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Narrative Review

The Latest Viral Battle: The Newest Crowned Viruses Soldiers Attacked to Innocent Human Beings

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Abstract

The main aim of this study is having a deep look from different facets at an undesirable virus, COVID-19, which challenge people's life around the world. There is another crucial goal for this study and is providing a piece of brief COVID-19 information from molecular aspects to clinical. COVID-19 has launched terrible mortality in the world as an epidemiologists reported in different articles. Some prevention ways are provided for more security in this article with meticulous studies which have done by scientists. Complex pathogenicity of the virus, structure, it's resemblance to SARS and MERS, and even easy transmission of the virus confused scientists to provide an efficient vaccine for humanity. Also, this tough situation of the virus required scientists to examine any effective medication on the small community of patients. In addition, there is a great resemblance pathological features of COVID-19 to SARS and MERS coronavirus infection. Moreover, COVID-19 soldiers attack the lungs region which resulted in lung failure. Having a complete study on the variety of articles lead to have an exact conclusion that COVID-19 is a resistant virus which transmits easily person to person and targets the individual's lung lead to lung failure. There is no exact treatment and even a lucrative vaccine for the virus yet.

Keywords: Virus Activation, Viruses, COVID-19

Introduction

One of the most significant human and animal pathogens are Coronaviruses which primary target human respiratory system. These coronaviruses include severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), porcine epidemic diarrhea (PED), and severe acute diarrhea syndrome (SADS) and eventually COVID-19, a new type of Coronavirus. Bats have speculated the ancestral host of these emerging viruses. Severe acute respiratory syndrome (SARS)-CoV and the Middle East respiratory syndrome (MERS)-CoV outbreak were the great public threat in the past which are substituted by a more severe virus, COVID-19. It is confirmed that bats are the reservoirs of SARS-CoV and this virus could not transmit directly to the body of a human and it passed an intermediate host, the civet, then to the human.[1]

At the end of 2019, another cluster of pneumonia has been added to the list of pneumonia pathogenesis factors by a novel betacoronavirus, known as 2019 novel coronavirus (2019-nCoV) in Wuhan, China.[2]

COVID-19 spreading forced the government all over the world to manufacture a way for preventing destructive effects related to this virus. Scientists are working inexhaustibly to find a new and effective treatment or even an efficient vaccine for COVID-19 disease.[3]

As the world suffering from an efficient antiviral therapy against COVID-19, treatment concentration is mainly on lung failure, which is caused by COVID-19. Oxygen therapy is the major treatment in this severe situation, and extracorporeal membrane oxygenation (ECMO) is suggested to refractory hypoxemia patients.

Observations

Prevention

In terms of personal hygiene, the best prevention way from COVID-19 is to avoid being exposed to the virus.[4] Handwashing with soap and water for at least 20 seconds has thought that could be effective for preventing COVID-19 transmission after exposure in a public place and after coughing or sneezing.[5] In the absence of water and soap, using hand sanitizer with at least 60% alcohol can be helpful.[6]

Covering all surfaces of hands with sanitizers and rub the hands together until they feel dry is the best way which can free all parts of the hand from the virus. It is essential to keep unwashed hands away from eyes, nose, and mouth to help prevent COVID-19 infection. In the COVID-19 prevalence situation in the community which people are living, being far from individuals who are at the high risk of the disease or putting distances each other is crucial in this crisis of COVID-19, it is not moral to not protect others from this terrible virus.[7]

Quarantine is the right way to cut COVID-19 transmission circle if there is any suspicion about having the virus. Stay others safe with covering coughs and sneezes with a tissue throw it in the trash, not in the environment, and finally wash contagious hands with water and soap. Wearing a mask is necessary just when you feel sick or someone around you is sick. Disinfecting surfaces with detergents frequently to kill the virus on the surfaces.[8,9]

Epidemiology

SARS-CoV which lasts just for eight-months period infected 8096 and the mortality rate was 9.5%. It should not be overlooked that COVID-19 is more serious than Middle East Respiratory Syndrome (MERS) which was caused by a novel coronavirus (MERS-CoV), a zoonotic coronavirus, that found in 2012.[10-12]

The high rate of COVID-19 prevalence in China as an epidemic disease, led its spread to other countries throughout the world. COVID-19 carriers increasing in other countries across all continents except Antarctica. Initially, COVID-19 occurred among China travelers and transmitted to the other travelers who have had contact with them.[13] COVID-19 as a global pandemic, on 11 March 2020 is announced by The Director-General of the World Health Organization.[14] Covid-19 affected all of EU/EEA countries and even the UK, reporting a total of 17 413 cases as of 11 March. The second target of COVID-19 after China, was Italy which represents 58% of the cases (n=10 149) and 88% of the fatalities (n=631). With the high spread of COVID-19 around the globe and European carriers that are rising in this situation. There is an immediate need for targeted action. The people of the world had not yet forgotten SARS that they were shocked with another high pathogen in the form of viruses again about ten years after SARS. It is named Middle East Respiratory Syndrome Coronavirus (MERS-CoV) which is appeared in the Middle East Countries.[15] At the end of 2019, Wuhan city reported more than 80,000 COVID-19 cases which all were laboratory-confirmed cases as well as clinically diagnosed cases.[10]

Transmission

Nosocomial transmission is a way, which SARS-CoV and MERS-CoV transmitted human-to-human.[16,17]

COVID-19 is chiefly spread by person-to-person who are in close contact with each other (within about 6 feet). Respiratory droplets which are outed by an infected person coughs or sneezes could make more carriers if there were no enough spaces between healthy and disease person and these droplets can land in the lungs and noses which cause a newly infected person. However, As COVID-19 can be survived more than 24 hours on objects metal more than 7 days, touching contagious surfaces by individuals and then touching the nose and mouth or even eyes can be a significant factor for COVID-19 transmitting.[8]

Cell Entry and Receptors

when the SARS-CoV has appeared in 2002, some major structural analyses have shown key atomic-level interactions between the SARS-CoV spike protein receptor-binding zone (RBD) and its host receptor angiotensin-converting enzyme 2 (ACE2) which control both the cross-species and human-to-human transmissions of SARS-CoV.[18-21]

Effectively, two virus-binding hot spots have been identified in human ACE2.[22] Many mutations occurred in the upstream of those two hot spots in the attachment region of the virus to the host cells, it's the cause of huge ranges of this virus hosts.[23]

The similar sequences found in the SARS-cov and COVID19 have suggested that both ACE2 receptors

are likely to be identical, compared to SARS-CoV RBM, 2019-nCoV RBM has no deletion or insertion and is fully conserved except one insertion in the outer loop of the ACE2 junction area.[24,25]

Researchers have stated analyzed the potential receptor usage by 2019-nCoV, based on the knowledge about SARS-CoV and COVID 19 genome sequence, The COVID19 RBD sequence, including it's receptor-binding motif (RBM) that directly contacts ACE2, and its similar to that of SARS-CoV, has been suggesting that COVID19 uses ACE2 as its receptor, several critical residues in COVID19 RBM (particularly Gln493) supply conducive interactions with human ACE2, consistent with COVID19's capacity for human cell infection.[19,26] Various studies have shown hosts that are vulnerable to SARS, The first damage was due to the adsorption tendency between the RBD and the host ACE2 and it happens at the early stages when the body cells face the virus.[27]

Within 10 years the crystal structure of this contact between virus RBS and hosts ACE2 in SARS virus has been identified, this structure indicates that the SARS virus is composed of a core structure and a receptor-binding motif (RBM) that binds to the outer surface structure of the host cell like ACE2.[28]

Virology

The COVID-19 is a member of a large family that has a single-stranded RNA virus and can be divided into four major genera.[29] Both SARS and COVID-19 belong to βgenus. An envelope-anchored spike protein mediates coronavirus inclusion into host cells by first binding to a host receptor and then fusing viral and host membranes. First, it binds to the host cell and then integrates with the host cell membrane.[24] Yet, there are no vaccines, monoclonal antibodies (mAbs), or drugs attainable for COVID19.[30-33]

Covid-19 Clinical Signs

The most suspicious part of the COVID-19story started in late December 2019 by a cluster of unexplained pneumonia cases in Wuhan, China. Some days later, the Scientists unveiled at the causative agent of This cryptic pneumonia as a novel coronavirus. SARS-CoV is named to this agent virus firstly and the related virus which is started in December 2019 and spread so fast all over the world is named by WHO as COVID-19.[34-36] COVID-19 severity varies from mild to severe and it depends on each person's immune system mechanism. Some peoples have no symptoms and the other ones who are under long medical conditions, such as heart or lung disease or diabetes may be at higher risk of serious illness. It should be noted that COVID-19 is so similar to influenza and may be considered as influenza firstly. COVID-19 main symptoms include fever, cough. Shortness of breath or difficulty breathing which may appear two to 14 days after exposure. There is another subsidiary symptom for COVID-19 like, tiredness, aches, runny nose, sore throat.[37-39] COVID-19 cover a variety of clinical spectrum from asymptomatic features to clinical symptoms characterized by respiratory failure that forced health workers to use mechanical ventilation for these kinds of patients and support these patients in an intensive care unit.[40-43]

Clinical Features and Diagnosis

Most of the symptoms of the COVID19 are similar to those that have seen in the SARS virus.[34] There is no clear complete clinical manifestation yet. Symptoms ranging from mild to severe, even with death in some cases.[37] Many researchers estimate that most people with COVID19 have no symptoms. Most people with mild infects have no symptoms, frequently their body temperature is also normal but they can spread it out studies have shown that 59% of people who are overtaking COVID19 have no symptoms it's one of the reasons that why this virus spread that much fast around the world.[44] Fever, cough, myalgia or fatigue, pneumonia, and complicated dyspnea are the most common signs whereas headache, diarrhea, hemoptysis, runny nose [19], and phlegm-producing cough are less common symptoms.[45,46]

Patients who recover after one week are had mild symptoms while severe cases experienced severe symptoms and were not recover due to alveolar damage from the virus that leads to progressive respiratory failure. Most of the dead patients included middle-aged and elderly patients with pre-existing diseases (tumor surgery, cirrhosis, hypertension, coronary heart disease, diabetes, and Parkinson's disease).[47-49]

Suspected COVID-19 patients have suggested for diagnosis process. Real-time fluorescence (RT-PCR) is a technique for the diagnosis positive nucleic acid of SARS-CoV2 has derived from samples such as

sputum, throat swabs, and the lower respiratory tract secretions.[50-52]

A chest CT scan has strongly recommended in patients who are suspected of COVID-19 as the respiratory system is the first organ that is affected by this virus.[53] COVID-19 patients in early stages have recommended having chest radiographs that are minor diagnostic values, whereas CT findings may be present even before symptom onset.[54-56] Intermediate to the advanced phase of the disease, the progression of features of acute respiratory distress syndrome (ARDS) may have shown in chest radiographs (Figure 1). Moreover, findings which are proven by CT are diagnostic key in several cases with an initial false-negative reverse transcription-polymerase chain reaction (RTPCR) screening test.[2]

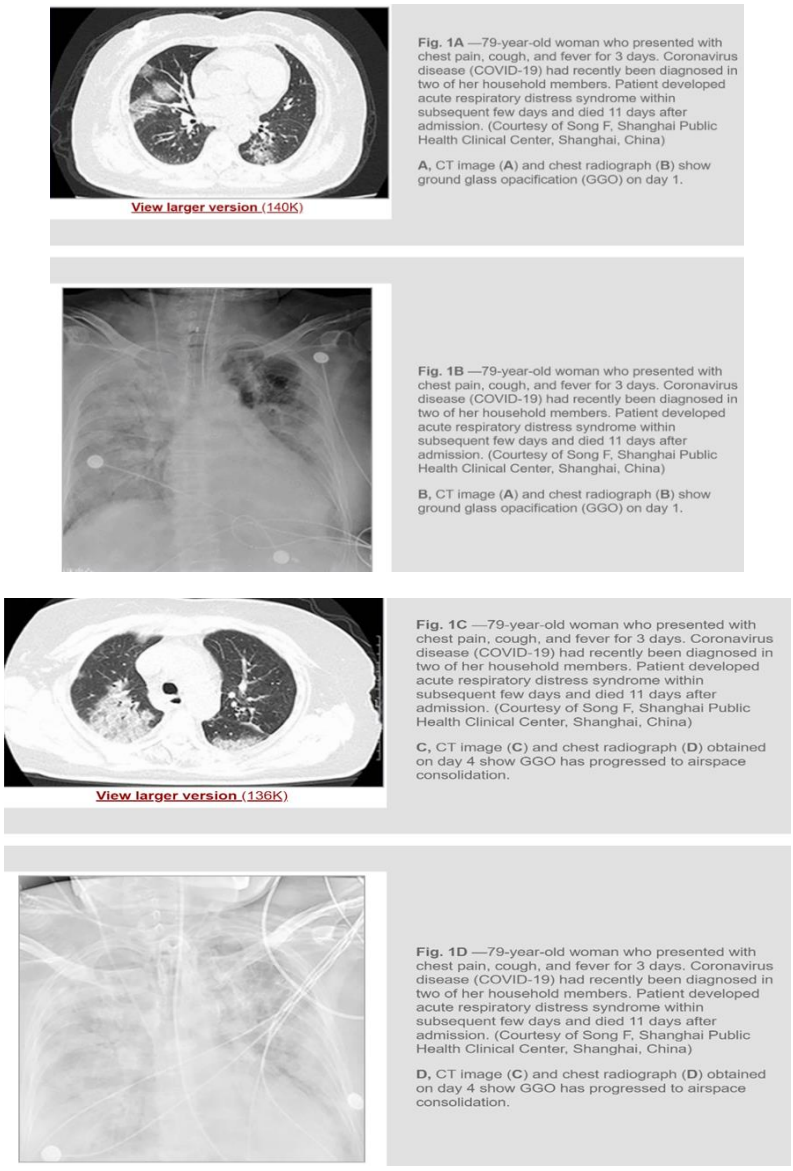

Figure 1. Coronavirus Disease 2019 (COVID-19): A Systematic Review of Imaging Findings in 919 Patients

Treatment

Front-line treatment staffs are at the highest risk of infection when they examine and treat patients who present with a respiratory infection.[24] Some infected people may not get sick, some individuals may get mild symptoms from which they will recover easily, and other infections may become severe. With previous bits of knowledge about coronaviruses, some people are at higher risk than another with problems including the elderly, individuals with feeble immune systems, newly born babies, people who are living together in a place, people who are kept in prison.[13,57]

Researchers have not found an exact antiviral treatment for COVID- 19 yet. The global, experienced weakness in producing a useful vaccine for COVID-19. The treatment is symptomatic, and oxygen therapy is a major treatment in this period as using ventilators for this kind of patients may be a key role in keeping up the patients with this mechanical instrument. There is another support, Hemodynamic, which is essential for septic shock managing. Intubation and protective mechanical ventilation should be managed by special precautions and expert operators. For not getting involved in the disease personal protective equipment.[50] Such as FFP3 or N95 mask, protective goggles, disposable gown long sleeve raincoat, disposable double socks, and gloves should be used by Specialist operators. Preoxygenation (100% O2 for 5 minutes) should be performed via the continuous positive airway pressure (CPAP) method. Two other things like heat and moisture exchanger (HME), should be placed between the mask and the circuit of the fan or between the mask and the ventilation balloon.[3]

Pathogenesis

COVID-19 severe symptoms are associated with a high rate of mortalities especially in the epidemic region of China and Italy. Median age (range 48-89) was the maximum rate of deaths in China.[58,59]

Higher leukocyte numbers, abnormal respiratory systems, and increased levels of plasma pro-inflammatory cytokines, were associated with infected COVID-19 patients.[60]

While there are remarkable differences that have been seenthrough SARS-CoV, MERS-CoV, and the other HCoVs pathogenesis, COVID-19 infection pathogenesis is confined with limited conceptions. In the early phase of the outbreak, it was not investigated as a dangerous pathogen for humans till severe acute respiratory syndrome (SARS) failure which is observed in the Guangdong province of China in 2002 and 2003. Before these outbreaks, there were the two most known types of CoV as CoV OC43 and CoV 229E that have mostly caused mild infections in people with an adequate immune system.[30,61]

Some major routines tests including complete blood count (CBC), assays investigating coagulation and fibrinolysis cascades (PT, aPTT, and D-dimers), and inflammation-related parameters (ESR, CRP, ferritin, and procalcitonin) are considered for patients who are suspicious to COVID-19. Several vital organs including the heart, liver and kidneys are the main parts of the body which will be attacked and impaired by the COVID-19 due to the possible ability of the virus. (R1: Laboratory findings in COVID-19 diagnosis and prognosis)

Impaired organs lead to the death of the patients due to the failure of multiple organs, shock, acute respiratory distress syndrome, heart failure, arrhythmias, and renal failure. (Comorbidities and multi-organ injuries in the treatment of COVID-19).

C-reactive protein (CRP) and lactate dehydrogenase (LDH) as systemic inflammation markers will be elevated in the first phase of the virus entrance. Based on the matter patient's infectious phase and disease severity multiple organs can be involved. Increased levels of alanine aminotransferase (ALT), a liver enzyme, and total bilirubin in blood show hepatocyte damage.

Kidney failure indicated by abnormally high creatine and urea concentrations can present another complication and potentially poor outcome. As the inflection progresses, additional markers are measured during hospitalization and intensive care monitoring.

Conclusions

The mortality rate among patients referred to medicine is approximately 2%, the actual ratio may not be clear for a while, if only the cases with severe symptoms are examined, the epidemic route could be inaccurate.[62-64] The first cases infected by COVID-19 were very severe so that they needed serious medical care, but the total number of people infected has been divaricated. As estimated that Coronaviruses are circulating on the earth for centuries but the origin of CoVs remains vague.[62,65] According to fast and easy COVID-19 transmission along with no vaccination against it, some prevention ways help individuals to be at low risk.[40]

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