MedCrave
Step into the World of Research

Journal of Human Virology & Retrovirology

Mini Review

Open Access

CrossMark

COVID-19 current scenario

Abstract

Outbreak of a highly infectious and lethal human viral diseases was first reported from China during late 2019.In a few months only, it spread to a large number of countries across the globe and many people died because of the lack of any target medicine. So far five human corona viruses have been identified, four of which are known to circulate in the human population, especially in children The viruses causing common cold but rarely infections of the lower respiratory tract were first identified in the mid-1960s Subsequently, a third human corona virus, which caused severe acute respiratory syndrome, with worldwide spread was identified in 2003. It was declared as pandemic in March 2020 by World Health Organization (WHO), since it spread rapidly across the globe in a very short span of time with considerable rate of mortality.

Keywords: corona viruses, microbes, respiratory syndrome, genome, pandemic

Volume 9 Issue 1 - 2021

LP Awasthi,[1] HN Verma[2]
[1]RNB Global University, Bikaner, India
[2]Jaipur National University, Jaipur, India

Correspondence: LP Awasthi, RNB Global University, Bikaner, India, Email lpawasthi14@gmail.com

Received: September 21, 2020 | **Published:** January 28, 2021

Introduction

The inception of the idea that infectious disease was caused by microbes that could pass through bacteria proof filters[1] was established and confirmed in the latter part of nineteenth century.[2,3] After the discovery of tobacco mosaic virus[4,5] and foot-and-mouth disease virus in cattle,[6,7] the first 'filterable agent' to be discovered in humans was yellow fever virus by Walter Reed.[8] It has been reported that viruses make up over two-thirds of all new human pathogens[9] because new species of human viruses, causing different diseases, are being identified regularly in various countries across the globe, An acute respiratory diseases in chickens {1930} was shown to be caused by infectious bronchitis virus which was found to be a corona virus.[10,11] Numerous novel corona viruses have been discovered in a wide variety of bat species throughout Asia, Europe, Africa and America.[11]

So far five human corona viruses have been identified, four of which are known to circulate in the human population, especially in children.[12,13] The viruses causing common cold,[14] but rarely infections of the lower respiratory tract {HCoV-OC43 and HCoV-229E} were first identified in the mid-1960s.[12,13] Subsequently, a third human corona virus, which caused severe acute respiratory syndrome, SARS-CoV, with worldwide spread was identified in 2003.[15,16]

Corona viruses, on the basis of their morphology and etiology have been divided into three groups. Group 1 comprised of HCoV-229E and HCoV-NL63), group 2 (HCoVOC43 and HCoV-HKU1), group 3 (no human CoVs as yet). Some virologists placed severe acute respiratory syndrome corona virus 2 (SARS-CoV2), first reported from Wuhan, China in December 2019, in group 2. It was declared as pandemic in March 2020 by World Health Organization (WHO), since it spread rapidly across the globe in a very short span of time with considerable rate of mortality. Several viral epidemics such as the severe acute respiratory syndrome corona virus (SARS-CoV) were reported in the last twenty years .

Other hosts

Majority of human virus species are zoonotic in nature as they are capable of infecting vertebrate hosts other than *Homo sapiens* The most commonly identified alternative hosts of corona virus were primates, carnivores and bats.[17] Only a few of the zoonotic viruses (less than 20%) are known to infect birds (17).

Systematic position

A considerable number of animal and human viruses, characterized by a distinctive morphology having enveloped spherical, or disc, kidney, or rod shaped (toro- viruses).have been placed under family *Coronaviridae.* The bulbous distal ends are envelope, made up of glycoproteins and the virions are surrounded by a "corona".[18] Members of family *Coronaviridae* were believed to cause only mild respiratory symptoms in human while other corona viruses infect livestock.[18] Major research work on these viruses was initiated, in 2003 because of the emergence of severe acute respiratory virus (SARS-CoV).

A fairly good number of new corona viruses were discovered, some with zoonotic potential causing serious outbreaks of disease in humans, followed by the more recent emergence of MERS-CoV is exemplary (18).

Structure and genome organization

Corona virus particles are made up of three structural proteins: a glycoprotein S,very large (200 K) (for spike), present on the viral envelope (15 to 20 nm), forming peplomers, transmembrane glycoprotein (M) and an internal phosphorylated nucleocapsid protein (N). Besides, a minor transmembrane protein E. As a result of heterologous RNA recombination, some rearrangements may also be there. The 5′-end of the genome is untranslated (UTR) sequence of 65 to 98 nucleotides, and is termed leader RNA. This leader RNA is also present at the 5′-ends of all subgenomic mRNAs. The 3′-end of the RNA genome has also untranslated sequence of 200 to 500 nucleotides. Both untranslated regions participate in the replication and transcription of RNA (Figure 1).[19]

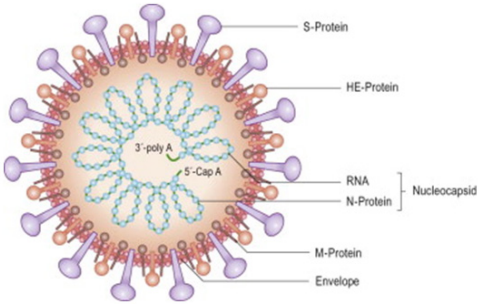

Figure 1 Treatment and epidemiology.

Clinical features and pathogenesis

Corona virus could enter also to human brain through the nose and reach the olfactory bulb of the brain. Collapse of the respiratory centre in the brain may be responsible for the breakdown of COVID-19 patients. Real-time generic information on pathogens causing the disease showed disease occurrence in the large and diverse patient populations, particularly in slum areas and crowded localities where social distancing was not possible.

Symptoms

The disease begins initially with Influenza-like symptoms, a few days after exposure which is followed by dry cough, dyspnea, and increasing respiratory distress for a few more days. In severe cases mechanical ventilation are required as a life support system. In most of the patients lymphopenia (70 to 95%) may be seen with a significant drop in both CD4 and CD8 T cells. These cells remain present in respiratory system, the lungs, the nasal passages, and also in the intestine that express RNA for both of these proteins much more than other cells. In most of the cases fever is the most common symptom, while some older persons experience fever later in disease progression. It has been observed that only 44% of patients had fever when they presented to the hospital, but 89% went on to develop fever at some point during their hospitalization. It has also been observed that a few patients experienced loss of smell and taste as a common symptom of COVID-19.[20]

Disease symptoms of corona virus (COVID-19) may appear two to 14 days following infection in the form of mild fever, cough, tiredness, loss of taste and / or smell, shortness of breath, muscle aches, chills, sore throat, runny nose, and headache and chest pain. On the other hand rash, nausea, vomiting and diarrhea have also been observed in some individuals. It has also been noticed that the severity of COVID-19 may range from very mild to severe. A few individuals may have only a few symptoms, while other may have no symptoms at all. Some people may experience worsened symptoms, such as worsened shortness of breath and pneumonia, about a week after symptoms start.

Older people {age 60+}, along with chronic medical conditions like heart diseases, diabetes, asthema / bronchitis, renal problems and hepatic disorders may have a higher risk of illness from COVID-19, The incubation period for COVID-19 disease,varies in different cases from 5 to 14 days, In general {97.5%} people who develop symptoms will do so within 12 days of infection.

Prevention

A wide range of drugs including protease inhibitors, used in HIV, have been tried for the control of COVID-19 but none of them could found to be clinically effective. It has been suggested that the viral S protein could be a candidate for developing a preventative vaccine against SARS and also for other corona viruses. It appears to be a big challenge for Virologists to manage the spread of virus in a number of new individuals because of the significant genetic variability of these viruses, and poor immunity in individuals against natural infection.[21] In UK for COVID 19 treatment a cheap and widely available drug called *dexamethasone* has been used to cut down death rates significantly in critically ill COVID-19 patients.[22] Some of the researchers took a special route rather than developing new medicines from scratch which might be more time consuming, they looked and aimed at repurposing the existing[24] medicines to fight against corona virus.

The chain terminators: Favipiravir and Remdesivir

There are antiviral medicines that prevent the normal corona virus from replicating and making moves within the body. The restriction in viral replication ensures lesser damage in the body and quicker recovery. Claims have also been made that a 'Pharmaceutical Cocktail' made from the antibodies of a recovered patient, can protect against corona virus. The neutralizing antibody cocktail will bypass the need for a patient to respond to a vaccine and will give instant immunity upon injection.

It has been reported that SARS-CoV-2 has round or elliptic and often pleomorphic form, with a diameter of 60–140 nm. It was found to be sensitive to ultraviolet rays and heat and could be inactivated by lipid solvents like ether (75%), ethanol, chlorine-containing disinfectant, peroxyacetic acid and chloroform.

Transmission

It was presumed that CoVID-19 disease could have been transmitted through animal-to-human as direct exposure from the Huanan Sea food Wholesale Market of Wuhan. However it was observed later on that most of the cases were not associated with this exposure mechanism. Data collected have indicated that in most of the cases virus could also be transmitted from human-to-human besides symptomatic people as the most frequent source of COVID-19 spread. It has been noticed that already infected but asymptomatic carriers could transmit the virus. This indicated that the use of isolation is the best way to contain this epidemic.

The primary inoculum is believed to be the respiratory droplets coming out from coughing and sneezing, as in the case of other respiratory pathogens, including flu and rhinovirus. Analysis of data related to the spread of SARS-CoV-2 in China seems to indicate that close contact between individuals is necessary. The spread, in fact, is primarily limited to family members, healthcare professionals, and other close contacts.

Diagnosis

The most accurate and reliable method of diagnosis is by real-time reverse transcription polymerase chain reaction (rRT-PCR) with a sample collected from nasopharyngeal swab of the patient.. Chest CT imaging may be a preliminary test for diagnosis in individuals where there is a high suspicion of infection based on symptoms and risk factors;

Physical characteristics

a. Thermal inactivation point: The virus was quite stable at 37 degrees C half-life, approximately 24 h) but was rapidity irreversibly inactivated by brief treatment at 37 degrees C (half-life, approximately 30 min). Thermal inactivation at 56 degrees C was highly effective in the absence of Protein, reducing the virus titre to below detectability; however, the addition of 20% protein exerted a Protective effect resulting in residual infectivity. If protein-contained solutions are to be inactivated, heat treatment at 60 degrees C for at least 30 min must be used Overall a thermal disinfection at 60°C for 30 min, 65°C for 15 min and 80°C for 1 min was effective to strongly reduce coronavirus infectivity by at least 4 log c.

b. Dilution end point: Active up to many fold dilutions. It has been observed that even a single virion could incite disease.

c. Longevity *in-vitro*: The virus survives for hours to days on surfaces. The virus was found up to one day on cardboard, up to three days on plastic (polypropylene) and stainless steel.[22] This, however, varies depending on the humidity and temperature. Surfaces may be decontaminated with many solutions including ethanol , propane (isopropyl alcohol). Soap and detergents are effective, if correctly used; soap products degrade the virus' fatty protective layer, deactivating it, as well as freeing them from the skin and other surfaces.

d- pH –Virus could not survive in acidic pH. The virus was quite stable at pH 6.0 but was rapidly and irreversibly inactivated by brief treatment at pH 8.0

Recommended measures to prevent infection

i. Social distancing may intercept and break the chain of infection (maintain strictly 2 meters distance, avoid visiting relatives and friend families, ceremonies and functions, travelling, hospitals, markets and other crowded places).

Frequent and thorough hand washing , at least for minimum 10 seconds, with soap.

Covering coughs and sneezes with a tissue or inner elbow, and keeping unwashed hands away from the face.

In addition, the use of a face covering is recommended for those who suspect they have the virus. Recommendations for face covering use by the general public vary.

Currently, there is no vaccine or specific antiviral treatment for COVID-19, Management involves the treatment of symptoms, supportive care, isolation, and experimental measures.

The authors of the Chinese CDC report divided the clinical manifestations of the disease by their severity:

- Mild disease: non-pneumonia and mild pneumonia; this occurred in 81% of cases.
- Severe disease: dyspnea, respiratory frequency ≥30/min, blood oxygen saturation (SpO2) ≤ 93%, PaO2/FiO2 ratio or P/F [the ratio between the blood pressure of the oxygen (partial pressure of oxygen, PaO2) and the percentage of oxygen supplied (fraction of inspired oxygen, FiO2)] < 300, and/or lung infiltrates > 50% within 24 to 48 hours; this occurred in 14% of cases.
- Critical disease: respiratory failure, septic shock, and/or multiple organ dysfunction (MOD) or failure (MOF); this occurred in 5% of cases.[23]
- In general, estimates suggest that 2% of the population is healthy carriers of a CoV and that these viruses are responsible for about 5% to 10% of acute respiratory infections. Common human CoVs can cause common colds and self-limiting upper respiratory infections in immune-competent individuals. In immune-compromised subjects and the elderly, lower respiratory tract infections can occur.[24]

Conclusion

COVID-19 is a highly infectious pandemic outbreak, word wide which can only be avoided by following social distancing, face covering and other precautionary measures / guidelines issued by the government health department.

References

1. Hadidi, A, Panayota E Kyriakopoulou, Marina Barba. Major advances in the History of plant virology. In: Awasthi LP. editor, Applied Plant Virology; Advances, Detection, and Antiviral Strategies. Academic Press, 50 Hampshire Street, 5th Floor, Cambridge, MA 02139, United States of America.
2. Mayer A. On tobacco demo seed disease: preliminary statement. Tijdschr. Landbouwk. 1882;2:359–364.
3. Mayer A. The Mosaic Disease of Tobacco. Landw. Vers. Stn. 1886;32:451-467.
4. Vanovski D. About the mosaic disease of the tobacco plant. Bull Acad Imp Sci. St Petersb. Nouv. Se´r. III, 35, 67_70. Translation published in English as Phytopathological Classics No. 7 [1942], American Phytopathological Society, St. 1892.
5. Beijerinck MW. Concerning a contagium vivum fluidum as the cause of the blotchy disease of the tobacco leaves. In: Beh K Akad, editor. Phytopathological Classics No. 7 Amsterdam 65, 1898. pp. 3–21.
6. Loeffler F, P Frosch. Summary report of the results of the research into foot and mouth disease. *Zentbl. Bacteriol Parasite kd Abt*. 1897;I 22:257–259.
7. Loeffler F, Frosch P. Reports of the Commission for Research on Foot-and-Mouth Disease at the Institute for Infectious Diseases in Berlin. Centralbl. Bacteriology, Parasite Science and Infectious Diseases I Dept. 1898;23:371–391.
8. Levine AJ, Enquist LW. History of virology. In: Fields BN. Knipe DM, Howley PM, editors. Fields virology. 5th edn Philadelphia, PA: Lippincott Williams &Wilkins. 2007.pp. 565–604.
9. Woolhouse MEJ. Gaunt E. Ecological origins of novel human pathogens. *Crit Rev Microbiol*. 2007;33(4):231–234.
10. Estola T. Coronaviruses, a New Group of Animal RNA Viruses. *Avian Diseases*.1970;14 (2):330– 336.
11. Drexler JF, Corman VM, Drosten C. Ecology, evolution and classification of bat coronaviruses in the aftermath of SARS. *Antiviral Res*. 2014;101:45–56.
12. Van der Hoek L, Pyrc K, Berkhout B. Human coronavirus NL63, a new respiratory virus. *FEMS Microbiol Rev*. 2006;30(5):760–73.
13. Chen Z, Wang Y, Ratia K, et al. Proteolytic processing and deubiquitinating activity of papain-like proteases of human coronavirus NL63. *J Virol*. 2007;81(11):6007–6060.
14. Bradburne AF, Bynoe ML, Tyrrell DA. Effects of a "new" human respiratory virus in volunteers. *Br Med J*. 1967;3(5568):767–769.
15. Chan-Yeung Moira, Xu, Rui-Heng. SARS: epidemiology. *Respirology.* 2003;8(s1): 14.
16. McKie Robin. Scientists trace 2002 Sars virus to colony of cave-dwelling in China". *The Guardian*. 2017.
17. Mark Woolhouse, Fiona Scott, Zoe Hudson Richard Howeyand, et al. Human viruses: discovery and emergence. *Phil Trans R Soc*. 2012;367: 2864–2871.
18. Wertheim JO, Chu DK, Peiris JS, et al. A case for the ancient origin of coronaviruses. *J Virol*. 2013;87(12): 7039–7045.
19. Yu Chen, Qianyun Liu, Deyin Guo. Emerging Coronaviruses: genome structure, replication, and pathogenesis . *J Med Virol*.. 2020;92(4):418–423.
20. Hussin A Rothan, Siddappa N Byrareddy. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun*. 2020;109:1–4.

21. Leila Mousavizadeh, Sorayya Ghasemi. Genotype and phenotype of COVID-19: Their roles in pathogenesis. *J Microbiol Immunol Infect*. 2020;S1684-1182(20)30082–30087.

22. Sterne JA, Murthy S, Diaz JV. Association Between Administration of Systemic Corticosteroids and Mortality Among Critically Ill Patients With COVID-19A. *Meta-analysis.* 2020;324(13):1330–1341.

23. Zunyou Wu, Jennifer M McGoogan. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention, JAMA. 2020;323(13):1239–1242.

24. David E Gordon, Gwendolyn M Jang, Bouhaddou M. A SARS-CoV-2 protein interaction map reveals targets for drug repurposing. *Nature*. 2020;583(7816):459–468.