How India Emerged as a World Leader in Tackling Covid-19

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Abstract- India became a self reliant country in the course of this pandemic because of the timely preventive measures adopted by our country in combating this global threat. International media including WHO and IMF had appreciated India for timely implementation of lockdown and other preventive measures. India maintained the lockdown until the time it could manage it economically. Our country displayed leadership qualities by supplying essential medicines to other nations. In fact, the entrepreneurial mindset of our people turned this disaster into an opportunity by manufacturing lakhs of PPE kits and other protective gears, so that these essentials could be supplied to other nations for their frontline health workers. We can also not forget the role of our real heroes which include police, doctors, nurses and paramedical staff.

Key Words: Covid 19, India, pandemic, patient, hospital, government, lockdown

I INTRODUCTION

Covid-19, a global health pandemic changed our lives drastically and we lived in a world full of anxiety, fear and uncertainty. The aggressive media reporting of this disease day in and day out had further dampened our spirits. Discovery of vaccines based on clinical and human trials seemed the only ray of hope but it required some time. The complex procedure of molecular research coupled with human trials made it a more complicated and time consuming affair. All in all, the entire process took a few months in order to get a commercially viable medicine in our hands.

Multiple theories were being researched to tackle this pandemic but the virus as its name implies Novel coronavirus was always a step ahead. We were perplexed about the cause, symptoms and transmission rate since different researches were showing contradictory results. A detailed analysis of India's role in combating this Covid19 is manifested.

II TACKLING COVID-19

2.1. Lockdown Strategies and other Preventive Measures taken by India initially

As soon as COVID-19 was declared a global health pandemic [1], India ensured prompt implementation of total lockdown for all government and private offices, business, commercial and industrial establishments, institutions, places of worship, all private and public transport and hospitality services etc. Total shutdown ensured limited spread of this virus, but also helped the nation to prepare for this pandemic. Efforts were made to raise the quantities of required medical equipment like masks, PPE kits, ventilators and testing kits. Also the hospitals were prepared with facilities to fight this pandemic. This also reduced the burden on the healthcare system that took care of patients with the most feared complications of COVID-19, i.e., severe bilateral pneumonia [2].

The Indian government also ensured that all the citizens of the country had the required information about this global health pandemic and the safety measures required to prevent its transmission by droplets, such as to wash hands properly with soap for 20 seconds, avoid touching viral entry points, such as eyes, nose and mouth, cover the mouth when coughing or sneezing, wear a facemask and practice social distancing by putting six feet of distance between individuals. In addition to these precautions, government-mandated social distancing measures such as lockdowns and stay at home orders, which were effective ways to minimize the spread of SARS-CoV-2 through droplet transmission. For this, the people were educated through electronic and social media, also

the caller tunes of phones propagated the information about the virus.

Apart from this, Pradhan Mantri Garib Kalyan Anna Yojana provided food and free ration to more than 80 crore people during the pandemic with an expenditure of more than 2 lakh crore rupees in various schools and community centres. The state governments tried to provide all the facilities to the workers of other states who were stuck in their state in the lockdown period. This strict lockdown enforced by the police force helped in keeping the number of covid patients under control. Many government and private hospitals were converted into corona healthcare centres with the required amenities.

Due to the dense population of migratory labourers returning to their native places after total lockdown it was very difficult to arrange for their isolation. Places like schools and colleges were converted into isolation centres where they had to isolate themselves for fourteen days to eliminate the chances of carriers spreading the disease to their homes. In this pandemic, frontline workers from paramedics and police emerged as the real heroes by helping the country in every possible way.

2.2. Strict implementation of rules and increase in production of face masks and PPE kits

Lockdown could not be a long term solution as it affected the Indian economy drastically [3]. So India started unlocking with adequate safety measures including sanitization of premises, thermal screening, ensuring mask wearing, hand washing, sanitizing and physical distancing which were essential for curbing the spread of this virus [4]. Hence all public and private sectors like banks, shopping establishments, workplaces etc were opened with precautions and safety measures to ensure prevention of transmission. Penalty charges were also imposed on people who failed to take the necessary precautions like maintaining a safe distance, wearing masks, proper sanitization etc. The violators not wearing masks were strictly punished under section 188 (Disobedience to order duly promulgated by public servant) of the Indian Penal Code. Stepping out without masks from homes would land the person directly into the prison for six months or a fine of one thousand rupees. Also, homemade masks were encouraged for the general public whereas medical grade N95 masks [5] were kept reserved for doctors and front line workers amid a widespread shortage of supplies. The United States followed the lead of India in advising its residents to use masks in public [6].

Production of N-95 masks were limited for hospital use before the pandemic but the spread of corona virus awakened government authorities to upscale the production of N-95 masks. Regular and multiple use of masks by a country of gigantic population was in itself a challenge for the industry and it was essential to look for alternatives. Hence small and medium enterprises, cottage industries and social media organisations were persuaded to make cloth masks and the government ensured its authenticity by advertisements involving celebrities from various fields.

Arogya Setu application (app) was developed by the Government of India, which used technologies like GPS to map the infected area in various categories and it provided a real time count of infected persons. It provided information about the preventions and safety measures for the pandemic, self-assessment and various contacts of doctors and police so that everyone could contact them as per their need. Later on it was made mandatory to download this app for any travel through public transport or intercity travel through air.

2.3. Zoning

Although the unlocking was carried out in phases to revive the sagging economy, on a flip side the number of positive cases mushroomed drastically leaving the government in jeopardy. In order to control the unstoppable spread of the virus. The Government of India came up with the iconic idea of dividing places into red, orange and green zones on the basis of the number of virus affected patients. In the red zones almost no movement of people was allowed to reduce the risk of transmission of infection and strict penalties were imposed for the offenders.

2.4. Facilities developed for hospitals and quarantine centres

2.4.1. Hospital beds

The state of Maharashtra, which had reported the maximum number of cases [7], required more beds and facilities. Mumbai had set up 330 Covid care

centres with 48,247 beds to quarantine high-risk people. Another 25,619 beds had been set up for asymptomatic and mildly ill patients. The city corporation created facilities in open grounds, horse-racing tracks, and exhibition centres, including some with oxygen-attached beds. Maharashtra has also issued a notification taking over 80% beds in all private hospitals to treat Covid-19 and non-Covid-19 patients. Delhi, which was second in the list with maximum number of patients, started three new government hospitals, a 450-bed hospital in Burari, a 2,000-bed hospital in Dwarka and a 400-bed hospital in Ambedkar Nagar. This model was replicated all over India.

2.4.2. World's largest covid care centre

The health infrastructure in the national capital of India received a major boost after the Radha Soami Satsang Beas centre in Delhi's Chattarpur had been converted into a 10,000-bed COVID-19 care centre (area of 29 acres) in record time. This centre had doctors from the Indo-Tibetan Border Police (ITBP), Indian Army and other paramilitary forces [8]. The entire facility was air-conditioned and meals were provided by Radha Soami Satsang Centre.

2.4.3. Home Quarantine

The number of patients increased exponentially during the partial withdrawal of lockdown and asymptomatic patients with mild symptoms were advised home quarantine in order to decimate the overworked hospital infrastructure. These low risk patients recovered at a much better pace in the comfort zones of their homes [9]. Helpdesks and teams of doctors remained in constant touch with home isolated patients for their constant monitoring of health. Free of cost oximeters (on return basis) were provided to the patients in home quarantine for keeping track of their oxygen level and if the need arose they were hospitalized for intensive care. Many hotels also served as quarantine centres for patients and doctors were also asked to stay here to protect their family members.

2.5. Role and Working of Oxygen Concentrators

Oxygen concentrators are medical devices that assist people who have a low level of oxygen in their blood. These concentrators work with electrical supply or batteries.

An oxygen concentrator receives air, purifies it, which is 80 percent nitrogen and 20 percent oxygen. The air coming out of the oxygen concentrator is 90 to 95 percent pure oxygen and 5 to 10 percent nitrogen. The nitrogen is separated to give the patient the highest dose of oxygen possible.

2.6. Role and working of Oximeter

Pulse oximetry is a non-invasive and painless test that measures oxygen saturation level or the oxygen levels in the blood. It can rapidly detect even small changes in how efficiently oxygen is being carried to the extremities farthest from the heart, including the legs and the arms.

The pulse oximeter is a small, clip-like device that attaches to a body part, like toes, earlobe or a finger. The oximeter utilizes an electronic processor and a pair of small light-emitting diodes (LEDs) facing a photodiode through a translucent part of the patient's body, usually a fingertip or an earlobe.

One LED is red, with a wavelength of 660 nm, and the other is infrared with a wavelength of 940 nm. Absorption of light at these wavelengths differs significantly between blood loaded with oxygen and blood lacking oxygen. Oxygenated hemoglobin absorbs more infrared light and allows more red light to pass through. Deoxygenated hemoglobin allows more infrared light to pass through and absorbs more red light.

The LEDs sequence through their cycle of one on, then the other, then both off about thirty times per second. The amount of light that is transmitted (in other words, that is not absorbed) is measured. These signals fluctuate with time because the amount of arterial blood that is present increases (literally pulses) with each heartbeat. By subtracting the minimum transmitted light from the peak transmitted light in each wavelength, the effects of other tissues are corrected to allow for measurement of only the arterial blood. The ratio of the red light measurement to the infrared light measurement is then calculated by the processor (which represents the ratio of oxygenated hemoglobin to deoxygenated hemoglobin) [10].

2.7. PPE Kits

Personal protective equipment (PPE) is protective clothing, helmets, goggles, or other garments or

equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals and airborne particulate matter. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities [11].

Due to the urgency of the COVID-19 outbreak, the government provided appropriate PPE kits not only for the medical staff but for the staff involved in various activities like cleaning, waste management and safe burials etc.

2.8. N-95 Masks

N95 masks are designed to remove more than 95% of all particles that are at least 0.3 microns (μm) in diameter [12]. In fact, measurements of the particle filtration efficiency of N95 masks show that they are capable of filtering ≈99.8% of particles with a diameter of ≈0.1 μm. SARS-CoV-2 is an enveloped virus ≈0.1 μm in diameter, so N95 masks are capable of filtering most free virions, but they do more than that also. It was evident that corona was an airborne virus, hence N95 masks became significant [13].

2.9. Role of various testing kits such as Antigen, RT-PCR and Antibody Test Kits

In the process of combating this virus, detection of infected people was most important, which included a long process of testing. Therefore, rapid test kits were certainly very useful as they speeded the testing process. The ICMR advised to use antigen kits along with the gold standard RT-PCR test. Suspected individuals who tested negative for COVID-19 by rapid antigen test were made to be tested by RT-PCR to rule out the infection. While the positive test results were considered as true positives and did not need reconfirmation by RT-PCR test. These tests were provided free of cost to all the citizens.

2.10. Real time RT-PCR

Reverse transcription polymerase chain reaction (RT-PCR) is a nuclear derived method for detecting the presence of specific genetic material in any pathogen including a virus. Originally, the method used the radioactive isotope markers to detect targeted genetic materials, but subsequent refining has led to the replacement of isotopic labelling with special markers, most frequently fluorescent dyes. This technique allowed scientists to see the results almost immediately while the process was still ongoing, whereas conventional RT-PCR only provided results at the end of the process. This helped in increasing the national testing capacity.

The ICMR also urged all the state governments, public and private institutions to scale up testing for coronavirus patients. As test, track and treat was the only way to prevent spread of infection and save lives, it was imperative that testing was made widely available to all symptomatic individuals in every part of the country and contact tracing mechanisms for containment of infection were further strengthened.

2.11. Antibody or Serology Test

The antibody test was not checking for the virus itself. Instead, it looked to see whether the immune system of the body had developed antibodies or not. This test was helpful for identifying the asymptomatic patient who might have SARS-CoV-2 and did not know it. So to avoid infection through asymptomatic carriers of the virus the antibody test was the only option.

2.12. Plasma therapy

In the search for an effective treatment for COVID-19, researchers advised an old method of fighting infectious diseases by transfusions with convalescent plasma. The blood of people who had recovered from an infection contains antibodies which could fight with the virus. so this plasma containing antibodies was administered to serious patients helping their immune system to reject the pathogen more efficiently[14]. Two plasma banks were established in Delhi where plasma from recovered patients were stored to cure other serious patients.

2.13. The Ventilator

The majority of patients of Covid-19 admitted to critical care needed their breathing supported by mechanical ventilators. A mechanical ventilator delivers the breaths to patients, usually using positive pressure to assist or push a breath into the lungs. Based on the condition of the patient various types of ventilation are used. We can fully ventilate

a patient and make sure all of their breaths are delivered by the breathing machine.

Before the corona outbreak, the cost of each ventilator was about 4 to 5 lakhs in India. As the disease spread, the number of cases increased, and almost one out of five patients needed to be ventilated, which led to the shortage of ventilators. Therefore, several institutions came forward and developed a digital ventilator, whose cost was around 1.5 lakh.

IIT Roorkee developed a completely indigenous ventilator with full functionality, at a low cost of only twenty five thousand. The Behemoth Indian Railways also developed a very low cost ventilator at its Kapurthala Rail Coach Factory with a bare cost of ten thousand and it had sought ICMR's permission to produce it on massive scale. Mahindra had developed ventilators to be priced less than Rs.7500. These are automated bag type ventilators with simple designs.

Maruti Suzuki tied up with AgVa Healthcare to produce more than 1500 ventilators. AgVa healthcare had provided the technology to make efficient ventilators with low cost, and the largest car manufacturing workers helped to manufacture it within the least possible time.

III STEPS TOWARDS IMMUNITY

The Indian Ayurvedic system had recommended immunity boosting recipes to tackle the coronavirus pandemic. Amid the coronavirus pandemic, it was important to take utmost care of one's health. It was advisable to take extra care of the body's self-defence mechanism or immunity. The Ministry of AYUSH had released a list of Ayurveda approved practices that helped to boost immunity by following these routines on a daily basis. The United States also joined India for ayurvedic trials [15].

IV INDIA BECAME A RAY OF HOPE FOR THE WORLD

India exported critical drugs [16] like hydroxychloroquine, paracetamol as well as azithromycin to over twenty countries in aid to fight against the Covid-19 pandemic.

V DISCOVERY OF VACCINE BY INDIA

India demonstrated its remarkable capabilities by developing a COVID-19 vaccine, a significant stride towards self-reliance in healthcare [17]. The nation's dedication to public welfare was evident as it provided the vaccine to its citizens free of cost, ensuring widespread protection. In a true spirit of solidarity, India extended its benevolence to the global community by sending the vaccine to other nations in need [18]. This accomplishment underscored India's commitment to global health and its pivotal role in combating the pandemic on a global scale.

VI EMERGENCE OF INDIA AS A SELF RELIANT COUNTRY

The leadership of the central Government and strict implementation of procedures by various state governments worked efficiently in tandem to avert possibly the greatest ever disaster for the second most populous country of the world. The solidarity displayed through discipline by our citizens made global headlines. Necessity as the mother of invention sums up the entrepreneurial skill set of our industry which took this as a challenge towards making India a self reliant country. The production of many items required to fight this virus were scaled up by our industries in extremely tough conditions of working under covid protocol. The development, distribution, and sharing of the COVID-19 vaccine by India embodied the spirit of unity, resilience, and collaboration, serving as a testament to the nation's capacity to rise to challenges and contribute to the greater good of humanity.

In this way, we can say that India finally stepped up to become a self-reliant nation.

VII CONCLUSION

In this study, emphasis was laid on explaining the responsible role played by India to cope with this pandemic on all fronts, like implementing timely lockdown, procuring facilities of hospital beds, ventilators, PPE kits and masks. Ideas like converting railway coaches into wards for covid patients, making beds out of cardboard, making

cloth masks, isolating in home, etc. had been very innovative. Our country had also emerged as a world leader by lending a helping hand to other nations. The recovery rate in India was high around 62.86% and the mortality rate fell progressively falling (being at 2.49%), which was amongst the lowest as compared to the other countries. These figures were definitely a ray of hope which signified not only the Government's insight, but also the efforts of the healthcare workers, the policemen and all those who were striving tirelessly to make India Covid free. India's remarkable achievement in developing a self-reliant Covid-19 vaccine stands as a beacon of hope and solidarity during a global crisis. With a commitment to ensure public health, India not only produced the vaccine in a record time but also distributed it to its citizens free of charge, exemplifying a resolute dedication towards safeguarding the well-being of its people.

This act of generosity extended beyond its borders, as India extended a helping hand to other nations by providing them with the vaccine. This display of international cooperation and humanitarianism showcased India's role as a global leader in times of adversity, justifying the '*Vasudhaiva Kutumbakam*' means the world is one family.

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