reports

Editorial

Possibility to Open Up New Areas by COVID-19 Infection

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The rapid increase of COVID-19 cases has brought the number of patients to 513 million. More than 6 million people have died as of 1 May 2022. Until now, epidemics of febrile infectious diseases such as dengue and malaria have occurred in the tropics. These mosquito-borne infections are also classified as disaster-related infections because people are susceptible to mosquito-borne infection when exposed to nature. Unlike these infectious diseases, COVID-19 cases predominantly spread in Western countries. A total of 15% of patients and 16% of deaths have occurred in the United States. The death toll of 6 million people worldwide indicates that COVID-19 is a disaster [1]. On the other hand, COVID-19 in developed countries has made it possible for advanced research to be conducted on acute febrile illnesses. With the latest technology, significant progress have been made in diagnosis, treatment, and prevention. In this Special Issue, we will publish the novel aspects of COVID-19 after a two-year pandemic as follows.

1. Development of diagnosis methods.
2. Therapeutic effects of new agents.
3. Improvements in monitoring and management of patients.
4. Characteristics of breakthrough infection.
5. Sequelae of COVID-19 infections.
6. Development of a vaccine against COVID-19 infection.
7. Disasters caused by COVID-19 infection.

Attempts to detect infected people by RT-PCR tests have already been attempted in dengue fever [2]. In COVID-19, automated or semi-automated kits were quickly created with promising results [3]. Since the RNA virus often causes disaster infections, it will be necessary to proceed with large-scale RT-PCR testing, not only in COVID-19, but also in other infectious diseases, to identify the risk of infection rates. In other words, the development of a diagnostic method for infectious diseases that can be performed more efficiently in disaster-stricken areas is desired. The complexity of the COVID-19 illness depends on the heterogeneities of the host's response. Patients might suddenly deteriorate into severe respiratory failure, necessitating non-invasive ventilation (NIV) or mechanical ventilation (MV). Early recognition of patients at risk of progressing to severe disease and the timely onset of targeted treatment is of the utmost importance. The production of immune mediators such as cytokines and complements is essential to fight the infection; however, these can be deleterious when produced in excess. The inhibition of virus entry and proliferation by chemical agents and antibodies may inhibit a subsequent cytokine storm. Immune therapies targeting the immune mediators of host defenses, such as corticosteroids, kinase (a Janus tyrosine kinase (JAK)) and IL-1 and IL-6 were developed. It was proposed that the early administration of a monoclonal antibody against IL-6 receptor (tocilizumab) prevented pneumonia and kidney injury caused by COVID-19 [4]. However, there is no clear indicator of which immune drugs should be given to which patients at what time. It is important to identify the patients with hyper-inflammatory syndrome who

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are suitable for anti-cytokine therapy, but it is not known which bio-makers reflect less heterogeneity of the host response.

Matricellular proteins such as galectin-9 (Gal-9) and osteopontin (OPN) are known to be markers of disaster-related febrile illnesses such as dengue, malaria, leptospirosis, and AIDS/TB [5,6]. The high AUC values of these biomarkers may indicate less heterogeneity of the host response. Furthermore, the cleaved forms of OPN and Gal-9 could be better markers in COVID-19, indicating that the proteins that aare produced by interacting with other inflammatory molecules such as proteases may show better performance as a biomarker [7]. Furthermore, thrombi occur when hypercoagulability, endothelial injury and blood stasis converge, and these conditions are frequently encountered in severe COVID-19. Subsequently, arterial and venous thromboembolisms have been frequently reported. Hyper-inflammatory syndrome may play an important role in subsequent arterial and venous thromboembolisms.

Another critical issue is the role of CT and X-ray imaging in diagnosing COVID-19—particularly those that have applied artificial intelligence to detect the disease or reach a differential diagnosis between various respiratory infections.

SARS-CoV-2 has a lower mutation rate than other RNA viruses because it encodes proofreading enzyme genes. Nevertheless, the ongoing rapid transmission between humans increases the genetic diversity of SARS-CoV-2 genomes, especially the Spike gene (or the receptor-binding domain, RBD): the latter is advantageous in virus infectivity, immune escape, and tolerance. The effects of developing vaccines or therapeutics on constantly mutating viruses need to be carefully observed. It is also interesting to clinically follow the severity of the breakthrough infection and the effect of antibody treatments.

Follow-up after treatment is also an essential issue because significant physical, psychological, and cognitive deficits following COVID-19–associated critical illness have been recognized [8]. The influence of venovenous extracorporeal membrane oxygenation (ECMO) on the outcomes of mechanically ventilated patients with COVID-19 needs to be clarified.

We are victorious in the fight against this disaster because of continuously advancing diagnostic methods, and the development of vaccines and excelletnt therapeutic agents. The technology developed for the purpose of tackling COVID-19 should also be applied to other disaster-related infectious diseases. Furthermore, it is necessary to explore the social and medical impact of this pandemic.

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