta coronavirus, happened in Wuhan, China. This Coronavirus, was from the outset named as the 2019 novel coronavirus on twelfth January, 2020 by world health organization (WHO), WHO legitimately named the infection as Coronavirus ailment (2019) that name is COVID-19 and Coronavirus study gathering (CSG) of the international

committee proposed to name the new Coronavirus as SARS-CoV-2, both gave on 11<sup>th</sup> February, 2020. The Chinese researchers quickly isolated a SARS-CoV2 from a patient in a brief time, frame on 7<sup>th</sup> January 2020 and came out with genome sequencing of the SARS-CoV-2 [1-4]. Coronavirus morphological features: Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) belongs to the family of coronavirus. Coronaviruses (CoVs) are the largest group of

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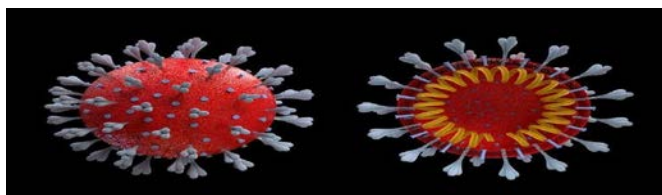
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viruses belonging to the *Nidovirales* order which includes *Coronaviridae*, *Ateriviridae*, *Mesoniviridae*, *Roniviridae* families. The *Coronavirinae* comprise one of the two subfamilies in the *Coronaviridae* family, with the other being the *Torovirinae* [5-8]. Apart from SARS-CoV-2, there are 6 known coronavirus in human. Coronavirus are large pleomorphic spherical particles with bulbous surface projection the diameter of the virus particles is around 120nm. The viral envelope comprises of a lipid bilayer layer, spike basic proteins are tied down, the positive-sense single- stranded RNA genome in a nonstop dots on a string type adaptation. The genome size for coronavirus ranges from around 27 to 34kb [9, 10]. To date, COVID-19 has spread rapidly in more than 190 countries, causing more than 11 million and more than 5 lakhs deaths as of 8 July 2020. Considering the global threat, the WHO has declared COVID-19 a public health emergency of international concern (PHEIC).

**Table 1: Structure of coronavirus**

Structural Protein	Function of Protein
Nucleocapsid Protein (N)	Bound to RNA genome to make up nucleocapsid
Spike protein (S)	Critically for binding of host cell receptor to facilitate entry of host cell
Membrane Protein (M)	Central organizer of CoV assembly Determines shapes of viral envelope
Envelope Protein (E)	Interacts with M to form viral envelope

**Fig 1: Image of coronavirus**



Reference: BBC coronavirus symptoms: Ghanadan record first cases of COVID-19 from Google images

#### Stages of corona viruses:

In general, there are four stages of COVID-19

Stage 1: Imported cases: When the cases of an infection are important into a country, which was not the source of the infection.

Stage 2: Locally transmission: When the virus is locally transmitted in the country. It means the person from whom the virus spread to the other one is from the country itself.

Stage 3: Community transmission: In this stage, the virus has started circulating in the community. Here it becomes very tough to track the chain of transmission of the virus. In this stage a lockdown becomes very need.

Stage 4: Epidemic: When the infection becomes Endemic.

**Table 2. Human corona virus [10]**

Virus	Genes	Disease	Discovered
CoV-229E	Alpha	Mid respiratory tract infection	1967
CoV-NL-63	Alpha	Mid respiratory tract infection	1965
CoV-HKU-1	Beta	Mid respiratory tract infection pneumonia	2005
CoV-OC43	Beta	Mid respiratory	2004
SARS-CoV	Beta	Human severe acute respiratory syndrome, 10% mortality rate	2003
MERS-CoV	Beta	Human severe acute respiratory syndrome 37% mortality rate	2012

#### Methods: [11]

**Study design:** A scoping reviews was conducted by different methodological frameworks. Generally 5 stages followed for conducting this scoping review include 1) Identification of clear research objective and search strategies, 2) Identifying relevant research, review and short communication articles, 3) Selection of relevant research, review and articles, 4) Extraction and charting of data, 5) Summarizing, discussing, analyzing and reporting the results.

**Literature search strategies:** Literature for the review was identified by searching the following online databases like Google scholar, Google search, Pubmed, as well as other reputed research, review and short communication, maximum these complete online databases and information contains archives of English and some are Chinese biomedical and also Indian journals. The search terms were novel corona virus, 2019, Pneumonia, respiratory diseases, COVID-19.

**Identification, Selection and data extraction from the studies:** After the articles were selected, data were extracted and recorded in proper manner by using word and Excel spread sheet. The extracted data were date of publication, Language of publication, name of journal, title of article, divide research and review article, author's country and affiliation etc.

**Summarizing:** Based on the main research objectives, article were classified into one of the following research domains: epidemiology, pathophysiology, causes, clinical symptoms, transmission, diagnosis, prevention and management. A publication was considered also based on country, Authors Journal name, publication dates, language etc. as well as methodological characteristics were analyzed respectively. All findings and statements that are mentioned regarding the outbreak in this review are based on published information as listed in the references.

**Life cycle of coronavirus:** [11, 12]

Life cycle of coronavirus has 4 steps of viral life in human.

1. Attachment and entry
2. Transmission of replicase gene from viral RNA
3. Replication and transcription
4. Assembly and release

**1) Attachment and entry:** The connection of the virus to the membrane is begun cooperation between two components i.e. S protein and its receptor. S protein contain the receptor binding domin (RBD) on which the virus connects first. The virus have section into the cytosol, thus it perform following activities.

- 1) Cleavage of S Protein
- 2) This cleavage exposes the fusion peptides
- 3) The two heptide will join to S2 site
- 4) This will form the bundle
- 5) The bundle pack is liable for the mixing of the viral and cellular membrane then the fusion of the membrane occurs
- 6) Finally the infection of virus will discharge its viral genome into the cytosol of the cell.

**2) Transmission of replicate gene from viral RNA:** [11, 12]

Replicate gene encoded two enormous ORES which are rep1a and rep1b that are answerable for the coding of two proteins that is pp1a and pp1ab. To communicate this two proteins, the virus need to utilize slippery sequence and pseudoknot which is liable for ribosomal frameshifting. For the most part ribosome loosen up the Pseudoknot and proceed with the interpretation until stop codon shows up to stop the procedure. In some cases the pseudoknot stops the ribosome for the translation process which results in frameshifting of ribosomes. Polyprotein contains NSPS 1-11 and 1-16. Numerous NSPS accumulates into replicate transcription complex (RTC) to make a situation which

is useful for RNA synthesis. This outcomes in replication of RNA and sub-genomic RNA transcription.

**3) Replication and transcription:**

RNA synthesis produces genome RNA and sub-genomic RNA. This sub- genomic RNA GI about as m-RNA for both auxiliariy and adornment genes. Genomic and sub-genomic RNA are delivered through negative strand mediate.

**4) Assembly and release:**

In the wake of shaping sub-genomic RNA Union and replication, the basic proteins i.e., S, M, E and N are first made an interpretation of and afterwards embedded into the endoplasmic reticulum. This protein moves towards endoplasmic reticulum golgi middle compartment. At this site the develop virus are shaped and gathered. This recently formed viruses then got discharge from the cell to deliver more viruses.

**Incubation period of the virus on different surfaces:**

The coronavirus is very sensitive it can live in air up to 3 hrs.

**Table: 3 Incubation period of the virus on different surfaces [13]**

Surface type	Incubation period
Air	3hrs
Copper	4hrs
Card board	24hrs/1day
Plastic material	48-72 hrs
Stainless steel	48-72hrs

**Etiology and pathogenesis of COVID-19 [14,15,18]**

COVID-19 virus SARS-COV-2 is 7th individual from the group of CoVs that infect people but four CoVs (HCoV-229E, HCoV- NCG3, HCoV-OC43, and HCoV-HKU1) can cause a wide scope of upper respiratory tract diseases i.e. normal cold, though MERS-CoV and SARS-COV are answerable for a typie pneumonia. The reasons for various disease locals are likely identified with the nearness of Dipeptidyl peptidase 4 (DPP4) and angiotensin converting enzyme (ACE2) in the lower respiratory tract. Which are the major human receptors for the surface spike(S) glycoprotein of MERS-CoV and SARS-COV respectively. The hereditary succession of SARS-COV-2 is 70% like that SARS-COV and SARS-COV-2 is equipped for utilizing a similar cell entry receptor as SARS-COV to taint people. In any case, there are more contrasts in the keys protein that the infections use to associate with have cells. SARS-COV-2 spike

tie to human ACE2 with roughly 10-20 crease higher partiality than the SARS-COV spike, making it simpler to spread from human to human. Upon entry into alveolar epithelial cells, SARS-COV-2 replicates quickly and triggers a strong immune response, bringing about cytokine storm conditions and pulmonary tissue harm. Investigation of the initial 99 confirmed cases of SARS-COV-2 infection uncovered that storm syndrome happened in patients with extreme COVID-19. 17% patients had ARDS, among whom 11% deteriorated within a short period of time and died of numerous organ failure. Moreover, the number of total CD4+ T-Cells, CD8+ T-cells and T-Cells are diminished in patients suffered with SARS-COV-2 infection, and the enduring T-Cells are practically depleted, recommending a diminished immune capacity in SARS-COV-2 infected patients.

### Transmission route of SARS-COV-2 [16-18]

The novel CoV can be transmitted between people by means of respiratory beads. Eminently the respiratory tract is most likely by all account not the only route of human to human transmission soon assumed the primary form of diffusion. Human transmission occurred among family members, including friends and close relatives. Local authority people and other professional, including health care workers also source of transmission of SARS-COV-2. COVID-19 can be transmitted through direct or indirect contact with eye, mouth or nose mucus membrane. There is likewise a chance of vaporized or aerosol transmission in a continuously exposure to high concentrations of aerosol. In addition, it has been accounted for that SARS-COV-2 patients have some GIT symptoms, including the nausea, vomiting, diarrhoea. An ongoing report demonstrated that the enteric clinical symptoms of COVID-19 are related with attacked ACE2 communicating enterocytes, proposing that the stomach related tract is an expected route of COVID-19 infections other than the respiratory tract, so that as it may require extra examination to test this Chance. Furthermore, regardless of whether transmission of SARS-COV-2 can happen by mRNAs of breastmilk or vertically from mother to newborn child has not been resolved.

### Symptoms [19]

Maximum of the patients infected with the coronavirus will encounter normal cold and flu, 80% of patients will show mild symptoms of this COVID-19 diseases. Adult have the best immunity power to fight against the infection but the demerit is that they are more likely to spread the infection of virus.99% of

the patients built up fever with very high temperature, while the greater part experienced fatigue and dry cough and trouble in breathing. Maximum of patients have infected extreme cases and remaining have become critically ill. Step by step breakdown of Corona virus symptoms, how indications progress among typical patients and how the disease COVID-19 goes from terrible to worse are given below

Day 1: In the beginning day of the side effects, the patient experiences fever along with fatigue, muscle torment and a dry cough. Not many of them may encounter sickness and loose bowels a couple of days before the excitement

Day 5: Patients may experience the ill effects of breathing issue particularly in the event that they are older or have some prior wellbeing condition.

Day 7: According to the Wuhan university study, these are the side effects of the patient that lead the patient to be conducted in the clinic.

Day 8: Patients develop acute respiratory distress syndrome (ARDS), a condition where the liquid fills up in the lungs and this is mostly fatal. This typically occurs in serious cases.

Day 10: The movement of the ailment prompts intensifying of the indication and now the patients is moved to ICU. Patients with milder symptoms most likely have progressively stomach pain and loss of appetite only a small fraction die.

Day 17: On average, after nearly 18 to 19 Day s patients who recover, are discharged from the hospital however, it's difficult to find out the symptoms in the earlier Day s of the infection. This is generally observed following 5-6 days.

General symptoms: Fever, chest pain, weariness, loss of smell and taste, dry cough, dysponea.

Less symptoms: cerebral pain, stomach torment, looseness of the bowels, vomiting, dizziness.

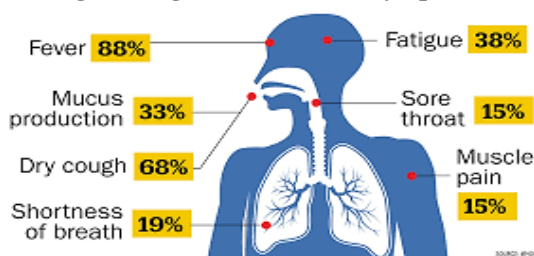
Severe complication reported among COVID-19 patients: Hypoxemia, ARDS, Arrhythmia, Shock, Acute cardiac injury and acute kidney injury.

### Diagnosis [20-22]

As the coronavirus that causes the COVID-19 malady spreads over the world, for the identification of viruses use real time reverse transcription polymerase chain reaction (RT-PCR). The real time RT-PCR one of the most precise research facility technique for identifying, tracking and contemplating the

coronavirus and also Field-effect transistor (FET) biosensing device.

**Fig 2: Image of coronavirus symptoms**



Ref: Time magazine corona virus questions and answered: we know about COVID-19 from Google images

### What is real time RT-PCR?

For recognizing the presence of explicit hereditary material from any pathogen, including a virus the real time RT-PCR technique is utilized. In this strategy radioactive isotopes markers are utilized to identify and focused on hereditary materials, however ensuring refining has prompted the supplanting of the isotopic naming with unique markers, most much of the time fluorescent colors. This strategy is the choice for diagnosis of human CoV, as multiplex real time RT-PCR assays have been created. They can recognize each of the four respiratory HCoVs and could be additionally adjusted to novel CoVs. Serologic examines are significant in case of RNA maybe very hard to isolate and it is no longer present in for epidemiological studies. It was recommended by the Chinese centre for disease control and prevention to utilize groundworks and tests like ORF1ab and N gene regions for the detection of SARS CoV-2 by RT-PCR.

### Why use real time RT-PCR?

- 1) This method is profoundly delicate and explicit.
- 2) It can deliver a reliable identified as quickly as 3 hours.
- 3) It is essentially quicker than the other methods which utilized for the Isolation of virus.
- 4) This method has a lower potential for contamination or mistakes as the whole procedures should be done with in a closed tube.
- 5) It keeps on being the most exact technique available for detection of the COVID-19 viruses.
- 6) Different techniques for determination like CT check, High-throughput sequencing also been suggested by different health authorities.

### Field-effect transistor (FET) biosensing device [23]

Field-effect transistor (FET)-based biosensing device for detecting SARS-COV-2 in clinical samples. The sensor was produced by coating grapheme sheets of the FET with a specific antibody against SARS-COV-2 spike protein. The performance of the sensor was determined using antigen protein, cultured viruses and nasopharyngeal swab specimen from COVID-19 patients. This FET device could detect the SARS-COV-2 spike protein at concentrations of 1fg/ml clinical transport medium. Moreover, the FET sensor successfully detected SARS-COV-2 in culture medium and clinical samples. This device is a highly sensitive immunological diagnostic method for COVID-19 that require no sample pretreatment or labeling.

### Importance of preventive care in Corona virus patients

#### Primary prevention [24-26]

- 1) Wash your hands frequently for at least 20sec at a time with warm water and soap.
- 2) Don't touch or contact your eyes, face, nose or mouth when your hands are grimy.
- 3) Don't go out in case you're feeling wiped out or have any cold, flu signs and manifestations.
- 4) Cover your mouth within your elbow at whatever point you cough or sneeze.
- 5) Clean any objects you touch a lot. Use disinfectant on objects like mobiles, laptops, keys, utensils, dish ware, doorknobs etc.
- 6) Avoid public gatherings, strict hygiene measures for the control of infection.
- 7) Health care personnel's must use personal protective masks like N95 masks, FFP3 masks, gowns, gloves etc.

#### Screening and quarantine [24-26]

1. One of the most significant undertaking is to screen the people originating from the endemic territories by checking their temperature, signs and manifestation of virus infection.
2. Furthermore, posing inquiries from them about their travel history and any sort of contact with the infected people.
3. There is another idea of collective screening of travelers going through aircrafts after leaving the endemic zones and showing up in some other city/ nation. Despite the fact that this activity has still not been productive and there are odds of missing over half of the cases of COVID-19, explicitly the ones who were demonstrating no side effects due to experiencing an incubation period.

4. In certain countries, isolate of effectively recognizable people wish signs and symptoms of COVID-19 was done strongly to prevent the further spread of the illness yet the mighty isolate may have ever enduring repercussions with psychosocial impacts.

#### Surface Disinfectant [27]

Surface are the most prone site for the transmission of corona virus infection from one to another. Depending upon the nature of surface, temperature, pH, and relative humidity of the surrounding, virus survive time different from 1-9 days. Use disinfectants highly risk exposed surface areas. Currently, the United States environmental protection agency (USEPA) recommended some disinfectants against COVID-19.

**Table 4: List of different surface disinfectant with composition and surface contact time [18, 27]**

Active ingredient	Composition	Contact time/min
Hydrogen Peroxide	Hydrogen peroxide: 0.5%	05
Octanoic acid	Octanoic acid: 5-10%	02
Sodium Chloride	Sodium chloride: 30.5%	10
Ethanol	Ethanol: 15-30%, Butane: 15-32%, Propane: 5-10%	0.5
Silver ion, Citric acid	Silver ion: 0.003% Citric acid: 4.846%	01

**Hand Hygiene: [28-30]** Human to Human transmission is a major part so frequent washing with soap and water or alcohol based sanitizer as recommended by WHO. Hand sanitizer may play a substantial role in providing effective hand hygiene

**Table 5: List of different Hand sanitizers with brand names and composition [18, 28-30]**

Brand	Component	Country
Lifebuoy	Ethyl alcohol 95%, Isopropyl alcohol 10%, Tocopheryl acetate 0.05%, Perfume gel base 109%	India
Himalaya	Dhanyaka 0.30mg, Ushira 0.30mg, Nagaramusta 0.25mg, Shati 0.10mg, Nimba 0.05mg	India
Savlon	Ethanol IP 66.5% v/v, Isopropyl alcohol IP 3.5% v/v, Permitted colors used, Gel based Q.S	India
Zuci	Strawberry extract, salicylic acid, Vitamin E	USA
3M	Chlorohexidine, Gluconate 0.5% w/v, Ethyl alcohol IP 70% v/v	USA

#### Face masks: [18, 27]

Corona virus maybe an airborne infection transmitted through respiratory droplets. Droplets transmitted up to 1 meter from who are diagnosed with coughing and sneezing. Different masks are available in the global market like dust masks, paper mask, cloth mask, face mask, surgical mask, N95 mask, laser mask etc. An ideal mask must be built with soft smooth material with characteristics features like protection against the microbes and infected droplets. The technical parameters like sub-micron particulate filtration efficiency (%), bacterial filtration efficiency (%), and breathing resistance may play key role in the choosing of mask. USA center for disease control and WHO recommends N95 or P100 respirators with 3 level protection FFP1, FFP2, and FFP3 against COVID-19 infection as they filter out 99.9% of 0.3 micron particles.

The US National Institute for Occupational safety and Healthy (NIOSH) classifies particulate filtering mask or filtering face piece respirators (FFRs) into 9 categories as N95, N99, N100 (N: not resistant to oil), P95, P99, P100 (P: Somewhat resistant to oil) R95, R99, R100 (R: Strongly resistant to oil) whereas 95, 99, 100 indicates filter's minimum filtration efficiency with 95, 99 & 99.97% respectively. According to the European Standard (EN149:2001), FERs are categorized into FFP1, FFP2 & FFP3 with minimum filtration efficiencies of 89, 94, 99% respectively.

#### Gloves [18, 31]

Contaminated hands share a major contribution to the spreadability of corona virus infection. Generally maximum people touch their faces frequently. The use of nitrile gloves is preferred over latex gloves because they resist some chemicals, including certain disinfectants but latex gloves shows a high rate of allergic reactions. Non powdered gloves are preferred over powdered gloves as powder that is corn starch, lycopodium powder and talc initiate the skin irritation resulted in allergic reaction on prolonged usage.

#### Face shields or Goggles

Eye mucus is a comfortable site for virus sustainability so as per WHO to wear a protective transparent glass, Zero power, face shield that covers from all sides with adjustable holder or elastic rubber band. As per the European standard directive 86/ 686/ EEC, EN166/2002 and ANSI/SEAZ 87.1-2010, an effective goggles or face shield is manufactured from acetate, propionate

and polycarbonate that offers improved visual clarity and optical quality with the potential for less eye strain.

### General medication [32, 33]

Suspected and affirmed cases ought to be treated in assigned hospital with effective isolation, protective conditions. Suspected cases should be treated in a separate room and isolated, and confirmed cases can be treated in the same ward in addition critical cases necessary to be admitted to the emergency care unit as soon as possible. Quick intervened consideration required for COVID-19, patients with WOB or SOB, constant torment or pressure in chest, new disarray or failure to excite, somewhat blue lips or face.

### Allopathic medication [18, 34]

Allopathic medication and management involve oxygen therapy, I.V fluid infusion with life support in serious cases. Antiviral medicines such as ganciclovir, ribavirin, nelfinavir, remdesivir, arbidol, oseltamivir, galidesivir are being examined for COVID-19 medication. The broad range of spectrum antibiotics maybe used to control the additional bacterial infections after a virus attack. Some drugs are under clinical trials and remaining approved by DCGS. The best approaches to fight with viruses is vaccination. Therefore, scientists are trying to develop a vaccine for this virus and probably maybe available after sometime.

### Ayurvedic, Unani and Homeopathy medication [18, 34]

Basically, both ayurvedic and unani are plant based medicines which are nontoxic and without any side effects. Most of the plant shows Antiviral activities for a long time. The most important plants are *Curcuma longa*, *Allium sativum*, *Ocimum sanctum*, *Piper nigrum*, *Cinnamomum verum*, *Glycyrrhiza glabra*, *Caucus maritimus* etc. Therefore, an aqueous extract of these plants along with other plants as mentioned above along with other plants as mentioned above maybe useful to prevent and management of COVID-19. The Government of India and Minister of AYUSH department encouraged Indian Traditional medicine practices. In Homeopathy, Arsenic at very low concentration is considered beneficial for several diseases including viral infections.

### Immunity boosters [18, 35, 36]

It is seen that early deaths were in older people, presumably as a result of the poor immunity, which forces quicker advancement of COVID-19. Therefore, it is noteworthy to boost our immunity

system. It is very important to suggest that people use a few enhancement or supplements to boost their immune system. Healthy people should take a lot of citrus fruits (Lemons, oranges) having different nutrients and vitamins D. Some dry fruits such as walnuts, dates, almonds are additionally helpful to improve the immune system. However, the patients may take Zinc supplements and vitamins with the counsel of clinical experts. It is too savvy not to smoke and other narcotic products. Continuously a satisfactory rest is fundamental to support up the insusceptible. Immune system maintain distance and do proper and normal exercises.

### Convalescent plasma therapy [37, 38]

It is derived from the patients with antibodies against 2019-nCoV can be effective in reducing the mortality rate of serious ill patients. It has been found to have an immunotherapeutic potential for the treatment of SARS, MERS. The efficacy of Convalescent plasma therapy is that antibodies from convalescent might suppress viremia through free viral clearance, blockade if new infection, as well as the acceleration of infected cell clearance. In addition, the use of convalescent by WHO under Blood regulators network when vaccine and antiviral drug was unavailable for an emerging virus. This therapy is not associated with the occurrence of adverse events. It should be used for the treatment of critically I'll patients with COVID-19 after the evaluation of the valence of antibody. It is worthwhile to test the efficacy and safety of convalescent plasma transfusion in COVID-19 patients.

Fig 3: Image of Reduce risk of COVID-19



Ref: Image collected from Google images search

**Ongoing Clinical trials [22]**

Most of the agents under trial are repurposed for the current COVID-19. Concurrently, several trails were initiated to test the specific vaccines and antibodies specifically targeting SARS-CoV-2. As of April 2020-291 active clinical trailed found specific to COVID-19 of these 291 trails 109 trails included Pharmacological therapy for the treatment of COVID-19 in adult patients of these 109 trails 82 international studies and 27 Placebo's controlled trails.

**Table 6: Drugs and undergoing clinical trials and testing [22]**

Drugs	Under clinical trials and testing
Interferons	Activate cytoplasmic enzymes affecting viral mRNA translation and protein synthesis
Interleukin-2	It shows mitigating activity
Immunoglobulin	It contains vague antibodies it squares viral Fc receptor initiated by boosting endogenous killing antibodies and forestalling immunized subordinate improvement of contamination.
Danoprevir	Hepatitis C virus NS3 protease inhibitor that to be used in combination with ritonavir
Remdesivir	It is a nucleotide analogue which is use to treat Ebola and Marburg virus .it was also effective against SARSCoV-1 and MERS
Favipiravir	Inhibitor of viral RNA dependent RNA polymerase which can be used in treating influenza and inhibiting polymerase of other viruses like Ebola, yellow fever

**COVID-19 Vaccine Race**

Now, Vaccines are not available in the market, but preparation of vaccine against COVID-19 is under process and it may take more than 10 months for the initial sample to get accessibility in the open market. The development of vaccine represented a more long term strategy to prevent COVID-19 outbreaks in the future. With the sequencing of SARS-CoV-2 genome, numerous nucleic corrosive bases immunization up and comer have been proposed generally dependent on the S protein coding arrangement.

**1. COVAXIN [39]** India's first potential COVID-19 vaccine has been given approval for Phase I and Phase II clinical trials. Named COVAXIN™, the vaccine was developed by Bharat Biotech and has been granted approval from the Drugs Controller General of India (DCGI). Human clinical trials are scheduled to start across India in July 2020. Bharat Biotech

created COVAXIN in collaboration with the Indian Council of Medical Research (ICMR) and National Institute of Virology (NIV). According to the company, the SARS-CoV-2 strain was isolated in NIV, Pune and transferred to Bharat Biotech. The indigenous, inactivated vaccine was developed and manufactured in Bharat Biotech's facility located in Hyderabad, India. The DCGI granted permission to initiate Phase I and II human clinical trials after the company submitted results generated from pre-clinical studies, demonstrating "promising" and "extensive" safety and immune responses.

**2. mRNA-1273:** means Moderns m RNA-1273 is a synthetic strand of mRNA created by Massachusetts based US Company. Expected to elicit antiviral response specifically towards the spike protein of SARS-CoV-2. Unlike conventional vaccine, does not require the virus. Therefore it is relatively safe and ready to be tested. If mRNA-273 proves to be safe for humans and pass the phase- I trail, successive evaluation of its efficacy will be carried out immediately.

**3. INO-4800:** A DNA immunization applicants made by Inovio Pharmaceuticals, a US based organization. Contrasted with ordinary antibody, Genetic vaccine requires lower costs of creation and simpler method of cleansing. At present is in Phase- I clinical testing in the US for COVID-19 and and could potentially advance to phase 2 or 3 efficacy trails this midyear.

**4. ChAdoX1nCoV-19:** Created by the University of Oxford composed of non-replicating adenovirus vector and the genetic sequence of the S protein of SARS-CoV-2. Entered phase1/2 clinical trails the non- relatively safe in children and individuals with underlying diseases if the vaccine is shown to be safe and effective in these earlier trails, vaccine manufacturing will be increases to allow larger studies to take place.

**5. BCG vaccine:** The Bacillus Calmette GUERIN live constricted antibody applicant is in the phase 2 or 3 and is utilized against tuberculosis to support the insusceptible framework. Clinical trials are being conducted to test the efficacy and safety of this vaccine candidate in protecting people against COVID-19 [40]

**6. BNT 162 SARS-COV-2 vaccine [41]** BioN Tech's BNT162 Vaccine Candidates are being developed to prevent COVID-19 disease infection. The BNT162 program is evaluating at least four experimental vaccine, each of which represents a unique combination of mRNA format and target antigen. BNT162b1 and BNT162b2 are both nucleoside-modified RNAs, BNT162b1 encodes an optimized SARS-COV-2 receptor-binding domain (RBD) antigen, while BNT162b2 encodes an optimized SARS-



COV-2 full-length spike protein antigen. On July 13, 2020 Pfizer Inc and BioNTech SE announced that 2 of the company's four investigational vaccine candidates from their BNT162 mRNA based vaccine program (BNT162b1 & BNT162b2) received Fast Track designation from the U.S.FDA. These vaccine candidates in the BNT162 program are currently being evaluated in ongoing phase 1/2 clinical studies in the USA and Germany.

**7. NVX-CoV2373 [42, 43]** SARS-COV-2 subunit vaccine (NVX-CoV2373) constructed from the full-length S-Protein and produced in the established Sf9 insect cell expression system. A stable S-protein structure generated by mutating the furin cleavage site to be resistant to cleavage and utilization of two proline substitution at the apex of the central helix. NVX-CoV2373 with matrix-M adjuvant in a non-human primate induces a Th1 dominant B and T-cell response, hACE2 receptor blocking antibodies and SARS-COV-2 neutralizing antibodies. A Phase 1 Clinical trials of NVX-COV2373 initiated in Australia during May 2020, with preliminary immunogenicity and safety results expected in July, 2020. The Phase 2 portion to assess immunity, safety and COVID-19 disease reduction is expected to begin thereafter. On July 7, 2020, NoVaVax, Inc. announced that it has been selected to participate in operation warp speed, including a pivotal Phase3 clinical trials, establish large-scale manufacturing and deliver 100 million doses of NVX-CoV2373, NoVaVaX COVID-19 vaccine candidate, as early as late 2020.

There are over a 100 vaccines being developed world wide and at least 30 clinical attempts in India. ICMR has joined force with Oxford University to create up to 60 million doses of potential vaccine, has effectively reported an exploration collaboration with Hyderabad based Bharat Biotech International Ltd (BBIL) to build up a COVID-19 vaccine. Additionally, the serum Institute of India (SII) which is the world's biggest creator of antibody vaccine by volume, has banded together with Oxford University to produce up to 60 million doses of vaccine. The name of the Universities and research organization who are continuously doing research to discover the cure for COVID-19 [22]

1. GSK (Glaxosmithkline)
2. Novavax US based company
3. Altimmune
4. Moderna – US biotech firm
5. Curevac – A German company
6. Imperial college – London

7. Inovio – US biotech
8. Zydus Cadila
9. Vaxart
10. Vaxil bio
11. Bharat Biotech
12. Oxford University

### CONCLUSION

The world is currently facing a health care crisis in form of Novel COVID -19. Its prevention is truly crucial because it is at community level right now. We summarized this review by fundamentally analyzing all the mini review, review, short communication and research articles with respect to the COVID-19. This review aims to provide the better understanding about the evidence of early findings on the signs and symptoms, implementing the public health strategies like hygiene of people hands, using masks, isolating the positive patients. Still there is no clinical treatment for novel coronavirus. The scientists are still attempting to discover proficient remedial designs for rewarding the novel coronavirus. This review helpful to the future researchers by providing reliable data about novel coronavirus and also useful to Pharmaceutical Divisions and wellbeing crisis.

### FINANCIAL ASSISTANCE

Nil

### CONFLICT OF INTEREST

The authors declare no conflict of interest

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