International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

Role of Various 4IR Technologies for Analysis and Prevention of Novel Covid-19 Virus

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Abstract - *The Coronavirus also known as COVID-19 has become a global calamity. This virus has affected many people around the globe. WHO (World Health Organization) declared COVID-19 as a pandemic. This virus has become the reason for lakh of death. It has also affected the world supply chains and due to coronavirus the economies are getting derailed. Coronavirus has also left millions vulnerable and has resulted lockdowns in many countries that are fighting against the novel COVID-19. There have more than six lakhs of cases reported of coronavirus as of 29th March 2020 and the number is increasing daily. In 2002, during the outbreak of Severe Acute Respiratory Syndrome (SARS), scientist all around the world took more than a year's time to decode the viruses' genome. But as per the reports, the genome for COVID-19 virus was identified within a month time. The most important thing that various countries like China are doing is that they are taking the advantage of 4IR (Fourth Industrial Revolution) technologies like Artificial Intelligence (AI), Internet of Things (IoT), Data Analysis, Big Data, Robots, and etc. The ability of these technologies is proving much high in helping various countries to control the spread of this virus. Therefore, in this research we have discussed the role of 4IR technologies for analysis and prediction of novel COVID-19 virus.*

Key Words: 4IR Technologies, COVID-19, Pandemic, AI, IoT, Big Data, Data Analysis, Robots.

1. INTRODUCTION

The COVID-19 is an infectious disease which has become an outbreak and it is declared as a pandemic by the World Health Organization [1]. There is a rapid growth in the COVID-19 infection. Usually symptoms of this infection includes shortening of breath, mild fever and Dry cough. Sore throat and pain in muscles are rare symptoms [5]. In most of the cases, there are only few of the mentioned symptoms whereas in some cases the patient may not have any symptoms until 14 days after being infected [7]. The one more symptom of this virus is diarrhea. Most of the deaths due to coronavirus are occurring due to haywire response of immune system of the patient. The reason for diarrhea is that if a patient was affected by the virus through gastrointestinal mucosal tract and if the virus entered through the respiratory tract than it leads to the symptoms like cough. Firstly, this virus breaks into the cells present inside their host and then reproduce and disrupt the normal functioning of human body [10]. The mortality rate of this infectious disease in 3.4% but this figure is not an accurate representation of the problem as the total number of tests performed in developing countries is very less [8]. The problem is that this outbreak will become an adverse clinical threat for the citizens because knowledge and resources required to deal with this kind of an infection is limited [9]. A city named Wuhan in China is considered as the epicenter for the coronavirus and the first case was detected in November in the year 2019. As of 29 March 2020, there have been more than six lakh cases reported. Amidst this there have been more than thirty thousand deaths and more than one lakh people have been recovered in various countries.

1.1 Cause and Symptoms

When a person gets affected by any virus, the body tends to launch its immune defense. The most common is the release of proteins called interferons that interfere with the virus's ability to replicate inside the body's cells [11]. Further various other immune cells also attack the virus that has just entered the body but virus itself has some of its own defenses to escape the effect of interferon.

The COVID-19 virus can be transmitted from one affected person through various means. This virus has the capability to be transmitted among the people within a distance about six feet. When an affected person from coronavirus sneezes, then the droplets act as the carrier for this virus. This virus can enter via a respiratory tract that leads to the symptoms like dry cough, shortening of breath, and mild fever. But when this virus gets established in the gastrointestinal mucosal tract then it will lead symptoms like diarrhea. As this virus can be transmitted through droplets, if the droplets enters the mouth then it can enter the oropharynx and from here it can transition into the lungs when we breathe and when a person sallow the droplets then it can go to the stomach[11]. The most common incubation period is one to fourteen days and the most common incubation period is of five days.

1.2 Preventive Measures

- Avoiding touch of various body parts like nose, mouth, eyes
- Proper and frequent handwashing with soap
- Maintain social distancing
- Use of sanitizers that have a content of seventy five percent alcohol

- Avoid going to crowded places like malls, shops, cinema etc.
- Use of face masks and gloves if required
- Avoid handshaking
- Self-isolation for any person who thinks that he/she may be affected by coronavirus
- Maintaining proper cleaning in houses as well as surroundings
- Avoid travelling to other countries
- Mass gatherings should be avoided
- Avoid using public transport

1.3 Number of Beds and Ventilators

Various medical facilities for treatment of COIVID-19 virus are important because once a test has been performed and the test comes out to be positive then the patient needs to be kept and isolated somewhere so that the virus does not spread from one person to another [3]. The issue that arises is that most countries does not have the required number of equipment and medical facilities to treat the patients affected by COVID-19. There are shortage of beds, medical kits for testing, ventilators and other equipment. As the number of patients increase in near future there would be shortage of these equipment and this can have many adverse effects. If the number of beds, ventilators and other medical equipment are less, then countries should focus in allocating resource to increase the production of these resources to avoid any future crises. Hence these factors affect country's ability to deal with this situation and are an important attribute for the analysis [4].

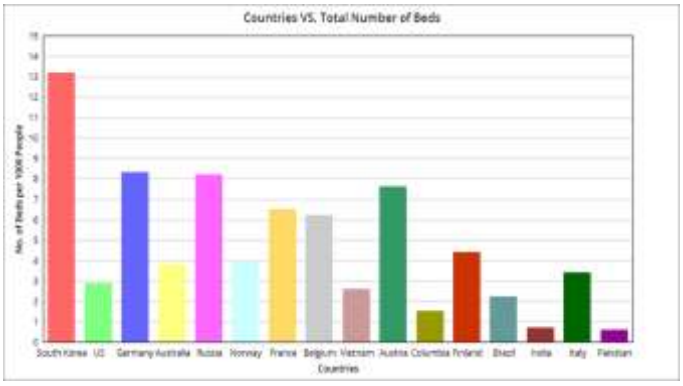

Fig. 1. Countries VS. Total No. of Beds.

2. IMPACT

The major impact that COVID-19 has left is economic instability. Due the outbreak of this virus globally, it has affected the economy of the world. A pandemic also results social instability, hate against the countries that were the reason for the birth of COVID-19 virus. This has also effected normal day to day working of countries because as a preventive measure many countries have imposed full lockdown. It has also effected many businesses as all the industries are shut down and it has also led to disruptions in supply chain.

The major impact that COVID-19 has led is that it is threat to the global economy as it has led to decrease in tourism. Oxford Economics, one of the leading institutes for economic forecasting, has warned that this pandemic could lead to a reduction of 1.3% in global economic annual growth, equivalent to 1.1 trillion dollars in lost revenues [6]. COVID-19 has also affected the stock market as there was continuous fall in the stock market in various countries of Asia. The major industries are shutdown therefore due to this majority of people are unemployed and this is also leading to recession.

3. 4IR TECHNOLOGIES

The 4IR stands for the Fourth Industrial Revolution. It is a term used to describe the combination of elements biological, physical and digital worlds. It's a blend of advancements in quantum computing, genetic engineering, 3D printing, Internet of things (IOT), robotics, Artificial Intelligence (AI) and other advancements in technologies. As an outcome of this perfect blend of technologies, the Fourth Industrial Revolution is transforming the way we live at a very rapid pace.

3.1 Artificial Intelligence

Artificial Intelligence plays a major role in health-care facilities of a country these days. With the use of predictive models and data analytics, we can develop a higher understanding about different types of diseases. An example of the application of artificial intelligence in analysis and prevention of COVID-19 virus is Lineatrfold algorithm, developed by Baidu, the Chinese internet giant. This algorithm can be used for fighting against the outbreak [13]. The COVID-19 has a single strand of RNA this means that this virus can mutate rapidly. This algorithm is a very fast algorithm which can be used to predict the structure of the virus.

Baidu has also developed technologies and tools which can be used for screening purposes of large scale population [12]. In this system they made infrared systems which make us of AI and can detect a person's body temperature.

3.2 Color Coding

China has a surveillance network controlled by the Chinese government. For screening of millions of people, Chinese government collaborated with Alibaba and Tencent to develop a system which can color code health of citizens in the view of the camera [13]. There are three types of codes red, green and yellow on the basis of the medical and travel history of people. These color codes are used to

identify whether a person should be allowed in public places or should be quarantined. Only people who are assigned green color code are allowed in public places. There are many checkpoints around the cities, at each checkpoint the assigned code and body person of the citizen passing the checkpoint is checked.

3.3 Robotic

In order to prevent the spread of virus isolation of people is a key factor. If we isolate all the humans, then the essential services will not be able to execute. In order to execute essential services robots can be used. They can be used for different services like cooking food at the hospitals, as food and hand sanitizer vendors. Robots can also be used for performing thermal imaging and diagnosis of human. Multicopter, a Shenzhen based company is transporting medical samples with the use of Robots [13]. A robot called Little Peanut was used to deliver food to passengers on a flight, who are now being quarantined in a hotel.

3.4 Drones

The delivery of patient samples and medical equipment which was earlier done by humans is now being done by use of drones. This method of delivery fast and also decreases the risk of package from being contaminated. The drones fly with a placard which has a QR code [13]. This QR code can be scanned to acquire or register Health information about the package. Drones are also being used to disinfect the streets. Some drones with facial recognition are also being used in order to warn the people to stay inside and wear face masks.

3.5 Facial Recognition and Big Data

The ability to access information about the spread of this virus has led to formation of organizations that are using Big Data to provide live updates about this situation. Temperature Detection and Facial detection techniques have been installed by Chinese government. SenseTime, a Chinese company has implemented this technology and can even detect and recognize a person wearing a mask accurately [13].

3.6 Autonomous Vehicles

The Delivery of essential goods like foodstuffs and medicines that was earlier done by humans is now being performed by autonomous vehicles. In China, the self-driving start-up Neolix has collaborated with Baidu's autonomous vehicle service Apollo to supply foods and other supplies to hospital in Beijing [13]. Apollo has also provided free autonomous cloud services and micro-car kits to companies that are fighting against the virus.

4. PROPOSED WORK

In this paper, we propose that all the countries should use these 4IR technologies to fight against the COVID-19 virus. Today every country is using humans to check whether a person is effected from COVID-19, this leads to the risk that the person who is checking others might get infected by the virus. So we suggest that all the countries should place thermal scanner at the entrances and exits of airports, railway stations, metro stations and other places. By this method the infected person while entering or exiting places can be found and that person can be taken immediately for treatment.

Secondly, there should be temperature sensors present in mobiles of every individual and an app should be developed that continuously monitors the temperature of the person and also monitors the person travel history. By this we can get to know the places that any infected person visited and we can try to sanitize that places to prevent further spread of virus.

Implementing surveillance cameras in every place will help a lot. All the surveillance cameras should be based on Artificial Intelligence technology. There should be thermal scanners placed in the cameras so that they can sense the change in temperature of body of a person and using Big Data and Facial Recognition we should get to know the details about the infected person.

Due to lockdown imposed in mostly all the countries, the delivery of all the products have been stopped. Due to this people are facing a lot of problems as they cannot go out for shopping for the essential things that they need. Therefore we suggest that all the countries should use autonomous vehicles for delivery of essential products. Drones or robots can also be used for delivery of daily need products like milk, bread, groceries and etc.

Using robots for taking care of people who in isolation can also prevent the spread of virus and by doing so the medical staff can take care of those patients who need more medical attention.

These 4IR technologies can be used to prevent the further spread of virus and by using these technologies people can get their daily need things at their places during lock down.

5. CONCLUSION

There have been many pandemics before COVID-19, but several comprehensive reports have revealed that COVID-19 has damaged tremendously the health of humans and many businesses. Even though the World Health Organization is trying to find a way to demolish the virus, the time period till which people will have to suffer is unknown. Neglecting this situation will result in worsening of this situation. The use of Fourth Industrial Revolution Technologies will be helpful for everyone and can be used to stop the spread of this virus.

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