

# Impact of Covid Pandemic Infectious Disease

Prasath JS\*

Department of Electrical and Electronics Engineering, KCG College of Technology, Chennai, India

## ABSTRACT

Corona virus is an infectious disease and it spreads everybody very easily and quickly. The number of COVID - 19 affected patients increases daily and the number of cases admitted in the hospital also increases. Due to this increased number of COVID - 19 cases, shortage of bed takes place. Doctors and nurses in the hospital unable to treat the all the COVID affected patients effectively. The COVID patients can be treated by the doctors in an effective way through the use of INTERNET OF THINGS (IoT). IoT allows to diagnose and to treat the COVID patients in home. IoT based health monitoring systems are potentially immensely beneficial for COVID - 19 patients. IoT based COVID patient monitoring system is used to prevent the spreading of corona virus by transmitting the information related to COVID symptoms to the doctors within the specific time period. IoT is also used for proper diagnosis of the state of patient health, even if the doctor is at far distance. This proposed work is the detailed analysis of COVID - 19 symptoms, solutions and an IoT - based system for monitoring the patient health those who are affected by COVID - 19. The symptoms related to COVID - 19 includes fever, cold, cough, body temperature, pulse rate, and oxygen saturation of the patients are discussed in this work. This work provides the overview of symptoms, various tests, variants and prevention of COVID - 19 viruses. This proposed review of COVID - 19 will become useful for nurses and doctors to diagnose and treat the COVID - 19 affected patients in an effective manner. This proposed framework of COVID - 19 creates awareness among public and to gain knowledge about the corona virus. This review discusses the key points in preventing the corona virus spreading and essential steps to follow the safety measures to reduce the spreading of corona virus.

### KEYWORDS

COVID - 19, Internet of things, Patient, Infection, Health

\*Corresponding Author:

Prasath J S, Department of Electrical and Electronics Engineering, KCG College of Technology, Chennai, India;

E-mail: jsprasath@gmail.com

How to Cite This Article:

Prasath J S. Impact of Covid Pandemic Infectious Disease. *J Evid Based Med Healthc* 2022;9(11):52.

Received: 04-May-2022,

Manuscript No: JEBMH-22-58428;

Editor assigned: 06-May-2022,

PreQC No. JEBMH-22-58428(PQ);

Reviewed: 20-May-2022,

QC No. JEBMH-22-58428;

Revised: 04-Jul-2022,

Manuscript No. JEBMH-22-58428(R);

Published: 14-Jul-2022,

DOI: 10.18410/jebmh/2022/09/11/52.

Copyright © 2022 Prasath JS. This is an open access article distributed under Creative Commons Attribution License [Attribution 4.0 International (CC BY 4.0)]

## INTRODUCTION

Since December 2019, global medical field facing lot of issues related to virus spreading around the world. Since February 2020, when the first COVID - 19 affected, casualty was registered at Kalaburgi, Karnataka, in a country like India with more than 1.39 billion population, having densely located households. The number of people infected by corona virus increases every day. As on 10<sup>th</sup> November 2021, more than 196,910,000 people in the world have been infected due to corona virus and approximately 4,850,000 people have died. COVID - 19 spread around 192 countries and territories on all continents. The protocols for patients are very hard to follow under such circumstances. The front - line workers like the doctors and nurses have been exposed to this virus and suffered greatly. In this ongoing war against Corona, the front - line workers stood like warriors. The COVID patient can be monitored and controlled in remote areas through the IoT. The various sensors are used for identifying the temperature of the body, blood pressure, glucose level, and oxygen level and pulse rate. These information can be processed and send through the internet to the doctors. Based on the level of these parameters, doctors suggest the medicines and precautions to take care of the COVID affected patient health. IoT - based real - time health monitoring system is proposed which utilizes the measured values of body temperature, pulse rate, and oxygen saturation of the patients.<sup>1</sup> This IoT - based technique is an Arduino based system, and it was tested and verified for five human test subjects. The results obtained from the system were found to be accurate when compared to other commercially available devices.

## LITERATURE REVIEW

IoT is widely used in monitoring the COVID affected patients round the clock in - home isolation or in - quarantine centers to check the severity of health conditions, using their vital parameters like body temperature, blood pressure, blood glucose levels, blood oxygen levels (SpO<sub>2</sub>) and pulse rate. The patient's location also can be monitored using Global Positioning System (GPS). The level of these parameters can be detected using the suitable sensors and transmit the information in digital without doctors physical contact. IoT can be used to monitor the COVID patients continuously and to analyze the variation of these parameters takes place for the patients. IoT gives information about the level of oxygen of the COVID patients to the doctors. The alarm signal can be generated when the COVID patients reaches the critical stage. At the initial level, it contains the multifaceted sensors where the patient's data is gathered and processed in the programmed tool so that the doctor can track the parameters along with their locations. The alert signal can be generated in case any of the parameters are not within the specified limits and thus offers remote surveillance. Creative novel application software can be used remotely to monitor the patient's vital parameters

and to display all this with the patient's

location in a doctor's smartphone. The display software should have features like patient details, location on a map, and the important health parameters with recorded time and various health zones. In case of any emergency, different alerts are to be generated to caution the front - line workers. IoT and machine learning based technique is proposed to combat the COVID - 19 pandemic in efficient manner. This work discussed about the monitoring of health status using IoT and identifies the severity of coronavirus in a human body through the measurement of body temperature and heart pulse of the patient. The developed system can provide healthcare, maintain distant communication, and emergency medical support to the patients. The present and future technology for the potential use of US for diagnosis and management of the novel COVID - 19 lung illness is reviewed.<sup>2</sup> It provides a high - level summary of the existing US technologies that are driving development in current and potential future US imaging systems for lung, with a specific emphasis on portable and 3 - D systems.

### Symptoms of COVID - 19 Viruses

Corona viruses are a family of viruses that can cause respiratory illness in humans. They are called "corona" because of crown -like spikes on the surface of the virus. Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and the common cold are examples of coronaviruses that cause illness in humans. The new strain of coronavirus called COVID - 19 was first reported in Wuhan, China in December 2019. The virus has since spread to all continents. A data - driven medical assistance system is proposed that is based on two real - world data sets in Wuhan, China.<sup>5</sup> This proposed system segregate data from various sources with tools of Machine Learning (ML) to predict COVID - 19 infected probability of suspected patients in their first visit, and then predict mortality of confirmed cases. The symptoms of COVID - 19 may vary from person to person. They may also vary in different age groups. The symptoms may also take up to 14 days to appear after exposure to COVID - 19. The COVID specific symptoms are listed below. The Corona virus can be detected through the various tests such as PCR (Polymerase Chain Reaction) and antigen suggested by research scientists and doctors.<sup>3</sup>

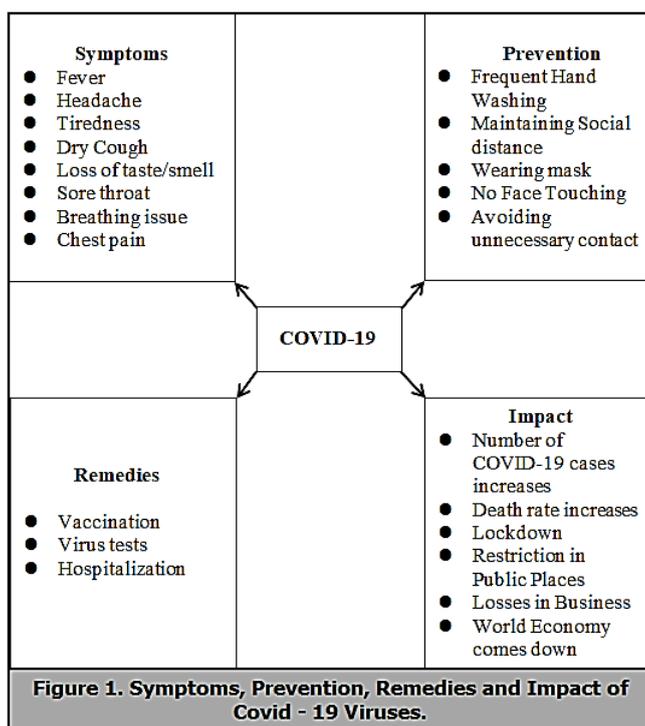
- Shortness of breath or difficulty in breathing
- Temperature equal to or more than 38 ° C
- Fever
- Cough
- Chills
- Fatigue or weakness
- Muscle or body aches
- Loss of smell or taste
- Headache
- Abdominal pain, diarrhea and vomiting
- Feeling very sick

The corona virus may affect the humans with the above mentioned symptoms or without any specific symptoms. The virus may

- Develop symptoms later (be pre - symptomatic)

- Never develop symptoms (be asymptomatic)

The various symptoms, prevention, remedies and impact of COVID - 19 Virus is shown in figure 1. The symptoms of the most people affected by corona virus are fever. Another commonly found COVID - 19 symptoms is tiredness. Many people are showing unawareness in the regular diet and they are not taking nutrition diet. The nature of work doing by majority of humans is mental work. The physical activities of the current generation human being are greatly reduced. The intake of food by the current generation people increases the cholesterol and body weight. Nowadays, people won't take healthy food such as proteins, vitamins, carbohydrates, and natural food. The awareness about the healthy diet should be created among people and to follow the nutrition diet in order to rectify the various diseases. All people should follow the prevention method of COVID - 19 viruses regularly. It is essential to get vaccinated by everyone as per the doctor suggestions. Everyone should undergo COVID - 19 virus test to identify the test result and accordingly should take necessary treatment.<sup>4</sup>



COVID - 19 vaccines are all highly efficient in preventing strong COVID - 19 illness and death. However, vaccines are rarely 100 % effective and the person may still become infected with or without symptoms.

**Infection and Spreading of COVID - 19 Viruses**

COVID - 19 gets into the human body through the mouth, nose or eyes. The virus enters directly from the airborne droplets or from the hands to the face. The virus travels to the back of the nasal passages and mucous membrane in the back of the throat. It attaches to cells there, starts to increase and moves into lung tissue. The virus can spread to other body tissues from the lungs. COVID - 19 spreads when an infected person breathes out droplets and very

tiny particles that contain the virus. These droplets and particles can be breathed in by other people or land on their eyes, noses, or mouth. The virus may contaminate surfaces they touch under certain circumstances. People who are closer than six feet from the infected person are most likely to get infected. COVID - 19 is spread in three main ways:

- Breathing in air when an infected person is nearby who is exhaling tiny droplets and particles that contain the virus.
- These small droplets and particles that contain virus land on the eyes, nose, or mouth, especially through splashes and sprays like a cough or sneeze.
- Touching eyes, nose, or mouth with hands that have the virus on them.
- Human being may be infected by corona virus but not have symptoms. However, the virus affected person can still spread the virus to others.

**COVID - 19 viruses is likely spread in the following cases**

- The virus travels in respiratory droplets released into the air when an infected person coughs, sneezes, talks, sings or breathes near you (within 6 feet). The person may be infected if you inhale these droplets.
- The person may get affected by COVID - 19 when he / she is in close contact (touching, shaking hands) with an infected person and then touching the face.
- It is considered possible to get COVID - 19 after touching a contaminated surface and then touching your eyes, mouth, or nose before washing your hands.

**Variants of COVID - 19 virus**

The variants in COVID - 19 occur when there is a change in genes of the virus. The variants in Coronavirus are classified in various categories according to the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC).

**Mutation:** A mutation is a single change in a virus's genome. It occurs frequently, but rarely modifies the characteristics of the virus.

**Lineage:** A lineage is a group of closely related viruses with a common ancestor. SARS - CoV - 2 has many lineages and it cause COVID - 19. Genetic lineages of SARS - CoV - 2 have been emerging and circulating around the world since the beginning of the COVID - 19 pandemic.

**Variant:** A variant is a viral genome (genetic code) that may contain one or more mutations. In some cases, a group of variants with similar genetic changes, such as a lineage or group of lineages may be designated by public health organizations as a Variant of Concern (VOC) or a Variant of Interest (VOI) due to shared attributes and characteristics that may require public health action.

A variant of interest is a coronavirus variant that, compared to earlier forms of the virus, has genetic characteristics that predict higher transmissibility, evasion of immunity or diagnostic testing or more severe disease. The attributes of a Variant of Interest are:

- Specific genetic markers that are predicted to affect transmission, diagnostics, therapeutics, or immune escape.
- Evidence that it is the cause of an increased proportion of cases or unique outbreak clusters.
- Limited prevalence or expansion in the US or in other

countries.

A Variant of Interest might need one or more appropriate public health actions, including advanced sequence surveillance, advanced laboratory characterization, or epidemiological investigations to assess how easily the virus spreads to others, the seriousness of disease, the efficacy of therapeutics and whether currently approved or authorized vaccines offer protection. A variant of concern is identified to be more infectious, more likely to cause breakthrough or re-infections in those who are vaccinated or previously infected. These variants are more likely to cause severe disease, evade diagnostic tests, or resist antiviral treatment. The possible attributes of a variant of concern are:

- Evidence of impact on diagnostics, treatments, or vaccines.
- Widespread interference with diagnostic test targets.
- Evidence of substantially decreased susceptibility to one or more class of therapies.
- Evidence of significantly decreased neutralization by antibodies generated during previous infection or vaccination.
- Evidence of reduced vaccine - induced protection from severe disease.
- Evidence of increased transmissibility.
- Evidence of increased disease severity.

A variant of high consequence is a variant for which current vaccines do not offer protection. As of now, there are no SARS -CoV - 2 variants of high consequence. The various categories of COVID - 19 variants have emerged in England, Brazil, California and other areas. Highly infectious variants such as beta, which first appeared in South Africa, may have higher ability to re - infect people who have rectified from earlier versions of the coronavirus, and also be somewhat resistant to some of the coronavirus vaccines in development. Still, vaccines currently used appear to offer significant protection from severe disease caused by coronavirus variants. The variants of corona virus are classified into Alpha, beta, gamma, epsilon, eta, Iota, kappa, mu, zeta, delta, delta plus and omicron.

**Alpha variant:** It was first detected in United Kingdom in November 2020. Alpha variant B.1.1.7 spread more easily and quickly. The alpha variant has 17 mutations compared to the original SARS - CoV - 2 viruses first discovered in Wuhan, China. Symptoms of the alpha variant are identical to those previously linked with COVID - 19, such as persistent cough and fever. However, fewer people reported symptoms of anosmia, a loss or change in sense of taste or smell, in January 2021 when B.1.1.7 accounted for about 86 per cent of infections, than in November to December 2020, when it accounted for just 16 per cent.

**Beta variant:** It was first detected in Eastern Cape Province of South Africa in December 2020. Beta variant was originally called B.1.351. Beta carries a mutation, called N 501Y, which seems to make it more contagious or easy to spread.

**Gamma variant:** It was first detected in Brazil in January 2021. Gamma variant was originally called P.1. According to the Global Virus Network (GVN), this variant has shown

pronounced transmissibility. The network further states that its mutations N 501Y, K 417N and E 484K in the "receptor building domain of spike protein", tend to amplify its affinity to human receptors.

**Delta variant:** It was first detected in India in October 2020. Delta is at least 50 percent more transmissible than the alpha variant. Delta was originally called B.1.617.2. It was renamed delta on 31 May 2021 when the World Health Organization adopted a new naming system.

**Omicron variant:** It was originally called B.1.1.529. The WHO on November 26 declared the recently - discovered B.1.1.529 strain of COVID - 19, first detected in southern Africa, to be a variant of concern and renamed it Omicron. The classification puts Omicron into the most - troubling category of COVID - 19 variants, along with the globally - dominant Delta, plus its weaker rivals Alpha, Beta and Gamma.

#### Omicron vs Delta Variant

- The transmission rate of Omicron is three times greater than the Delta variant.
- Omicron can cause mild, moderate as well as heavy infection and even death.
- Most of the omicron affected people have mild symptoms and the death rate is very less as compared to the Delta variant.
- The symptoms of Omicron are sore throat, headache, body ache, cold, sneezing, fever, fatigue, dry cough, and night sweat whereas the symptoms of Delta variant are sore throat, runny nose, fever, fatigue, headache, loss of smell and taste.
- The RT - PCR (Reverse Transcription - Polymerase Chain Reaction) tests can be used to identify the Omicron variant. This test is used to track the spread of Omicron at the initial stages. The SARS - CoV - 2 antigen rapid diagnostic tests are used to identify the delta variant.

#### Prevention of Spreading COVID - 19 Viruses

The preventive measures are essential to reduce the spreading of corona virus. The measures need to follow are:

- Wear a mask that covers your nose and mouth to help protect individuals and others.
- Maintain six feet distance between person to person
- Take a COVID - 19 vaccine
- Avoid crowds and poorly ventilated indoor spaces.
- Wash the hands frequently with soap and water.
- Use hand sanitizer if soap and water are not available.

The distance between the people to person should be maintained minimum six feet to reduce the corona virus infection. Everyone should maintain the distance from one another in home as well as in public places.

**Inside your home:** Avoid close contact with people who are sick.

- If possible, maintain six feet between the person who is suffered from virus infection and other household members.

**Outside your home:** Put six feet of distance between yourself and people who do not live in your household.

- Remember that some people without symptoms may be able to spread virus.
- Stay at least six feet (about two arm lengths) from other people.
- Maintain distance from others especially important for people who are at higher risk of getting very sick.

Wash the hands often with soap and water for at least 20 seconds especially after you have been in a public place or after blowing your nose, coughing, or sneezing.

Hand washing should be regular in practice during the following activities.

- Before eating or preparing food
- Before touching your face
- After using the restroom
- After leaving a public place
- After blowing your nose, coughing, or sneezing
- After handling your mask
- After changing a diaper
- After caring for someone sick
- After touching animals or pets

### Prevention of COVID - 19 Virus for Individuals

While vaccines are having a significant impact on controlling the spread of COVID - 19, the virus continues to circulate. Ongoing efforts continue across Canada to:

- Increase overall vaccine coverage.
- Decrease the spread of COVID - 19

### Public health measures remain an important part of our response to COVID - 19 viruses. These include:

- Although COVID - 19 vaccines approved for use in Canada provide substantial protection against severe illness, no vaccine is 100 % effective. Fully vaccinated individuals can still be infected and transmit the COVID - 19 virus.
- The chances of infecting virus among fully vaccinated individuals are less than for those who are unvaccinated or partially vaccinated.
- As it gets colder and when more of our activities move indoors, we may come into closer contact with others outside of our household Individual public health measures are actions you can take to help prevent the spread of COVID - 19 and other illnesses, like flu. These measures are most effective when layered together and used alongside vaccination. Many individual public health measures were practiced before COVID - 19 to prevent the spread of other infectious illnesses. They should continue to be part of your everyday practices, today and always. This includes things like staying home when sick and regular hand hygiene. For the time being, you should also continue to wear a mask and maximize your physical distance from others for additional layers of protection.

## RESULTS AND DISCUSSION

### Testing of COVID - 19 Virus

**PCR Test:** PCR means Polymerase Chain Reaction. It is a test to identify the genetic material from a specific organism, such as a virus. This test is used to determine the existence of a virus if anybody has the virus at the time of the test. The test could also identify fragments of the virus even after anybody no longer infected. The PCR test for COVID - 19 is a molecular test that analyzes your upper respiratory specimen, looking for genetic material Ribo Nucleic Acid (RNA) of SARS - CoV - 2, the virus that causes COVID - 19. Scientists use the PCR technology to amplify small amounts of RNA from specimens into Deoxyribo Nucleic Acid (DNA), which is replicated until SARS - CoV - 2 is detectable if present. The PCR test has been the gold standard test for diagnosing COVID - 19 since authorized for use in February 2020. It's accurate and reliable.

There are three key steps to the COVID - 19 PCR test

**Sample collection:** A healthcare provider uses a swab to collect respiratory material found in your nose. A swab is a soft tip on a long, flexible stick that goes into your nose. There are different types of nose swabs, including nasal swabs that collect a sample immediately inside your nostrils and nasopharyngeal swabs that go further into the nasal cavity for collection. Either type of swab is sufficient for collecting material for the COVID - 19 PCR test. After collection, the swab is sealed in a tube and then sent to a laboratory.

**Extraction:** When a laboratory scientist receives the sample, they isolate (extract) genetic material from the rest of the material in the sample.

**PCR:** The PCR step then uses special chemicals and enzymes and a PCR machine called a thermal cycler. Each heating and cooling cycle increases (amplifies) the amount of the targeted genetic material in the test tube. After many cycles, millions of copies of a small portion of the SARS - CoV - 2 virus's genetic material are present in the test tube. One of the chemicals in the tube produces a fluorescent light if SARS - CoV - 2 is present in the sample. Once amplified enough, the PCR machine can detect this signal. Scientists use special software to interpret the signal as a positive test result. A positive test result indicates that the individuals have an infection with SARS - CoV - 2. This could be due to asymptomatic infection, but if you have symptoms, then this infection is called COVID - 19. Majority of people have mild illness and can recover safely at home without medical aid. A negative test result indicates that the individuals did not have an infection with SARS - CoV - 2 at the time the specimen was collected. However, it is possible to have COVID - 19 but not have the virus detected by the test. This may happen if the individuals recently became infected but not showing any symptoms yet or it could happen if the individuals have COVID - 19 for more than a week before being tested. A negative test does not assume that the individuals are safe always. The person can be exposed to COVID - 19 after the test, get infected and spread the SARS - Cov - 2 viruses to others.<sup>5,6</sup>

**Antigen test:** This test identifies bits of proteins on the surface of the virus called antigens. The time duration of the antigen tests is approximately 15 to 30 minutes. Rapid antigen tests are most precise when used within a few days of the start of the symptoms, which is when the

largest amount of virus is present in your body. The antigen test is typically quicker but is less sensitive than the PCR test. Because the antigen test is not as accurate as PCR, if an antigen test is negative, the healthcare provider could request a PCR test to confirm the negative

antigen test result.

### **IoT based COVID - 19 Patient Health Monitoring System**

Internet is widely used to monitor the symptoms of COVID - 19 affected patients and transmit this information to the doctors. The sensors are used to detect the COVID symptoms such as body temperature, heart rate etc. and send this data to the doctors for necessary actions. The mobile application can also be developed and programmed to monitor the health status of COVID - 19 affected patients. The doctors can download the data related to the COVID - 19 specific symptoms on their mobile phone, laptop / desktop through application software. In case of abnormalities in the parameters, the doctor can interact with the patient over the phone and provide medical advice. This can be used even in the future to monitor the old patients whose family is away from home due to their busy professional life. The same device can be installed in the hospitals too, to monitor the patients from the doctor's mobile phone / laptop / desktop. This will help our front - line warriors to avoid exposure to the infected patients and also reduce the usage of PPE kits which they had to wear for a long duration. A low - cost pervasive ambient sensor is proposed for respiration rate estimation and cough detection. A lightweight signal processing algorithm is designed and proposed for detecting breathing and coughing. This system could be used as an effective device for identifying the patients those who are suffering from COVID - 19 symptoms and enable large scale monitoring of patients diagnosed. IoT based wearable monitoring device is designed to measure various vital signs related to COVID - 19 virus.<sup>7</sup> The system automatically alerts the doctors about any violations of quarantine for potentially infected patients by monitoring their real time GPS data. The wearable sensor placed on the body is linked to the edge node in IoT cloud where the data is processed and analyzed to define the state of health status. A new predictive framework is proposed that identifies the severity and mortality risk of COVID - 19 patients.<sup>8</sup> this framework helps doctors, hospitals, and medical facilities in their decision making about which patients need to get attention. An IoT - based healthcare framework to allow remote monitoring for patients in a critical situation was proposed. This work extends the framework by combining wearable and unobtrusive sensors to monitor patients with coronavirus disease. The wireless wearable should be small, portable, and easy to use will enable the patients to better access the health care, enhance the quality of healthcare and provide healthcare workers with better patient care through constant monitoring of patients. This will decrease the emergency room visits and the admission to the hospitals, in turn, providing is better capacity to treat more patients. A potential fog - cloud combined IoT platform is proposed for preventing and controlling the COVID - 19 virus.<sup>8-12</sup> This work includes diagnosis of COVID - 19 virus symptoms, monitoring of quarantine,

tracing contact, social distancing, outbreak forecasting, and SARS - CoV - 2 (Severe Acute Respiratory Syndrome Corona Virus - 2) mutation tracking. The recent technological advancements related to fog computing, clouding computing, artificial intelligence, and big data analysis can be utilized for IoT and COVID - 19

applications are discussed. The corona virus disease or COVID - 19 has influenced the world with serious pandemic situation. This situation is associated with health issues and infection is rising all over the world. Due to which lot of infected patients need medical facilities and services with adequate resources and management. Internet serves different operations and processes than can be employed in such pandemic situations. Internet of Things (IoT) based system has strong technology area where medical diagnostics and patient database can be handled effectively. The potential solution for security and privacy challenges faced by the use of IoT applications for fighting against COVID - 19 is presented. The various security mechanisms including authentication, access control solutions, key management, cryptography solutions, block chain - based solutions, intrusion detection systems, and privacy - preserving solutions required for developing IoT based system for COVID - 19 is addressed. A potential application of the IoT in healthcare and physical distance monitoring for pandemic situations is presented.<sup>13</sup> This framework includes a lightweight and lowcost IoT node, a smartphone application, and fog - based Machine Learning tools for data analysis and diagnosis. The network can be created with large number of interconnected devices can be connected for COVID - 19 quarantine centre. The alert and tracking system is possible to integrate with this system in order to capture the data related to the patient health status, health conditions and medical emergencies. The system may also include the set of sensors arranged in COVID quarantine facilities to maintain record and entry exit logs for tracking patients or infected people. Decision making based on data collected *via* the smart system may help in more convenient and faster way. A real - time identification and monitoring of COVID - 19 patients through IoT is proposed. This framework involves collection of data related to the disease symptoms through IoT, data collection of health center or quarantine center through IoT, data warehouse and to provide treatment. The machine learning algorithm is used to identify the severity level of COVID - 19 patients. The quarantined COVID - 19 patient conditions is monitored through the set of devices and sensors like temperature probes, Electro Cardiogram Sensor (Ecg), Blood Pressure Sensor (BPS), SPO<sub>2</sub> pulse oximeter. A lightweight and secure mutual authentication and secret key establishment protocol is proposed that uses Physical Unclonable Functions (PUFs) to activate the network devices to confirm the doctor's legitimacy and sensor node before establishing a session key. It preserves the sensor nodes deployed in an unattended and hostile environment from tampering, cloning, and side - channel attacks. A cost - effective IoT - enabled Covid - 19 Standard Operating Procedure (SOP) compliance systems is proposed that counts the number of person entering and leaving a vicinity, ensures physical distancing, detects body temperature and warns attendees and managers of

violations.<sup>14</sup> The system consists of multiple sensor nodes communicating with a centralized server. The data stored on the server can be used for compliance auditing, real-time monitoring, and planning purposes. A complete model of COVID patient monitoring system is developed that allows doctors to identify the symptoms through internet.<sup>15</sup> The heart beat rate, body temperature and body

movement is monitored through the bio-medical sensors interfaced with microcontrollers. The health status of COVID-19 virus affected patient can be monitored and to provide treatment through IoT. The health reports and status are followed with the set of procedures:

- The patient body condition is monitored with the network of sensors. Doctors can investigate and visualize data for the COVID-19 patients and their health status in accordance with condition of severity.
- The treatments and historic health records of patients can be accessed through database. The information is possible to download and store in local devices. Thus doctors and other medical persons also able to check and monitor patient records and recovery rate.
- Team of people monitoring COVID-19 centre supplies and resources must be assigned with digital devices and smart wearable. Intercommunication of security and other agencies makes efficient way of handling all the operations related to management of pandemic conditions.
- Entry - Exit of assets and people *i.e* either patient, belongings, equipment, vehicles etc. needs to be checked for attendance and timely service. Data related to visited people, time period, vehicles entry - exit provides information to sense operations and safety rules.
- Within COVID-19 centres, challenges occur in integrating IoT system and database management. Critical data related to patients and health status needs to be gathered. Such data is really valuable for evaluating reports of patients. Even real time status of condition of severity and diagnosis is monitored as well as stored in database for the use of doctors and medical research purpose.

As fever is one of the most obvious symptoms of the COVID-19, it is essential to test the body temperature frequently. Since COVID-19 is a respiratory disease, the condition of the lungs, oxygen saturation levels, heart rate, and respiration rate monitoring of patients are important factors. All people should take COVID-19 tests and to find if any symptoms are showing. The precautionary measures need to take especially COVID-19 affected patients. COVID patients must quarantine themselves from the others for a period of fourteen days. The proper nutrition and safety measures should be followed by everyone to control and reduce the spreading of corona virus infection. The full body checkup is essential for all people irrespective of age and to maintain the normal blood pressure and sugar levels. This checkup gives awareness among people to follow the healthy diet and it reduces the overall death rate of the COVID affected patients.

## CONCLUSION

Corona virus is the harmful disease when it is not identified at the initial stage and it spread easily to every human being. COVID-19 affect the humans with specific symptoms or without any specific symptoms. The death rate increases due to the COVID-19 all over the world. This proposed work is the detailed analysis of origin of COVID-19, its symptoms, infection, spreading, tests,

prevention and IoT based system for monitoring the health condition of COVID patient. This analysis of COVID-19 identifies that the corona virus may affect any person irrespective of age and symptoms. The symptoms of COVID-19 such as fever, cough, headache, body pain etc. can be detected using suitable sensors, transmitted and monitored through the IoT. Doctors can easily diagnose and treat the COVID affected patient with the help of internet. The number of COVID cases admitted in the hospital continues to rise and the effective way of treatment is essential in today's situations. The spreading of corona virus can be reduced by wearing standard mask with coverage of nose and mouth and taking vaccination. Everyone should take healthy diet and to do breathing exercise daily to prevent from occurring the corona virus. The people should avoid to go in the public places having more crowd, and to maintain distance in the public places including offices, shops, markets, restaurants as well as in residence. The COVID-19 tests is essential for everyone irrespective of age to identify and to take necessary precautions to rectify the virus. It is everyone's responsibility to break the spreading of COVID-19 chain by taking vaccination as per the doctor's suggestion, to follow the Standard Operating Procedure (SOP), and to take nutrition diet which leads to healthy life.

## REFERENCES

1. Mohammad Monirujjaman Khan, Safia Mehnaz, Antu Shaha, et al. IoT - Based Smart Health Monitoring System for COVID-19 Patients. *Comput Math Methods Med* 2021;1-11.
2. Xiaoshuai Chen, Shuo Jiang, Zeyu Li, et al. A Pervasive Respiratory Monitoring Sensor for COVID-19 Pandemic. *IEEE Open J Eng Med Biol* 2021;2:11-16.
3. Yudi Dong, Yu-Dong Yao. IoT Platform for COVID-19 Prevention and Control: A Survey. *IEEE Access* 2021;9:49929-49941.
4. Mohamed Amine Ferrag, Lei Shu, Kim - Kwang Raymond Choo. Fighting COVID-19 and Future Pandemics With the Internet of Things: Security and Privacy Perspectives. *IEEE J Automatic Sinica* 2021;8(9):1477-1499.
5. Jiayi Lu, Renchao Jin, Enmin Song, et al. An Explainable System for Diagnosis and Prognosis of COVID-19. *IEEE IoT J* 2021;8(21):15839-15846.
6. Mehedi Masud, Gurjot Singh Gaba, Salman Alqahtani, et al. A Lightweight and Robust Secure Key Establishment Protocol for Internet of Medical Things in COVID-19 Patients Care. *IEEE IoT J* 2021;8(21):15694-15703.
7. Nizar Al Bassam, Shaik Asif Hussain, Ammar Al Qaraghuli, et al. IoT based wearable device to monitor the signs of quarantined remote patients of COVID-19.

Informatics in Medicine Unlocked 2021;24:1-15.

8. Safynaz Abdel-Fattah Sayed, Abeer Mohamed Elkorany, Sabah Sayed Mohammad. Applying Different Machine Learning Techniques for Prediction of COVID-19 Severity. IEEE Access 2021;9:135697-135707.

9. Aniello Castiglione, Muhammad Umer, Saima Sadiq, et al. The Role of Internet of Things to Control the Outbreak of COVID-19 Pandemic. IEEE IoT J 2021;8(21):16072-16082.

10. Itamir De Morais Barroca Filho, Gibeon Aquino, Ramon Malaquias, et al. An IoT-Based Healthcare Platform for Patients in ICU Beds During the COVID-19 Outbreak. IEEE Access 2021;9:27262-27277.

11. Md Mashrur Sakib Choyon, Maksudur Rahman, Md Mohsin Kabir, et al. IoT based Health Monitoring and Automated Predictive System to Confront COVID-19. IEEE Access 2020;2(2):11-16.

12. Xuejun Qian, Robert Wodnicki, Haochen Kang, et al. Current Ultrasound Technologies and Instrumentation in the Assessment and Monitoring of COVID-19 Positive Patients. IEEE Transac 2020;67(11):2230-2240.

13. Seyed Shahim Vedaiei, Amir Fotovvat, Mohammed Reza Mohebbian, et al. COVID-Safe: An IoT-Based System for Automated Health Monitoring and Surveillance in Post-Pandemic Life. IEEE Access 2020;8:188538-188551.

14. Afnan Bashir, Umer Izhar, Christian Jones. IoT-Based COVID-19 SOP Compliance and Monitoring System for Businesses and Public Offices. Enginnee Proceed 2020;1-6.

15. Ruhul Amin, Troyee Sharmistha Saha, Faiyaz Bin Hassan, et al. IoT Based Medical Assistant for Efficient Monitoring of Patients in Response to COVID-19. IEEE Access 2020;83-87.