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SARS-CoV-2 / 2019-Novel Corona Virus: An Epidemic to Pandemic

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ABSTRACT

An unexpected outbreak of pneumonia of unfamiliar aetiology in Wuhan, Hubei, China was reported in December 2019. World Health Organization identified the pathogen and named it COVID-19. COVID-19 made the world go through a crisis. The impact of this viral disease is now an issue of major concern. Respiratory infections, dry cough with fever are the major symptoms which are due to beta coronavirus, namely Severe Acute Respiratory Syndrome corona virus 2 (SARS-CoV-2). Within a short spell, COVID-19 spread all over China. Since January to today 24 March 2020 this epidemic turned into pandemic with continuous rise of cases and deaths. Italy, Germany, Spain, USA, Iran, France are the countries where the disease is spreading in a community level and rest of the countries over the globe the positive cases are also coming in the report. As the disease is communicable, it is highly necessary to take measures before it starts spreading in countries like India where the population is very high. The treatment of this severe acute respiratory syndrome corona virus 2 is not clear so far. Prevention is the only way to stop spreading this fatal disease. In view of this, the total state of knowledge regarding COVID-19 and the suggestive prevention are discussed by considering countries (considering India) where the population is high and this pandemic just started spreading.



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INTRODUCTION

The mysterious corona virus or severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) is basically from corona virus family (B-corona virus cluster) (WHO, 2020). The outbreak was initiated at

Wuhan, Hubei, China on December 2019. As of 24 March 2020, 190 countries are under threat. The statistics shows more than 16,500 deaths (WHO, 2019; Coronavirus Update, 2020). All though it was declared as pandemic by world health organization (WHO) on 11 March 2020, the terminology was well-known to molecular biologists. The severe acute respiratory syndrome (SARS) was seen in Hongkong, Singapore in 2003, which was also having similar symptoms of cough, fever, difficulties in breathing. COVID-19 is strain of a SARS-CoV-2. But, this is a form of SARS and is more fatal and life threatening. As it creates the problem of SARS it was named SARS-CoV. This power variant of SARS-CoV is further named as 2009 novel corona virus when it was first reported in Wuhan, China. It is a disease related to breathing issues and similar symptoms of SARS-CoV, so this SARS-CoV-2 is named as Corona

Virus Disease 2019 (COVID-19). Herein, we brief the current over view and need of knowledge about the unknown aetiology ([Symptoms of Novel Coronavirus \(2019-nCoV\), 2020](#); [European Centre for Disease Prevention and Control, 2020](#)).

COVID-19 and it's outbreak

In December 2019, a group of people were identified as pneumonia patients in Wuhan, Hubei, China ([Huang *et al.*, 2020](#)) with some health issues like fever, cough, lung infiltration etc. Chinese centre for disease control (CCDC) found out that the health issues are related to intakes of bats, snakes and marmots ([Coronavirus, 2020](#)). CCDC understood this because the virus which is powerful variant of SARS. It is announced SARS-CoV-2 and furthermore, world health organization (WHO) renamed as COVID-19 ([Coronavirus COVID-19 Global Cases, 2020](#)).

In the second week of January 2020, this Chinese outbreak started spreading throughout Wuhan city and government announced for lockdown. It was suspected as contagious and considered as epidemic. In the last week of January 2020, WHO announced COVID-19 global emergency as it was becoming pandemic. All the countries having vulnerable health sectors were warned and tried to make them aware about its fatality.

COVID-19 epidemic to pandemic

It is important to discuss few features of corona virus which make the diseases from epidemic to pandemic.

It is more contagious than normal flu virus. The fatal impact of pathogen normally is depending on the life span of the pathogen outside the body. Although normal flu contagious but cannot able to stay longer outside the human body. In such cases somebody can be affected only when he or she is in direct contact (like talking during meet, sleeping together, travelling together etc.) But, if the infected patient touches any wall, door or railing it is not possible to spread from there as the pathogen will die before starting contamination. But SARS-CoV-2 does the mutation very fast and can sustain in plastic or metal surface ([Rothe *et al.*, 2020](#)) for two days and can stay in air for few hours as it has been reported so far.

So, it is the case that if somebody touches the place where COVID-19 patient has touched few hours ago, then there is a chance that it may spread to other uninfected persons. Similarly, a COVID-19 patient is travelling in a train, bus or in flight, the people sitting in the surroundings may be unaware of his/her own infection. In this way, it can be a chain process of spreading the virus which can cross the bound-

ary of one country and thus it becomes an epidemic to pandemic.

C. Darwinian's evaluation theory says "survival of the fittest". It is basically reproductive success and the biological term is genetic mutation. Viruses, bacteria etc. pathogens are also in a race of the Darwinian's theory of survival. We are surrounded by virus bacteria and other pathogens but still these are not capable enough to hamper our lives because of our immunity systems which are continuously fighting with such pathogens. On the contrary, the viruses also prepare themselves and get mutated with unique strain to break our immunity system; COVID-19 is such a case under consideration.

The immunity system differs from human to human with the region to region, so it is not certain that same virus can surely affect all. But the corona virus has done gene mutation several times and thus COVID-19 becomes unique where our immune system cannot protect human body from its dangerous health hazards.

So, it becomes very tough to restrict the spreading. This situation is called community spread which can spread in chain rule within three four weeks. This is the reason the first world countries like Italy, United States of America etc. are helpless and are under serious threat.

It is already discussed that the virus affects the human body based on the immune system, so normally, it cannot make more impact on the immune system of the youth and will not show any symptoms although it can stay in the body. So, it becomes very tough to know about the existence of the virus in the body. Unknowingly, viral transmission keeps occurring from one body to another and becomes epidemic in large scale pandemic.

The above numerical reasons are natural and it was understood from the devastating outbreak at China. China and WHO have warned everyone about the way of getting rid of the contamination of this epidemic before it becomes pandemic. But unfortunately it was not strictly followed in some countries specially Italy and Iran during first 10-14 days. Isolation was the one and only option which was not maintained properly assuming that it was a concern of elderly people or thinking it to be normal cough or cold.

In the first week of February 2020, COVID-19 was reported at few places in Europe and Italy. On 19 February 2020, a UEFA champions League Atlanta - Valencia was held in Italy with 40000 crowds. The consequence was outbreak of COVID-19 rapidly. Bergamo, the province of Italy is the most effected

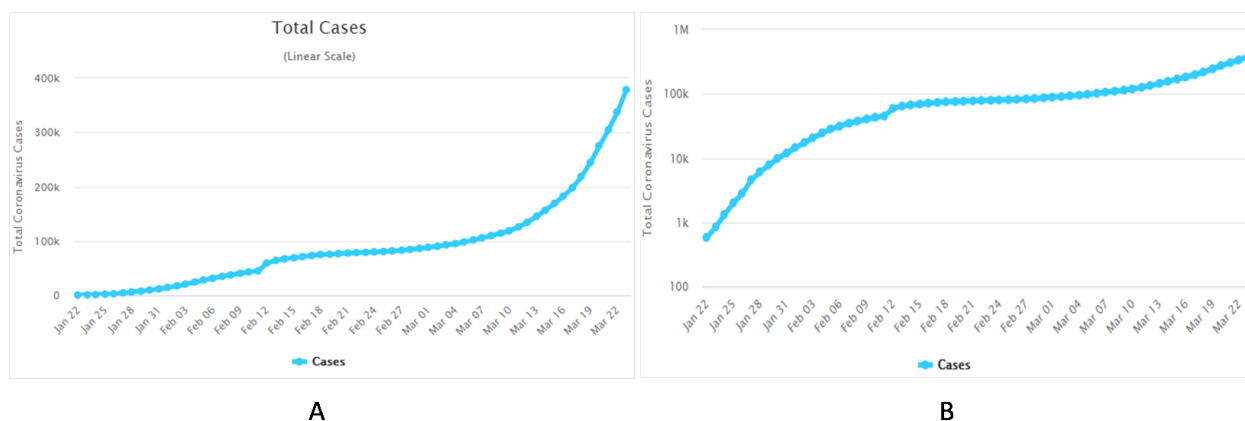


Figure 1: (A): Linear plot Deaths and recovered or discharged patients (cases with an outcome) considering "Total Cases"= total cumulative count (398,792). (B): Logarithmic plot Deaths and recovered or discharged patients (cases with an outcome) considering "Total Cases"= total cumulative count (398,792)

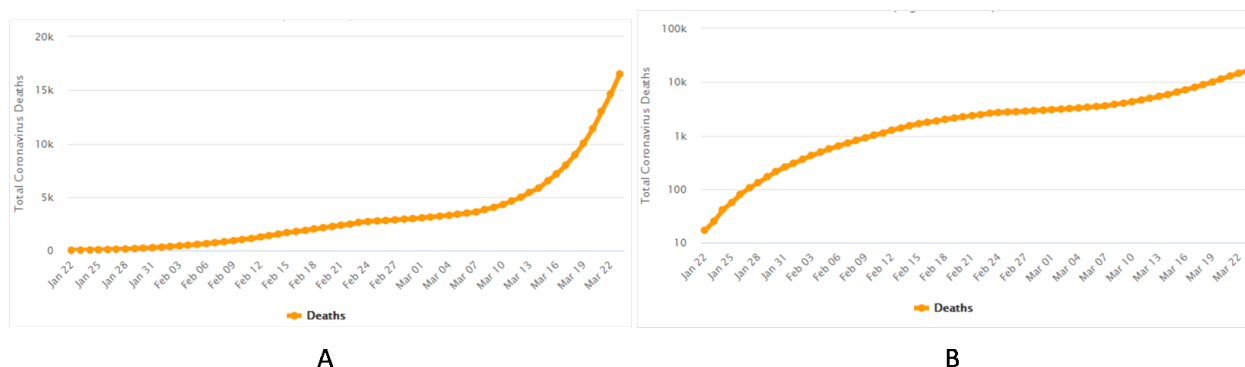


Figure 2: (A): Logarithmic plot total deaths from Jan 22 – Mar22. (B): Logarithmic plot total deaths from Jan 22 – Mar22.

Table 1: International statistics of pandemic COVID-19 as of now 24 March 2020, 9 PM

Currently Infected	Cases with Outcome
277,785	121,007
Mild Condition	Recovered/ Discharged
265,563 (96%)	103,748 (86%)
Serious or Critical	Deaths
12,222 (4%)	17,259 (14%)

(Information from Coronavirus Update (Live): on 24.03.2020 —Worldometer)

Table 2: Statistics of some countries of pandemic COVID-19 as of now 24 March 2020, 9 PM IST

Country	Total Cases	New Cases	Total Deaths	New Deaths
China	81,171	+78	3277	+7
Italy	63,927	-	6077	-
USA	46,285	+2551	588	+35
Spain	39,673	+4,537	2696	+385
Germany	31,370	+2,314	133	+10
Iran	24,811	+1,762	1934	+122
France	19,856	-	860	-
India	519	+20	10	+1

(Information from Coronavirus Update (Live): on24.03.2020 —Worldometer)

Table 3: The death rate by age as a factor till the report of 28 February 2020

Age	Death Rate for Confirmed Cases	Death Rate for All Cases
80+	21.9%	14.8%
70-79	-	8.0%
60-69	-	3.6%
50-59	-	1.3%
40-49	-	0.4%
30-39	-	0.2%
20-29	-	0.2%
10-19	-	0.2%
0-09	-	No Fatalities

(Information from Coronavirus Update (Live): on 24.03.2020 —Worldometer)

Table 4: Based on symptoms & travel CDC Vs. WHO diagnosis criteria

	CDC	WHO
Epidemiological Risk	Travel history of from Hubei, China Travel history of from Mainland, China Contact with lab-confirmed COVID-19 patient within fourteen days of symptoms initiation.	Travel history of from Hubei, China Health sectors people worked in an environment where patients being cared of. Despite treatment including degradation of condition. Contact range of 2 meters for 15 minutes with assured SARS-CoV-2 Healthcare and capacity to handle of COVID-19 Above mentioned happening within 14 days of symptoms initiation.
Clinical Features	Fever Lower Respiratory Issues /Infection (need of hospitalization)	Acute respiratory issues Fever more than 37C0 Cough Onset within approximately ten days Hospitalization required

zone so far.

Global response and India's move

A positive effort of funding € 10,000,000 is made for efficiently managing clinical sectors and the patients along with the preparedness, response and recovery (Sohrabi *et al.*, 2020). The govt. of United Kingdom (UK) has already released a fund of £20,000,000 in this regard (BBC Coronavirus, 2020). The companies like Novacyt's molecular, Co-diagnostics have come up with testing kits (Verdict Medical Devices, 2020a,b). Most of the countries have been allowing international flights. As of 24 March 2020 the status of COVID-19 is shown in the Table 1 & Table 2, (Coronavirus Update, 2020) and Figure 1 and Figure 2, (Coronavirus Update, 2020).

Table 3, (Coronavirus Update, 2020) shows the death rate by age as a factor. Death is the ratio of number of deaths to number of cases, which is

equals to the probability of dying if infected by the virus (%). This probability differs depending on the age group which is proved from the present statistics by the WHO-China Joint Mission published on Feb. 28 by WHO (Report- WHO, 2020).

India, one of the highly populated countries is also hitting a period of exponential growth of this disease. Govt. of India is closely observing the pandemic. On 19 March 2020 Govt. of India has declared as a disaster and enabled the state disaster respond fund. Indian government has temporarily restricted the landing of international flights from 22 March 2020 for upcoming seven days. Health screening is being done at major points like stations, bus stands, airports etc. Excluding emergency sectors, most of the sectors are locked down and instructed for "work from home". WHO and Ministry of Health and Family (Welfare (MoHFW)

are working together for COVID-19 surveillance, lab, R&D, training on precaution-prevention and control ([spread of novel coronavirus, 2020](#)).

India hitting exponential covid-19 growth

It has taken forty days to report fifty cases. On 45th day the number was 100. It crosses 150 after 48th day. The number of positive cases of India is doubling in less than five days down from six days before. This keeps India in the graph of countries over the world-in the United States, it is doubling in every two days [COVID-19 \(2020\)](#). After knowing the spread out of COVID-19 the Indians residing in different countries started returning to their homes. It may be one of the reasons of rapid growth of number of affected peoples in India. It is a communicable disease so the spread out of this disease is very easy in highly populated country like India. For better understanding the chances of rapid increment of number cases in Indian scenario, let consider the following.

A person gets affected on 22 March 2020 and the virus is transmitted from him to five different persons during travelling. On 23 March each of five persons makes close contact and transmits to another five persons. Now the number of peoples having COVID-19 is who are not aware of the presence of COVID-19 in their body as it is initial stage without any symptoms. Let us think, as suddenly the symptoms are becoming evident the first person is sent to quarantine. Now on 24 March 2020 onwards 30 persons are moving in different places without any symptoms and spreading the virus unintentionally five days to five people per day.

Therefore,

24 March 2020 - $30 \times 5 = 150$ Persons

25 March 2020 - $150 \times 5 = 750$ Persons

26 March 2020 - $750 \times 5 = 3750$ Persons

27 March 2020 - $3750 \times 5 = 18750$ Persons

28 March 2020 - $18750 \times 5 = 93750$ Persons

It implies within 28 March the COVID-19 cases will become 93750. Moreover, if in initial case the number of infected person is 100 instead of 1 then it will be almost impossible for a nation to combat such disaster and it is power of compounding. In chemistry it is called chain reaction of nuclear reaction. From the analysis it is understood that any how it is required to break the chain reaction to get rid of its fatal consequences. So the only prevention as of now is self-isolation with proper hygiene.

Indian scenario and action of covid-19 happenings

There is no treatment as of now; no antiviral vaccine is reported so far. These viruses are in micro-level dimensions. So, normal medicine is not much useful for recovery. Besides, the gene mutation of COVID-19 is one of the important constraints to combat with the virus. Genome sequencing of ELISA test kits are very costly and very few in numbers. The kits which are used today cannot assure 100 percent accuracy. So here is a chance of false positive and false negative which may lead to further transmission of the virus.

Various bodies, including WHO, US centres for disease control and prevention (CDC) ([World Health Organization, 2019](#); [Lu et al., 2020a](#)), government of India have issued some rules of regulations to prevent COVID-19 spread. It is recommended not to travel, be quarantine for coming days, avoids hand-shaking, parties all types of gatherings. Ministry of Human Resource and Development of government of India has announced on 17 March 2020 to shut down all the institutions and continue work from home. Government has urged to common people to stop community spreading. From 24 March 2020 onwards, government of India has declared 21 days lock down to stop the further spreading. On the view of below poverty level people government has announced free rations and open "Prachesta" a new scheme for daily wagers during these lock down. Basic hygiene measures are highly required. Use of hand wash, sanitizer and mask are recommended able for as precaution. Clinical features of COVID-19 are basically dry cough, high fever, diarrhoea and respiratory functional problems ([Chen et al., 2020](#)). CDC and WHO have used the following suggestive which is shown in Table 4, ([Information Center, 2020](#); [nCoV, 2020](#); [Centers for Disease Control and Prevention, 2020](#)) will help to have early precautions to the countries like India where COVID-19 just started spreading.

Pathopsychology of covid-19

SARS-CoV-2 is beta corona virus which is the main reason behind COVID-19. The single stranded ribonucleic acid (rRNA) structured SARS-CoV-2 is under sub family of Coronavirinae sub-family. It is seen that genome is linked with 2003 SARS. SARS-CoV is composed of 14 binding residues which converts enzyme 2 by interacting angiotensin of these amino acids are basically SARS-CoV-2 ([Lu et al., 2020b](#); [Fehr and Perlman, 2015](#)). Moreover exact reason of SARS-CoV-2 is hypothetical as there is no effective laboratory research is performed so far.

CONCLUSIONS

The recent COVID-19 outbreak is announced as global emergency by WHO. COVID-19 cases continue to rise with 277,785 infected cases and 17,259 death as of now over the globe. As there is no treatment or direct medicine available so far to combat COVID-19, self-quarantine is the one and only option for the countries like India, where this pandemic has just begun spreading. Extensive research is required to find out the transmission mechanism of the virus. Differentiation of antibody clonality of infected and no infected subjects could be a great step to understand the future host adaptations, mutations, transmission and pathogenicity.

Moreover, it is now a great concern to maintain self-isolation with proper hygiene and make ourselves aware about the discussed symptoms of COVID-19.

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