AIJR Preprints
Section: Coronavirus
Article Id: 90, Version: 1, 2020
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Version 1: Received: 23 May 2020 / Approved: 31 May 2020 / Online: 01 June 2020

Key Features of SARS-CoV-2 and Available Therapies for COVID-19

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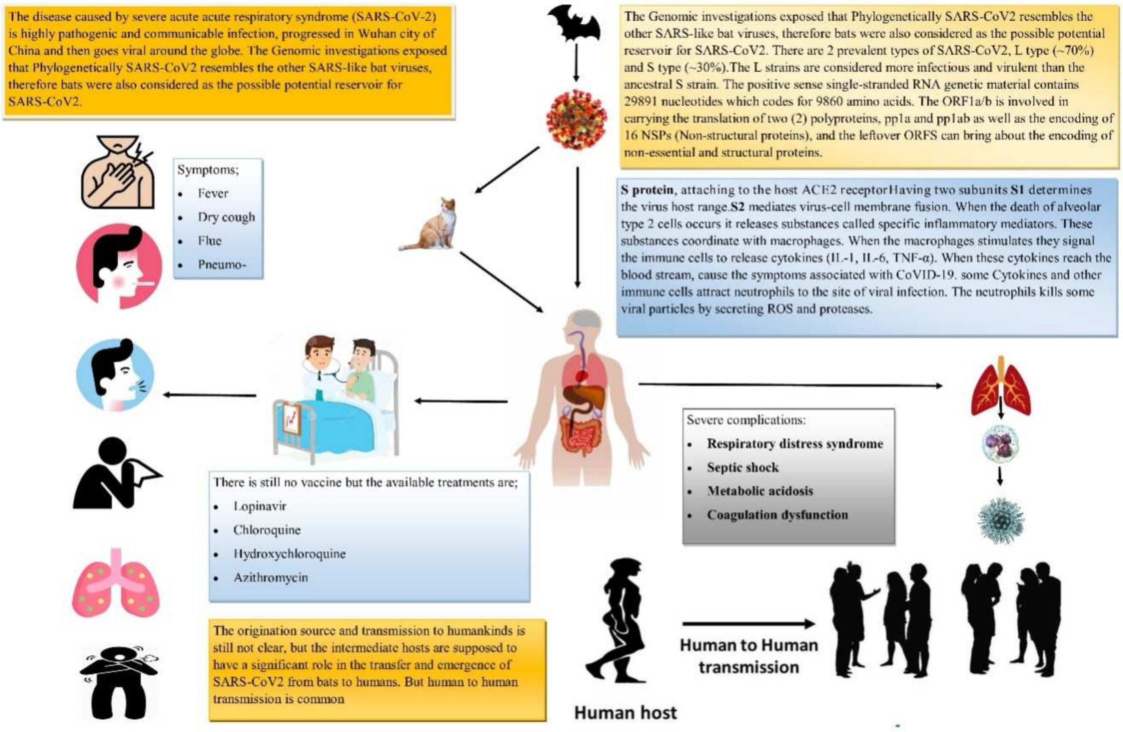
ABSTRACT

The disease caused by severe acute respiratory syndrome (SARS-CoV2) is highly pathogenic and communicable infection, progressed in Wuhan city of China and then goes viral around the globe. The Genomic investigations exposed that Phylogenetically SARS-CoV2 resembles the other SARS-like bat viruses, therefore bats were also considered as the possible potential reservoir for SARS-CoV2. There are 2 prevalent types of SARS-CoV2, L type (~70%) and S type (~30%).The L strains are considered more infectious and virulent than the ancestral S strain. The positive sense single-stranded RNA genetic material contains 29891 nucleotides which codes for 9860 amino acids. The ORF1a/b is involved in carrying the translation of two (2) polyproteins, pp1a and pp1ab as well as the encoding of 16 NSPs (Non-structural proteins), and the leftover ORFS can bring about the encoding of non-essential and structural proteins. The origination source and transmission to humankinds is still not clear, but the intermediate hosts are supposed to have a significant role in the transfer and emergence of SARS-CoV2 from bats to humans. There is still no approved drug or vaccine available for Covid-19. In the current review, we condense and fairly evaluate the emergence and pathogenicity of SARS-CoV2, SARS-CoV and MERS-CoV. Moreover, we also discuss the treatment and vaccine developments strategies for Covid-19.

Keywords*:* Coronaviruses; SARS-CoV2; Transmission; Infection; Outbreak; COVID-19

How to Cite:

Sayed Ali Raza Shah *et al.* “Key Features of SARS-CoV-2 and Available Therapies for COVID-19”. *AIJR Preprints,* 90, version 1, 2020.
https://preprints.aijr.org/index.php/ap/preprint/view/90



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Symptoms;
- Fever
- Dry cough
- Flue
- Pneumo-

S protein, attaching to the host ACE2 receptorHaving two subunits **S1** determines the virus host range.**S2** mediates virus-cell membrane fusion. When the death of alveolar type 2 cells occurs it releases substances called specific inflammatory mediators. These substances coordinate with macrophages. When the macrophages stimulates they signal the immune cells to release cytokines (IL-1, IL-6, TNF-α). When these cytokines reach the blood stream, cause the symptoms associated with CoVID-19. some Cytokines and other immune cells attract neutrophils to the site of viral infection. The neutrophils kills some viral particles by secreting ROS and proteases.

Severe complications:
- **Respiratory distress syndrome**
- **Septic shock**
- **Metabolic acidosis**
- **Coagulation dysfunction**

There is still no vaccine but the available treatments are;
- Lopinavir
- Chloroquine
- Hydroxychloroquine
- Azithromycin

The origination source and transmission to humankinds is still not clear, but the intermediate hosts are supposed to have a significant role in the transfer and emergence of SARS-CoV2 from bats to humans. But human to human transmission is common

Graphical Abstract

1. INTRODUCTION

Coronaviruses are non-segmented single stranded positive sense RNA enveloped viruses that belongs to the family Coronaviridae under the order Nidovirales and spread largely in human being and other mammals [1]. Though mostly, the infection of coronavirus in humans are not severe, the epidemics of the two beta-coronaviruses, (SARS-CoV)[2-4]and (MERS-CoV)[5,6] have affected more than ten Thousand (10,000) individuals in the last two decades, with death rates of for SARS-CoV (10%) and for MERS–CoV (37%) [7, 8].The outward surface of the corona virus possess crown like spikes; that's why, it was entitled as a coronavirus. The size of Coronaviruses ranges from (65-125nano meter in diameter) and the genome contain a single-stranded Ribonucleic acid as their genetic material, (size ranges from 26kbps to 32kbs in length. The family of corona viruses comprises of four subdivisions, alpha (α), beta (β) CoVs, gamma (γ) CoVs and delta (δ) coronavirus. The severe form of (SARS-CoV), H5N1 influenza type A, 2009 outbreak of(H1N1)and Middle East respiratory syndrome coronavirus (MERS-CoV) have the capability to cause acute lung injury. Before the 2002-200 outbreak of SARS, the CoVs were believed to infect animals only [9].The coronaviruses that were previously known can only be the tip of the iceberg, with possibly more severe and new zoonotic proceedings to be exposed.

In December, 2019, a progressions of pneumonia like cases of unfamiliar source arose in Chinese areas especially in (Wuhan and Hubei) with clinical appearances that were very close to viral pneumonia [10]. Wuhan is the urban and most populated area located in central China, with more than 11 million population.

Most of the patients showed clinical signs of elevated temperature or pyrexia, dyspnea, dry cough, and bilateral lung infiltrates on computed tomography. The infected individuals were all said to be connected to Wuhan's Wholesale Huanan Seafood Market, which is famous for trading fish and a diversity of living animal species like snakes, poultry, bats, marmots etc [11].But it was noted from more investigations that the virus also infected the personages, who have not visit the seafood in Wuhan. From these interpretations it was noted that the virus also possesses the ability to spread from infected human to healthy one, as reported by more than 150 countries around the globe. The virus can transmit from the infected individual to the healthy person by means of sneezing, aerosols or coughing. These droplets or aerosols can then get enter into the body of healthy individual through the process of inhalation by mouth or nose and can infect the lungs [12-14]. When the samples from the lower RT of these patients are processed for sequencing analysis by Chinese CCDC on January 7th, 2020, it confirms a specified novel coronavirus from the β group of the coronaviruses, and was named COVID-19 suggested by scientist concerned with World Health Organization [15].At the time of writing, processing and analyzing of this article, the rate of transmission of SARS coronavirus type 2 or COVID-19 is higher than SARS-CoV and the possible reason for this higher transmission rate might be genetic recombination at glycoprotein S in the receptor binding domain (RBD) site of the novel CoV may have boosted its transmission capability. The origination of CoVs, associated infectiousness and biological features of SARS and MERS with a special focus on COVID-19 were discussed in this review article.

The HumanCoV-229E and NL63 are kept in group 1 CoVs also called Alpha coronavirus, while human CoV-OC43, HCoV-HKU-1, SARS coronaviruses and Middle east coronavirus are classified in group 2 also called Beta coronavirus.. The newborn COVID-19 has origin of Beta coronavirus represented SARS-CoV type 2. Gamma-CoV coronaviruses are related to some avian species. Genomic characterization of these viruses had revealed that the reservoirs of alpha and beta Coronaviruses are bats and rodents probably. On the other hand, avian species are concerned with representation of reservoir's delta and gamma viruses. Intra and interspecific recombination of genome is common which increased the chances of genetic diversity in CoV [16].

2. ETIOLOGY

In 1937 the first CoV were isolated and found it responsible for infectious bronchitis in birds and poultry that had the ability to devastate its stocks [17].There are now two recognized strains of the disease. The L strain is more infectious and severe than the ancestral S strain [18].The disease has an R0 of around 6.6. Which means 1 person infects that many other people on average. There are also super-spreader incidents where one person can infect dozens of others. One person on average infects at least 6.6 other people [19]. The median incubation period is around 5 days, but outliers of 24 or more days have been seen. The ability of the virus to stay active on surfaces for up to 27 days is also a cause of significant concern [20]. Members of coronaviridae can cause diseases ranges from respiratory, enteric, hepatic to neurological in many animals such as cats, cattle, camels, and bats. Till date, seven human coronaviruses are identified.

According to the general estimation only 2% populations are healthy carriers of Coronaviruses. While only 5% to 10% of acute respiratory infections are due to these viruses [21]. Common human CoVs, OC43, and HKU1 are beta-CoVs and human CoV-229E and NL63 are alpha coronaviruses. They are responsible for causing common colds and upper RTI's in individuals having proper immunity however the upper respiratory tract infections due to these viruses are self-limiting in individuals having strong immunity.

Individuals having weak immunity are susceptible to lower respiratory infections caused by these viruses. Other human coronaviruses: such as SARS-CoV, CoVID-19, and MERS coronavirus are belongs to beta-CoVs. These are capable of causing extra-respiratory and respiratory complications. SARS-CoV-2 or COVID-19 has mortality rates of 2-4% comparing to SARS-CoV, MERS-CoV which has mortality rates upto 10% and 37%respectively.The SARS-CoV-2 belongs to the beta-CoVs category. The round crown shape SARS-CoV-2 has a diameter of approximately 65–125 nm and can travel hardly up to 1m in air. Furthermore, this virus is sensitive to rays like ultraviolet rays and heat and can be effectively inactivated by solvents like ethanol, ether and disinfectant (chlorine-containing).SARS-CoV-2 has 89% nucleotide identity with SARS, like-CoVZXC21 of bat and 82% with that of human SARS-CoV [22]. Due to this reason, the novel virus was called SARS-CoV-2. Its positive sense single-stranded RNA genetic material contains 29891 nucleotides which codes for 9860 amino acids. The genome analysis suggested that SARS-CoV-2 probably evolved from a strain found in bats, but still its origins is not understood.

Up till now, maximum COVID-19 infected cases have shown mild symptoms of high temperature (fever), sore throat and dry cough. Though, in some cases, different serious complications like severe pneumonia, organ failure, pulmonary oedema, septic shock and ARDS (acute respiratory distress syndrome) are being reported [23]. The reports shows that mainly infected individuals with COVID-19 are male (54.3%) with an average age of 56 years old. Particularly, the patients who need intensive care support and were aged and having multiple complications like cardiovascular, cerebrovascular, endocrine, digestive, and respiratory diseases. The patients who are in intensive care were also reported to have dyspnea, dizziness, abdominal pain, and anorexia [24].

3. EMERGENCE AND PROLIFERATIONOF CORONAVIRUSES

First arise in the last months of 2002 in Guangdong Province of China. The individuals infected with SARS shows symptoms like fever, headache followed by respirational signs as cough, dyspnea and pneumonia. As SARS have high rate of transmission among human, that’s why it blowout speedily to other countries with more than 8000 infected and 776 expiries around the globe [25-26]. In June of 2012, some of the residents of Saudi Arab were diagnosed with alike clinical symptoms to SARS, gradually lead to acute respiratory distress syndrome (ARDS) and renal failure in patients with serious condition. The virus was then documented as a member of CoVs with a name as MERS-CoV [27-28]. Mostly, the individuals infected with MERS were in the Middle East and mainly in Saudi Arab. Few of the cases who travelled from Middle East to USA, Africa and some European countries were reported positive for MERS. It was reported that the MERS outbreak in Republic of Korea arose in 2015, when an individual (MERS Positive) travelled from Middle East to Korea. This makes the Republic of Korea as second home for MERS epidemic with 185 infected and 36 expiries [28].

4. CORONAVIRUSES- INFECTION SITES AND HOSTS

The sites of infection and spreading are very significant to be resolved by developing strategies and protective policies to control the rapid growing infection. The initial cases of SARS-CoV was believed to arise from raccoon dogs and from the business of civets, which was confirmed by controlling the civets market. After ponderous culling of market civets in 2004, no SARS infected case was reported [28-30].In May 2001,the serum samples from healthy individuals were taken and when processed for molecular assessment in Hong Kong, their antibodies incidence rate was noted to be 2.5% against SARS-coronavirus. The outcomes of the study indicates that the transmission of SARS-coronavirus in humans far before the epidemic in 2003 [31].

A study on the Rhinolophus bats also considers it a source for viral reproduction as they have anti-SARS-corona virus antibodies [32]. The epidemic of MERS were firstly emerged in the Kingdom of Saudi Arabia (KSA) in June 2012, and the infected individuals were found to have interaction with dromedary camels, butth is epidemiological connection was lacking in many cases. The MERS-coronavirus was also reported in *Tylonycteris* bats and *Pipistrellus* bats in China and *Eptesicusisabellinus* bats in Spain [33]. The connection of the MERS-coronavirus with the camels and bats reflects that they are the main source, intermediate host and transferring medium for humans [34,35]. At first, scientists reported that SARS-CoV-2 may originate from the snake, but after genomic analysis, the COVID-19 was reported to have 96.2% whole genome sequence similarities with Bat CoV RaTG13 [36].From genomic similarity findings it was concluded that the potential reservoir for SARS-CoV2 were bats (Table 1)[37, 38], as bat CoV and human SARS-CoV2 have same ancestry [39], but the seafood market is not dealing with the trade of bats. On carrying out the further investigations it is found that the two SARS-coronavirus (CoVZXC21 or CoVZC45) are very close toSARS-CoV2 Spike (S) glycoprotein and an unknown beta-coronavirus [40].However, more investigations should be carried out to find the intermediary source through which the virus is transmitted to humans.

5. TAXONOMY

Coronaviruses are well-known pathogens causing diseases in humans while animal's diseases are concerned with Toro viruses causing diarrhea in animals. Coronaviridae consists of two main virus genera Toro viruses and Coronaviruses. Some Toro viruses are seen in feces of humans but the etiological concern is not clear. Based on antigenic relationships coronaviruses are categorized into three classes, the spike represented by (S), the membrane represented by (M) and the nucleocapsid proteins resented by (N) proteins [41].**Figure 1**.

6. GENOMIC STRUCTURAL VARIATIONS AND VIRAL FACTORS OF SARS-COV-2

The comparative analysis of the whole genome of SARS-CoV2 with SARS-CoV and MERS-CoV confirms that SARS-CoV2 is mostly identical to the SARS-like bat CoVs [42] and the size of one strain of SARS-CoV2 is of 29.9 kb [43] as compared to SARS-CoV (27.9 kb) and MERS-CoV (30.1 kb) [43]. A growing body of evidence showed that the coronaviruses genome possess a variable number (6-11) of open reading frames [44]. It has also been identified that the SARS-CoV2 genome is almost 80% similar to other human coronaviruses. In the first ORF (ORF1a/b), where mostly Viral RNA is positioned, can carry out the translation of two (2) polyproteins, pp1a and pp1ab as well as the encoding of 16 NSPs (Non-structural proteins), and the leftover ORFS can bring about the encoding of non-essential and structural proteins (**Figure 2**). The four vital structural proteins are encoded by the remaining viral genome which includes Spike (S) glycoprotein, Envelope (E) protein, Matrix (M) protein, and Nucleocapsid (N) protein [45] and also those proteins, which can affect the host immune response. A latest study on transcriptomic sequencing of SARS-Cov2 reveals that phylogenetically SARS-Cov2 bear a resemblance to SARS-CoV. This resemblance is mostly seen to happen in the S-glycoprotein gene and RBD (receptor binding domain) demonstrates the transmission of virus to humans directly [46].

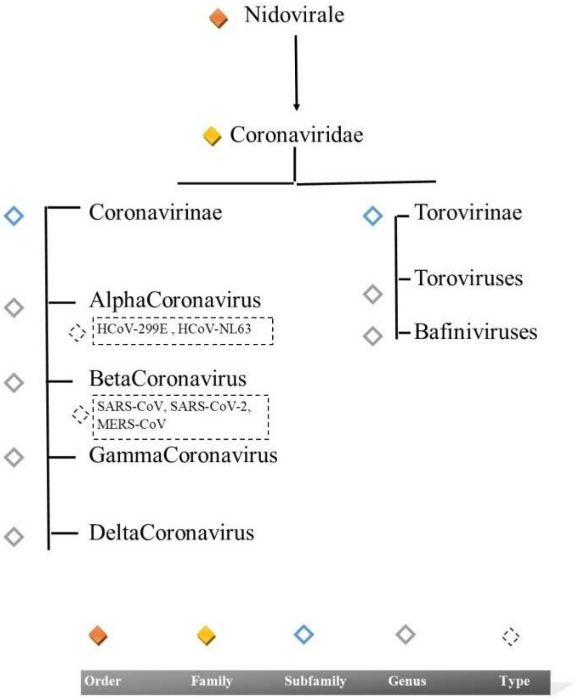


Figure 1. Taxonomy of Coronaviruses

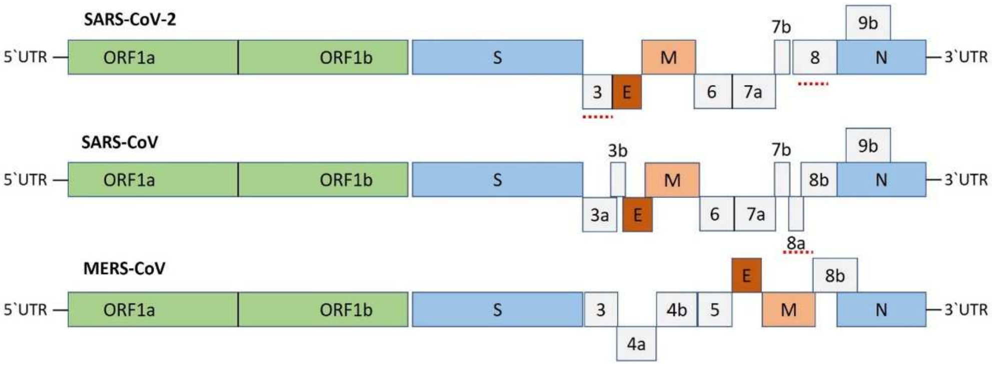


Figure 2. Beta coronaviruses genome organization; The Beta coronavirus for human (SARS-CoV-2, SARS-CoV and MERS-CoV) genome comprises of the 5'-untranslated region (5'-UTR), open reading frame (orf) 1a/b (green box) encoding non-structural proteins (nsp) for replication, structural proteins including spike (blue box), envelop (maroon box), membrane (pink box), and nucleocapsid (cyan box) proteins, accessory proteins (light gray boxes) such as orf 3, 6, 7a, 7b, 8 and 9b in the SARS-CoV-2 genome, and the 3'-untranslated region (3'-UTR). The doted underlined in red are the protein which shows key variation between SARS-CoV-2 and SARS-CoV. The length of nsps and orfs are not drawn in scale [68].

The proteins of SARS-CoV2 are mostly alike to SARS-coronaviruses, but also have some alterations too. As in NSP7, NSP13, Envelope proteins, Matrix proteins, p6 and 8b proteins, there is no evidence of amino acid replacement, which is reported to occur in NSP2, NSP3, spike proteins and RBD [47]. A recent study also favors that the SARS-Cov2 infective ability is because of change/mutation in NSP2 and NSP3 [48]. It may be the reason that people irritates to investigate the host orientation and transmission of SARS-CoV2 and SARS-coronaviruses. There are also reports of mutation of SARS-CoV2 among infected individuals in china [49] but SARS-CoV2 less mutant than the H7N9 [50]. A study on the genetic analysis of SARS-CoV2 concludes that there are 2 prevalent types of SARS-CoV2, L type (~70%) and S type (~30%) [51].The L strains are more infectious and virulent. In order to eradicate these pandemic, scientists needs to have considered also these factors of novel coronavirus.

7. TRANSMISSION

As the first case reported in Wuhan china so it is said that this virus came from Hunan Seafood Wholesale Market situated in Wuhan, but there is still no evidence. Human to human transmission is common as according to the CDC and WHO, it was obvious that close contact is the major facilitator to transmit COVID-19 infection. The virus travels up to one meter in air and contracted by the person who is in close proximity to the infected person. From the analysis of the investigations and research conducted by the China CDC, the incubation period could be 3 to 7 days or may up to 2 weeks [52]. It was also concluded from the data that within every seven days this novel SARS-CoV-2 doubles its progeny and the reproduction number is R_0 is 6.6, simply each patient can transmits the infection to an extra 6.6 individuals. On the other hand if we compare SARS-CoV with SARS-CoV-2, the Reproduction rate of the SARS-CoV epidemic were approximately 3 in 2002-2003[53].**Figure 3.**

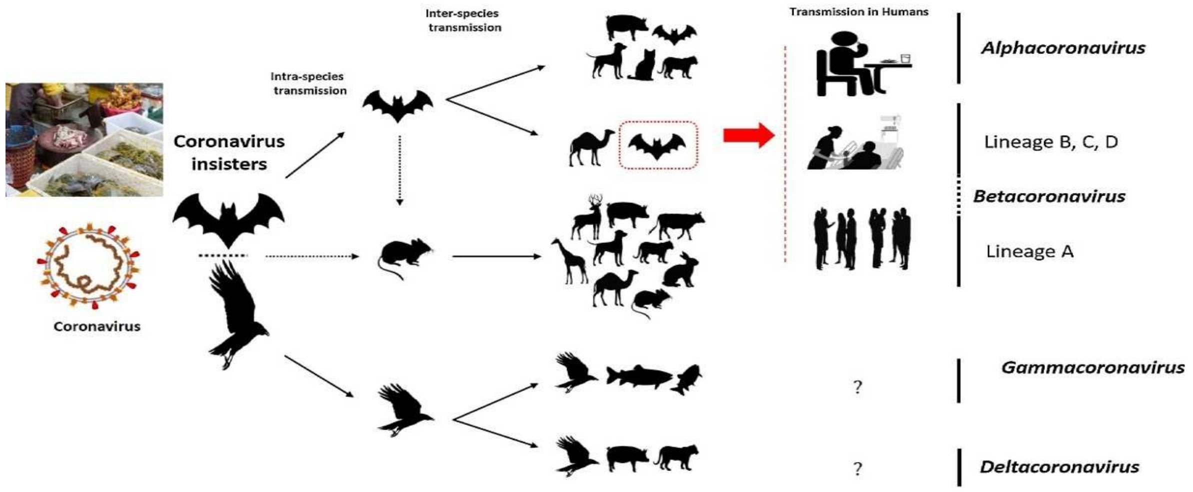
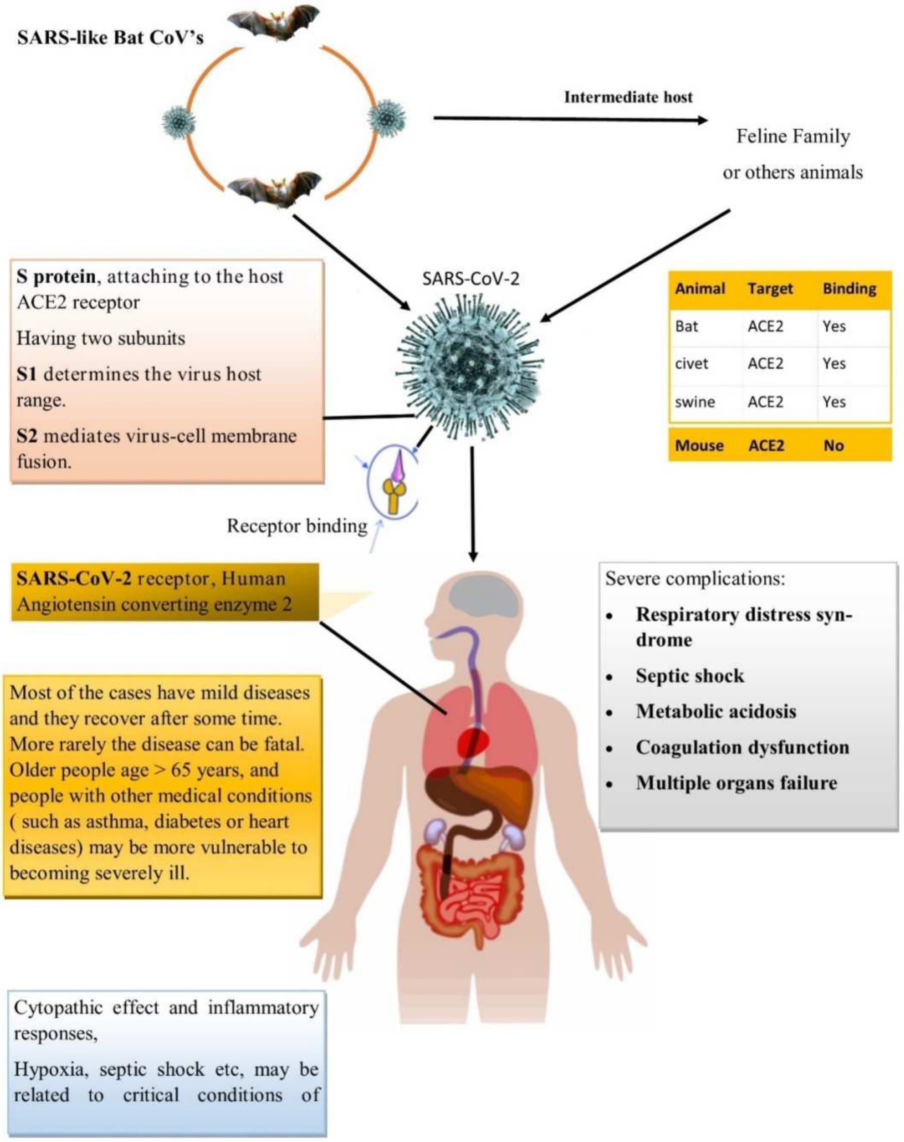


Figure 3. The key reservoirs and mode of transmission of coronaviruses (suspected reservoirs of SARS-CoV-2 are red encircled); only α and β coronaviruses have the ability to infect humans, the consumption of infected animal as a source of food is the major cause of animal to human transmission of the virus and due to close contact with an infected person, the virus is further transmitted to healthy persons. Dotted black arrow shows the possibility of viral transfer from bat whereas the solid black arrow represent the confirmed transfer [68].

8. PATHOGENICITY OF COVID-19

When the virus get entry in to the human body it attaches with a special type of receptor present on the alveolar cells surface of lung called Angiotens in converting enzyme 2 receptor (ACE-2). There are three types of alveolar cells; type 1 is responsible for exchange of gases, type 2 cells of alveoli are responsible for production of surfactant and type 3 cells are concerned with macrophages [54]. The ACE-2 is present on type-2 cells, the S-spike or glycoprotein of SARS-CoV-2 bind to ACE-2 as shown in **Figure 4**. After the binding of virus to its receptor it moves inside the cell and start its replication, as the virus multiplies, the cells getting dies specially type 2 alveolar cells [55].



S protein, attaching to the host ACE2 receptor

Having two subunits

S1 determines the virus host range.

S2 mediates virus-cell membrane fusion.

Animal	Target	Binding
Bat	ACE2	Yes
civet	ACE2	Yes
swine	ACE2	Yes
Mouse	ACE2	No

SARS-CoV-2 receptor, Human Angiotensin converting enzyme 2

Severe complications:

- **Respiratory distress syndrome**
- **Septic shock**
- **Metabolic acidosis**
- **Coagulation dysfunction**
- **Multiple organs failure**

Most of the cases have mild diseases and they recover after some time. More rarely the disease can be fatal. Older people age > 65 years, and people with other medical conditions (such as asthma, diabetes or heart diseases) may be more vulnerable to becoming severely ill.

Cytopathic effect and inflammatory responses,

Hypoxia, septic shock etc, may be related to critical conditions of

Figure 4. Pathogenicity of SARS-Cov-2

9. IMMUNE RESPONSES & SYMPTOMS

When the death of alveolar type 2 cells occurs it releases substances called specific inflammatory mediators. These substances coordinate with macrophages. On stimulation, the macrophages signal the immune cells to release cytokines (Interleukin-1, IL-6, TNF-α) shown in **Figure 5**. When these cytokines reach the blood stream, it causes the symptoms associated with CoVID-19 [56].

- At the level of lungs, the cytokines cause the vasodilation and capillary permeability thus causes alveolar edema which leads to shortness of breath (hypoxia).
- There is increase in surface tension created by the loss of surfactant (death of type 2 alveolar cells) which leads to alveolar collapse, and the symptoms of hypoxia appears at this stage.
- The cytokines stimulate the hypothalamus to increase the set point eradicate the virus, this response cause symptoms of fever.
- Some Alveolar type 1 cells are also destroyed in the whole action causing cough symptoms
- At extreme level SIRS(systemic inflammatory response syndrome) will occur, that lead to MODS (multiple organ dysfunction syndrome) or septic shock.
- Uncomplicated (mild) Illness, Moderate Pneumonia, Severe Pneumonia, ARDS (Acute Respiratory Distress Syndrome) and sepsis are common conditions associated with COVID-19. However some Cytokines and other immune cells attract neutrophils to the site of viral infection. The neutrophils kills some viral particles by secreting ROS and proteases [57].

10. TREATMENT AND THERAPIES

There is no vaccine and no specific available antiviral drug for the treatment of COVID-19. However oxygen therapy is given in severe COVID-19 infection, while in respiratory failure, the mechanical ventilation may be necessary. WHO released guidelines in January 2020, and addressed that how to recognize and treat the patients with severe SARS and how to prevent and control the infection; strategies about monitoring and early supportive therapy; a guideline for laboratory diagnosis; management for respiratory failure, ARDS and septic shock, prevention of complications, treatments; and considerations for pregnant patients. Here we report only those strategies and guidelines, which are necessary to treat or address respiratory failure, which includes HFNO (high flow nasal oxygen) or NIV and protective mechanical ventilation.

10.1: Guidelines for protective mechanical ventilation

- Special precautionary measures are necessary to adapt during protective mechanical ventilation.
- An expert operator should performed all the procedure carefully having personal protective equipment such as mask (N95), disposable socks and gloves, gown, long sleeves lab coat and eye goggles.
- Continuous positive airway pressure method should be used for pre-oxygenation (100% O2 for 5 minutes).
- Maintain adequate exchange of heat and moisture among the mask and ventilation balloon or between the fan circuit and mask.
- Lower tidal volumes and inspiratory pressures must be maintained for mechanical ventilation, Pplat< 28 to 30 cm H2O must be achieved.

- To prevent the loss of PEEP, disconnections of the ventilator must be avoided.

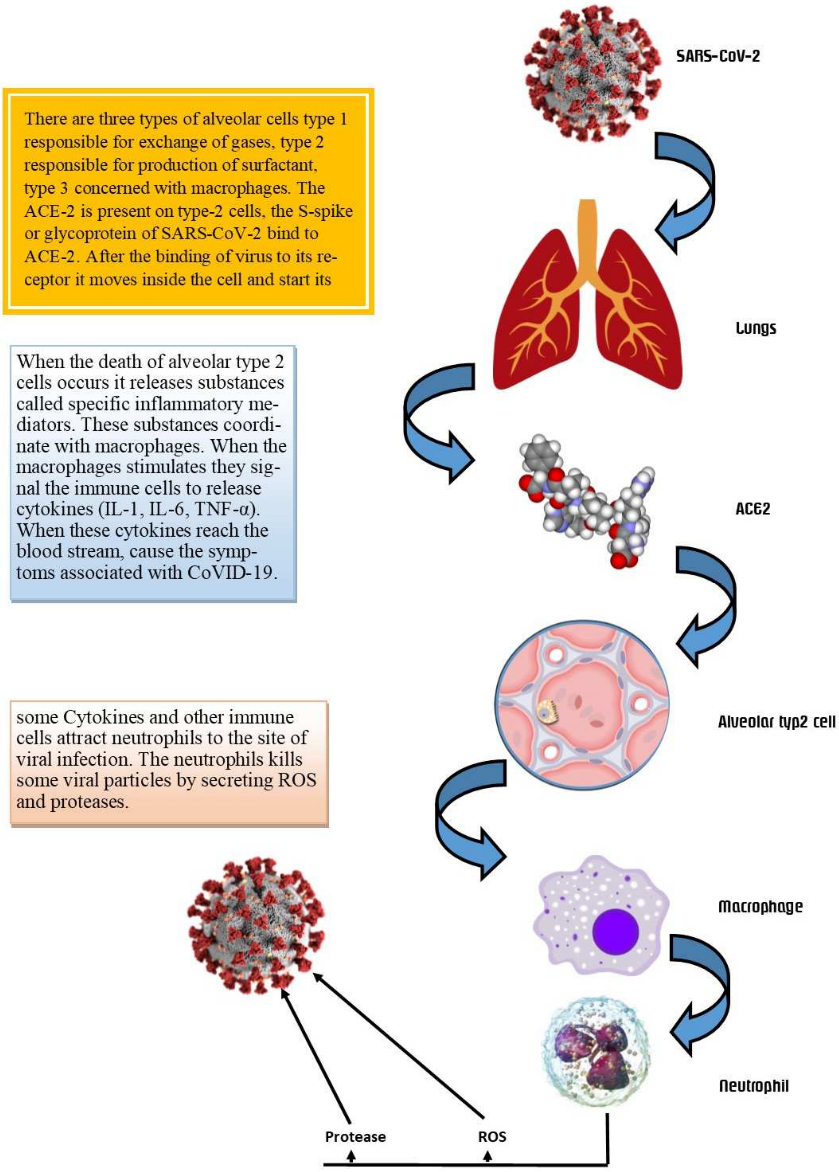


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Figure 5: Immune Response to SARS-CoV-2

10.2: Non-invasive ventilation or high-flow nasal oxygen

- Must be performed by experts having good approaches with good interface fittings of systems and do not create widespread dispersion of exhaled air, to reduce the risk of airborne transmission [58].
- In respiratory failure (non-severe), the non-invasive techniques can be recommended.
- Preference must be given to mechanical ventilation instead of NIV, if the condition does not improve or even get more worsen within a 1–2 hours.

11. OTHER AVAILABLE THERAPIES FOR COVID-19

Systemic corticosteroids are not recommended to cure viral pneumonia or ARDS, according to WHO authors the corticosteroids are less effective and give more possible harm. Patients of COVID-19 with associated lung injury were more likely to be harmed by the addition of corticosteroids to their regimen. Patients were given corticosteroids were more likely to require mechanical ventilation [59]. So it must be avoided. Moreover, some centers recommend the use of antibiotics but its inappropriate use should be avoided.

- Lopinavir/ritonavir both are protease inhibitors combine used for HIV. Lopinavir is an antiviral agent while ritonavir inhibit the metabolism of lopinavir, thus increasing its efficacy. This combination have worked against SARS-CoV-1and functions synergistically with ribavirin [60]. Several approaches have been made to use this combination against SARS-CoV-2 and it is found effective, but still there is no antiviral treatments, approved by the FDA,
- Chloroquine, Hydroxychloroquine, Alpha-interferon, Azithromycin, Tocilizumab and COVID-19 convalescent plasma investigated and found effective against SARS-CoV-2 [61] but still there is no emendation from FDA.
- Remdesivir is RNA polymerase inhibitor effective against Ebola and Marburg viral infections [62]. Remdesivir tested positively in a rhesus monkey model of MERS infection [63] and now against SARS-CoV-2, it is found effective [64].
- In Italy, a great investigation was done on using of tolicizumab against COVID-19. Tolicizumab is a humanized IgG1 monoclonal antibody, to target the IL-6 receptor. **Table 1.**

Table 1: Available treatment for COVID-19

Drug	Classification	Mechanism of action against SARS-CoV-2
Lopinavir	HIV Protease Inhibitor	Suppress coronavirus replication by binding to enzyme M^{pro}
Chloroquine	Antimalarial	ACE2 cellular receptor inhibition, inhibition of viral enzymes etc
Hydroxychloroquine	Antimalarial	inhibition of viral enzymes, virus assembly, fusion of the virus etc
Azithromycin	Macrolide Antibacterial	Inhibition of mucus hypersecretion, decreased production of ROS, accelerating neutrophil apoptosis, and blocking the activation of nuclear TF.
Remdesivir	Nucleoside Analogue	Inhibitor of RNA-dependent RNA polymerases (RdRps)
Tocilizumab	Interleukin-6 (IL-6) Receptor-Inhibiting Monoclonal Antibody	Inhibits IL-6-mediated signaling by competitively binding to both soluble and membrane-bound IL-6 receptors.

12. VACCINE

Still there is no vaccine available for SARS-CoV2 but scientist around the globe are working on different strategies for developing vaccine. Though, there are some vaccines under trial against SARS-CoV2 as the United States National institute of allergy and infectious diseases have prepared mRNA based vaccine [65] and INO-4800-DNA vaccine will be shortly available for human testing [66].Chinese CDC are also at work to produce an inactivated virus vaccine [67, 68].Many companies are working to develop the vaccine for Covid-19, and by now they are in phase 1 trial. But after trails, it will take almost 6-12 months to commercialize.

13. CONCLUSION

The Wuhan seafood market is said to be the origination point of SARS-CoV2. Up to date 199 countries are affected. The reason for the quick spreading and infection was DNA recombination and spike glycoprotein. Phylogenetically SARS-CoV2 resembles the other SARS-coronaviruses. There is still no treatments available for human coronavirus, although until now scientists have developed the relaxing and therapeutic plans to handle the SARS-CoV2. The already available antivirals are being used in combination therapy or alone to combat the effects of SARS-CoV2. Remdesivir, Lopinavir, Ritonavir, and Oseltamivir are believed to jam the infectivity of COVID-19 in infected individuals. The high rate of transmission of virus is believed to be the result of homologous recombination at S protein of receptor binding domain region as well as by the individuals who travels from the infected areas and no screening measurements for the travelers. It is the need of time now that antiviral drugs and vaccines should be developed and planned for coronaviruses in such a way that it should be used also against future epidemics. Many companies are working to develop the vaccine for Covid-19, but after trails, it will take almost 6-12 months to commercialize. World should now focus/ think on implementing the ban on the use of wild animals and birds as a source of food. Mostly in developing countries, PCR is used for testing, which is costly as well time consuming, so developing of accurate and rapid diagnostic kits for the detection of Covid-19 is the need of hour.

ACKNOWLEDMENTS

The authors acknowledge the professor at Department of Microbiology, Hazara University, Mansehra, Pakistan for guidance and support to accomplish this review article.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

AUTHORS CONTRIBUTIONS

Sayed Ali Raza Shah as a first author contributes to cover the collection, compilation and interpretation of data. Abdullah contributes to cover the figures, tables and setting up of data. S. Yousaf Shah contributes in providing the data regarding the ongoing trials, therapies and treatment. Atif Hameed contributes in proof reading and language checking. Farhana Maqbool contributes in data interpretation and providing the latest information regarding the current issue of Covid-19 pandemic.

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