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## COVID-19: A REVIEW

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### **Abstract:**

The coronavirus disease 2019 (COVID-19) pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has emerged as a significant global health crisis, challenging healthcare systems, economies, and societies worldwide. In this comprehensive review, we elucidate the epidemiology, transmission dynamics, clinical manifestations, and pathogenesis of COVID-19. We summarize the current understanding of the virus-host interaction, immune response, and viral pathogenic mechanisms underlying the disease severity spectrum, ranging from asymptomatic infection to severe pneumonia and acute respiratory distress syndrome (ARDS). Furthermore, we discuss diagnostic modalities, therapeutic interventions, vaccine development efforts, and public health strategies implemented to control the spread of the virus. This review aims to provide a holistic perspective on COVID-19, highlighting the urgent need for continued research and global collaboration to mitigate the ongoing pandemic and prepare for future emerging infectious diseases..

**Keywords:** ARDS., SARS-CoV-2

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## **INTRODUCTION**

The coronavirus disease 2019 (COVID-19) pandemic, caused by the novel coronavirus SARS-CoV-2, has brought unprecedented challenges to global health, economies, and societies. First identified in December 2019 in Wuhan, China, COVID-19 quickly spread across the globe, leading to widespread illness, mortality, and significant disruptions to daily life. COVID-19 belongs to the family of coronaviruses, which are enveloped RNA viruses known for causing respiratory and gastrointestinal infections in humans and other mammals. SARS-CoV-2 is highly contagious, primarily transmitted

through respiratory droplets when an infected person coughs, sneezes, or talks, although airborne transmission and fomite transmission are also possible. The clinical spectrum of COVID-19 ranges from asymptomatic infection to severe respiratory illness and death, with older adults and those with underlying health conditions at higher risk for severe outcomes. Common symptoms include fever, cough, shortness of breath, fatigue, and loss of taste or smell, although the disease can also present with a wide range of other symptoms and complications. Efforts to control the spread of COVID-19 have included public health

measures such as social distancing, mask-wearing, hand hygiene, travel restrictions, and quarantine protocols. Additionally, rapid diagnostic testing, contact tracing, isolation of cases, and vaccination campaigns have played crucial roles in reducing transmission and mitigating the impact of the pandemic. Despite significant progress in understanding and combating COVID-19, challenges remain, including emerging variants of the virus, vaccine distribution disparities, vaccine hesitancy, and unequal access to healthcare resources.

### **CLASSIFICATIONS:-**

Coronaviruses (CoVs) are a family of enveloped RNA viruses belonging to the order Nidovirales and the family Coronaviridae.

They are classified into four genera: Alphacoronavirus ( $\alpha$ -CoV): Includes viruses that primarily infect mammals, such as humans, bats, pigs, and carnivores. Examples include Human coronavirus 229E (HCoV-229E) and Human coronavirus NL63 (HCoV-NL63). Betacorona

virus ( $\beta$ -CoV): Includes viruses that infect mammals, including humans, bats, rodents, and other animals. Notable members include Severe Acute Respiratory Syndrome coronavirus (SARS-CoV), Middle East Respiratory Syndrome coronavirus (MERS-CoV), and SARS-CoV-2 (the virus responsible for COVID-19). Gammacoronavirus ( $\gamma$ -CoV): Primarily infects birds, although some strains have been found in mammals. Examples include Avian infectious bronchitis virus (IBV) and Beluga whale coronavirus SW1. Deltacoronavirus ( $\delta$ -CoV): Infects both birds and mammals. Examples include Porcine coronavirus HKU15 and Bulbul coronavirus HKU11. Coronaviruses are characterized by their large, positive-sense single-stranded RNA genomes and distinctive club-shaped spike proteins protruding from their surface,

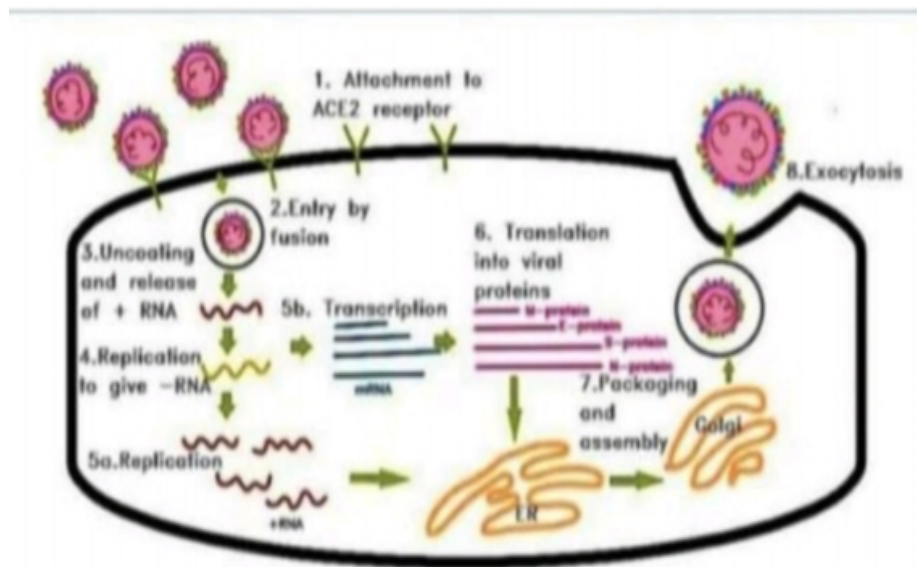
giving them a crown-like appearance under electron microscopy, hence the name "coronavirus." These spike proteins play a crucial role in viral entry into host cells by binding to specific cellular receptors. SARS-CoV-2, the virus responsible for the COVID-19 pandemic, is a betacoronavirus closely related to SARS-CoV and shares similar genomic and structural features. Understanding the classification of coronaviruses is essential for studying their biology, epidemiology, pathogenesis, and the development of diagnostics, therapeutics, and vaccines.

### **MECHANISM OF ACTION**

The mechanism of action of coronaviruses, including SARS-CoV-2, involves several key steps: Attachment and Entry: Coronaviruses primarily infect respiratory epithelial cells. The initial step involves the spike (S) protein on the virus surface binding to specific cellular receptors on the host cell. For SARS-CoV-2, the receptor is angiotensin-converting enzyme 2 (ACE2), which is expressed on the surface of various cells, including those in the lungs, heart, kidneys, and intestines. After attachment, the virus enters the host cell through fusion of the viral membrane with the host cell membrane, facilitated by proteolytic cleavage of the S protein by host cell proteases. Genome Replication and Transcription: Once inside the host cell, the viral RNA genome is released into the cytoplasm. The viral RNA serves as a template for the translation of viral replicase-transcriptase polyproteins. These polyproteins are proteolytically processed into individual non-structural proteins (nsps) by viral and host proteases. The nsps assemble into replication-transcription complexes (RTCs), which generate new viral RNA genomes and subgenomic RNAs through a process of RNA replication and transcription. Protein Synthesis and

**Processing:** Subgenomic RNAs are translated into viral structural and accessory proteins, including the S, envelope (E), membrane (M), and nucleocapsid (N) proteins, as well as various accessory proteins. These proteins play essential roles in virion assembly, viral particle budding, and immune evasion. **Assembly and Budding:** Viral genomic RNA, together with the nucleocapsid protein, is encapsulated by the viral envelope, which contains the viral membrane (M) and envelope (E) proteins. The assembled viral nucleocapsid buds into the endoplasmic reticulum-Golgi

intermediate compartment (ERGIC), acquiring its envelope, and is then released from the host cell through exocytosis. **Immune Evasion:** Coronaviruses have evolved various mechanisms to evade host immune responses. These include the inhibition of type I interferon (IFN) production and signaling, modulation of antigen presentation, and interference with innate and adaptive immune responses. Additionally, the high mutation rate of RNA viruses allows for the emergence of viral variants that may evade host immune surveillance.



### HISTORY OF CORONAVIRUS

The history of COVID-19 can be traced back to late 2019 when cases of a mysterious pneumonia-like illness were reported in the city of Wuhan, Hubei province, China. Here's a timeline highlighting key events in the history of COVID-19: December 2019: Cases of pneumonia of unknown cause detected in Wuhan, China, are reported to the World Health Organization (WHO). January 2020: Chinese authorities identify a novel coronavirus, initially named 2019-nCoV, as the cause of the outbreak. The virus is

officially named "Severe Acute Respiratory Syndrome Coronavirus 2" (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV). The outbreak is declared a Public Health Emergency of International Concern (PHEIC) by the WHO. Cases are reported in multiple countries, leading to the declaration of a global pandemic on March 11, 2020. February 2020: The WHO releases a formal name for the disease caused by SARS-CoV-2: "Coronavirus Disease 2019" (COVID-19). Countries implement various measures to contain the spread of the virus,

including travel restrictions, quarantine protocols, and social distancing measures. March 2020: COVID-19 cases continue to rise globally, with outbreaks occurring in Europe, North America, and other regions. Many countries impose lockdowns and restrictions on movement to slow the spread of the virus. Healthcare systems face significant challenges due to the surge in cases, leading to shortages of medical supplies and hospital beds. April - December 2020: Efforts to develop diagnostics, treatments, and vaccines for COVID-19 accelerate globally. Clinical trials for

potential treatments, such as remdesivir, dexamethasone, and monoclonal antibodies, are conducted. Multiple vaccines against COVID-19 are developed and authorized for emergency use, including those developed by Pfizer-BioNTech, Moderna, and AstraZeneca. Vaccination campaigns begin in many countries, prioritizing healthcare workers, the elderly, and other high-risk groups. 2021 - Present: COVID-19 vaccination efforts continue, although challenges related to vaccine distribution, hesitancy, and inequity persist.



### **DIAGNOSIS:-**

Diagnosis of COVID-19 involves several methods, including clinical evaluation, laboratory testing, and imaging studies. Here are the primary diagnostic approaches for COVID-19: Clinical Evaluation: Healthcare providers assess symptoms such as fever, cough, shortness of breath, fatigue, muscle or body aches, loss of taste or smell, sore throat, congestion, nausea, or diarrhea. They also consider risk factors such as recent travel to areas with high COVID-19 transmission or close contact with confirmed

cases. Laboratory Testing: Polymerase Chain Reaction (PCR) Testing: PCR testing is the gold standard for diagnosing active COVID-19 infection. It detects the genetic material (RNA) of the SARS-CoV-2 virus in respiratory specimens such as nasopharyngeal or oropharyngeal swabs. PCR tests are highly sensitive and specific but may take several hours to yield results. Antigen Testing: Antigen tests detect specific proteins from the SARS-CoV-2 virus in respiratory specimens. They provide rapid results within minutes but may be less sensitive than PCR tests, particularly in

asymptomatic individuals or during the early stages of infection. Serology (Antibody) Testing: Serology tests detect antibodies produced by the immune system in response to SARS-CoV-2 infection. They are used to identify past infection but are not suitable for diagnosing acute COVID-19 cases. Serology tests may also help assess population-level immunity and vaccine effectiveness. Imaging Studies: Chest X-ray or Computed Tomography (CT) Scan: Imaging studies may show characteristic findings such as ground-glass opacities, consolidation, or bilateral pulmonary infiltrates suggestive of COVID-19 pneumonia.

### **TREATMENT**

The treatment of COVID-19 depends on the severity of the illness and may involve supportive care, antiviral therapy, anti-inflammatory agents, and oxygen therapy. Here are the main components of COVID-19 treatment: Supportive Care: For individuals with mild symptoms, supportive care at home may be sufficient. This includes rest, hydration, and over-the-counter medications to relieve symptoms such as fever, cough, and body aches. Patients with moderate to severe symptoms, such as difficulty breathing or persistent chest pain, may require hospitalization for close monitoring and supportive interventions. Oxygen Therapy: Patients with severe COVID-19 pneumonia or acute respiratory distress syndrome (ARDS) may require supplemental oxygen therapy to maintain adequate oxygenation levels. Oxygen can be delivered through nasal cannula, face mask, or mechanical ventilation in the intensive care unit (ICU). Antiviral Therapy: Antiviral drugs such as remdesivir may be used to inhibit viral replication and reduce the duration of illness

in hospitalized patients with severe COVID-19. Remdesivir is administered intravenously and is most effective when initiated early in the course of the disease. Other antiviral agents, including monoclonal antibodies such as casirivimab/imdevimab and sotrovimab, have received Emergency Use Authorization (EUA) for the treatment of mild to moderate COVID-19 in high-risk individuals. Anti-inflammatory Agents: Corticosteroids such as dexamethasone have been shown to reduce mortality and improve outcomes in hospitalized patients with severe COVID-19 and hypoxemia. Corticosteroids help mitigate the inflammatory response and cytokine storm associated with severe disease. Other immunomodulatory drugs, including tocilizumab (an IL-6 receptor antagonist) and baricitinib (a Janus kinase inhibitor), may be considered in certain patients with severe COVID-19 and elevated inflammatory markers. Anticoagulation: COVID-19 is associated with an increased risk of blood clotting and thromboembolic events. Anticoagulant therapy with drugs such as heparin or low-molecular-weight heparin (LMWH) may be administered to prevent or treat thrombosis in hospitalized patients, particularly those with severe disease or high D-dimer levels. Monoclonal Antibodies: Monoclonal antibodies targeting the SARS-CoV-2 spike protein, such as bamlanivimab/etesevimab and casirivimab/imdevimab, may be used for post-exposure prophylaxis or treatment of mild to moderate COVID-19 in high-risk individuals, including those with immunocompromising conditions or chronic medical conditions. Treatment protocols for COVID-19 continue to evolve based on emerging evidence, clinical experience, and the availability of new therapeutics.



### **REFERENCES:-**

- Xu X, Chen P., Wang J et al (2020) Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. *Sci China Life Sci* 63:457-460  
<https://doi.org/10.1007/s11427-020-1637-5>
- Farnoosh G, Alishiri G, Zijoud SRH, et al (2020) Understanding the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease (COVID-19) based on available evidence a narrative review. *J Mil Med* 22:1-11.  
<https://doi.org/10.30491/JMM.22.1.1>
- Chan JF-W, To KK-W, Chen H, Yuen K-Y (2015) Cross-species transmission and emergence of novel viruses from birds. *Curr Opin Virol* 10:63-69,  
<https://doi.org/10.1016/j.coviro.2015.01.006>
- He J, Tao H, Yan Y et al (2020) Molecular mechanism of evolution and human infection with SARS-CoV-2. *Viruses* 12:428.  
<https://doi.org/10.3390/v12040428>
- Guan W. Ni Z, Hu Y et al (2020) Clinical characteristics of coronavirus disease 2019 in China *N Engl J Med* 382:1708-1720.  
<https://doi.org/10.1056/NEJMoa2002032>
- Heymann DL (2020) Data sharing and outbreaks: best practice exemplified. *Lancet* 395:469-470.  
[https://doi.org/10.1016/S0140-6736\(20\)30184-7](https://doi.org/10.1016/S0140-6736(20)30184-7)
- Liu X, Wang X-J (2020) Potential inhibitors against 2019-nCoV coronavirus M protease from clinically approved medicines. *J Genet Genomics* 47:119-121.  
<https://doi.org/10.1016/j.jgg.2020.02.001>
- Yan R. Zhang Y, Li Y, et al (2020) Structural basis for the recognition of SARS-CoV-2 by full-length human ACE2. *Science* (80-) 367:1444-1448,  
<https://doi.org/10.1126/science.abb2762>
- Ji W, Wang W, Zhao X et al (2020) Cross-species transmission of the newly identified coronavirus 2019-nCoV. *J Med Virol* 92:433-440. syndrome. *Lancet*
- Zumla A, Hui DS, Perlman S (2015) Middle East respiratory 386:995-1007.  
[https://doi.org/10.1016/S0140-6736\(15\)60454-8](https://doi.org/10.1016/S0140-6736(15)60454-8)
- Read R (2020) Flawed methods in "COVID-19: attacks the 1-beta chain of hemoglobin and captures the porphyrin to inhibit human heme metabolism."

- <https://doi.org/10.26434/chemrxiv.11938173>
12. Boccia S, Ricciardi W, Ioannidis JPA (2020) What other countries can learn from Italy during the COVID-19 pandemic. *JAMA Intern Med* 180:927. <https://doi.org/10.1001/jamainternmed.2020.1447>
  13. Zhu N, Zhang D, Wang W et al (2020) A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 382:727-733. <https://doi.org/10.1056/nejmoa2001017>
  14. Lu R, Zhao X, Li J et al (2020) Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet* 395:565-574. [https://doi.org/10.1016/S0140-6736\(20\)30251-8](https://doi.org/10.1016/S0140-6736(20)30251-8)
  15. Goh GKM (2017) Viral shapeshifters: strange behaviors of HIV and other viruses. Simplicity Research Institute.
  16. Goh G, Dunker A, Foster J, Uversky V (2019) HIV vaccine mystery and viral shell disorder. *Biomolecules* 9:178.
  17. Huang C, Wang Y, Li X et al (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 395:497-506.
  18. Zhou P, Yang X Lou, Wang XG, et al (2020) Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin, bioRxiv.
  19. He J, Tao H, Yan Y, et al (2020) Molecular mechanism of evolution and human infection with the novel coronavirus (2019-nCoV). bioRxiv 2020.02.17.952903.
  20. Ding N, Zhao K, Lan Y et al (2017) Induction of atypical autophagy by porcine hemagglutinating encephalomyelitis virus contributes to viral replication. *Front Cell Infect Microbiol* 7:56.
  21. Segars J, Katler Q, McQueen DB et al (2020) Prior and novel coronaviruses, coronavirus disease 2019 (COVID-19), and human reproduction: what is known? *Fertil Steril* 113:1140-1149.
  22. Kearney JE (2020) Chloroquine as a potential treatment and prevention measure for the 2019 novel coronavirus: a review. *J Chem Inf Model* 53:1689-1699
  23. Li X, Geng M, Peng Y et al (2020) Molecular immune pathogenesis and diagnosis of COVID-19. *J Pharm Anal* 10:102-108. <https://doi.org/10.1016/j.jpha.2020.02.002>
  24. Gundlapally J, Kumar A, Kashyap A, et al (2020) In search of novel coronavirus 19 therapeutic targets. *HELIX* 10:01-08. <https://doi.org/10.29042/2020-10-2-01-08>