



Corona Virus: Review on Structural Arrangement, Clinical and Potential Inference against Respiratory Viral Infection

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ABSTRACT

SARS-COV being a zoonotic virus causes a range of respiratory disorders. The prevalence of this epidemic is due to lack of medications, vaccines and very common symptoms associated with it. The menacing effect COVID can be seen on vulnerable sections of society such as immune compromised people, adults, children and patients with history of cardiovascular and respiratory issue. This article is descriptive review to elaborate all literature in regard to COVID-19 epidemiology. The treatment management, diagnosis, transmission, symptoms, and all future guidelines to prevent the proliferation of this inoperable epidemic are explained. This document also evidences about the medication prospects that can be utilized in order to enhance immunity and suggests the usage of drugs that can be used for treatment of COVID- 19 infections.

Keywords: COVID- 19, Covalasant plasma therapy, Medication, Preventive measures, Structural aspects, WHO.

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INTRODUCTION

In 1960s Corona virus (*corona viridae*) was first discovered as a group of enveloped single-stranded ribonucleic acid viruses with positive sense¹. Coronaviruses are viruses of *Orthocorona viridae* subfamily, in the order Nidovirales of family *Corona viridae*. Genome size of this family of virus scale between 26 to 34 kilobases², that is greater as compared to other ribonucleic viruses. Its name derived from a Latin term corona meaning “crown” or “halo” when observed under two-dimensional transmission electron microscopy, it appears as crown, hence it named as Coronavirus. They have club shape and their surface is covered with spikes of peplomers. Seven human pathogenic strains have been identified so far, since their discovery. Alpha corona viruses as well as beta corona virus within *Orthocorona viridae* subfamily under *corona viridae* family, both are transmissible to humans¹. Novel corona virus is the seventh strain of the *corona viridae* family and *Orthocorona viridae* subfamily, in which most of the members are zoonotic viruses, which means they are transmissible from animal to human. Even though, bats and snakes are claimed to be natural repository of coronaviruses, still there is no affirmation that the novel corona virus was developed as well as transferred from the seafood market³. Coronavirus targets human respiratory system primarily. The Middle East respiratory syndrome (MERS-CoV) and the severe acute respiratory syndrome

(SARS-CoV) are previous outbreaks of corona virus, which have been recognized as pathogens responsible for major health risk of public⁴.

Recently detected COVID-19 (December 2019) is caused by SARS-COV2 (Severe Acute Respiratory Syndrome Corona Virus 2) which is identified as causative agent of a prospective lethal disorder. Many infected people were revealed from the animal market of Wuhan city (China) and this is expected that it is probably of zoonotic origin of novel coronavirus disease⁴. In Huanan Seafood Wholesale Market, Wuhan, an outbreak of a cluster of cases of unrecognized pneumonia with fever, dry cough, fatigue and intermittent gastrointestinal symptoms occurred⁵. Within next 8-12 weeks of the detection of disease, COVID-19 associated global health emergency has been declared on 30th January by WHO⁶, it spread worldwide to the extent that WHO declared it as global pandemic on March 11, 2020⁶. COVID-19 is pandemic, since it is evident that this has the potential to spread globally and quickly and this is not limited to particular weather condition⁷. COVID-19 is 60-140 nm in scale and has a mean nano-aerosol size of 100nm. This virus also can be airborne by binding to various human secretions such as any particulates, droplets of nasal or any saliva secretions of infected person or fine particles suspended in air⁸.

History

Since 1918 flu pandemic, COVID-19 is the fifth pandemic. On 11 March 2020, the WHO eventually determined that COVID-19 could be characterized as a pandemic, since 1918 Spanish flu (H1N1) which caused an estimate of 50 million deaths, Asian flu (H2N2) cause 1.5 million in 1957, Hong Kong flu (H3N2) cause 1 million death in 1968, whereas, 2009 Pandemic flu (H1N1) cause 300,000 deaths⁹.



Firstly, corona virus was recognized as a source of common cold in 1960. An estimate of 500 patients or more emerged with symptoms like flu, in one Canadian research in 2001. Virological investigation depicted that 3.6 percent cases were found positive in polymerase chain reaction (PCR) for the HCoV-NL63 strain of corona virus. Corona virus was considering being safe and non-fatal virus before 2002. Whereas, in 2002-2003 an outbreak in province of Guangdong within south China, spread viral infection (SARS) to various countries such as Vietnam, Thailand, Taiwan, Singapore, United states of America and Hong Kong, which resulted in excessive death rate in approximate of thousand patients or more. Afterwards, microbiologists and researchers of infectious disease investigated the pathogenesis of this disease and believed that novel strain of corona virus was the source of this infection. Center for Disease Control and Prevention (CDC) and World Health Organization proclaimed it as emergency period, when 774 were dead among 8096 diagnosed individuals (in 2004). Furthermore, according to an article in Hong Kong, more than half of the patients

diagnosed for SARS were found positive for coronavirus. Progression of this virus revealed that this is not a mild virus and it can become more fatal to humans. Indeed, further epidemic in 2012 within Saudi Arabia ended with numerous deaths, which firstly expended to other middle east countries afterwards proliferate globally, renewing the interest in researches of this novel strain of coronavirus that is MERS¹⁰.

Structure of Covid-19

The structure of covid-19 is similar to the bat origin corona virus SARS which is a beta-corona virus that mostly infects humans³. SARS has spikes (S) on the upper surface as well as envelope (E), membrane (M) and the nucleocapsid (N) proteins in its structure¹¹. Structural analysis reveals that COVID-19 likely has SARS-like structure but the nucleocapsid protein and spike glycoprotein mutated in case of COVID-19. It has a typical crown-like structure due to the presence of spike glycoprotein on its surface¹². The genomic size of COVID-19 is 29.9kilobase³.

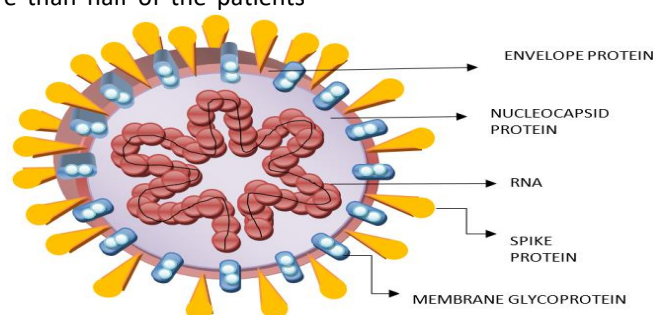


Figure 1: Representing structure of Covid-19 depicting Envelope protein, Nucleocapsid protein, Spike protein and membrane glycoprotein which enclosed RNA of corona virus.

Symptoms

In certain individuals, the disorder may manifest as pain and aches, runny nose, nasal congestion, diarrhea or sore throat. All affected persons cannot experience all these signs, either. In 80% infection cases, infection will be mild and no special treatment is needed. In serious cases, mainly in elderly people and with comorbid conditions, the infection results in impaired functions of kidney and liver, leading to failure of organ and may be death. After exposure to infected person, the incubation period ranges from 2 to 14 days. The average fatality figures for incident are 2–3.4%¹³. According to a recent research statistical data, mostly men were infected, very less of the patients have underlying disease such as cardiovascular disease, diabetes, hypertension¹⁴. Some of the infected cases received high flow oxygen therapy, invasive (mechanical) ventilation; Very few of them received noninvasive ventilation^{14, 15}. The virus transmitted from person to person by means of respiratory droplets, close contact and by touching any object or surface, respiratory related widely recorded respiratory symptoms are^{6, 13, 15, 16, 17}.

- Fever
- Dry cough
- Chest tightening/ pain

- Fatigue
- Sore throat
- Myalgia
- Lymphopenia
- Prolonged thrombin time
- Elevated lactate dehydrogenase

Non respiratory uncommon symptoms are:^{6, 15, 17}

- Nausea
- Vomiting
- Anorexia
- Sputum production
- Headache
- Haemoptysis
- Diarrhoea
- Lymphocytopenia approx. 50 percent

Transmission

Corona virus transmitted from animals to humans. It is found in camels, bats and pigs¹⁸. The transmission occurs

primarily through respiratory droplets, by cough, sneezing, shaking hands and contact with infected place. Viral particulate remains on plastics and stainless steel for 72 hours after application¹.

The incubation period of this is 2-14 days; still patients of corona can transmit these virulent particulates by contact and also through respiratory droplets even before appearance of symptoms. Physiological changes that occur in pregnant women related to respiratory and immune system makes them more prone to COVID-19 infection. The patients with the history of cardiovascular diseases, respiratory issues, diabetes are also very susceptible¹⁹.

Binding with the receptor of host cells is the early step of any viral infection. Then fusion with cell membrane occurs, due to this epithelial cells of lung are initial targets of the COVID-19. Thus, corona virus transmission occurs human-to-human by binding reactions between cellular receptor and receptor-binding virus spikes. The cell receptors are found to be angiotensin- converting enzyme 2 (ACE2) receptors⁴.

Preventions

Considering the lack of effective treatment, prevention is the only practice that can be performed to avoid exposure COVID-19. Following initiatives can assist to achieve the goal¹².

1. Use of face masks to prevent spread of COVID through sneezes and cough.
2. Properly washing hands regularly with soap or disinfection.
3. Avoid contact with infected people.
4. Appropriate distance should be maintained from non-infected people, maintain social distancing.
5. Refrain from touching eyes, mouth and nose.
6. If ill, seek medical care and follow the advice provided by doctors.

Detailed WHO guidelines issued includes

1. Thoroughly and regularly hands must be cleaned with any alcohol-based hand sanitizer or can be washed with any soap and water.
2. Avoid refraining face, mouth, nose and eyes.
3. Try practicing and maintaining respiratory and personal hygiene by covering the mouth region

Medication systems pursue for the period of pandemic situation during corona virus

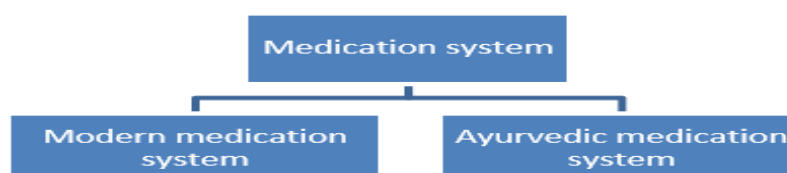


Figure 2: Shows the medications system follows during covid-19

and the nose cavity by bended elbow while you sneeze and cough.

4. If you feel fever, difficulty in breathing and cough, then seek proper medical care as early you can.
5. Stay informed always and strictly follows the advice given by the healthcare providers.
6. Maintain minimum 1 m distance with individuals who are coughing and sneezing.
7. For health workers: use particulate respirators such as certified N95 or Filtering Face Piece 2, medical mask when you are providing care to suspected or confirmed cases.
8. For common people: use medical mask in public areas.

To prevent spreading of virus^{3, 20}

1. Full care to the patients with less identification symptoms is to be provided.
2. The patient must be isolated rapidly, infection prevention and control measures are to be taken, symptomatic care of individuals with mild disease and supportive treatment for severe COVID-19 patients is to be carried out.
3. Specific efforts to reduce the proliferation of disease should be represented to whole susceptible individuals including all health care providers, immune compromised patients, elderly people, pregnant women and children.
4. Usage of social media, international media and societal culture for spreading awareness about personal hygiene, measures to prevent from exposure, avoiding public gatherings is to be done.
5. COVID-19 vaccines development is to be accelerated.

Disease affiliated with corona

1. Anxiety-related symptoms, depression and sleep problems increase due to the risk of corona infection. The possible reason for these can be "hypochondriac concerns" (worry about being infected and feared that the epidemic was hard to control²¹).
2. OCD (obsessive compulsive disorder) might get worsen²².



Modern medication system

According to the WHO: "there is no certain medicine recommended to stop or treat the novel corona virus" Recently utilization of either some individual or amalgamation of various anti-viral, anti- malarial and other

category medications for treatment of COVID-19 are shown in table 1. Basically, these medications are not applicable for covid-19 but they have ability to lower the concentrations of viral infections and also limit symptoms associated from it^{23, 24}.

Table 1: depicted the delivery of following drugs can be used in epidemic situations in covid-19.

S. No.	Drugs	Category	Mode of action / References
1.	Remdesivir lopinavir Ritonavir	Anti-viral	obstruct enzyme and diminish chances of virus replication ²³
2.	Favilavir (fapilavir)	Anti-viral	hinder RNA dependent RNA polymerase ²⁴
3.	Ribavirin	Anti-viral	Low micromolecular concentration ⁶
4.	Umifenovir	Anti-viral	Reduce viral concentration ²⁵
5.	Darunavir	Anti-retroviral	HIV protease inhibitor ²⁵
6.	Sarilumab	Human monoclonal antibody	Fight against interleukin -6 receptor ²⁵
7.	Chloroquine and hydroxychloroquine	Anti- malarial	Inhibit replication of cells responsible for SARS ²⁴
8.	Tocilizumab	Immunosuppressive	Block interleukin -6 cell ²⁴
9.	Glucocorticoids	Steroidal hormone	- ⁶
10.	Dexamethasone	corticosteroid	- ²⁴
11.	Nitazoxanide	Anti-parasitic Anti -viral	Reduce macromolecular concentration ⁶
12.	Baraticinib	-	Block JAK1 and JAK2 ²⁶
11.	Interferon α	Immunomodulating agents	improved better oxygen saturation and perform rapid resolution of chest ²⁵
13.	Interferon β	Immunomodulating agents	Intensify lung condition ²⁶
14.	Interleukin 37	Anti-inflammatory cytokines	Suppress inflammation ⁴²
15.	Interleukin 38	Anti-inflammatory cytokines	repress inflammation system ²⁷

Ayurvedic medication system

The governments focus on boosting immunity of entire population in pandemic circumstances. The health life style management e.g., healthy diet, exercise, yoga can improve better immunity and oppose the attack of peripheral pathogens^{24, 28}

Ayurvedic medicines can provide: ^{24, 28, 29}

- Protection
- Potential effectiveness

- Wide spectrum
- Ease of accessibility
- Effortlessly administration management
- Cost efficient

In Ayurvedic medication system, research reports of several data helps to understand how to improvise and achieve a better healthy immune system for the defense from upper respiratory defects which is frequently affected through corona virus^{28, 30}.



Table 2: Depict the following herbs can be used in covid 19 condition to enhance immune system of body

S. No	Herbs	Biological name	Pharmacotherapeutic Effects/ References
1.	Rasayana (Brahma Rasayana, Chyavanprasha or AmritBhallataka)	-	Intensify immune ³¹
2.	Sanjivanivati	<i>Selaginellabryopteris</i>	Reduce fever ³²
3.	Sannipatajvara		Treat cold, cough, in-digestion ³³
4.	Guduchi	<i>Tinospora cordifolia</i>	Improve immunity, treat fever, indigestion, stress anxiety, respiratory problems ³⁴
5.	Shunthi	<i>Zingiberofficinale</i>	Manage vomiting, weakness, anti-inflammatory agents ³⁵
6.	Haldi	<i>Curcuma longa</i>	Anti-oxidant, improvise liver against toxicity ³⁶
7.	Tulsi (holy basil)	<i>Ocimum sanctum</i>	Cure common cold ³⁷
8.	liquorice	<i>Glycyrrhizaglabra</i>	Use to control nausea, vomiting, muscle pain ³⁸
9.	Adua	<i>Adhatoda vasica</i>	Cough and upper respiratory difficulty ³⁹
10.	Green chireta	<i>Andrographis paniculata</i>	Use to avoid common cold and flu ⁴⁰
11.	Chirayita	<i>Swertiachirata</i>	Protect from toxins and foreign bodies ⁴⁰
12.	Triphala	<i>Emblicoeffinialis</i> <i>Terminaliabellicrica</i> <i>Terminalia chebula</i>	Improve immune system, antioxidant ⁴¹
13.	Trikatu	<i>Piper nigrum</i> <i>Piper longum</i> <i>Zingiberofficinale</i>	Treat throat infection and respiratory disease ⁴¹
14.	Dashamulakwath	<i>dashmool</i>	Reduces muscles and joint pain ⁴²
15.	Talishadi	<i>Abieswebbiana</i>	Support and improve lung and respiratory function ²⁸

The commencement of the novel corona virus triggered large population throughout all over globe. The feasible treatments are given to contaminated corona patients with aid of hydroxychloroquine antimalarial agents, antiviral agents, anti-inflammatory agents and other possible drug practices. In overdosing of chloroquine and hydroxychloroquine are highly lethal, leading to the quick onset produce unwanted effects such as seizures and coma on central nervous system and also create cardiovascular breakdown. Manage supportive treatment methods, such as provide oxygen supply in moderate medical cases. The physician also recommends boosting up an immunity of body system to fight against pandemic circumstances. There are a series of medications utilized in the time period of corona virus but this is not an exact method of treatment to decline the level of infected patients. Still, the formulations of unique vaccines are also under consideration. The alternative option to employ the antibody therapy such as convalescent plasma therapy might be an instant healing remedy for emergencies cases.

Convalescent plasma remedial analysis

Research investigators suggest that imply recuperative, restorative or convalescent plasma is one which manage epidemic. Plasma therapy is older, uncomplicated, effortless and prospective popular approach. Blood is a connective along with specialized liquid; it is composed of plasma, red blood cells, white blood cell, platelets. Plasma mainly made up of water and mixture of an appropriate amount of necessary elements such as proteins, glucose, mineral hormones, ions, carbon dioxide. Plasma serum gathers from infected patient's blood with severe or moderate symptoms, the patient who has recently recovered from viral infection. The specialized plasma serum holds combination of week antigens and antibodies afterward administration into a contaminated viral patients to struggle and fight against viral infectious disease. Protein rich antibodies that are particularly produced by 'B cells' of the immune system are proficiently bound to 'antigens' a precise molecular fragment available on the pathogen that conquer body resistance system as



well as directly neutralize or stimulate, initiate immune responses. Based on study reports information, administration of restorative plasma injected in patients that are safe, effective over and above probably turn down the mortality rate and recovery of patients become fastest. According to the reports, that donation of convalescent plasma may be a valuable and helpful approach towards to treat critically unwell infected patients with dangerous respiratory viral disease.

For the donation of complexed antigens-antibodies plasma, needed a healthy and recovered corona virus infected individual called 'convalescent plasma donor'. Each plasma contributor should have a documented history from laboratory-confirmed and committed report of corona virus infection. The suspicious patients are taken under the observation, after the proper evidence of RT-PCR positive reports, afterward utilize recuperative plasma securely and incorporate into body through blood in infected individuals. Plasma contribution supporters should be healthy and may not affect from any dangerous illness previously. The documentation part is important and all donors should submit an informed consent along with negative reports from corona infection as well as patient may also free from any infectious diseases as per guidelines standard blood banking.

Hence the neutralization of corona virus, recognize monoclonal antibody is imperative may be antibodies effects on the other cells and can destruct the potential ability of immune system. So, monoclonal antibodies are specific and precise can target and mark common epitope on these viruses also recommended possible prevention and treatment of infectious disorder.

It is very prime step to segregate the raised antibodies by corona virus recover health improved patients. Securely acquire antibodies should be created on a larger scale for the treatment of respiratory system affected corona virus. These strategies are employing for emergencies conditions. While alternative substitute are more time consuming in the advance development and progress of vaccines and novel drugs exploration are under investigation. Neutralized corona virus antibodies possibly exploit to prevent infected persons bare to corona virus. Hospital staffs such as physician and nurses are more prone from infection so early dealing management of treatment is necessary which can reduce the chances of severe exposure. The research reports signify that administration of convalescent plasma produce safe and secure action for those with severe corona virus disease^{43, 44}.

CONCLUSION

SARS-CoV-2 is the type of corona virus which is responsible for the COVID-19 epidemic spread all over the world. It is among the seven human transmissible corona viruses and suggested that its origin can be from the bat's Corona virus. Initially, human cases were found in Wuhan, a city of China. Human-to-human transmission of this disease may

occur through respiratory droplets, sneezing and touch. It enters the pulmonary cells through endocytosis via the ACE-2 receptor. Treatment options are explained as supportive care and preventive measures. Currently, no vaccine or confirmed medication is approved by WHO. This document concludes the medication suggestions and prevention management approaches that can benefit the human health during this epidemic COVID.

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