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Review Article

Covid-19: Review on Worldwide Pandemic Outbreak

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Abstract Coronavirus are largest group of non-segmented, enveloped, zoonotic RNA viruses, characterised by crown-like spikes that project from their surface. Severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) are highly pathogenic coronavirus. It infects humans, non-humans and cause variety of diseases. CoVs mostly cause respiratory and gastrointestinal diseases from the common cold to more severe. Transmission may be symptomatic and asymptomatic. Human to human is the main driver of spreading COVID-19 infection. Various strategies are underworking to develop anti-drug or vaccines against COVID-19 pandemic. Different mitigation measures have been used to fight against (COVID-19).

Keywords: Disease, SARS, RNA, pandemic.

Introduction

Orthocoronavirinae or Coronavirinae is the scientific name of coronavirus. A novel Coronaviruses (COVID-19) are wide a group of viruses belong to the family Coronaviridae, order Nidovirales. Four different genera of CoVs, namely, Alphacoronavirus (?CoV), Betacoronavirus (?CoV), Deltacoronavirus (?CoV), and Gammacoronavirus (?CoV). The crown-like appearance of the viral particle due to the presence of spike glycoproteins on the envelope from which they were named after. Most of the deadly infectious diseases are infected by the viruses. COVIDs are single stranded, non-segmented, enveloped RNA viruses known to be responsible for a broad spectrum of diseases in various species. They infect a wide range of animals including cattle, horses, camels, cats, dogs, rodents, birds, bats, pigs, horses, whales, and humans. The coronavirus affecting the human population is referred to as human coronavirus (HCoVs).

It is considered a zoonotic virus. Severe acute respiratory syndrome coronavirus (SARS-CoV) emerged in 2002 and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012. The SARS-CoV-2 is 2019 novel coronavirus that currently causing a severe outbreak of disease termed as COVID-19 in China and many other countries, threatening to cause a global pandemic.

Structure of Coronavirus

The SARS-CoV is a betacoronavirus. It contains four major structural proteins: spike (S), envelope (E), membrane (M), and nucleocapsid (N) (Snijder et al., 2003). The S, M, and E proteins together form the envelope of the virus. The presence of M protein is the most abundant and it is responsible for the shape of the envelope. The E protein is the smallest structural protein. The RNA also serves as a template for in vitro translation of viral proteins (Leibowitz et al., 1982). The number of accessory proteins and their function is unique depending on the specific coronavirus (Fehr et al., 2015). The envelope glycoproteins are responsible for attachment to the host cell.

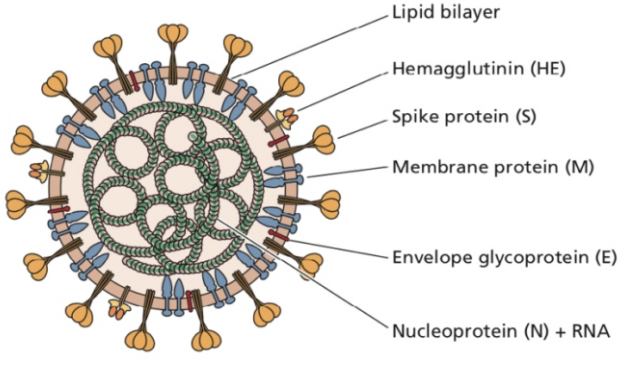

Figure 1 Structure of coronavirus

Genome Organisation

The genome of coronavirus is linear with positive-sense single-stranded RNA (+ssRNA) virus that has icosahedral nucleocapsids and replicate in the cytoplasm of host cell. Usually, the genome of RNA viruses is less than 10 kb length with 38% G + C content. Coronavirus genome size from 28-32 kb, (Lee et al., 1991) the largest among RNA viruses. The genome is polyadenylated at the 3? end and predicted to have 14 functional open reading frames (ORFs) (Rota et al., 2003). In terms of Whole genome sequence (WGS), SARS-CoV-2 is closer to the SARS-like bat coronavirus. Mutations are observed in NSP2 and NSP3 and the spike protein, that plays a great role in infectious capability and differentiation mechanism of SARS-CoV-2

The envelope glycoproteins are responsible for attachment to the host cell. Coronaviruses are divided into three serotypes: groups 1, group 2, and group 3 (Enjuanes et al., 2000). Group 2 coronaviruses contain a gene encoding hemagglutinin esterase (HE) that is homologous to the influenza C virus.

Types of Coronavirus

Based on symptoms, human coronavirus (HCoVs) is classified into two different strains. The common human coronavirus produces mild symptoms and rare coronavirus infection produce potentially severe symptoms.

Human coronaviruses produce mild symptoms

1. Human coronavirus 229E, alpha coronavirus (?-CoV)
2. Human coronavirus NL63, alpha coronavirus (?-CoV)
3. Human coronavirus OC43, beta coronavirus (?-CoV)
4. Human coronavirus HKU1, beta coronavirus (?-CoV)

Human Coronaviruses Produce Severe Symptoms

1. Middle East respiratory syndrome-related coronavirus (MERS-CoV), beta coronavirus (?-CoV)
2. Severe acute respiratory syndrome coronavirus (SARS-CoV), beta coronavirus (?-CoV)
3. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), beta coronavirus (?-CoV)

Symptomatic Transmission

The transmission of COVID-19 viral infection from a person who have signs or symptoms development.

Asymptomatic Transmission

The transmission of COVID-19 viral infection from a person who doesn't develop any signs or symptoms. The recent reported cases are truly asymptomatic.

Common Symptoms

After a coronavirus infection, the onset of symptoms takes 2-4 days or sometimes more. The most common symptoms of COVID-19 which leads from the minor infectious diseases to lethal effects.

1. Direct contact or Close contact
2. Contaminated surfaces or objects
3. Respiratory droplets
4. Cough
5. Watery diarrhoea
6. Sneezing
7. Breathlessness
8. Headache
9. Fever
10. Sore throat

Risk Assessment of Covid-19 Illness

- Covid-19 increase with increase in population age (People who are older have a higher risk of infection)
- Weakened immune system
- High blood pressure
- Type-2 Diabetes
- Pregnancy
- Cardiovascular disease
- Asthma
- Kidney disease & Lung disease

Life Cycle of Corona Virus

1. Attachment and entry into cell
2. Replicase protein expression
3. Replication and transcription
4. Assembly and release

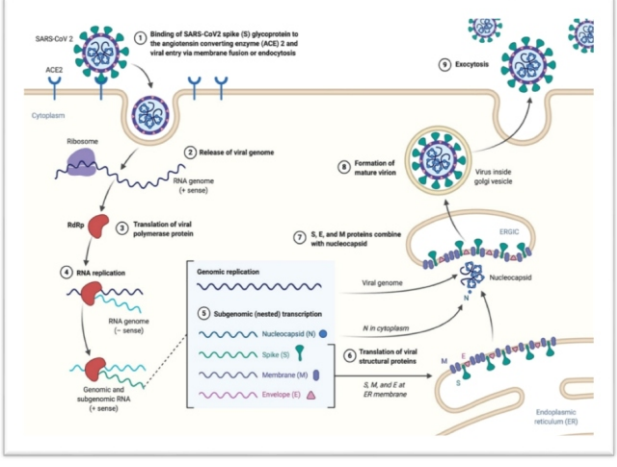

Figure 2 Life cycle of coronavirus

Route of Transmission

According to the CDC (Centre for Disease Control and Prevention), the complications are more common in the lower respiratory tract. Symptomatic people are the most common source of COVID-19 spread and remain asymptomatic people transmit the virus isolation is the best way to contain the epidemic. The new coronavirus has been responsible for millions of infections globally, causing hundreds of thousands of deaths. Basically COVID-19 virus is transmitted between people via respiratory droplets and contact routes (Liu et al., 2020). Droplet transmission is commonly occurring when a person comes in close contact with the person who has respiratory symptoms. Transmission may also occur through fomites in the immediate environment around the infected person. (ong et al., 2020). Initially, the outbreak began in china, coronavirus has been identified as a cause of large disease from bat origin (Zhu et al., 2020) and (Drosten et al. 2003). During pregnancy the possibility of transmission COVID-19 between mothers and infants (Chen et al., 2020). SARS-CoV has a higher degree of stability in the environment than other known human coronaviruses (Rabenau et al., 2005). Human-to-human transmission is the only plausible explanation for the magnitude of the on-going outbreak. (Imai et al., 2020). SARS-CoV primarily infects epithelial cells within the lung. The virus can enter macrophages and dendritic cells but only leads to an abortive infection. Sputum and saliva contain large amount of this virus. Coronaviruses are capable of adapting new environments through mutation and recombination.

Epidemiology

In 2012, Saudi Arabia was infected with coronavirus belongs to beta-coronavirus originating from camels as a primary host (Paden et al., 2018). The COVID-19 was first reported from the Wuhan, Hubei Province in the People's Republic of China as the cause of respiratory illness in December 2019, have rapidly assumed a global form (Kim et al., 2020). Human coronavirus (HCoVs) poses a major threat to global public health. At the beginning of the outbreak, china was reported as higher mortality rate. Before the coronavirus outbreak, Nipah virus and Hendra virus are two zoonotic coronaviruses were originated from bats in Asia and Africa. (Halpin et al., 2000 and Yob et al., 2001) As of February 28, 2020, there have been 83,704 confirmed cases of COVID-19 globally, with 2,859 deaths by WHO. Wuhan, the centre of the epidemic with 10 million population, is also an important centre in the spring festival transportation network. In March the World Health Organization (WHO) declared the outbreak a pandemic.

Table 1: The most affected to least affected country, number of cases and death of COVID - 19 outbreaks, according to Worldometer reports on July 5, 2020.

Countries	Cases	Deaths
United states of America	2,957,291	132,413
India	695,396	19,692
Germany	197,460	9,085
Canada	105,317	8,674
China	83,553	4,634
Australia	8,449	104
Hongkong	1,269	7
Taiwan	449	7

Prevention

Careful monitoring of COVID-19 by sterilised hospitals. High risk of nosocomial spread (Wang et al., 2019). Strategies and standard preventative measures imply to prevent the transmission of diseases.

- Hygiene, physical or social distancing, wearing mask reduce the rate of transmission.
- Using personal protective equipment (PPE) and washing hands is recommended best to prevent the spread of infection.
- CDC (Centre for Disease Control and Prevention) recommended using an alcohol-based hand sanitizer with at least 60% alcohol by volume when soap and water are not readily available.
- Surface cleaners are used to decontaminate the force of infection.
- Testing, quarantine and self-isolation are encouraged to reduce the rate of virus spread. Public gatherings should be avoided.
- Increasing health literacy in the population can improve the management and control of COVID-19 and even further global pandemics.

Vaccination

Different strategies are used to develop a vaccine against SARS-CoV can be effective. There is no available vaccine against COVID-19. To date, there are no anti-viral therapeutics that specifically target human coronaviruses, so treatments are only supportive. Despite this, several strategies are being developed for vaccine development for live-attenuated vaccines for instance by making gene rearrangements and knockouts in the nsp1 (Zust et al., 2007) or E proteins rearranging the 3? end of the genome

(De han et al., 2002) modifying the TRS sequences , or using mutant viruses with abnormally high mutation rates that significantly attenuate the virus (Graham et al., 2005). Cross-reactivities between antibodies against SARS-CoV and common CoVs have been observed (Che et al., 2005). CDC (Centre for Disease Control and Prevention) works on the development of an inactivated virus vaccine.

Diagnosis and Treatment

- The two commonly known Reverse real-time quantitative polymerase chain reaction (RT-qPCR) and high-throughput sequencing are the two nucleic acid detection technologies for SARS-CoV-2 (Lippi et al., 2005).
- Chest X-ray examination has low sensitivity of early diagnosis in lung changes.
- High resolution chest computed tomography (CT) used in detection of Covid-19 pneumonia. symptomatic, -immunoglobulin and respiratory treatment is necessary.

Conclusion

SARS-CoV-2 is a betacoronavirus is a zoonotic viral agent. bats seem to be a significant reservoir for these viruses. It is easily transmitted from animals to humans and cause severe disease. However, the researchers are working to develop ef?cient strategies to cope with the infection.

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