

Transmission of Novel Coronavirus 2019 (SARS-CoV-2) and Current Scenario of Covid-19

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1. Introduction:

Corona viruses are enveloped nonsegmented positive sense RNA viruses belonging to the family coronaviridae. This family consists of four genera based on their properties, including genus genetic Alphacoronavirus, genus Betacoronavirus, genus Gamma coronavirus, genus Deltacoronavirus [1]. The recent outbreak of viral pneumonia in the city of Wuhan in Hubei province of China was caused by a novel coronavirus. The city of Wuhan is considered as the epicenter of this viral infection which continues to seek global coronaviruses attention. Most human

Abstract

On December 31, 2019, the china country office was informed about the cases of pneumonia of unknown etiology detected in Wuhan city of Hubei province. Several quarantine and screening measures have been enhanced for travelers from Wuhan city at the point of entries since January 7, 2020. On January 30,2020, WHO declared Global health emergency of international concern. As of February 24, 2020, there were 80,150 confirmed cases across the globe in which the mainland china has 77,659 confirmed cases and 2,663 deaths, by the end of March 30, 2020 total cases 7,22,088 and total death 33,976 in worldwide. This disease spread across 199 countries and territories around the world and 2 international conveyances: The Diamond Princess cruise ship harbored in Yokohama, Japan, and the Holland America's MS Zaandam cruise ship]. This article deals about the spread of novel corona virus (SARS-CoV-2) and the rapid transmission of the disease COVID-19, its symptoms and the diagnostic methods used across the world and also, gives a brief idea about the drugs that are under the process of clinical trials performed by several laboratories, pharmaceutical companies and tribal medicines.

Keywords: Corona Virus, SARS-CoV-2, COVID 19

infections are mild, but the epidemics of the betacoronaviruses, severe two acute respiratory syndrome coronavirus (SARS-CoV) in 2003 and middle east respiratory syndrome coronavirus (MERS-CoV) in 2012, have caused drastic effect on more than 10,000 patients worldwide in the past two decades, with the mortality rates of 10% for SARS-CoV and 37% of MERS-CoV [2]. Both of them belong to the betacoronavirus genus and are zoonotic pathogens that can cause severe respiratory diseases in humans [2], But the novel viral pneumonia was not SARS-CoV, caused by MERS-CoV, influenza virus or adenovirus. On December 12, 2019, Wuhan Municipal

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Health Commission (WMHC) reported 27 cases of viral pneumonia. All of these patients were exposed to Huanan seafood wholesale market where poultry, snakes, bats, and other farm animals were sold. On January 3, 2020, WHMC updated the number of cases was increased to 59 with 7 critically ill patients [2]. On January 10, it was officially reported that this viral pneumonia is caused by novel coronavirus, designated as 2019-nCoV by WHO which was later named as SARS-CoV-2 by ICTV Coronaviridae Study Group on February 12, 2020. The disease was named as COVID-19. SARS-CoV-2 is the seventh member of enveloped RNA coronavirus (subgenussarbecovirus, subfamily - Orthocorona viridae). The RNA genome ranges from 26 to 32 kb and it is the largest among all the RNA viruses.

2. History

The history of human coronaviruses began in 1965 when Tyrrell and Bynoe [10] found that they could passage a virus named B814. It was found in human embryonic tracheal organ cultures obtained from the respiratory tract of an adult with a common cold.

In the late 1960s, Tyrrell was leading a group of virologists working with the human strains and a number of animal viruses. These included infectious bronchitis virus, mouse hepatitis virus and transmissible gastroenteritis virus of swine, all of which had been demonstrated to be morphologically the same as seen through electron microscopy. [11,12]

This new group of viruses was named coronavirus (*corona* denoting the crown-like appearance of the surface projections) and was later officially accepted as a new genus of viruses. [13] Since 2003, 5 new human coronaviruses have been discovered in China, USA, Netherland and Japan [14]. Three of these are group I viruses that are closely related and likely represent the same viral species. In 2004, van der Hoek et al³² reported the discovery of a new human coronavirus, NL63, isolated from a 7-month-old girl with conjunctivitis, fever coryza, and bronchiolitis. Using a novel genomic amplification technique, these investigators were able to sequence the entire viral Phylogenetic genome. analysis demonstrated that this virus was a group I coronavirus related 229E to and transmissible gastroenteritis virus, a virus of pigs. Screening of 614 respiratory specimens collected between December 2002 and April 2003 turned up 7 additional individuals who tested positive for NL63. All had upper or lower respiratory tract disease or both.

3. Human Coronaviruses

Seven strains of human coronaviruses are known, of which four produce the generally mild symptoms of the common cold:

- 1. Human coronavirus OC43 (HCoV-OC43)
- 2. Human coronavirus HKU1
- 3. Human coronavirus NL63 (HCoV-NL63, New Haven coronavirus)
- 4. Human coronavirus 229E (HCoV-229E)

and three viral symptoms that are potentially severe:

- 1. Middle East respiratory syndrome-related coronavirus (MERS-CoV)
- 2. Severe acute respiratory syndrome coronavirus (SARS-CoV or "SARS-classic")
- 3. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), previously known as 2019-nCoV or "novel coronavirus 2019"

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The coronaviruses HCoV-229E, -NL63, -OC43, and -HKU1 continually circulate in the human population and cause respiratory infections in adults and children world-wide^[15]

4. Transmission and Outbreaks

Some of the recent studies and evidences demonstrate that the disease is originated from bats because more than 500 species of coronaviruses have been identified in bats in china. It is also believed that the virus is jumped from the species barrier to humans from another intermediate animal host [6]. This virus rapidly spreads from person to person who are in close contact with one another within about 6 feet [3]. This virus transmits via respiratory droplets produced when an infected person coughs or sneezes. Some of the studies demonstrate that the virus also spreads by fecal contamination. It can also spread from contact with infected surfaces or objects [3]. It is most viable in frozen state and it is thermolabile.

4.1 Outbreaks of Coronavirus

Outbreaks of coronavirus types of relatively high mortality [Figure 1, 2, 3] are as follows as on March 30, 2020, 02:25 GMT: [17]



Figure 1 OUTBREAKS OF CORONAVIRUS-RELATED DISEASES (As on March 30, 2020)



Figure 2 AGE OF CORONAVIRUS DEATHS



Figure 3 COVID-19 Fatality Rate by SEX

4.2 Pre-Existing Medical Conditions (Comorbidities)

Patients who reported no pre-existing ("comorbid") medical conditions had a case

fatality rate of 0.9%. Pre-existing illnesses that put patients at higher risk of dying from a COVID-19 infection are shown in Figure 4 [16].



Figure 4 PRE-EXISTING MEDICAL CONDITIONS

5. Symptoms

Coronaviruses causes different types of respiratory and gastrointestinal symptoms ranges from common cold to pneumonia (generally very mild). The symptoms of COVID-19 include fever, cough, shortness of breath, pneumonia, ARDS (Acute Respiratory Distress Syndrome), kidney failure and ultimately leads to death. Symptoms may appear 2 to 14 days after

exposure. Most of the infected patients were men who had underlying diseases include: hypertension, diabetes, cardiovascular disease [1]. Estimation of median age of affected patient is 56 in which 67% were men and 50% have chronic disease, fever. Estimation of median incubation period (the time between infection and onset of symptoms) are 2 to 14 days (ranging from 0 to 27 days). The patient who are considered to have severe illness could be decided according to any of the following criteria: dyspnea, respiratory rate more than 30 hypoxemia, chest bpm, x-ray with multilobar infiltrates pulmonarv or infiltrates progressed with more than 50% within 24-48 hours and the patients who are considered to be critically ill could be decided according to any of the following criteria: respiratory failure, septic shock, other organ failure which requires Intensive Care Unit (ICU) admission[5]. Estimated mortality rate and Infection-fatality ratio (IFR) are 2.3% and 0.94% respectively.

6. Diagnosis

Initial investigations include a complete blood count, coagulation profile, and serum biochemical test (including renal and liver function, kinase, creatine lactate dehydrogenase, and electrolytes). Respiratory specimens, including nasal and pharyngeal swabs, bronchoalveolar lavage fluid, sputum, or bronchial aspirates. Radiological assessments included chest xray or CT scan. In order to develop a diagnostic test for this disease, the specimen from the lower respiratory tract of the affected patients were isolated and detected using metagenomic sequencing within days of obtaining the sequence data, polymerase chain reaction (PCR) assays were developed for clinical diagnostic use. Centers for Disease Control and prevention (CDC) has developed a new testing kit for SARS-CoV-2 called as "Centers for Disease Control and prevention (CDC) 2019 -Novel Coronavirus Real -Time Reverse Transcriptase (RT)- PCR Panel" [3]. It is intended for use with applied biosystems 7500 fast DX Real-Time PCR instrument with SDS 1.4 software [3].

Two South Korean firms, Seegene and SD Biosensor have received government approval to supply RT-PCR based Novel Coronavirus (COVID-19) diagnostic kits in India. The government also approved 12 rapid antibody test kits for COVID-19 diagnosis. Seven of them are Chinese companies. Overall, 16 companies can now market their test kits in the country. The advantage of antibody rapid tests is that the result can be made available within 30 minutes. The test comes positive after 7 to 10 days of infection. While positive test indicates exposure to COVID-19, negative does not rule out the infection.

The approvals for antibody based rapid kits were granted to BioMednomics (USA), Getein Biotech (China), Sensing Self Ltd (Singapore), Hangzhou Biotest Biotech (China), AmonMed Biotechnology Co (China), Beijing Tigsun Diagnostics Co Ltd (China), Biomaxima (Poland), CTK Biotech (USA), Hunan Lituo Biotechnology Co (China), Vivacheck Lab (China) and Wondfo (China).

Currently the RT-PCR probes for diagnosis of COVID-19 are procured from the USA and supplied to government testing laboratories across the country. Recently the government had allowed two private companies - Indian company MyLab and German firm Altona Diagnostics - to supply COVID-19 test kits to both government as well as private testing laboratories in India.

Thirteen kits have failed to clear the validation requirement of Indian Council of Medical Research (ICMR) and may have to

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try again for marketing approval for their test kits in India.

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7. Treatment and Vaccine Development

Evidences shows that there are more than 80 running or pending clinical trials on potential treatments for COVID-19, the illness caused by SARS-CoV-2[8]. An HIV drug combination (lopinavir and ritonavir) and an experimental anti-viral drug called remdesivir shows some evidence to suggest they have potential to fight against this virus [8]. These two HIV drugs block enzymes that viruses need to replicate. Clinical trials in animals shows the reduced levels of the viruses. Remedesivir, adenosine analogue made by the company GILEAD has also had some success against coronaviruses in animals and by the end of April or may this drug could be approved by Chinese authorities. This drug is recognized as a promising anti-viral drug against a wide array of RNA virus's infection in cultured cells, mice and nonhuman primate models and it is currently clinical development for under the treatment of Ebola virus infection [7]. This drug incorporates into nascent viral RNA chains and results in pre-mature termination. Chinese researchers have also launched a few trials that test chloroquine, an anti-malarial and auto-immune disease drug that killed SARS-CoV-2 in cell culture [8]. Chloroquine is well-known to block virus infection by increasing endosomal pH required for virus or cell fusion, as well as interfering with the glycosylation of cellular receptors of SARS-CoV [7]. Some of the clinical trials were done by the antibodies of COVID-19 survivors that the antibodies of one person steadily builds up to fight a virus can help someone freshly infected to fight it off rapidly. Some of the evidences demonstrate that a Chinese herbal medicine that contains extracts from the dried fruit lianqiao (*Forsythiae fructus*), have been used to treat infections for more than 2,000 years.

8. Conclusion

The total number of patients recovered from the disease COVID-19 are 151,766 [16] and they are recovered by quarantine measures and supportive treatment with oseltamivir and several steroidal drugs at the initial stages of symptom onset. The origin of SARS-CoV-2 still remains unclear. But people worldwide across has а controversial thought that this virus could have been originated from China as the country has Wuhan Institute of Virology where many international collaborative projects are going on. So that, here we are in need bioinformatic tools for differentiate the wild and artificial strains for clarify the Past history shows that the bioethics. outbreak of Human corona virus like SARS CoV, MERS CoV are very less compared to SARS-CoV-2, Its prove that the SARS CoV 2 must be artificial. Some of the recent studies demonstrate that there are 400 species of coronaviruses in the saliva of bats. Several clinical trials are going on for the treatment and vaccine development of COVID-19 by various biotechnology laboratories and pharmaceutical companies worldwide. The rate of infection differs in each country may various factors like climatic be on conditions, food habits of people, Non hygienic life style (Naturally they are having more immunity. Outbreaks in developing countries is very less compared to developed countries as they may have less immunity due to too much hygienic

and using genetically modified food), Age factor & Sex (Males being commuters are proved higher to get this disease when compared to female). In this current situation, the number of infected patients and deaths were increasing day by day and the World Health Organization (WHO) recommends the basic principles to reduce the general risk of transmission of acute respiratory infections include the following: avoiding close contact with the people suffering from acute respiratory infections, frequent hand-washing, especially after contact with direct ill people or environment, avoiding unprotected contact with farm or wild animals, people with symptoms of acute respiratory infection should practice cough etiquette, within health care facilities, enhance standard infection prevention and control, practices in hospitals, especially in emergency departments.

Most of the countries like China, Africa and India has its own traditional medicines for kind of diseases. Previously all the establishment of proven medicines, traditional medicine was the dominant therapeutic system in those countries, but the arrival of the pharmaceutical companies was a noticeable turning point in the history of this olden tradition and culture. Natural medicines are generally not satisfactorily proved. There is a lack of the detailed documentation of the traditional knowledge due to that traditional practices transferred orally. In India, different indigenous systems of medicines like Siddha, Avurveda, Yunani, Homeopathy and Naturopathy are practiced. Various Tribal communities practice different types of traditional healing practices and enough documentation is available on the healing practices. Hence the attempt is made for the same. During outbreak of dengue and chikungunya, extracts of papaya leaf (to increase the platelet count) and Nilavembu Kashayam (which is a combination of different herbs like Plectranthus vettiveroides, Zingiber officinale etc..) played a protective role as immune stimulants and immunomodulators. A survey and more study is needed to find out the traditional medicinal therapies which is suitable for COVID 19.

When there is an emergency all over the world, chances could be given to natural medicinal sciences also apart from allopathy medicines in order to save the lives of people.

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Conflict of interest

Authors declares no conflict of interest

Compliance with Ethical Standards

The authors declare that they have no conflict of interest. This article does not contain any studies involving animals or human participants performed by any of the authors

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