

## COVID-19 Pandemic: An Overview

Anuj Tripathi<sup>1</sup>, Minu Chaudhuri<sup>1</sup> and Smita Misra<sup>2\*</sup>

<sup>1</sup>Department of Microbiology and Immunology, Meharry Medical College, Nashville, TN, USA

<sup>2</sup>School of Graduate Studies and Research, Meharry Medical College, Nashville, TN, USA

**\*Corresponding Author:** Smita Misra, School of Graduate Studies and Research, Meharry Medical College, Nashville, TN, USA.

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### Abstract

The emergence of novel coronavirus disease, COVID-19 caused by a novel strain of Coronavirus named SARS-CoV2 (severe acute respiratory syndrome coronavirus2) due to its similarity to previously known SARS-CoV, has paralyzed the world. It has affected over 100 countries in the world till date (April 14th 2020), after starting from city of Wuhan, Hubei Province, China with first case reported in December 2019. WHO has declared it a pandemic on 30th January 2020, and confirmed SARS-CoV2 to be 10 times more infective than any previously known CoV. Human-to-Human is the only known way of spreading the infection. Due to the lack of any effective treatment and vaccines social distancing is the only way to avoid the spread of virus. COVID19 has affected 1,807,308 peoples and has claimed over 100,000 lives to date worldwide. Here we report a timeline of world events and efforts that are being taken to fight the unseen enemy and face the challenge.

**Keywords:** COVID-19; SARS-CoV2 (Severe Acute Respiratory Syndrome Coronavirus2); Infectious Diseases

Infectious diseases have accompanied the mankind since the commencement and have impacted the history of human development and civilization. In particular, pandemics and epidemics have influenced the wars and the fate of the dynasties and their subjects. Like the effect of Malaria in the fall of the Roman Empire, the Black Death in the 14<sup>th</sup> century which killed nearly a third of the world's population and the impact of the "Spanish" flu pandemic of 1918-19 [1,2]. The more recent pandemic in the 21<sup>st</sup> century is the 2009 and 2010 influenza caused by H1N1 virus. Then in the early decade of the 21<sup>st</sup> century we had the first outbreak of the coronavirus (CoV) disease, called SARS-CoV (Severe acute respiratory syndrome-CoV) which lasted almost 17 months from November 16, 2002 to 19<sup>th</sup> May 2004, it started in China and spread to 17 other countries including Canada and United States. Another CoV outbreak happened in 2012 and lasted till June 2015. Because of its prevalence in Middle East it was called MERS-CoV (Middle East Respiratory Syndrome related CoV) that spread in 26 countries including USA and several European Union Countries. There is a most recent outbreak of the CoV infection detected in December 2019 in the city of Wuhan, Hubei Province, China and due to its global spread pretty quickly, WHO declared this outbreak as pandemic on 30<sup>th</sup> January 2020. Because of its similarity to the SARS-CoV, the new virus is named CoV2 and WHO named the disease COVID-19 (Coronavirus disease, 2019) [3].

### The outbreak timeline for COVID-19

CoVs have been traditionally considered nonlethal pathogens to humans, mainly causing approximately 15% of common colds. However, in this century, as mentioned above we had encountered highly pathogenic human CoVs twice, SARS-CoV affected 8,098 people worldwide claiming 774 lives [2,3], followed by MERS-CoV, affected 2506 people and had claimed 862 deaths till June 2015 [1]. The current COVID-19

is the third CoV outbreak, recorded to be the deadliest one [1,4]. The timeline for the current outbreak of COVID-19 is illustrated in figure 1.

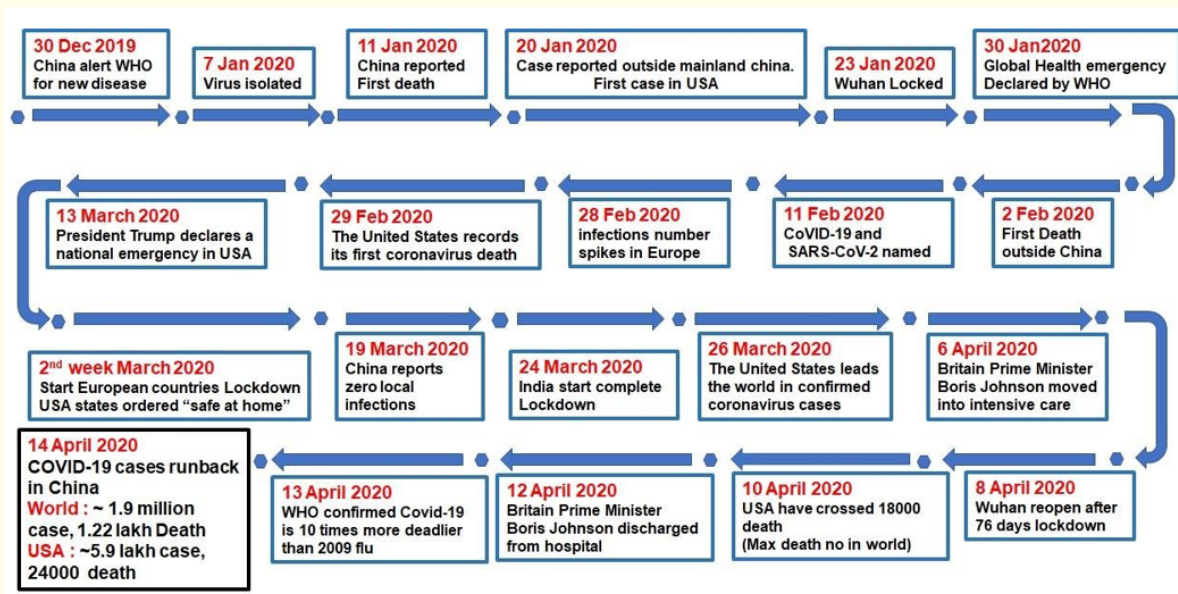


Figure 1: COVID-19 pandemic outbreak timeline.

**What is a coronavirus?**

CoV are members of the subfamily Coronavirinae in the family Coronaviridae and the order Nidovirales. CoV are enveloped positive sense RNA viruses ranging from 60 nm to 140 nm in diameter. CoV have the largest known RNA genome ranging from 27,317 nucleotides (nts) for HCoV-229E to 31,357 nts for the murine hepatitis virus-A59, with G + C contents varying from 32% to 43% [5,6]. The Spike like projections on its surface giving it a crown like appearance under the electron microscope; hence the name coronavirus. They are divided into four genera: Alpha-, Beta-, Gamma-, and Delta CoV. The AlphaCoV and BetaCoV have the human pathogens while the GammaCoV and DeltaCoV infect birds. To date out of the seven human CoV (HCoVs), HCoVNL63 and HCoV-229E are AlphaCoV, and HCoV-OC43, HCoV-HKU1, SARS- MERSCoV are the BetaCoV. Depending upon the genomic structures, COVID-19 has close similarity to SARS-CoV thus it is classified as BetaCoV. Similar to SARS CoV, COVID-19 also uses ACE2 as the entry receptor [5,7,8].

**Epidemiology, pathogenesis and clinical features**

People of all ages are susceptible for COVID-19 infection. While we are still learning about this new infection, it has been found that older persons and persons with pre-existing medical conditions (such as high blood pressure, heart disease, lung disease, cancer or diabetes) appear to develop serious illness more often than others. The incubation period of virus varies from 2 to 14 days after the exposure. Symptoms often are wide ranging or being completely asymptomatic, particularly at the beginning of the infection. The most common symptoms are fever, tiredness, dry cough, aches and pains, nasal congestion, runny nose, sore throat or diarrhea. Usually mild symptoms, can even lead to sever acute respiratory distress syndrome, can progress to pneumonia, respiratory failure and death. The main source of infection is known through droplets generated during sneezing and coughing from symptomatic and asymptomatic patients. To date

human-to-human is the only known driver of infection. There is no report of transmission from pregnant mom to their fetus. The fatality rate of COVID-19 cases is estimated to the range between 2 and 3% but among hospitalized adult patients, it is ranged from 4 to 11% [2,7]. Studies have found that SARS-CoV-2 replicates poorly in dogs, pigs, chickens and ducks, but ferrets and cats are permissive to infection. Recently, a tiger at the Bronx Zoo in New York City, USA has tested positive for the SARS-CoV2 [9].

### Diagnosis, prevention and treatment

If the patient has possible exposure to COVID19 infection due to travel or contact with infected individual and are presented with symptoms then they are subjected to testing. The primary test relies on the RT-PCR looking for the SARS-CoV2 genetic material in the nasal and throat swabs. Serological tools looking for the antibody response in the circulation of the exposed/infected individuals are still under research and development (R&D). Prevention is the best cure in the present scenario by maintaining social distancing and avoiding crowding. Following personal hygiene, like; frequent washing of hands with soap and water and using face mask are other ways of avoiding exposure. Use of common household disinfectants to wipe solid surfaces, door knobs, refrigerator handles, and others on a regular basis is also an effective way to avoid exposure. To date, there is no vaccine and no specific antiviral medicine to prevent or treat COVID-19. However, those affected should receive care to relieve symptoms. People with serious illness should be hospitalized. Some drugs which are still under-trial to test efficacy against COVID19 include antiviral drugs such as Ribavirin, Lopinavir-ritonavir (used for SARS and MERS), Remdesvir (used for Ebola), Arbidol, Favipiravir (used for influenza). The most promising candidate is the known antimalarial drugs, Chloroquine/hydroxychloroquine. Use of plasma from the patients recovered from COVID19 infection is also being considered and under trial as a possible therapy [10,11].

### Vaccine

The publication of genetic sequence of SARS-CoV2 on 11 January 2020 [12,13], triggered intense global effort for vaccine development. About 115 vaccine candidates have been identified globally, out of which 73 are at preclinical stage. The most promising candidates include mRNA- 1273 (Moderna, MA, USA), Ad5-nCoV (CanSino Biologicals, China), INO-4800 (Inovio, PA, USA), LV-SMENP-DC and pathogen-specific aAPC (Shenzhen Geno-Immune Medical Institute, Guangdong, China). WHO also initiated a global collaborative effort for COVID19 vaccine development on April 13<sup>th</sup> 2020 [14].

### Conclusion

This new virus outbreak has challenged the economic, medical and public health infrastructure for whole world. To date roughly 1,807,308 peoples are infected and more than 100,000 lives have been claimed by COVID19 worldwide. We are far away from effective drugs or vaccine for COVID-19. Due to its high infection rate, SARS-CoV-2 caused a collapse of health care system and lockdown of many countries worldwide. A global and rigorous clinical research is urgent to beat this pandemic.

### Bibliography

1. Coronavirus disease (COVID-19) pandemic.
2. Froes F. "And now for something completely different: from 2019-nCoV and COVID-19 to 2020-nMan". *Pulmonology* 26.2 (2020): 114-115.
3. Get the Facts About Coronavirus.
4. United States Coronavirus Cases.
5. Mousavizadeh L and Ghasemi S. "Genotype and phenotype of COVID-19: Their roles in pathogenesis". *Journal of Microbiology, Immunology and Infection* (2020): S1684-1182.

6. Brian DA and Baric RS. "Coronavirus Genome Structure and Replication". *Coronavirus Replication and Reverse Genetics* 287 (2005): 1-30.
7. Ye ZW, *et al.* "Zoonotic origins of human coronaviruses". *International Journal of Biological Sciences* 16.10 (2020): 1686-1697.
8. De Wit E, *et al.* "SARS and MERS: recent insights into emerging coronaviruses". *Nature Reviews Microbiology* 14 (2016): 523-534.
9. J Shi, *et al.* "Susceptibility of ferrets, cats, dogs, and other domesticated animals to SARS-coronavirus 2". *Science* (2020).
10. Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease (COVID-19).
11. Phua J., *et al.* "Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations". *The Lancet Respiratory Medicine* (2020).
12. JFW Chan., *et al.* "Genomic characterization of the 2019 novel human-pathogenic coronavirus isolated from a patient with atypical pneumonia after visiting Wuhan". *Emerging Microbes and Infections* (2020): 221-236.
13. Andersen K G., *et al.* "The proximal origin of SARS-CoV-2". *Natural Medicine* 26 (2020): 450-452.
14. Thanh Le T., *et al.* "The COVID-19 Vaccine Development Landscape". *Nature Reviews Drug Discovery* (2020).

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