Review Article

Novel coronavirus disease-19: An overviwe of pathogenesis, health influences and measures

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ABSTRACT

The coronavirus disease-19 (COVID-19) signs mostly include fever and respiratory symptoms (unusual viral pneumonia by SARS-Coronaviruses 2 or SARS-CoV-2). The Receptor-Binding Domain (RBD) of COVID-19 and SARS-CoV are similar, causing cross-reactivity of anti-SARS-CoV antibodies with associated spike protein, exerting promising implications for rapid development of vaccines and therapeutic antibodies against COVID-19. ACE2 is the SARS TMPRSS2 for spike (S) protein receptor for initiation of infection; hence, it is a target for pharmacological intervention. Furthermore, designing novel monoclonal antibodies binding specifically to COVID-19 RBD is essential. A viral S proteins (TMPRSS2) was proposed for clinical use by blocking the viral intake by cell.

***Keywords*:** Corona virus disease-19, virulence, prevention, control

INTRODUCTION

Coronaviruses are important human and animal pathogens. At the end of 2019, a novel corona virus disease (COVID-19) was identified as causative agent of a cluster of pneumonia cases in Wuhan (Hubei Province) of China. The virus that causes COVID-19 is also known as severe acute respiratory

syndrome coronavirus 2 (SARS-CoV-2); previously referred to as 2019-nCoV [1]. Links to these and other related society guidelines are found elsewhere [1,2].

Pathogenesis

The patient's sputum showed positive by real-time polymerase chain reaction results that confirmed COVID-19 infection [3-6].

SARS-CoV-2 uses the SARS-CoV receptor for entry and the serine protease TMPRSS2 for spike (S) protein priming. Cell entry of Coronaviruses depends on the binding of the viral S proteins to cellular receptors and S protein priming by host cell proteases [1,4,5-7].

Rout of transmission

The rout of its transmission has not been well understood. Noticeably, in Wuhan city, seafood live animals markets were suggested to be associated with the disease distribution [7]. Moreover, person -to-person transmission via respiratory route is aubstantial way through coughs, touching and sneezing which can be remained in aerosols under experimental conditions for at least three hours [8]. It has been proposed that airborne route is a major way, however the viral agent was detected in blood and stool samples [9]. Live virus has been cultured from stool in some cases [10], but according to a joint WHO-China report, fecal-oral transmission did not appear to be a significant factor in the spread of infection [11, 12]. It is worth considering that the transmission from healthy carriers is also possible as an alternative infection route [13].

Virology

The COVID-19 causative agent is an RNA, betacoronavirus in the same subgenus as the severe acute respiratory syndrome (SARS) virus (as well as several bat coronaviruses), but in a different clade. The receptor-binding gene modul of SARS-COV2 is highly similar to that of the SARS, using a same receptor for binding, which is ACE2 permitting viral penetration [14,16]. Two types of COVID-19 were identified in China including types L (most of agents) and S, but clinical features were not determined [17].

Clinical feture

The COVID-19 infection symptoms are initiated during nearly 5-6 days [18]. Moreover, the disease course until death has a range of 6 to 41 days (mean=14 days) depending upon the age and immune system conditions. Additionally, this period is shorter among patients>70 years [19]. The disease is appeared with fever, dry cough, fatigue, and even headache, haemoptysis, diarrhoea, dyspnoea, and lymphopenia. Using the chest

CT scan pneumoniae, RNAaemia, acute respiratory distress, acute cardiac injury, and accumulation of white fluid within lungs result in death [20]. The inflammation has been also reported, but interferon inhalation therapy was ineffective and increased pulmonary worsening [6].

The severity of infection depends on patients conditions, or maybe remained mild (in 81 % of cases). The severe and critical (death cases) infections respectively occurred among 14 % and 0.7-5 % of patients in China [21]. Furthermore, comorbidities of patients who had underlying disease mainly were associated with death [10,22]. The case fatality rate was different in Italy being higher (7.2 %) but in South Korea was lower (0.9%) that that of China [5,23], mostly due to higher ages in Italy (mean=64) and lower ages in South Korea (mean=40).

Impact of age

Although the COVID-19 occurs among persons with any age, older age are more vulnerable to it, nevertheless pediatrics maybe also severely affected [20,24]. The death rate increases to 8 and 15% when age reaches to 70 years [25]. These data has been verified by various studies [22]. In a small study of 10 children in China, clinical illness was mild; 8 had fever, which resolved within 24 h, 6 of them had cough, 4 had sore throat, 4 had evidence of focal pneumonia on CT, and none required supplemental oxygen [26].

Complications

During the disease, several complications such as dyspnea [24], acute respiratory distress syndrome (ARDS) (41 % of cases) following eight days, arrhythmias, acute cardiac injury and shock have been reported [27]. Notably, diabetes mellitus, and hypertension have been related to the ARDS [28]. In a series of 21 severely patients admitted to the ICU in the United States, one-third developed cardiomyopathy [29].

Infection prevention and control in healthcare settings

All the personel should be educated and informed about the European Centre for Disease Control (ECDC) and IPC guidelines when handling suspect and confirmed cases of CoVID-19. According to the ECDC, suspected patients should be isolated or separated from others. Suspected patients should be asked to wear a surgical mask in order to reduce the spread of respiratory droplets [30].

The airborne transmission of the disease should be prevented and controlled. Confirmed patients who require admission must be kept in an isolation room (single rooms with negative pressure) with a

separated bathroom. Healthcare personel are recommended to wear Personal Protective Equipment (PPE). The ECDC guidance for wearing and removing personal protective equipment in healthcare settings for the care of patients with suspected or confirmed COVID-19' has provided additional recommendations [31].

Other management strategies include use of hospitalization and close monitor for all cases, and home care for mild cases (due to limited capacity and resources unable to meet demand for healthcare services) or in a case of informed refusal of hospitalisation [32,33].

Home care

Home management is appropriate for patients with mild infection who can be adequately isolated in the outpatient setting [34]. The choice of strategy depends upon the patient population (immunocompromised versus nonimmunocompromised), the availability of testing supplies, and access to testing [35].

Prevention

Screening of cases by measing fever and respiratory signs is helpful for prevention of COVID-19. Application of face mask and personal distance are required for all persons and those who had a travel should be separated for 14 days [36].

Where outbreak is ongoing, society unnecessary activities should be delayed and instead virtual visits can be used to mitigate the risk of COVID-19 [37].

It was stated that 43 % of confirmed cases acquired infection in hospital settings and in Washington State, inadequate use of infection control procedures contributed to the spread of infection to 81 residents, 34 staff members, and 14 visitors [38]. Therefore, visits from hospitals should be limited.

Community measures

Infection prevention and control in the community

The usefulness of face masks and social distance by healthy persons is helpful to some state, while it should adhere by recovered patients or suspected carriers [39,40]. During cold wheather, due to the co-infection of influenza and COVID19, the schools should be closed and online teaching or smaller groups attendance should be followed. Also, children should be educated about mask wearing and washing hands. In the event of illness, strict isolation of sick children and staff at home or healthcare facilities is advisable in all the scenarios [41].

In the workplace and the community, reducing time of work and using shifts, following distance working/teleworking or online working, and decrease of all kinds of contacts are required [42].

Vaccines design

Due to similarity of coronaviruses binding motives, rapid development of vaccines and therapeutic antibodies against COVID-19 is possible though should be evaluated for costs and applicability. The cell receptor binding of the virus determines accurate target antigens for designing the vaccine constructs as well as viral proteins targeted by the immune system. Therefore, these vaccines can improvement into clinical trials in humans to induce the expected immune response and protection for vaccination of the population. The viral nsp1 with 9 kD is encoded by α-CoVs and β-CoVs but not by γ-CoVs and δ-CoVs lack nsp1. This protein is a potential virulence factor which blocks host cell translation, cellular mRNA degradation, chemokine dysregulation, inhibiting the IFN signaling, modulate host and viral gene expression during infection, promotes cellular host mRNA degradation, regulates the host and viral gene expression, suppresses host gene expression such as type I Interferon. It is a target for covid vaccine development. In addition, development of spike1 subunit protein-based vaccine might depend on ACE2 receptor. Viral replication in the presence of ACE2 in Cell lines may be the most well-organized approach for large-scale vaccine production [43,44].

CONCLUSION

The recently identified 2019 novel coronaviruses disease (COVID-19) has caused extra-human severe pneumonia infections. COVID-19 or SARS-CoV-2 has become pandemic with increasing rate of unusual viral pneumonia in patients. ACE2 is the COVID-19 receptor for initiation of infection, hence, a prime target for pharmacological intervention. SARS-CoV- 2 uses the SARS-CoV receptor for entry and the serine protease TMPRSS2 for spike (S) protein priming. A TMPRSS2 inhibitor was approved for clinical use by blocking the viral penetration and might constitute a treatment option. Due to similarity of coronaviruses binding motives, rapid development of vaccines and therapeutic antibodies against COVID-19 is possible though should be evaluated for costs and applicability.

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