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Novel Coronavirus (COVID-19)-A Critical Review

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ABSTRACT

No one has even imagined that infection in the respiratory system in the form of pneumonia because of novel coronavirus (SARS-CoV2) in small town of China, Wuhan during end of December in the year 2019 will come out as an extremely communicable infection. The World Health Organization (WHO) has acknowledged the current epidemic as a threat to whole population worldwide. At present, still we have not reached the advanced levels of research to treat and control this contagious disease. Due to lack of information about the pathogenesis and proliferation pathways of this novel coronavirus, whole world is looking forward for its exact prophylaxis. On the basis of recent proofs provided by review and research articles from various genuine sources, we tried thoroughly to summarize the various factors regarding COVID-19 like its epidemiology, clinical characteristics, diagnosis, treatment and prevention. Through this review we have made an effort to present a common conceptual literature on coronavirus to help community to fight against this dangerous virus, and will hope that this review will be a source of reference to young researchers for advanced studies.



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laboratory reports of samples taken from infected patient confirmed this pneumonia as a novel coronavirus pneumonia (NCP), caused by the novel coronavirus (Huang *et al.*, 2020). Corona virus can be characterized as a sphere-shaped, single stranded, RNA enveloped and enclosed with club shaped glycoprotein. Corona viruses are classified into further four sub types such as alpha, beta, gamma and delta. Each of sub types of corona viruses has further many serotypes (Saif, 2004; Mailles *et al.*, 2013).

INTRODUCTION

When the whole world was celebrating the end of year in December 2019, an individual with symptoms of pneumonia was reported in small city of Hubei Province, Wuhan in the People's Republic of China (PRC). The key symptoms of this respiratory infection were quite comparable with the clinical features of normal viral pneumonia. Senior physicians from Centers for Disease Control (CDC) in China after critical investigation and on the basis of

Coronavirus (COV) is a positive-sense, single-stranded RNA virus having well defined structure found in a diameter of about 80-120nm. It was confirmed from previous researches that there were six types of Coronaviruses reported and responsible for severe contagious infections in individuals, following SARS-CoV and MERS-CoV another seventh type was SARS-CoV-2 that affected human population to greater extent (Zhu *et al.*, 2019). SARS-CoV-2, SARS-CoV and MERS-CoV shared the common type of classification i.e. β -coronavirus. The of SARS-CoV-2 and SARS is confirmed to have approximately 79% genome sequence homology, 2019-nCoV is

neither to the SARS which is similar to bat CoVs (MG772933) as compared to SARS-CoV (Wu *et al.*, 2020). Fascinatingly, for elevated connection of receptor-binding domain (RBD) in Spike-protein, many laboratories tests reveal that SARS-CoV-2 utilizes (ACE-2) angiotensin-converting enzyme-2 receptor, similarly in case of SARS-CoV (Hoffmann *et al.*, 2020). Coronavirus mostly finds its entry into the cell via spike-protein present on the surface of the target cell by recognizing the related receptor, ultimately resulting into contagious infection and even death. According to the structural model analysis, efficiency of binding angiotensin-converting enzyme-2 receptor by SARS-CoV-2 is 10 times greater than SARS-CoV, however greater than the threshold which is necessary to cause viral infection (Wrapp *et al.*, 2020).

Epidemiology and pathogenesis

First reported case of infection because of the COVID-19 epidemic was revealed on 12th of December in 2019 in which patient showed mysterious symptoms of pneumonia, followed by another more 27 individuals with viral pneumonia out of which seven cases were severe to handle, and on 31st December infection was declared. It was confirmed from the Etiologic investigations in the form of various laboratory tests done on infected patients admitted in hospitals with comparable viral infections that transmission of infection is from animals to humans. 22nd January, 2020 was the date when novel CoV has been confirmed infection which was developed from wild bats that basically belongs to Group 2 of beta-coronavirus which contains (SARS-CoV) Severe Acute Respiratory Syndrome Associated Coronavirus. Around 87317 individuals were confirmed as CoV infected during first week of March, 2020 has by the World health Organization (Casella *et al.*, 2020). Out of confirmed 87317 cases, around 2900 individuals lost their lives because of this contagious virus (Casella *et al.*, 2020). China was the epicenter and confirmed the larger ratio of viral infection and casualties, but later countries like Italy, Spain and super-power America is crossing the numbers. Around 59 Nations around the globe are now under trap of corona virus infection. Due to prevailing situations, illiteracy, ignorance and the ongoing character of this pandemic, it is definite that the number of patients and nations will keep on increasing with time. Roughly 10% of acute respiratory infections are considered to be occurred because of corona virus (Chen *et al.*, 2020b). People with normal immune response, infection of respiratory tract and flu with nasal discharge can be the clinically symptoms. Aged population and people with poor immu-

nity are more prone to this contagious infection and suffer from chronic infections of respiratory tracts. Corona viruses such as MERS-CoV, SARS-CoV, and SARS-CoV-2 which commonly invade human population are characterized by severe lungs infection with prominent pulmonary and extra-pulmonary features (Casella *et al.*, 2020).

Clinical features

There are multifarious clinical characteristics studied so far for the confirmation of COVID-19 infection, onset of the infection can be started from without any prominent symptom to particular acute respiratory distress syndrome followed by improper functioning of multiple organs. Most general clinical characters of this disease are fever (exceptions in some patients), cough and throat infection, severe body ache along with headache, restlessness, weakness, muscular pain and shortening of breath. From a group of patients, it is reported that patients normally suffers from pneumonia in first seven days followed by dysfunctioning of respiratory system and ultimately demise. Progress of this infection which ultimately results into casualty is connected to intense augmentation of inflammatory cytokines namely IL2, IL7, IL10, GCSF, IP10, MCP1, MIP1A, and TNF α (Chen *et al.*, 2020a).

Diagnosis

U.S. CDC has already framed tailored policies and protocols for combating this infection by proper medical care of patients with corona virus symptoms (Casella *et al.*, 2020). Individual who showed symptoms of infection, require instant medical care by experts to combat infection. Corona virus tests are performed by watching the symptoms which are basically due to this epidemic infection. Medical care by experts mainly comprises of the supervision of a patient who has showed valid positive laboratory tests initially during first 14 days and most important is their travel history worldwide specially in infected countries during this pandemic (Casella *et al.*, 2020). Samples from the upper and lower respiratory tracts must be taken for testing from patients who developed corona virus symptoms as per the guidelines of international health agency-World Health Organization.

Transmission

From the earlier epidemiological researches, it is proved that there are three basic methods for the transmission of viral infection around the globe. These are the ways of transmission (Barreto, 2006). They are mentioned below,

1. Source of infection

2. Route of transmission
3. Susceptibility

Source of infection

Many studies found that Bats can be the reason and act as a host of SARS-CoV-2 virus, at the same time pangolins and snakes are considered as the transitional source of infection. Research carried by renowned institute of Shanghai revealed bats may be the natural source of SARS-CoV-2 infection. In addition, research done by Peking University in Beijing, China evaluated snakes as the certain source of SARS-CoV-2 infection (Ji *et al.*, 2020). On the other hand, advanced researches confirmed that snakes cannot be considered as a source of infection of SARS-CoV-2 (Zhang *et al.*, 2020). Research done by the Wuhan institute of virology, Wuhan, China revealed that the resemblance of gene sequence amid SARS-CoV-2 and bat coronavirus is very high i.e. 96% achieved through sequencing technology (Zhou *et al.*, 2020).

Route of transmission

Closeness and social contacting are considered to be very dangerous, and the easiest methods of spreading of SARS-CoV-2 infection in society. Through droplets (sputum/saliva) while coughing and sneezing might also be the source of spread and transmission viral infection. Furthermore, researchers have also confirmed that samples of stool, respiratory tract, saliva and urine contains SARS-CoV-2 carriers and responsible for this epidemic. On the basis of information revealed by bioinformatics evidences, it is indicated that samples from digestive tract may be a possible route of SARS-CoV-2 (Wang *et al.*, 2020b).

Susceptibility

Many investigations from epidemiological reports confirmed that aged people are more prone to infection caused by SARS-CoV-2, average age of deaths among population was 75 years or having previous history of multiple ailments like diabetes, cardiovascular disease, asthma and most them have gone through major or minor surgeries before hospitalization due to corona virus (Wang *et al.*, 2020a).

Management

Disconnection from the society, isolation and self quarantine are the supreme capable decisions taken by an infected individual to avoid infection and transmission of this outrageous virus COVID-19 in the society. Presently, still we are in search of potent anti-viral drugs to combat this contagious coronaviruses that infect human very badly, additionally available treatments are just to support infectious

conditions prevailing in patients. Tested in laboratories during many researches, it is only concluded that interferon (IFNs) are effective against coronaviruses to some of the extent while in combination therapy with ribavirin, chances of activity can be elevated in vitro in comparison with only IFNs to treat some contagious coronaviruses; though, in vivo efficiency of the combination therapy still needed additional proofs. Viral infections by SARS and MERS in past have undoubtedly encouraged research fraternity to work on communicable virus and resulted into a large number of promising antiviral drugs including viral proteases, polymerases, and entry proteins. On the other hand, still it is need of today to design and develop molecules with great potential to combat this infection and have ability to stop further replication of viral infection. Hence, scientists around the globe are in search of anti-viral medicine and vaccine is combat the current conditions worldwide (Cascella *et al.*, 2020). So, it can be concluded that the only way to arrest COVID-19 is isolation, self quarantine, effective symptomatic treatment and therapy with artificial medical oxygen. Common symptoms like fever, cold and acute infections require special caring administration by expert medical and paramedical staff along with support and motivation of family members. Most common and efficient way till date to treat this contagious infection is to take good amount of immunity boosters (Vitamin-C), (Paracetamol) acetaminophen, nutritional supplements, hot beverages and anti-bacterial therapy (Wang *et al.*, 2020b). Intake of drugs like alpha-interferon, chloroquine phosphate, lopinavir and ritonavir are also advisable as a medical treatment (Cascella *et al.*, 2020). Ribavirin and abidor can also be included as antiviral drugs for prophylaxis (Wang *et al.*, 2020c).

Prevention

Preventive measures, strategies to control disease and protocols to decline future transmission are to be framed which can ultimately help to control mortality rate worldwide. International health agency, World health organization has emphasized on social distancing, minimized close contact with infected individuals, and avoidance of touching of inanimate surfaces which can be direct or indirect source of viral infection (Cascella *et al.*, 2020). Most of the nations worldwide are following lockdown and even curfews to break the transmission chain by stopping social contacting. N-95 masks, and even tailored masks made up of cotton cloth must be used by whole population either infected or healthy to avoid spread of saliva droplets during sneezing and coughing. This can be one of the major preventive measures to stop further transmission. Regular use

of alcohol based sanitizers and washing of hands with soap for at least 20 seconds can be another important preventive measure to avoid the spread of viral infection. Immuno-compromised individuals should follow lockdown strictly and keep themselves away from public places as they are at high risk of this contagious infection. Strict hygiene measures must be adopted by medical and paramedical officials working in healthcare departments to decline the rate of future transmission with usage of N-95 masks and personal protective equipment (PPE).

CONCLUSIONS

During the last 50 years, one can easily conclude from previous endemics that ample diversity of diseases irrespective of animals and humans has been occurred because of many types of coronaviruses. This is issue of concern and chances of future reoccurrence of these contagious viruses will carry on and will remain reason for human and animal epidemic due to their capability of recombination, mutation and infecting multiple species and cells. In conclusion, COVID-19 is a virulent disease and spreading at an alarming pace around the globe which is caused by a serious infection due to novel coronavirus, SARS-CoV-2. Mortality ratio and number of infections reported worldwide due to this COVID 19 virus is very high as compared to SARS or MERS. Responsible cause for SARS-CoV-2 infection worldwide is bats, and even basic symptoms which abrupt initially are just like SARS which includes pneumonia, chills, fever, respiratory congestion, cough, headache and body ache. Corona virus is extremely contagious and communicable which can be spread among society via aerosols, saliva droplets and close contact with infected person and surfaces. Self isolation and quarantine is the initial and result oriented protocols which are required to be followed along with paramedical observation to avoid future transmission of this disease. This disease has become very serious issue of concern in positively tested elderly patients and become a warning signals around the globe. Hence, to control the mortality rate and to discontinue further community transmission is the major issue and needed to be resolved at the earliest. Moreover, researchers are still not able to find out the exact mechanism of action of this virus and particular anti viral drug, vaccines are still in queue to be developed. In the last, it can be concluded that, it is imperative to have control on different sources which are causing infections, to put stoppage on future transmission, isolating and quarantine of infected patients and utilization of available medicines and

antibiotics to manage growth of this highly contagious disease. Research fraternity must involve themselves proactively in the design and development of anti viral drugs and vaccines for the treatment of corona virus.

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