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Review Article

Coronavirus Pandemic: Emergence, Transmission, Preventive Measures and Management

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A B S T R A C T

Coronavirus is found in animals and, rarely, can be transmitted from animals to humans and then spread person to person. An occurrence of the coronavirus infection (COVID-19) in China is causing global concern. It came from a seafood and meat market in Wuhan, China, in December 2019. It has since spread to many countries around the world including India. World Health Organization (WHO) declared novel coronavirus eruption a "pandemic" on March 11th, 2020. Patients infected with the COVID-19 virus will experience mild to moderate respiratory illness. Older people and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. Prevent spread of infection by washing hands or using an alcohol based rub frequently and not touching face. This virus transmits primarily through droplets of saliva or discharge from the nose when adiseased person coughs or sneezes, so it's important to cover face by mask and coughing into a flexed elbow at public places. Currently there are no specific vaccines or treatments for COVID-19. In this review, we summarize recent information about the emergence, tansmission, preventive measures and therapeutic options available now.

Key words: Virus, COVID-19, Pandemic, Preventive Measures

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INTRODUCTION:

Coronaviruses (CoVs) are enveloped, positive-sense, single-stranded RNA viruses that belong to the subfamily Coronavirinae, family Coronavirdiae, order Nidovirales.[1]Since December 2019, an increasing number of cases of novel coronavirus infection have been identified in Wuhan, a large city of China.[2]In recent days, infections have been identified in other Chinese cities and many countries around the world.[3] On February 11, 2020, the World Health Organization (WHO) announced the disease caused by this novel virus as coronavirus disease-2019 (COVID-19).It is a highly diffusible virus, spread by droplets, direct contact and contact with infected objects, whose time of incubation is 1 to 14 days and is shed also by asymptomatic infected people.[4] Most of the infected people only show mild-to-moderate respiratory symptoms or nothing at all. Only 5-10% of the infected individuals show the complete severe respiratory syndrome called COVID-19[5].

BACKGROUND OF EMERGENCE COVID-19: In 2003, the Chinese population was infected with a virus causing Severe Acute Respiratory Syndrome (SARS) in Guangdong, China. The virus was confirmed as a member of the Beta coronavirus subgroup and was named SARS-CoV.[6, 7]A decade later in 2012; a couple of Saudi Arabian nationals were diagnosed to be infected with another coronavirus. The detected virus was confirmed as a member of coronaviruses and named as the Middle East Respiratory Syndrome Coronavirus (MERS-CoV).[8]

Recently at the end of 2019, Wuhan an emerging business hub of China experienced an outbreak of a novel coronavirus that killed more than eighteen hundred and infected over seventy thousand individuals within the first fifty days of the epidemic. This virus was reported to be a member of the group of coronaviruses. The novel virus was named as Wuhan coronavirus or 2019 novel coronavirus (2019-nCov) by the Chinese researchers. The International Committee on Taxonomy of Viruses (ICTV) named the virus as SARS-CoV-2 and the disease as COVID-19. [9, 10]

The outbreak was initiated from the Hunan seafood market in Wuhan city of China and rapidly infected more than 50 peoples. The live animals are frequently sold at the Hunan seafood market such as bats, frogs, snakes, birds, marmots and rabbits.[11]However, further investigations revealed that some individuals contracted the infection even with no record of visiting the seafood market. These observations indicated a human to the human spreading capability of this virus, which was subsequently reported in more than 100 countries in the world.[12, 13]

History

Coronavirus disease was first described in 1931, with the first coronavirus (HCoV-229E) isolated from humans in 1965. Until the outbreak of severe acute respiratory syndrome in late 2002, only two human coronaviruses (HCoV) were known – HCoV-229E and HCoV-OC43. Once the SARS coronavirus (SARS-CoV) had been identified, two further human coronaviruses were identified. Three groups of coronaviruses exist: group 1 (HCoV-229E and HCoV-NL63), group 2 (HCoVOC43 and HCoV-HKU1), group 3 (no human CoVs as yet). SARS-CoV is an outlier to all three groups, although some place it in

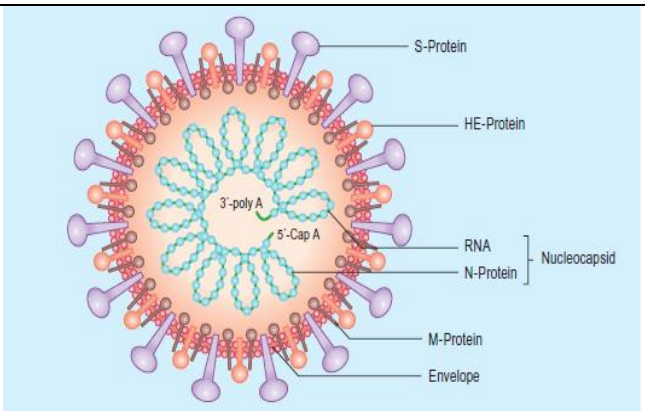
Coronaviruses are classified into three groups, initially based on antigenic relationships of the spike (S), membrane (M) and nucleocapsid (N) proteins and now re-enforced by viral genetic phylogeny (Box 57.1). The HCoVs 229E and NL63 are group 1 corona viruses, while OC43, HKU-1 and SARS coronaviruses are classified in group 2. Group 3 coronaviruses are found in avian species. Genetic recombination readily occurs between members of the same and of different corona virus groups providing opportunity for increased genetic diversity.

Table: 1 Classification of corona-viruses

Group 1	**Group 2**	**Group 3**
• Human coronavirus (HCoV) 229E	• Human coronavirus (HCoV) 229E	• Avian infectious bronchitis virus (IBV)
• Human coronavirus NL63	• Human coronavirus NL63	• Turkey coronavirus (TcoV)
• Porcine transmissible gastro-enteritis virus (TGEV)	• Porcine transmissible gastro-enteritis virus (TGEV)	
• Canine coronavirus (CCoV)	• Canine coronavirus (CCoV)	
• Feline infectious peritonitis virus (FIPV)	• Feline infectious peritonitis virus (FIPV)	
• Porcine epidemic diarrhoea virus (PEDV)	• Porcine epidemic diarrhoea virus (PEDV)	
• Bat coronaviruses (e.g. 1A, HKU2)	• Bat coronaviruses (e.g. 1A, HKU2)	
	• Human coronavirus (HCoV) 229E	
	• Human coronavirus NL63	

Table: 2 Classification of corona-viruses

Order - Nidovirales	
Family - Coronaviridae	
Sub Family - Coronavirinae	
Genus	**Species**
Coronavirus	Human coronavirus 229E
	Human coronavirus OC43
	Human coronavirus NL63
	Human coronavirus HKU1
	Severe acute respiratory syndrome coronavirus
	Human enteric coronavirus
Torovirus	Human torovirus

Structure of Corona virus	
Positive sense single stranded RNA Genome ~30 000 nucleotides long Pleomorphic viruses 80 × 160 nm diameter, with 12–24 nm surface projections (spikes) that cause the corona (Latin: crown) appearance Major proteins: S – spike E – envelope M – membrane N – nucleocapsid	

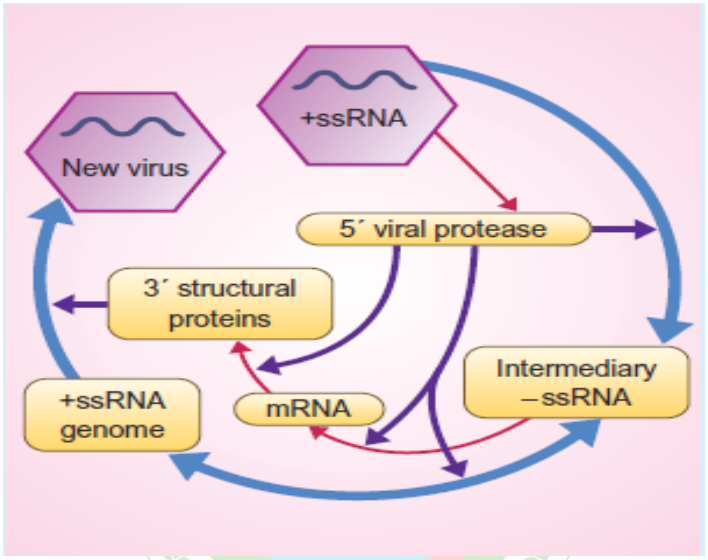


Figure: 2 Replication cycle of coronaviruses.

TRANSMISSION:

Several studies suggested that bats are the natural reservoir of a wide variety of CoVs, including SARS-CoV-like and MERS-CoV-like viruses.[14]Upon virus genome sequencing, the COVID-19 was analyzed throughout the genome to Bat CoV RaTG13 and showed 96.2% overall genome sequence identity, [15]suggesting that bat CoV and human SARS-CoV-2 might share the same ancestor, although bats are not available for sale in Hunan seafood market in Wuhan city of China. Besides, protein sequences alignment and phylogenetic analysis[16] showed that similar residues of receptor were observed in many species, which provided more possibility of alternative intermediate hosts, such as turtles, pangolin and snacks.

Multiple reports have confirmed human-to-human transmission of the COVID-19.[17] Human-to-human transmission occurs mainly between family members, including relatives and friends who intimately contacted with patients or incubation carriers.[18]It is reported that 31.3% of patients recent travelled to Wuhan and 72.3% of patients contacting with people from Wuhan among the patients of non-residents of Wuhan.[19]

Transmission occur mainly is through droplet infection (respiratory secretions) and close person-to-person contact. It can also spread through sweat, stool, urine, and respiratory secretions[20]. When virus enters into the body, it binds to the primary target cells such as enterocytes and pneumocytes, thereby establishing a cycle of infection and replication. Other target cells of CoV are epithelial renal tubules, tubular epithelial cells of kidney, immune cells, and cerebral neuronal cells.[21]

PREVENTIVE MEASURES:

In the aspect of the hastily communicable disease and a large number of infected people, there is an imperative necessity for effective prevention and control measures such as controlling of infection source, blocking the transmission route and protect susceptible population. Infection prevention guidance or COVID-19 is based upon guidance previously developed for MERS and SARS as well as interim guidelines provided by the WHO.[22, 23]

- Cover mouth and nose with napkin or towel when coughing or sneezing.
- Try not to touch mouth, nose, or eyes before cleaning hands thoroughly after returning from public places.
- Use an alcohol-based hand sanitizer that contains at least 60% alcohol if soap and water are not available.
- Avoid transport and stay at home.
- Wear masks when going to crowded places

- Boost immunity by balanced diet, adequate exercise, regular rest as well as maintaining emotional stability and mental health.
- Air disinfection of cities and communities
- Blocking traffic and lockdown of cities
- Educate public about disease to reduce the anxiety and distress caused by misinformation
- High filtration masks such as N95 masks and protective clothing (goggles and gowns) should be used in hospitals where health-care workers are in direct contact with infected patients.
- Measures should include screening questions (including travel history)
- Isolate the suspected persons for the specified time period to minimize the progress of disease

MANAGEMENT:

Currently no favourable cure available, however, numerous compounds have been proven effective against SARS-CoV and MERS-CoV but have not been tested widely for newly emerged SARS-CoV-2[24]**.** Most treatment strategies focus on symptomatic management and supportive therapy only[25]**.**

In suspected patients viral testing should be initiated early for disease confirmation and symptomatic treatment initiated as needed.[26] Intravenous fluids should be used judiciously in patients without overt signs of fluid depletion as they may worsen oxygenation with increasing disease severity.In patients presenting with severe respiratory symptoms with radiographic findings, broad spectrum antibiotics should be administered.[27]

There are articles citing effectiveness of anti-HIV drugs: Ritonavir, [28]lopinavir, either alone or in combination with oseltamivir for current corona virus infection. [29]

Chloroquine has been used to treat malaria for many years with a mechanism that is not well understood against some viral infections[30].Several possible mechanisms are investigated: Chloroquine can inhibit pH-dependent steps of the replication of several viruses, with a potent effect on SARS-CoV infection and spread[31]. Moreover, chloroquine has immune modulatory effects, suppressing the production/release of TNF-α and IL-6.

It also works as a novel class of autophagy inhibitor[32], which may interfere with viral infection and replication. Several studies have found that chloroquine interfered with the glycosylation of cellular receptors of SARS-CoV and functioned at both entry and at post-entry stages of the COVID-19 infection in Vero E6 cells[33].

A combination of **Remdesivir and chloroquine** was proven to effectively inhibit the recently emerged SARS-CoV-2 in vitro but further experimental support and validation needed[34].

CONCLUSION:

COVID-19 is a contagious respiratory disease triggered by a newly virus SARS-CoV-2. People who have underlying medical conditions and those over 60 years old have a higher risk of developing severe disease and death. Common symptoms include: fever, tiredness**,** dry cough**,** shortness of breath**,** aches; very few people report diarrhoea, nausea or a runny nose. People with mild symptoms should self-isolate and inform to health department for advice on testing and recommendation. It is necessary to develop potential therapeutic strategies to prevent further epidemics and cure infected people. At present superlative prophylaxis accepted globally is social distancing and “stay home, stay safe” apart from taking other suggested safeguards.

- COVID 19 is an new disease caused by new Corona Virus, SARS- CoC-2
- Primarily, it is zoonotic disease-wild animals (bats, pangolin, camel, cattle etc.)
- COVID 19 is transmitted from bats and fomites
- Elderly and having co-morbidities are high risk
- Common symptoms including fever, dry cough and breathing difficulty
- RT-PCR is the confirmatory diagnostic test

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