A LIGHT ON TECHNOLOGICAL SUPPORT TO FIGHT AGAINST CORONA VIRUS AND COVID-19

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Abstract-**With the start January 2020 and pandemic called COVID-19 enter the world. The main reason for COVID-19 disease was a virus originated from laboratory of Wuhan, China which was named as Corona virus. On 9-Jan-2020, WHO issued a statement stating that Chinese researchers had made preliminary determination of the virus named novel Corona virus. since then, the virus has affected many countries of the world, which has resulted in more than 13 million of positive cases of COVID-19 and more than 570000 deaths has been reported all over the world. Thankfully more than 7 million persons around the world had recovered from this disease due to vigilance of government of various countries. Many countries applied the strategy of testing, identifying and quarantine the symptomatic and asymptomatic patients suffering from Corona virus. The confirmed COVID-19 cases were quarantined in hospitals till their report comes negative and asymptomatic patients suffering from mild symptoms of Corona virus, like cough cold fever were home quarantine for 14 days where they were monitored regularly by medical team. Governments had also applied preventive strategies to stop the spread of Corona virus from person to person like massive thermal screening at airports, railway platforms, bus stands and various other public places. Public had been made aware of various preventive measures like social distancing, wearing of mask, washing hands with soap and water. In spite of the preventive measures, when the virus started spreading massively, the governments took measures like lock downs, enforcement of curfew, sealing off hotspot areas of the outbreak. Various medical, law enforcement, NGO, Government and private agencies fought from Corona virus day and night, kept public aware, safe from Corona virus and treat the patients found positive from COVID-19. Apart from these agencies technology also played an important role to fight against novel Corona virus leading to COVID-19. In this article we are going to discuss importance of the role played by technology to spread awareness in public and provide firm support to minimize the spread of Corona virus and hence reducing its impact especially with reference to our country INDIA.**

*Index Terms***: ACE-2 proteins, AI, COVA, COVID-19, MERS, Plasma Therapy, RNA, RSMP, RT-PCR, SARS, SONA 2.5.**

I. INTRODUCTION

Whole world welcomed year 2020 with lot of joy, happiness, dreams and ambitions that the year would bring lot of prosperity in their lives. Unfortunately, the destiny has other plans. By the end of first week of January 2020 there were signs that this year could bring one of the deadliest viruses the humanity had ever faced. On 9th January 2020, WHO, release a statement indicating that Chinese researches had come across a virus in lab of Wuhan, city of China. The virus was named Novel Corona virus which led to the disease called COrona VIrus Disease 19 that is COVID-19. The first COVID-19 case was reported in China in November 2019 and the first COVID-19 case was reported in India on 30-Jan-2020. Since then, cases have rapidly increased all over the world. In India the number the number of COVID-19 cases was reportedly more than 9 lakhs and increased with the rate of over 28000 cases per day [1]. The governments all across the world took serious steps to stop the spread of Corona virus by testing, screening and making general public aware about the consequences of Corona virus and how to take preventive measures at home and public places, so that the spread of virus could be minimized resulting in a smaller number of COVID-19 cases. Governments all across the world also took good care of COVID-19 patients by providing them the best possible facilities in government and private hospitals available with them, as a result more than and half of the total number of COVID-19 patients had recovered so far and the recovery rate continuously increased. Indian government quickly realized that in a country with such a vast population it would be very difficult to control COVID-19 cases if they spread in rural areas along with urban areas. The Government of India not only quickly took steps to reduce the spread of Corona virus but also used technology available to make general public aware about this virus. Institutions of India help the government by innovating new tools and app which provided firm support to identify, trace, and reduce the impact of Corona virus. Technology also educated the people about this virus and the preventive measures, which could stop the spread and contamination from this virus. This article discusses the support provided by information and technology to stop the spread of Corona virus, identification and treatment of COVID-19 patients to various countries of the world with special reference to our country INDIA.

This article is divided into various sections. The section 2 gives brief introduction about Corona virus and COVID-19 disease. Section 3 discusses the steps taken by government to reduce the spread of Corona virus, medical treatment and facilities which helped COVID-19 patients to recover. Section 4 discusses the support provided by the technology to fight against Corona virus. Section 5 discusses limitations and future scope of technological support to fight against this virus. Section 6 concludes the article.

2. CORONA VIRUS AND COVID-19

Corona virus originated from seafood market in Wuhan city of China, the first case was reported in November 2019 and series of cases found in December 2019. Chinese health authorities and WHO were investigating cause of outbreak of recent Corona virus.

Corona virus belongs the family of viruses that can cause range of illnesses in human body including fever, cough, cold and can take forms like severe acute respiratory syndrome (SARS) endemic of 2003-2004 and Middle East Respiratory Syndrome (MERS), outbreak in South Korea in 2015, which were life threatening. The virus is named after its shape which takes form of a crown with spikes around it and hence it is known as Corona virus. The most recent Corona virus affecting human body is named as Novel Corona virus (SARS-COV-2) leading to disease called COVID-19.

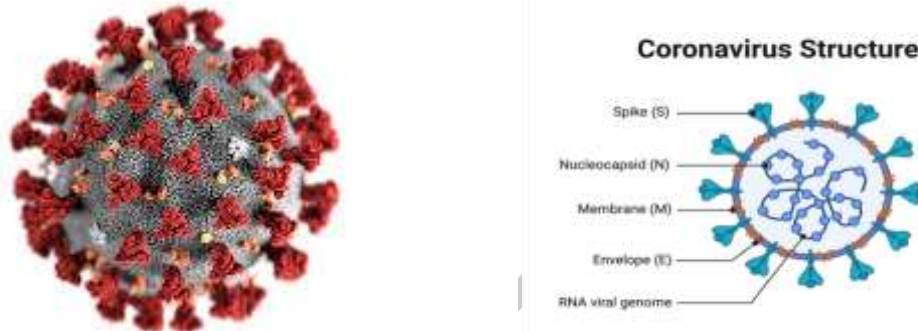### 2.1 Structure And Effect of Corona Virus on Human Body

Fig. 1 Structure of Corona Virus [2][3]

Corona virus particle contains 4 structural proteins: Ribonucleic acid (RNA), envelope, membrane and spike. RNA form genetic core which is surrounded by a ball formed by envelope and membrane proteins. The spike protein is in form of club shaped protrusions which stick all over the ball looks like a crown or sun Corona hence it got its name. These protrusions bind themselves to the receptors on host cells determining the type of cell and thus the range of cell species that the virus can affect. The major difference between Corona virus which causes cough cold and that causes severe illness is that, the former primary infect upper lung track(nose and throat) while the latter infect lower respiratory tract the lungs and can lead to pneumonia.

Corona virus leads to COVID-19 disease in the following manner. This virus enters the human body through eyes nose or mouth, from where in goes to the respiratory track where it attack the cells human body which produces the proteins called ACE-2 (Angiotensin -Converting Enzyme 2) . This virus remains in throat for a period of 3 days called incubation period. The virus binds itself to the ACE-2 proteins after which membrane of Corona virus explodes, it releases its RNA (Ribonucleic Acid) which hijacks the host cells. The virus first infects the cells lining near the throat during incubation period, then it attacks the cells in the lungs. Here these cells turns into to Corona virus factory, as each cell could produce large number of cells. Virus causes infection in mucus membrane which hampers the lungs ability to oxygenate the blood. The inflammation in the cells and there reduced efficiency can cause the lungs to be filled with fluid, puss, dead cells and infection which can lead to pneumonia. Pneumonia caused by Corona virus is far more dangerous which can eventually lead to death of human being. Some people find difficulty in breathing and they require ventilator, while in other serious cases the lungs are so much damage that person cannot survive even with help of ventilator. This virus also attack heart, kidneys and other internal organs, which leads to multiple organ failure in human body.

2.2 Symptoms of COVID-19

The most common symptoms of COVID-19 are fever, dry cough, and tiredness. The less common symptoms are pain, sore throat, diarrhea, conjunctivitis, headache, loss of taste and smell, rashes on skin, discoloration of fingers and toes. The severe symptoms are difficulty in breathing, shortness of breathing, chest pain or pressure, loss of speech or movement.

On an average when someone is infected with virus, it takes 5 to 6 days for symptoms to show, however in some cases it could take up to 14 days. People with serious symptoms should immediately seek medical help, while people with light symptoms should observe and manage their symptoms at home.

2.3 Human immune system response to Corona virus

The virus antigens on their surface which when detected, initiate the human immune system into action. The human immune system generates another class of chemicals called cytokines and chemokines. These particles trigger inflammation in cells in respiratory system which produces mucus and running nose, to trap viral particles and sneezing to expel them out of human body. Inflammation also triggers the fluid buildup in the lungs which contains the host of specialized T-cells that damage many of the body own cells as well as the viral particles. The dry cough results in expelling this fluid out of human body. This process can take one or two weeks, therefore the patients are suggested quarantine themselves for two weeks so that the virus does not transmit to others from them,

2.4 Tests for Corona Virus and COVID-19[4]

When most common symptoms like cough, cold, fever persists in human being for a week or so, he is advised to be tested for COVID-19 by the doctor. There are few tests for COVID-19 detection in which following three are very common tests:

2.4.1 **Molecular RT-PCR Test:** Reverse Transcription Polymerase Chain Reaction or RT-PCR test is used to detect the presence of RNA of Corona virus. The specimens are collected from throat or nose through the swab. This test detects virus even if virus load is low therefore it is a very effective test. The biggest challenge is to expand the testing.

2.4.2 **Virus Antigen Test:** The test collects the sample of mucus form the throat or nose of the human using the swab, which is dipped into liquid to dissolve the mucus and release the virus. The liquid is applied to the test slide containing antibodies. Any virus present is struck to these antibodies. The second mixture of antibodies chemically modifies with

the dye is applied to test slide again. The virus is sandwiched between these two antibodies and the dye make the virus visible. This test is less accurate then RT-PCR test.

2.4.3   **Antibody (Serological) Test.** This test is done after the patient recovers from the COVID-19 that is when patient's immune system started producing antibodies- proteins which were critical to fight against Corona virus and clean them out. The health care worker takes blood sample from finger and check for whether patient's body developed antibodies against Corona. The WHO cautions that there is lack of proof whether presence of antibodies means that you are prevented from re infection against Corona virus. The Level of immunity and how long immunity last long is not known. The benefit of this test is that persons who had recovered from COVID-19 can donate their plasma to other patients suffering from Corona and develop their immunity using Plasma Therapy.

2.5 Recovery and Treatment.

2.5.1 Home Quarantine: In cases of mild symptoms the patient is suggested to quarantine himself for a duration of two weeks where is own immune system fights with virus and the body recovers in that duration.

2.5.2 Hospitalization: If the symptoms developed from mild to serious, then the patient seeks medical help and he is taken to the hospital or other centers specially for COVID-19 patients. They are kept till their report comes negative from Corona virus and are discharged in 2-3 weeks' time. Currently there is no medicine recommended for the treatment of COVID-19 and no cure in available. The researchers are testing a variety of possible treatments. In the meantime, medical governing authorities of various countries has granted permission for medicines approved for other diseases to be used to treat severe COVID-19 patients when no other options are available. The two Malaria drugs Hydroxychloroquine, Chloroquine and an antiviral drug Remdesivir has been approved for the treatment.

2.5.3 Plasma Therapy [5]: This is another technique use for treatment of COVID-19 patients. In this Plasma is taken from persons who had recovered from COVID-19 and their immune system starts producing antibodies-proteins to fight Corona virus and clear it from human body. The plasma is injected into the vein of COVID-19 patients. This therapy is generally done for patients who had chronic medical condition, like diabetes, heart disease or weak immune system.

3.   ROLE OF GOVERNMENT FOR PREVENTION AND TREATMENT OF COVID-19

As per the suggestions and recommendations of WHO government of many countries had taken effective steps to control the spread of Corona virus and treat COVID-19 patients. This article discusses the steps taken by Indian government in particular to control the pandemic. Along with Indian government, researchers, NGO and other organizations came forward to help in controlling the spread of Corona virus and treatment of COVID-19. Various steps taken by the government with help of various individuals and organizations to control the pandemic were:

3.1 **Preventive steps:** Proactive measures to control the spread of Corona virus in India.

a. Heavy Thermal Screening: Heavy screening of travelers coming from abroad was conducted on all international and national airports and mandatory quarantine of 14 days was applied to all.
b) All visas except diplomats and employment were suspended.
c) All national cross borders and state borders were sealed.
d) All over country schools, gyms, malls, clubs, hotels, community halls, etc. were shut down, examinations were postponed till situation comes under control.
e) All places of worship were closed to avoid public gatherings.
f) Work from home concept was promoted for employees so that they do not need to come to offices.
g) To stop the spread of Corona virus Prime Minister imposed 21 days nationwide lockdown which was extended further with required relaxations as per the situation.
h) Many doctors and medical institutions advised use of warm water, ginger, turmeric, holy basil (tulsi) for strengthening the immune systems of humans.
i) Many app and tools were developed to provide information regarding Corona virus and COVID-19.

3.2   Educational and Informative steps:

a) Government provided authentic information about Corona virus and kept track of positive cases of COVID-19 and suspects of patients with Corona symptoms.
b) Government provided guidelines, helpline numbers, number of cases and other data on ministry of health official website.
c) Government provided authentic information about the preventive measures which every citizen should follow in order to be safe from Corona virus like social distancing i.e keep distance of 2 meters, wear the face mask, wash the hands with soap and water for 20 seconds, use 60 percent or more alcohol based sanitizer to clean hands, wash all vegetables, sanitize all products coming from outside.
d) Information was also provided that how long the virus can stay on different surfaces.
e) Thermal screening was made mandatory for all organizations, railway platforms, roadways bus stands, and other places of public gathering.
f) Training at various levels was conducted to provide information about Corona virus and COVID-19 disease.
g) Online classes were promoted so that loss of studies of students could be minimized.

3.3 Medical Steps:

a) The government increased the number of tests daily to indentify the potential COVID-19 cases and persons with minor symptoms like cough cold and fever were home quarantined and observed by medical staff.
b) Apart from government testing labs many private labs were also authorized to conduct tests for COVID-19.
c) The persons found positive for COVID-19 were immediately taken to hospitals and Corona centers for treatment.
d) India had capacity of 0.7 beds per thousand [6]. To overcome this government converted many universities, hotels, railway coaches etc. into isolation stations where the COVID-19 patients could be treated.
e) Personal Protection Equipment (PPE) Kits were provided to medical staff and other Corona warriors who were involved in treatment of COVID-19 patients.
f) Large number of ambulances with ventilator facilities were arranged which provided service 24 X 7 for COVID-19 patients.
g) Proper food, medicines etc were provided to COVID-19 patients in Hospitals and isolation centers till they were found negative from COVID-19 and were discharged to go home.
h) No medicine is available for Corona virus till now, so Indian government allowed the use of two malaria drugs Hydroxychloroquine, Chloroquine and an antiviral drug Ramdesivir.

3.4 Financial Help

a) Indian government provided the package of twenty lakh crores for revival of the economy.
b) Many individuals and organizations donated to PM relief fund, CM relief funds etc.
c) Many corporate giants provided ventilators, hospitals for COVID-19 patients, hotels for doctors and law enforcing agencies.
d) Many individuals, organizations provide food, shelter for the poor, buses for migration of
Laborers.
e) Government provided free gas to the poor, also transferred money into their Jandhan accounts
f) The income tax return (ITR) filing date was extended to 30th Nov 2020.
g) Public and private organizations had been asked not to cut pay of employees during lockdown.
h) Insurance of 50 lakhs Rupees had been provided to every medical and health worker fighting against Corona virus.

4. ROLE OF TECHNOLOGY TO FIGHT AGAINST CORONA VIRUS AND COVID-19

To plan and execute steps (discussed in previous section) against Corona virus at grass root level required a lot of manpower and other resources. The technology played a vital role in helping individuals, government and other agencies in planning and executing the fight against Corona virus. This section discusses the support of technology to find against Corona virus and COVID-19 in India

4.1 **THE ROLE OF MEDIA:** The electronic media and the print media continuously provided the information regarding Corona virus, COVID-19 and the preventive measures which could be used to remain safe from the disease. The media provided the information about the virus and interaction with the doctors, medical staff, law enforcement and other government agencies during the lock down, so that every citizen could be aware of the current situation and manage accordingly.

4.2 **Innovations by Indian Army, Navy and DRDO [7]:** the Indian Army, Indian Navy and DRDO use technology to modify some of the equipment's and made them smart and efficient to fight against Corona virus.

4.2.1 **Remote controlled trolley**. Electronics and Mechanical Engineers (EME) of Indian Army created a remote-control trolley which could be use by frontline healthcare workers to take essential items. The trolley was equipped with built-in wash basin and dustbin.

4.2.2 **Contactless sanitizer and dispenser:** In this Corona tenure we all know the importance of sanitizer. Whenever soap and water is not available we sanitize our hands and surroundings with sanitizer, hence often touch the bottle of sanitizer. To solve this problem Centre for Fire Explosive and Environmental Safety (CFEES) developed automatic mist-based sanitizer dispensing unit which use contact less sensors to detect the hands and dispense the sanitizer.

4.2.3 **Ultraviolet C Light-based sanitization box:** ultraviolet C light based sanitization box has been developed by Defense Institute of Physiology & Allied Sciences (DIPAS), Institute of Nuclear Medicine & Allied Sciences (INMAS) and DRDO laboratories in Delhi, which could be used to store and sanitize lot of utilities like wallet, keys, mobiles, specs, watches etc.

4.3 **Innovations in Hackathon [8]:** Indian government organized a hackathon on 3rd and 4th April 2020 to get workable solutions to fight against Corona virus. Various solutions were provided by winning teams were remotely operated ventilator system by Big Bang Boom team, UV light disinfectant robot by team 132 that can automatically disinfect surfaces using ultraviolet light, device to detect the shortness of breath a major symptom of COVID-19 which could be connected to the computer system by team 118.

4.4 **Technological implementations by various states [9]:** Various state governments in India with the help of private organizations, researchers, new startups and others developed AI (Artificial Intelligence) Power Tools to tackle the situation of Corona virus and COVID-19.

4.4.1 **Kerala**: Government of Kerala used AI based 'Thermal and Optical Imaging Camera' for fever screening. It is used to scan the people from safe distance fever and those found ill were isolated. Government also used the robot Nightingle-19. This robot not only delivers food and medicines in bulk to the patient but also allows doctors and other healthcare workers to interact with the patient using video mode. Nightingle-19 was used in hospitals of Kannur and

Thalasseri. The government also used GoK – Kerala Direct mobile app to provide general announcement, information, guidelines, quarantine protocol details, health and safety tips details to the visitors of Kerala.

Fig2.   Nightangle-19 Robot [10]

4.4.2 **Karnataka:** Government used Corona virus app to keep track of places occupied by COVID-19 patients during the 14 day incubation. Another app track that the patients stayed at home and upload photo continuously to ensure that they were at home. Karnataka government also launched "Apthamitra" helpline and mobile app to provide the guidance and medical advice to those who are in need and suffering from Corona virus and COVID-19. Using the mobile app the patient can directly interact to the doctor and other healthcare staff to get the required guideline.

4.4.3 **Tamil Nadu [11]:** Government took the help of Chennai based startup Garuda to disinfect hospitals, institutions, organizations and various other areas in the cities of Tamil Nadu. Around 300 drones were used to disinfect 50,0000 thousand acres of land including hospitals, hotels, educational institutions, colleges and other public places. Tamil Nadu Government also developed COVID-19 QUARANTINE MONITOR to ensure that citizens under home quarantine time does not violate quarantine guidelines.
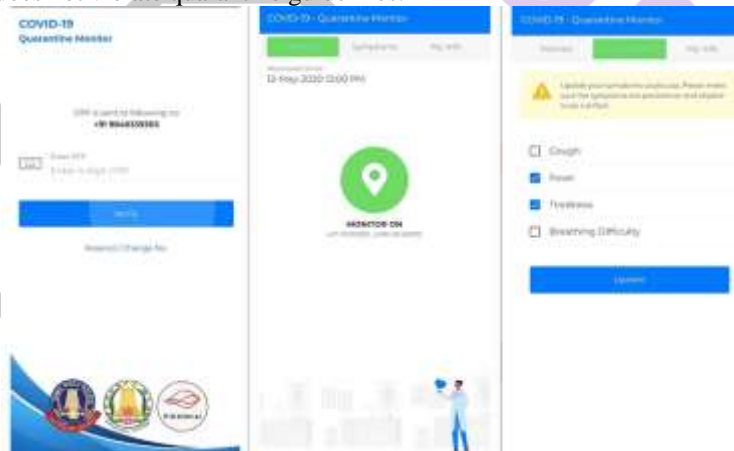

Fig. 3 Quarantine Monitor [12]

4.4.4 **Punjab [13]:** The government of Punjab designed and developed Corona virus alert (COVA) app which provided the citizens of Punjab information, guidelines and other government advisories. This helped the user to generate curfew passes and view all orders and travels instructions provided by the government.

4.4.5 **GOA [14]:** Government of Goa developed Test Yourself Goa app in collaboration with Innovaccer to help the users to self-diagnose the COVID-19 symptoms. It also advised how to quarantine, keep distance, use the mask, etc. along with management videos.

4.4.6 **Rajasthan [15][16]:** The RajCovidinfo and RSMP RajConecT mobile app were developed by Rajasthan Government. The RajCovidInfo app provided all the information, guidelines, health advisories, statistics, alerts and helpline related with COVID-19. The RSMP RajConecT mobile app allows users to take part in various surveys and provide region wise updated regarding COVID-19. It also allows buying and selling of items by users, audio/video calls, skydrive to keep all documents uploaded. Department of Medical, Health and Family Welfare, Rajasthan government, has also uploaded all the information regarding COVID-19 on its website http://www.rajswasthya.nic.in/

Fig. 4.   RSMP-RajConnecT app[17]

4.5   **Tools and Apps used by Indian Government [18]:**

With the help of various educational institutions, ministries, other government and private organizations, government of India develop various tools and mobile apps to combat the COVID-19 and reduce the spread of Corona virus. Some of the tools and apps developed by Indian government to fight against COVID-19 are as follows:

h)   4.5.1 **Aarogya Setu :**   Arogya Setu app developed by NIC India is one of the most downloaded app by citizens of India. Using this app user can self-check COVID-19 symptoms and can easily locate nearest health centre or hospital. This app also warns the user if has come in the proximity of COVID-19 patient. Launched on 2nd April 2020, this application on basis of location data generated from GPS and Bluetooth, track where the user visited. After checking the information with Indian Council of Medical Research (ICMR) data of positive Corona cases, it alerts the user that he/she is likely to cross path with infected person. This app directly connects users with essential health services of Indian government

4.5.2 COVID-19 Feedback app: This app developed by Indian Ministry of Electronics and Information Technology basically act as a survey tool to collect information from the users about any test or treatment they had undergone in recent past. Using this information, the government identifies the worst affected areas and work on developing facilities in those areas.

4.5.3 MyGov app: This app developed by government of India so that the citizens could directly connect with the government and share their ideas, comments and suggestions to central Ministries and other health organizations. With the help of this app the user could also find out latest figures regarding COVID-19, important helpline numbers, email addresses and contact numbers of concerned authorities in case of any emergency.

i)   **4.5.4 SAHYOG app:** This app had been developed by India national mapping agency, survey of India to compliment Aarogya Setu app to enhance contact tracing, public awareness and self-assessment objectives. This app collects data at state level from various government/private departments organizations, academic institutions, government employees and students to develop national database which could be used by various agencies as and when required to combat COVID-19 and stop the spread of Corona virus. This app worked as a key tool to help Corona warriors and health community workers to carry out door to door survey, contact tracing, conduct public awareness programs and to deliver essential items. This app helped the government to improve its response time.

4.5.5 Corona Kavach app [19]: Ministry of Electronics and Information Technology in association with the Ministry of Health and Family Welfare develop this app, which is a location based COVID-19 tracking app to alert the users when they are at a risk of getting contaminated by the virus by coming in a proximity of another person affected by Corona virus or at a high risk, it also provides the information about COVID-19 cases in India. After asking a series of questions this app will provide you the status of all good, see a doctor, quarantine and infected.

Fig. 5 CORONA KAVACH app[19]

4.5.6 ROBOTS and Drones [20][21]: Indian government also deployed various robots in different hospitals to take care of patients and fight against Corona virus and COVID-19. Some of the robots used by the government of India and other state governments

are: The AIIMS Delhi deployed Milagrow Humanoid Robot & IMAP 9.0 Floor Robot by Milagrow, Chennai hospitals deployed Zafi robot by propeller Technologies, SMS Hospital Jaipur deployed Sona 2.5 robot by Club First to serve food and medicines and take care of patients in the hospitals. Karmi-Bot robot design by Kochi-based Asimov Robotics, perform the functions conducted by above mentioned robots, along with that it also was able to disinfect the premises using ultraviolet radiations. The IITs of India developed various drones, robots and tools to disinfect premises and helped in treatment of COVID-19 patients. IIT Guwahati develop two types of drones one to disinfect the premises and second to help in thermal screening of individuals and two robots to provide food and medicines and to collect garbage in isolation wards of hospitals. IIT Bombay has developed digital stethoscope which can listen to the heartbeat of a patient and record it to minimize the risk of healthcare workers and doctors of coming in contact with COVID-19 patients.

Fig. 6 Sona 2.5 Robot [22]

4.5.7 **Educational Apps:** During the lockdown the students of various schools, colleges and other institutions suffered a lot as their classes were called off. Teachers and Professors tried very hard using various apps and tools available on mobile and internet for taking online classes, like zoom, google meet, cisco WebEx, saynamaste etc. Various assignments were given to students and online tests were conducted using various online learning systems like Google classroom, MOODLE, open edX, CANVAS etc. Table1 summarize the role of technology in fight against COVID-19

Table 1: Role of Technology in fight against Covid-19

S.NO.	INSTITUTION	TOOL/ TECHNOLOGY	ROLE
1	Media	Television/Radio/ Internet	Spread awareness, Provide data and information about Covid-19
2	Indian Army/ Navy/ DRDO	Remote controlled trolley/ Contactless sanitizer and dispenser/ Ultraviolet C Light-based sanitization box	Contactless supply of essential items and sanitization.
3	Kerala Government	Nightingile-19 Robot/ Gok-kerala Direct app	Robot to deliver food and medicine/ App for Covid-19 information
4	Tamil Nadu Government	Drones/ Quarantine Monitor (QM)	Drones for sanitization/ QM for home quarantine information.
5	Punjab Government	COVA app	Covid-19 information.
6	Goa Government	TestYouselfGoa	Self-testing of Covid-19 symptoms.
7	Rajasthan Government	Sona 2.5 Robot/ RajCovidinfo and RSMP RajConecT app	Robot to deliver food and medicine/ App for Covid-19 information, medical facilities, chat boat, video call, survey etc.
8	Indian Government	Aarogya Setu/MyGov/ Sahyog/Corona Kavach app.	Self-testing of Covid-19 symptoms, Covid-19 info and other medical facilities.
9	IIT Guwahati	Drones	Sanitization
10	IIT Bombay	Contactless Digital Stethoscope	Monitor heartbeat

Table 1

5.   LIMITATIONS AND FUTURE SCOPE OF SUPPORT OF TECHNOLOGY TO FIGHT AGAINST CORONA

The previous session discussed how the technology helped various individuals, government/ private organizations and other NGOs to fight against Corona virus and COVID-19. One thing should be remembered that technology could be used only as a support system and cannot replace human beings and their responsibilities in such critical time of Corona virus and COVID-19. This section discusses the limitations of technology, its support and scope of further improvement in this area.

5.1 Limitations of Technological Support in fight against COVID-19

5.1.1   Many people living in rural areas of India are not educated, not use to mobile phones and Smartphone, so to teach them how to use the technology is a difficult task.

5.1.2   Many people intentionally do not provide right information to the devices which may lead to collection of garbage data.

5.1.3   There is a risk of leaking information if data is not handled securely by various government/private organizations of the country.

5.1.4   Robots are doing the duties of health care staff very well but, they could not be held responsible in case anything goes wrong with the patient.

5.1.5   Robots could not replace human doctors which are working day and night for treatment of patients suffering from Corona virus and COVID-19.

5.1.6   Robots and drones can help in surveillance of various premises and locations but, could not replace policeman and other law enforcing agencies, working in those areas.

5.1.7   It is difficult to teach unethical, uncivilized people the value of social distancing even with the use of technology.

5.1.8   There is still no medicine available for treatment of COVID-19 which is a serious issue.

5.1.9   There are very limited online examination systems which could conduct school level and university level examinations of the students.

5.2 Future scope of use of technology to fight against Corona virus and COVID-19

No matter how advance technologies are used to fight against Corona virus and COVID-19, there is still a lot of scope in their improvement which is discussed as follows:

5.2.1   With the use of technology precise treatment, whether medication or therapy, should be quickly developed for COVID-19.

5.2.2   With use of technology, therapy or meditation should be developed for COVID-19 patients so that they can quarantine themselves at home and only critical patients should be taken to hospital.

5.2.3   Technology should be developed to quickly trace the crowded areas where social distance is not followed and inform the authorities immediately.

5.2.4   Technology should be used to develop low cost test equipments so that the cost of testing COVID-19 suspects could be minimized.

5.2.5   Various apps should be developed to promote online teaching so that the students of schools, colleges and various coaching institutions do not suffer and can get quality online education at home itself.

5.2.6   Proper Learning management system is required for efficient online education in schools and colleges.

5.2.7   Online examination system should be developed so that school level and university level examination could be conducted in a fair and efficient manner.

CONCLUSION

Since the start of year 2020 whole world started to face a new virus known as Corona virus which lead to a disease called COVID-19, which was declared pandemic on 11-March- 2020 by WHO. Every nation tried to tackle the situation as per guidelines of WHO. With the help of technology and foresightedness the Indian government effectively controlled the spread of Corona virus and provided efficient treatment and care for COVID-19 patients. The result was that only few cities were adversely affected by Corona and in most of the cities the impact was less which was efficiently handled by medical, law and order, and other organizations. This article started with introduction to Corona virus and COVID-19 disease. Then the role of government for prevention of spread of Corona virus and treatment of COVID-19 was discussed. In the next section discussed the support provided by technology to combat with the situation of Corona virus and COVID-19. The next section discussed the limitations of technology to support the fight against the Corona virus and COVID-19. We hope that sincere efforts will be provided by researchers, medical staff, healthcare workers and other organizations to quickly overcome this situation. We hope that new technologies will emerge, to support fight against Corona virus, new therapies and medicines will be developed for treatment of COVID-19 and the world would be quickly free from Corona virus and COVID-19.

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