

Review paper on COVID-19 Corona Virus Disease - 2019

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Abstract: An outbreak of 2019 novel coronavirus disease (COVID-19) in Wuhan, China has spread quickly nationwide. Here, we report results of a descriptive, exploratory analysis of all cases diagnosed as of February 11, 2020. All COVID-19 cases reported through February 11, 2020 were extracted from China's Infectious Disease Information System.

**Analyses included: 1. Summary of patient characteristics
2. Symptoms of the disease 3. Preventive measures taken 4.**

INTRODUCTION

Coronaviruses (CoV) are family of RNA (Ribno Nucleic Acid). They are called Coronavirus because the virus particle exhibits a characteristic "Corona"(crown) of spike protein around its lipid envelope. CoV infections are common in animals and humans. Some strains of CoV are zoonotic, meaning they can be transmitted between animals and humans, but many strains are not zoonotic. In humans CoV can cause illness ranging from the common cold to more severe disease such as Middle East Respiratory Syndrome (caused by MERS-CoV) and Severe Acute Respiratory Syndrome (caused by SARS-CoV). The Source of the Coronavirus is believed to be a "Wet Market" in Wuhan (China) which sold both dead and live animals including both fish and birds. Such market pose a heightened risk of viruses jumping from animals to humans because hygiene standards are difficult to maintain if live animals are being kept and butchered on site .They are also densely packed. The animal source of the latest outbreak has not yet been identified but original host is thought to be bats. Bats are host to wide range of zoonotic viruses including Ebola, HIV, and Rabies. This disease was first detected in China, and later it spreads in all over the world, which resulted in affecting many more people across globe.

HOW COVID-19 SPREADS

COVID-19 spreads mainly by droplets produced as a result of coughing or sneezing of infected person.

1. Person-to-person; The virus is thought to spread mainly from person to person.
 - Between people who are in close contact with one another (within about 6 feet)
 - Through respiratory droplets produced when an infected person coughs or sneezes .These droplets can land in mouth or noses of people who are nearby or possible be inhaled into lungs.
2. Can someone spread the virus without being sick :
 - People are thought to be most contagious when they are most symptomatic (the sickest)
 - Some spread might be possible before people show symptoms ; there have been reports on occurring with this new corona virus but this is not thought to be the main way the virus spreads.
3. Spread from contact with contaminated surface or objects : It may be possible that a person can get infected by touching their own mouth and nose or possibly their eyes , but this is not thought to be the main way the virus spreads.

The incubation period of COVID-19(time between getting the infection and showing symptoms)is 1 to 14 days. Some people with the infection but without any serious symptoms can also spread disease.

WHICH GROUP OF PEOPLE ARE AT HIGHER RISK OF GETTING INFECTED

1. People who have travelled to other countries in last 14 days and their family members
2. People coming from other states if they have been working with people who travelled to other countries in last 14 days.
3. Family members and contacts of patients confirmed to have COVID-19.
4. People older than 60 years of age and people with medical problems like high blood pressure, heart problems, respiratory disease/asthma, cancer or diabetes are at higher risk for developing serious complications.

SYMPTOMS OF COVID-19

According to World Health Organization (WHO), the main symptoms include: Dry Cough, Temperature, Tiredness/Lethargy, Shortness of Breath . Some patients may have "aches and pains, nasal congestion, runny nose, soar throat or diarrhea",the WHO says "These symptoms are usually mild and begin gradually .Some people become infected but they don't develop any symptom and don't even feel unwell.

Here are some takeaways from the studies in the U.S. and China:

- The first symptom of COVID-19 is usually a fever.The fever is often followed a few days later by dry cough, one in which one do not cough up any phlegm, and shortness of breadth.
- The symptoms begin from two to 14 days after you have been exposed to the virus . A new study from Johns Hopkins Bloomberg School of Public Health suggests a median time of about five days.

- The average duration of fever was 12 days. Ninety–nine percent of the patients studied had a fever. About 50% felt fatigued and had a dry cough , with 33% having difficulty breathing and complaining of muscle pain.
 - The study showed that 85% of those with the virus only experience “phase one” of the virus’s course. Phase one encompasses the first seven days of symptoms. Those with more critical cases of COVID-19 went on to suffer more severe symptoms that last for two more weeks ,on average.
 - Age is a strong risk factor for severe illness, complications and death.
 - The second Wuhan study also said it observed that the average hospital stay was 10 days
- Here is what having COVID-19 looks like day-by-day:

Day 1: Most of those infected - 88% -will have a fever and feel tired. Many also have muscle pain and dry cough. Some people, around 10% according to the study from China, experience nausea or have diarrhea in the days just before the fever begins.

Day 2-4: The fever persists as does the cough.

Day 5: Breathing difficulty begins on the day5. It is especially likely to happen if the person has a pre-existing condition or is older.

Day 6: Breathing difficulty , cough and fever persist. Some people describe chest tightening or having a feeling that a “band is around their chest.

Day 7: It is on this day that people who have been experiencing persistent chest pain or pressure, shortness of breath and bluish lips or face are admitted to the hospital.

People who are suffering less severe symptoms will likely see those symptoms begin to get better.

Day 8: According to the Chinese Centre for Disease Control and Prevention ,about 15%of people with COVID-19 will develop symptoms of ARDs, or acute respiratory distress syndrome.

According to the Mayo Clinic, ARDs “happens when fluid builds up in the tiny ,elastic air sacs(alveoli)in your lungs. The fluid keeps your lungs from filling with enough air, which means less oxygen reaches your bloodstream .This deprives your organs of the oxygen they need to function “.

Day 10: If breathing difficulties worsen, it is on this day that patients who are in the hospital will tend to enter the intensive care unit.

Day 12: In the Wuhan study ,fever ended for most people on Day 12, Many still had a cough.

Day 13-14: For those who will survive the virus, breathing difficulties are generally ending on these days.

Day 18: For those who do not survive the virus, the average number of days from onset of symptoms until death is 18 ½ days.

FOUR STAGES OF VIRUS TRANSMISSION

Stage 1: First appearance of the disease: It is the phase when the disease is just introduced and positive cases begin to emerge for the very first time .The appearance of the disease is restricted to people with travel histories to the infected areas, as was the case with the few Indian COVID-19 cases reported from the end of January to mid-March .In this stage, everything is contained, as very few people have contracted the virus.

Stage 2:Local transmission : This stage is when the local transmission starts to develop. The virus spreads locally, through an individual who either has a travel history , or the one who has come in direct contact with an already infected person. This stage typically sees an infected person pass the virus onto his/her family, friends, neighbours, and people who tend to be in his/her close vicinity and locality . the virus transmission in this stage can be monitored by contact tracing ,isolating people with symptoms, strict screening measures, social distancing and lockdown efforts. According to the Indian Council of Medical Research(ICMR),India is currently in this stage of the novel coronavirus transmission.

Stage 3:Community transmission : This is the stage where the community transmission starts to occur, making it difficult to trace the source of the infection spread. The infections are typically passed on in public. Moreover, individuals who don’t have a travel history to any infected ‘hotspots’ ,or who have had no known contact with any foreign source-person, also start to test positive. Once community transmission begins , it becomes difficult to contain the disease and to stop the chain of transmission . As the disease pops-up in random individuals in a community , contact tracing and isolation becomes impossible and large-scale lockdowns become extremely important.

Stage 4:Widespread outbreak : In this fourth and final stage of transmission , there is a widespread outbreak- an epidemic-as the number of cases and deaths begin rapidly multiplying with no end in sight. In this stage , the disease becomes endemic, i.e. native to the population.

TYPE OF TREATMENT IS AVAILABLE FOR THE NOVEL CORONAVIRUS

Vaccines and treatment options for COVID-19 are currently being investigated around the world. There’s some evidence that certain medications may have the potential to be effective with regard to preventing illness or treating the symptoms of COVID-19. Here are some treatment options that are currently being investigated for protection against SARS-COV-2 and treatment of COVID-19 symptoms.

Remdesivir: Remdesivir is an experimental broad-spectrum antiviral drug originally designed to target Ebola. Researchers have found that remdesivir is highly effective at fighting the novel coronavirus in isolated cells. This treatment is not yet approved in humans, but two clinical trials for this drug have been implemented in China . One clinical trail was recently also approved by the FDA IN THE United States.

Chloroquine: Chloroquine is a drug that’s used to fight malaria and autoimmune diseases. It’s been in use for more than 70 years and is considered safe. Researchers have discovered that this drug is effective at fighting the SARS-COV-2 virus in studies done in

test tubes. At least 10 clinical trials are currently looking at the potential use of chloroquine as an option for combating the novel coronavirus.

Lopinavir and ritonavir: Lopinavir and ritonavir are sold under the name Kaletra and are designed to treat HIV. In South Korea, a 54-year old man was given a combination of these two drugs and had a significant reduction in this level of the coronavirus. According to the World Health Organization (WHO), there could be benefits to using Kaletra in combination with other drugs.

APN01: A clinical trial is set to start soon in China to examine the potential of a drug called APN01 to fight the novel coronavirus. The scientists who first developed APN01 in early 2000s discovered that a certain protein called ACE2 is involved in SARS infections. This protein also helped protect the lungs from injury due to respiratory distress. From recent research, it turns out that the 2019 coronavirus, like SARS, also uses the ACE2 protein to infect cells in humans.

Favilavir: China has approved the use of the antiviral drug favilavir to treat symptoms of COVID-19. The drug was initially developed to treat inflammation in the nose and throat. Although the results of the study haven't been released yet, the drug has supposedly shown to be effective in treating COVID-19 symptoms in a clinical trial of 70 people.

BASIC PROTECTIVE MEASURES AGAINST THE COVID-19

Stay aware of the latest information on the COVID-19 outbreak, available on the WHO website and through your national and local public health authority. Most people who become infected experience mild illness and recover, but it can be more severe for others. Take care of your health and protect others by doing the following:

- **Wash your hands frequently:** Regularly and thoroughly clean your hands with an alcohol-based hand rub or wash them with soap and water as rubbing kills viruses that may be on your hands.
- **Maintain Social distancing:** Maintain at least 1 metre (3 feet) distance between yourself and anyone who is coughing or sneezing i.e. when someone sneezes they spray small liquid droplets from their nose or mouth which may contain virus. If you are too close, you can breathe in the droplets, including the COVID-19 virus if the person coughing has the disease.
- **Avoid touching eyes, nose and mouth:** hands touch many surfaces and can pick up viruses. Once contaminated, hands can transfer the virus to your eyes, nose or mouth. From there, the virus can enter your body and can make you sick.
- **Practice respiratory hygiene:** Make sure you, and the people around you, follow good respiratory hygiene. This means covering your mouth and nose with your bent elbow or tissue when you cough or sneeze. Then dispose of the used tissue immediately. Droplets spread virus. By following good respiratory hygiene you protect the people around you from viruses such as cold, flu and COVID-19.

PREVENTIVE MEASURES TAKEN TO STOP SPREADING OF COVID-19

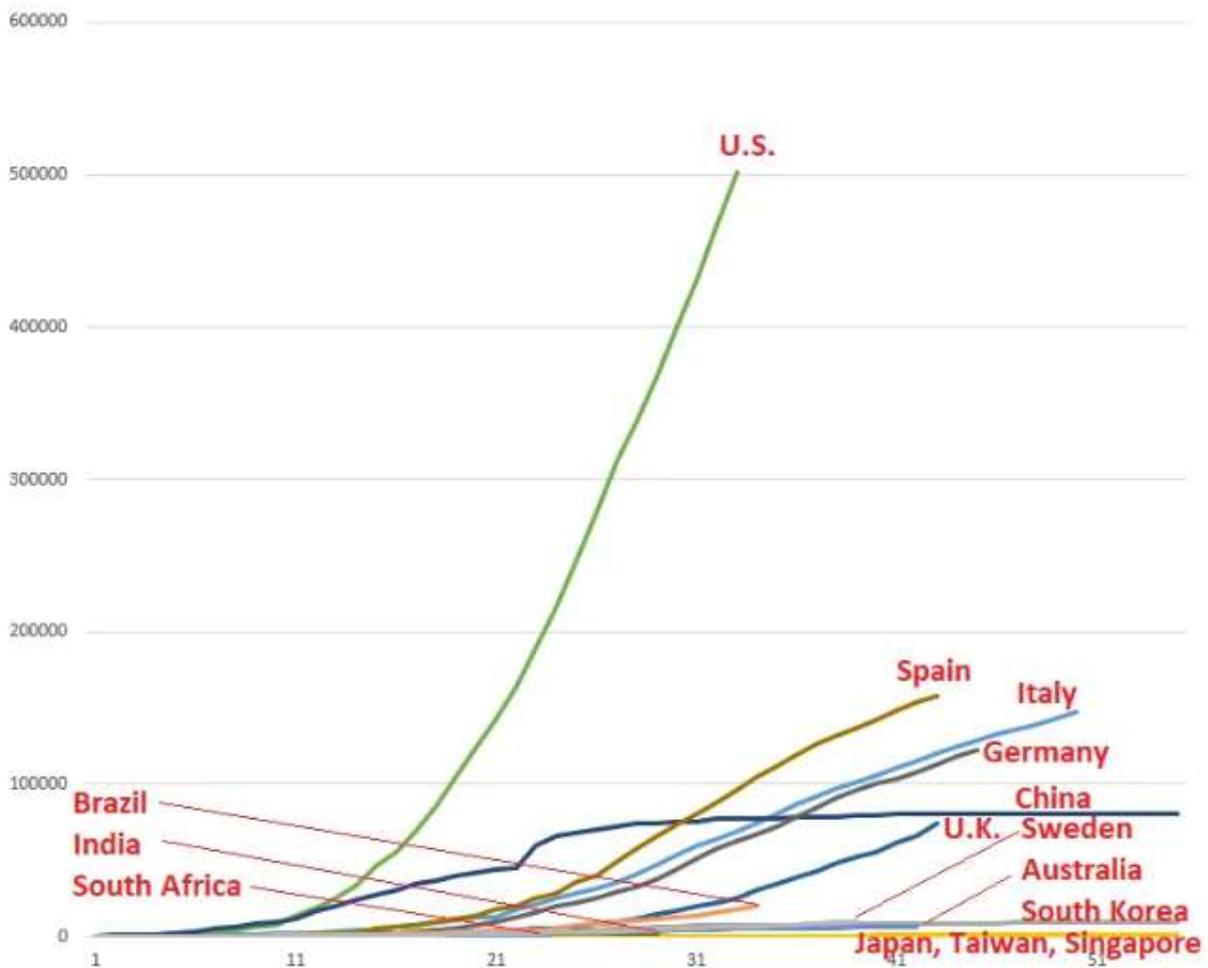
In order to contain the spread of COVID-19, some precautionary measures are required to be taken by all the employees and the Ministries/Departments. In this regard, it has been decided to issue the following advisory for the well-being of Government employees and in public interest.

All the Minister/Departments are advised to take all necessary measures such as :

1. Install thermal scanners at the entry of Government buildings, as feasible. Mandatory placing of hands sanitizers at the entry of Government buildings. Those found having flu-like symptoms may be advised to take proper treatment/quarantine etc.
2. Discourage, to the maximum extent, entry of visitors in the office complex. Routine issue of visitors/temporary passes should be suspended with immediate effect. Only those visitors whom have proper permission of the officer who they want to meet, should be allowed after being properly screened.
3. Meetings, as far as feasible, should be done through video conferencing. To minimize or reschedule meetings involving large number of people unless necessary.
4. Avoid non-essential official travel.
5. Undertake essential correspondence on official email and avoid sending files and documents to other offices, to the extent possible.
6. Facilities delivery and receipt of dak at the entry point itself of the office building, as far as practicable.
7. Close all gyms/recreation centres/crèches located in Government buildings.
8. Ensure proper cleaning and frequent sanitization of work-place, particularly of the frequently touched surfaces.
9. Ensure regular supply of hand sanitizers, soap and running water in the washrooms.

STATISTICAL REPRESENTATION

Cumulative Confirmed Cases Since N=20



(fig 1.1 graph as on 11th April 2020(GMT+0))

The graph represents the cumulative growth of confirmed coronavirus COVID19 cases starting at around the 20th case for each of the following countries: Brazil, Australia, South Africa, the United Kingdom, Spain, Germany, India, Taiwan, Singapore, South Korea, Japan, Italy, and the United States. For China, I had to start with the 548th case given the data available. To facilitate the comparison between countries, I've lined up the countries so their 20th case occurs at the origin on the X-axis. Of course, their 20th cases didn't happen on the same day but, by lining them up, we can compare growth rates between countries. The X-axis numbers represent the number of days since the 20th case, except for China. These data are current on April 10, 2020. On the graph, you can really see the flattening of the curves for Spain, Italy, and Germany. Compare the steeper middle portion of each country's curve to their flatter portion towards the end.

APPLICATIONS DEVELOPED FOR COVID-19

For the live tracking and to provide various information on COVID-19 to the people in India, The National Informatics Centre which comes under the Ministry of Electronics and Information Technology (MeitY) has developed the 'Aarogya Setu' application. As India settles into an extended coronavirus lockdown, the government wants to ensure it frequently pursues contact tracking. To end this, the Narendra Modi government of India for its people has launched the Aarogya Setu (ie. A bridge to healthcare) mobile application on 2nd April 2020. The app is meant to alert users if they have come in contact with a COVID-19 positive patient, and what measures they need to take in case that happens.

How Aarogya Setu app helps to find out symptoms : Aarogya Setu is designed to keep a user informed in case he/she has crossed paths with someone who has tested positive. The tracking is done through a Bluetooth & location-generated social graph, which can show your interaction with anyone who has tested positive. After installing the app, one has to switch on Bluetooth (you are recommended to keep it on at all times) and Location. Then, set 'location sharing' to 'Always' (one can change this anytime later).

It has a tool for self-testing. The user is asked to answer a number of questions. In case someone of the answers suggest Covid symptoms, the information will be sent to a government server. The data will then help the government take timely steps and initiate the isolation procedure, if necessary. The user will be alerted if someone came in close proximity with covid symptoms unknowingly, tests positive. The app alerts are accompanied by instructions on how to self-isolate and what to do in case user

develops symptoms. The data is shared only with the government . The app doesn't allow user's name and number to be publicly disclosed.

The steps required to use the app are as follows:

1. After user's run the app, allow it to access device's location, as prompted.
2. User will get an OTP, after entering OTP they have access to app.
3. User has to choose gender from the options given.
4. User has to enter his/her full name, age ,profession
5. User will be asked about their foreign travel history in last 30 days. User has to give appropriate answer ,their foreign travel history ,if any, will be matched with that of those who've tested positive ,with help of ICMR(Indian Council of Medical Research) database.

Then , the app asks user whether or not user are ready to volunteer in the times of need. Assuming user's answer Yes, a 20-second assessment test starts.

After installing Aarogya Setu in phone ,it will detect other nearby smartphones that also have the app installed .It can then figure out the risk of infection based on sophisticated parameters if any of these contacts is tested positive. The basis of calculation- which is done using Bluetooth, algorithms and Artificial intelligence-is the smartphone user's interaction with others.

Benefits: Aarogya Setu app is available on both the platforms-Andriod and iOS. The app is available in 11 languages-English, Hindi, Telugu, Kannada ,Malayalam ,Tamil, Punjabi ,Bengali, Oriya, Gujarati, and Marathi. The app is expected to be available in more Indian languages soon. The benefits of using Aarogya Setu app are mentioned below:

1. The Aarogya Setu App works on Bluetooth-based technology and tries to determine risk based on the user's location.
2. The risk factor is also based on the data available for that particular location.
3. It keeps the user informed in case he/she has crossed paths with the positive Covid-19 case within 6-feet proximity .
4. The app recommends several measures to the user such as Self Assessment Test, Social distancing ,do's and don't's , amid Covid-19.
5. The Aarogya Setu App also informs the user about the precautionary measures , and how to maintain social distancing in times of global pandemic.
6. As per the statement by PMO(Prime Minister's Office), the app could also be an e-pass facilitating travel from one place to another.
7. In case, a user is at high risk, the app will advise him/her to go for a test at a nearby testing centre and call on toll-free number 1075 immediately.
8. The app is also equipped with a chatbot that answers all the basic questions on coronavirus disease or Covid-19.
9. The users can also find the helpline numbers for each state in India.

Drawbacks: Internet Freedom Foundation (IFF) raised concerns about information collection purpose limitation, data storage, institutional divergence , and transparency and audibility . These concerns comes amid affirmative claims by certain sections of the government and technology volunte..

The app always want's its user to keep his/her gps and Bluetooth on .

HOW INDIA'S COVID-19 DEATH RATE COMPARES TO WORST HIT COUNTRIES

At present , there are 18 countries, including India , with over 14000 cases(as on19th april 2020). India 14000. India Today Data Intelligence Unit(DIU) analyses how India fares compared to the other 17 countries when they had similar number of cases. Late in the evening (on 19th april 2020), the total number of coronavirus cases in India inched towards the 15,000-mark;the death toll was nearing 500. This made India among a handful of countries to have reported such a large number of cases.

According to health ministry ,by 4pm on April 18 ,India had 14,378 cases of coronavirus infections and 480 deaths a case fatality ratio (CFR) of 3.3 per-cent. At present , there are 18 countries , including India, with over 14,000 cases. India Today Data Intelligence Unit(DIU) analyses how India fares compared to the other 17 countries when they had similar number of cases.



Death CFR (as on 19th april 2020)

Source : Johns Hopkins and MoHFW

Better than UK, worse than US : A comparison of these countries shows that India is in the middle with the 9th highest CFR. At 15,000 cases , Germany had the lowest Covid-19 deaths. When Germany had recorded 15,320 cases, it had 44 deaths(0.28 per-cent fatality rate). The fatality rate at 15,000 in Russia was 0.82 per-cent, followed by the United States at 1.46 per-cent . Canada(1.64 per cent) and Turkey had a CFR of less than 2 per cent when they had crossed the 15,000 mark. Countries that followed are China(2.1 percent), Switzerland (2.25 per cent), Portugal (2.8 per cent), Austria(2.9 per cent) and India(3.3 percent). The rest of the countries had a CFR above 4 per cent when they reached 15000 cases.

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