Comparative Analysis of the impact of COVID-19 in Kerala and US

[1]Abhinsha Z, [2]Dr.Noha Laj, [3]Nabil Iqbal

[1] MSc Student, [2]Asst.Prof in Microbiology, [3]Medical Transcriptionist
[1]Department of Microbiology,
[1]A J College of Science and Technology, Trivandrum, India

Abstract: This article is a case study done to compare the impact of COVID-19 in Kerala and United States. The study proved the efficiency of Kerala, a small coastal area, located along the Southern part of India in combating the pandemic. Lack of large economy, medical facilities and proper infrastructure was not a hindrance in its pathway to emerge as the best in the field. Kerala is ranked high in dealing with the Pandemic in an effective way. This study is a meagre attempt to highlight the efficiency of Kerala Govt. in battling the pandemic.

Index Terms **- Kerala, U.S, challenges, break the chain, quarantine.**

I. INTRODUCTION

First detected in Kerala in January, coronavirus may have entered India as early as November 2019

On January 30, India had registered its first confirmed COVID-19 case in Kerala. However, scientists from top Indian research institutes believe that the ancestor of the novel coronavirus strain, which spread from China's Wuhan, was in circulation as early as November 2019. As per scientists, the most recent common ancestor (MRCA) of Indian strains was in circulation by December 11, 2019.

The Times of India reported that scientists used a technique called 'time to most recent common ancestor' to estimate that the origin of the viral strain, which is being transmitted in Telangana as well as other states across India, was dated between November 26 and December 25. The median for the time period is December 11. It is still not clear whether passengers from China had introduced the virus to India before January 30 as no large-scale coronavirus tests used to be conducted at that time. Scientists at Hyderabad's Centre for Cellular and Molecular Biology (CCMB) and other institutes have also found a different strain and named it as Clade I/A3i.
(("There is no data for us to yet say that the new virus population (Clade A3i) among Indians is any more or less dangerous than the other virus population (Clade A2) present here," tweeted CCMB.))

As per the daily, a "clade" is "a group of organisms believed to comprise all the evolutionary descendants of a common ancestor".

The viral strain, which was discovered in the first coronavirus case in Kerala, had its roots in Wuhan. However, the one found in Hyderabad (Clade I/A3i) is different as it originated in a Southeast Asian country, not in China. CCMB director Dr Rakesh Mishra said it is not yet clear from which country did the new clade originate from.

The MRCA of Clade I/A3i was found to be in circulation between January 17 and February 25, with the median being February 8. Another clade "A2a, which is the predominant clade in India had a MRCA of 2nd Jan 2020 (95% HPD Interval 13 Dec 2019 - 22 Jan 2020)". The research team also included experts from the Institute of Genomics and Integrative Biology (Delhi) and the Academy of Scientific and Innovative Research (Ghaziabad) [1].

I. HOW KERALA MASTERED THE ART OF CONTACT TRACING TO FIGHT COVID-19

The public came to know of the concept of contact tracing when Nipah virus struck in May 2018. During the COVID-19 outbreak, this is being practised on a much larger scale beginning from Thrissur.

On January 22, a 23-year-old medical student from Thrissur started from Wuhan, where COVID-19 had begun to wreak havoc, for India. She arrived in Kolkata and had a stopover for a few hours before the flight took off again, landing in Kochi on January 24. She then left for her home in Thrissur by a private vehicle. Kerala was already preparing for the pandemic by then. Everyone returning from China was asked to report to the nearest Public Health Centre and stay under home quarantine. The medical student did so too.

Days later, on January 30, she became India's first COVID-19 patient after testing positive for the virus while under observation at the General Hospital in Thrissur. Early the next day, she was moved to the Government Medical College, Thrissur. Her condition was stable. Now, the government had to recreate the student's journey from Wuhan to Thrissur, identify everyone who came in contact with her and ensure that all these primary contacts are quarantining. It was going to be an arduous task.

Dr Kavya Karunakaran, a Junior Administrative Medical Officer from Thrissur, bore the responsibility of doing the in-depth interview of the patient which would help in tracing her contacts. The district team traced 63 travel contacts (primary) and 18 community contacts of the student. Most of them were students from Wuhan who travelled with her. Later, one of them tested positive in Alappuzha. "Contact tracing starts with the patient. The reference point is the infected person and we reach others through them. People who travelled and communicated with them need to be identified. When the case was identified in Thrissur, we developed the protocol at the Government Medical College based on SARS-CoV," said Dr Kavya.

"China returnees were under surveillance from the third week of January. The majority of them were studying medicine and we didn't have to impress upon them the importance of quarantining. The challenge was pinpointing the contacts. Mapping out the journey itself was not difficult with regard to travel history. The rest depends on the memory of the patient. But we have alternatives for this," she said. "Identifying the people who travelled with the student itself was a bit difficult. Some were on the journey from Wuhan to Kolkata and some from Kolkata to Kochi. We needed to establish who they were and where they were at the time. The patient did not know all the students who travelled with her since they are all studying at a big university. In this case, we got contacts from students of other years and tracked their batchmates. In some cases, they did not have Indian numbers," noted Dr Kavya.

"We contacted them through social media, tried to establish their location and asked them to quarantine themselves. Some of these students/co-passengers were not within India. In these cases, also, we followed a similar protocol. The technical support regarding the passengers on the flight and all work related to the airlines was done by the state machinery. And most importantly, a steady team is important in tracking the contacts efficiently. In Thrissur, we have a great team," said Dr Kavya.

At this point itself, a state level control room was set up to combat COVID-19. One of the major tasks undertaken by the state control room was surveillance which reduced the burden on the various districts. In fact, the team at the state control room identified some primary contacts. People who were travelling with the students before they boarded the flight were also among them. Alerts were sent to other states if necessary, once such contacts were identified.

During this time, a call centre was set up and a tool was also developed with questions at the Government Medical College in Thiruvananthapuram. Through the call centre, all the quarantined people were called and asked questions which enabled the medical team to analyse their needs and ascertain if they were following the guidelines. While the tool has not been validated, it was later replicated in Pathanamthitta when the second wave of cases broke out.[2]

II. SECOND CLUSTER OF CASES

During the second wave of cases, the state was presented with a very complex situation when members of a family that returned from Italy and two of their relatives tested positive in Pathanamthitta. The family returned to the state on March 1.

"Five field level teams were launched to find primary and secondary contacts. In total, 1254 primary and secondary contacts were identified and quarantined within a matter of a few days. The teams visited each of the places that the Italy returnees had been to. They collected CCTV footage based on an approximate time frame, checked the records of the various places which include hotels, houses and a private hospital. This is the point where technology doesn't help us as much as we think it would," said Dr Amjith Rajeevan, Assistant Surgeon, Nilakkal Primary Health Centre.

Dr Amjith was part of the State Control Room team during the Wuhan cases and later the one to do the in-depth interviews of the patients in Pathanamthitta. The field teams also travelled through the Ranni region where the family lives. In fact, during these regular trips they even identified some of the primary contacts walking around despite being quarantined.

Notably, most members in the field team as well as the surveillance team had very limited experience of contact tracing, if at all. Dr. Amjith himself had some experience in tracing the origins of a hepatitis outbreak in Kozhikode earlier.

III. IN-DEPTH INTERVIEWS

In-depth interviews of the patients are key in identifying the places a person travelled to and people they interacted with. Dr Amjith is still doing in-depth interviews and feels the process is a deeply emotional affair. "I have only met about four people in person for in-depth interviews, especially in cases where the patients are old or where our presence is necessary. We try not to waste a Personal Protective Equipment (PPE) kit if it's not necessary. All other interviews are done through phone calls. 90 percent of them were very cooperative when speaking with us and in divulging information. However, it is a gradual process because they may not remember everything. We also interview the primary contacts so that they can fill in the blanks. Some patients give us more details as they remember," said Dr Amjith.

There are cases where the patients are in intensive care and unable to talk much. In such cases, the contact tracing and route map making are done with the help of primary and secondary contacts. In the case of a COVID-19 patient in Pothencode, Thiruvananthapuram, who was also one of the state's casualties, the contact tracing was done mostly through primary contacts.

IV. FIELD WORK AND CHALLENGES

The field level work to identify contacts was not easy. The team of doctors and health care workers was following all the infection control methods while at work. In Pathanamthitta, they visited the primary contacts. Across the state, at local level, there is a system already in place which can be used for field work and includes ASHA (Accredited Social Health Activist) workers, Junior Public Health Nurses (JPHN), medical officers and block level officials above that. However, field teams were deployed first in the Pathanamthitta case and are still on standby if needed.

"We followed all the infection control procedures. There are people who divulged more information and responded to us better when they were moved away from their family and asked questions regarding their travel history. When it came to the private hospital they visited, we had to quarantine patients who were in the same room when they visited. It was a long process and we tried to close all loopholes," said Dr S Sethulakshmi who was part of the field surveillance team.

"We identified people who were at the same place as the patients at the same time and traced their contacts too. But there was still this small chance that we missed someone who might have got infected. However, only people in our list ever tested positive in that cluster. Even after identifying them, there were cases where the primary contacts were breaking quarantine," she said. To keep quarantine violators in check, the district administration had released a WhatsApp number where the public can raise complaints and concerns. There were a few instances where the government instructions were not followed.

"As soon as we are alerted of this, we send a team to give them instructions. If the people under quarantine do not abide by these, we call in the police. We identified the reasons for breaking the quarantine and further focused on providing essential services and food," said Dr Sethulakshmi.

The state already operated community kitchens during the floods of 2019 with the help of Local Self Government (LSG) bodies and Kudumbashree, a community-driven agency of the government for poverty eradication and women's empowerment. This time, they were set up on a much larger scale and across the state as cases increased to provide cooked food to people under quarantine and later to families that couldn't afford food or cook on their own during the nationwide lockdown. The food was delivered at their homes by volunteers of local bodies. [3]

3.1 Route maps

. The route maps were made with the details collected from the patient as well as the primary contacts. Even if the field teams missed anyone in the primary/secondary contact list, the route maps help in identifying the people who were missed. The time and location lead to people approaching the authorities to have their health evaluated. The graphic representations have thus proved effective. This also quashes the rumours spread through social media when a person tests positive.

3.2 Media surveillance

A team in each of the district control rooms goes through the print, television and social media to help identify the needs of people under quarantine, keep tabs on pneumonia deaths and debunk fake news.

"We see reports that people under quarantine have a water shortage or that food kits are not reaching them or that they are being harassed. We also learn about people who were cured and collect positive stories which helps boost the team. A crucial aspect is going through the obituary page and tracing pneumonia deaths, which cannot be dismissed in the current scenario," said Dr Amjith.

"We were prepared for asymptomatic patients in Pathanamthitta because of the media surveillance even before we had any such cases. The social media page of the Pathanamthitta district collector was active. If we identify a cluster of comments, it means there is a need. Now, we go through all the comments. It need not be about the health department. Even if it is regarding the civil supplies department or excise, we hand over the data to the authorities," he added. [3]

V. Timeline of COVID-19 in Kerala

The first case of the COVID-19 pandemic in Kerala (first in India) was confirmed in Thrissur on 30 January 2020. As of 15 June, there have been 2407 confirmed cases with 1046 (43.45%) recoveries and nineteen deaths in the state. The last death case(single) came on June 12. Kerala has one of the lowest mortality rates of 0.79% among all states in India.

5.1 January

The first positive cases of COVID-19 in India was reported from three students of Kerala origin, travelling from the Wuhan province of China, the point of origin of the disease. They belonged to Thrissur, Alappuzha and Kasargod districts and two of them were medical students at a University in Wuhan. Following the detection of positive cases, the government of Kerala declared a 'state calamity warning'. Following this over 3000 contacts of the affected individuals were placed under quarantine, out of this 45 were placed in hospital quarantine.

5.2 February

The three positive individuals later recovered from the infection succeeding hospital care. The 'state calamity' warning was withdrawn after 4 days, since no further cases were reported. Students who were stranded in airports in China due to lockdown were evacuated and flown into Cochin International Airport and quarantined at isolation wards in Kochi Medical College, though, later none of them were tested positive.

5.3 March

The Government of Kerala declared high alert from 4 to 8 February and then again from 8 March, due to second wave being reported from the state. Isolation wards with 40 beds were set up in 21 major hospitals of the state and a helpline was activated in every district. As of 9 March, more than 4000 persons were under home or hospital quarantine. On 4th March, 215 health care workers were deployed across Kerala and 3,646 tele counselling services were conducted which provided psycho-social support to families of those suspected to be infected. Despite the threat of coronavirus infection, the Kerala government decided to go ahead with Attukal pongala, a huge, yearly, all-women religious congregation held at the capital city, Thiruvananthapuram. The government of Kerala has started a YouTube channel for

updating the public regarding the status of coronavirus spread in Kerala and precautions to be taken. There are three coronavirus testing centres in Kerala : National Institute of Virology Field Unit, Thiruvananthapuram Medical College, Calicut Medical College.

On 10 March, the Kerala government arranged special isolation wards in prisons across the state and orders were issued for the shutdown of all colleges and schools up to grade 7. Another decision urged people to not undertake pilgrimages, attend large gatherings such as weddings and cinema shows.

A milestone of the government was launching a mobile application called GoK Direct, an initiative from the Kerala Startup Mission and Information & Public Relations Department developed by startup Qkopy which provided information and updates regarding the COVID-19. It is. The app was designed in such a way that it can also send text message alerts to basic phones (without internet). The app focuses on general announcements, information and updated guidelines for travellers, details about the quarantine protocol and also health and safety tips for visitors to the state.

On 15 March, a new initiative 'Break the Chain', a signature campaign aiming to educate people about the importance of public and personal hygiene was introduced by Government of Kerala. Under this campaign, Honourable Chief Minister Pinarayi Vijayan-led government has installed water taps at public spots such as at the entry and exit gates of the railway stations with hand wash bottles.

On 19 March, Chief minister announced a stimulus package of Rs 20,000 crore to help the state overcome both the COVID-19 and economic hardship caused by it and included Rs. 500 crores for healthcare, Rs 2,000 crore for loans and free rations, Rs 2,000 crore for creating jobs in rural areas, Rs 1,000 crore for families with financial difficulties, and Rs 1,320 crore for paying two months pensions in advance. The government has also ordered salons and workout centres to be shut down.

On 22 March, Health minister of Kerala, K. K. Shailaja strongly warned people to follow the orders from Health department. A citizen science initiative, Collective for Open Data Distribution - Keralam (CODD-K), by a group of technologists, academicians, and students advocating open data was released which was the first bilingual (Malayalam and English) online dashboard for non-specialists to provide real-time analysis, and daily updates of COVID-19 cases in Kerala by leveraging publicly available data from the daily bulletins published by the Department of health services (DHS), Government of Kerala, and various news outlets.

On 23 March, Chief minister announced a statewide lockdown (prior to the announcement of nationwide lockdown by the Honourable Prime Minister) till 31 March to prevent further spread. Public transports were shut down. There was no restriction for private vehicles but district to district travels were only allowed with thorough checking and submission of affidavits or pass issued by the state. [4]

State initiatives for successful control of COVID-19

VI. Break the Chain

A mass hand washing campaign was intoduced on March 15 to educate people, the importance of public and personal hygiene, inaugurated by Health Minister, Smt. K. K. Shailaja. The government has appealed the public to promote ***break the chain*** campaign as a safety measure. [5]

Images tweeted by @cochin_customs

VII. Quarantine

Kerala is the only state in India that mandates 28 days of home quarantine for those returning from countries affected by coronavirus or red/high risk zones, while the national guidelines for India is 14 days. People who are advised home quarantine are advised to stay at their homes during the 28-day period, and report to healthcare authorities if they show symptoms of coronavirus infection. The health care workers or volunteers constantly keep in touch with the ones who are quarantined.

VIII. Repatriating Keralites

At least 4.27 lakh NRKs (Non-resident Keralites) have registered on the NORKA (Department of Non Resident Keralites Affairs) portal, of which about 1.69 lakh people constitute the most vulnerable sections, those who have lost their jobs, employment contract has not been renewed; those released from prisons and awaiting deportation, pregnant women, students who have completed courses and whose visa had expired. Those on the priority list included pregnant women, elderly people and others requiring urgent medical treatment, students, those who left on visiting visas and have overshot their welcome and those who lost their jobs and do not have a place to stay.

For weeks, the state health department has been engaged in setting up facilities and protocols that will be pushed into action when the expatriates come home. Later, Health minister said in a statement that her department is fully equipped to deal with the challenge of welcoming the expatriates at all four international airports – Trivandrum International Airport, Cochin International Airport, Calicut International Airport and Kannur International Airport.

District wise arrangements for expats at a glance

Thiruvananthapuram- 7500 rooms

Pathanamthitta- 8100 rooms

Wayanad- 135 buildings
Alappuzha - 10,000 beds
Malappuram- 15,000 beds
Kannur - 4000 beds
Thrissur - 7581 beds
Kozhikode - 15,000 beds
Meanwhile, MES group will hand over 150 buildings and MSS will allow government to take up their buildings for operating care centres. All buildings under Muslim League and related groups will be surrendered to the government for this purpose. [6]

IX. Pre-arrival protocols

Passengers inside flights will be seated in a zig-zag fashion, wearing masks. 45 minutes before arrival, announcements will be made inside the flight about quarantine procedures. Travellers will have to fill in self-report forms and submit at the help desk. 15 to 20 people will be deboarded at a time, with one-metre distance between them. At the aerobridge, their temperatures will be checked. Thermal scanners was setup from the MP fund released by Honourable MP Dr. Sasi Tharoor. Those running a fever will be sent to the isolation bay. If they do not have a fever, they will be directed to the help desks. Each of the help desks will be manned by a doctor, staff nurse, volunteer and a data entry operator. Passengers are checked for fever or other symptoms at the help desk by the doctor. If they do, they are directed to the isolation bay.
The Indian Consulate had appealed to passengers not to overcrowd the airport, maintain social distancing and follow all necessary precautions stipulated by the authorities. Air India crew members on board the repatriation flights will be fully protected with protective gear, including Personal Protective Equipment.
Post-arrival protocols
Separate mobile health applications have been created to register and track the expatriates who arrived at the airports in the first phase. The app to be used at Thiruvananthapuram was named 'Karuthal' , the one designed for Kochi is 'Ayurraksha' and the one for Kozhikode is 'Agamanam'. All the details of those who have registered on the NORKA website have been plugged into the app. Using QR codes, each of the travellers can be contacted and traced.
Initially, there will be a basic medical screening for those wishing to return home. Only those found asymptomatic will be allowed to board the aircraft. Medical teams will be deployed at the arrival lounge with screening facilities. The passengers will be home quarantined for 14 days and monitored by ward-level Vigil Committees in their residences. Those who wanted to stay in corona care homes will be shifted to such centres near airports. The state government has requested the Central Government to provide passengers' list before their arrival. The expatriates have to strictly undergo the mandatory quarantine in government-arranged facilities of seven days. On the seventh day, PCR test will be conducted and that tested negative will be sent home. The test result will be announced the next day. Those who test positive will be sent to hospitals. Those who proceed to their homes will have to remain in quarantine for one more week. [7]

X. Categorisation of hot spots and zones

Kerala designated four districts – Kasargod, Kannur, Kozhikode and Malappuram – as 'Red Zone', Idukki and Kottayam as 'Green Zone' and the remaining eight districts as 'Orange Zone'. Lockdown restrictions in the Green and Orange Zones were relaxed on 20 and 24 April. Inter-state and inter-district travel would continue to be banned. People travelling outside their homes would be required to wear a mask. Every district would be given a special plan for preventive measures. According to the government's order, 13 services, including air, rail and inter-district bus services, will not be available in the zoning system throughout the lockdown. The zonal classification will be changed from time to time to assess the situation in the districts. Lock-down control in hotspots in Red Zone districts has been decided to be implemented more strictly. No public transportation will be allowed, including in the Green Zone.

XI. How Kerala Is Protecting Its Health Workers from Coronavirus

Kerala, which reported India's first coronavirus case back in January, has only seen six cases of health workers being infected and have since recovered. As countries around the world continue to cope with the highly infectious novel coronavirus, a major challenge has been maintaining the health and morale of the workers at the frontline of the fight—doctors, nurses, ambulance drivers, hospital workers and para-medical staff. While several states in India are grappling with the shortfall created by quarantined or infected healthcare personnel, Kerala has seen only a few cases an of which most of them have been cured and no death was reported unlike the other states.

XII. How did Kerala manage this?

Apart from its investment in a strong public health system, the state has learnt from its experience of dealing with the Nipah virus outbreak in 2018 and 2019. The government prepared ahead to ensure that it would have adequate Personal Protective Equipment (PPE), and has been focusing on safe waste disposal as well as providing counselling to the health workers.
The Kerala government employs around 15,000 doctors and nurses. There is a second line of health workers such as Asha workers, Kudumbasree health volunteers, Anganwadi workers, hospital development committee members, palliative volunteers and other health activists who are in constant touch with people on the ground.
"Many Malayali nurses on duty all over the world have died in recent weeks after contracting the disease. However, the state has ensured full protection to all those working in treatment facilities here. The government has a responsibility to take care of them" said state health minister K.K. Shailaja, who has drawn praise for her scientific temper and level-headed approach to the crisis.

XIII. Planning for PPE

Pariyaram Medical College in Kannur is the biggest treatment centre for coronavirus in the state. However, what makes the institute different from others like it around the country is the way it ensures availability of PPE.

"As soon as we started seeing reports of scarcity of PPE in different parts of the world, we started thinking of a way out. We have asked for help from local plastic product manufacturers, textile production units, footwear makers and women self-help groups. We have also made available enough raw materials from Tirupur and Erode in neighbouring Tamil Nadu. Now we are manufacturing the PPE for our requirement through the women's collective and under the technical help of the local plastic and textile manufacturers. Our doctors are ensuring strict quality control,'' said Dr Arifa Rahman, who works at Pariyaram Medical College. The designs and models of PPE have been evolved taking into consideration the hardships suffered by nurses and health workers.

"Humidity is very high in Kerala at present and thus it is uncomfortable and humid inside the PPE. But there is no option," said K.V. Jomol, a nurse at Pariyaram Medical College. She said the smell of the different kinds of plastic being used for manufacturing the protective gown makes her dizzy. Wearing and removing the suit is a cumbersome process, and requires help from a trained colleague.

"You require a minimum of 30 minutes to wear this plastic protective layer along with two layers of gloves, a mask, goggles and plastic protective cover over footwear,'' said Dr. Rahman.

While other states have been trying to make up for a shortfall in PPE, authorities in Kerala say they are not worried.

"Across Kerala, we have enough stock of medicines and PPE. We started the purchase in January itself from different sources including China,'' said Kerala Social Security Mission executive director Dr Mohammed Asheel.

XIV. Other measures

The state has been devising ways to act on the innovative measures developed by in-house professionals. On April 12, Kerala's famous poverty eradication mission Kudumbashree, comprising women neighbourhood groups, began mass production of the TMC shield, a protective gear for medical staff deputed to treat COVID-19 cases. TMC is a special mask developed by post-graduate doctors from the Thiruvananthapuram medical college. According to Kudumbasree mission director S. Harikishore, the shield will prevent the N-95 mask and goggles worn by doctors and medical staff from becoming carriers of the virus through droplets. The disposable shield is priced at Rs 10 per unit. The raw materials are being sourced easily from plastic and textile manufacturers in the state, he said. Medical staff collect samples from people at newly set upped Walk-In Sample Kiosk (WISK) to test for the COVID 19 coronavirus at Ernakulam Medical College in Kerala on April 6, 2020.

The state has also established Walk-in Sample Kiosks (WISK) to help health workers collect throat swabs without using PPE. These kiosks, were developed by the Ernakulam Government Medical College Hospital in consultation with the district administration, have been modelled after the sample collection method adopted by South Korea. The kiosk, fitted with ultraviolet light, gloves and exhaust fan, can itself function as a personal protection kit, according to Dr Ganesh Mohan of Ernakulam Medical College.

"The health worker will remain in the kiosk and collect the throat swab using the gloves attached to it. The gloves would be sanitised after each use,'' he said. The inspiration for developing the model was a photo seen on social media of a similar sample collection method in South Korea.

XV. Keeping spirits high

The state is also taking care of the mental wellbeing of health professionals by providing them with access to psychological counselling. 30-year-old nurse Veena Damodaran, who is now in-home quarantine after treating a dozen COVID-19 positive cases at an isolation ward at Government Medical College Hospital at Pariyaram in Kannur, has reason to believe that a negative attitude is more deadly than coronavirus.

"In all those 14 days which I spent in the ward, the major task was finding ways to prevent negativity creeping into the minds of patients. As negativity is contagious, I had to defend myself against it in all those days,'' she said. Mental health experts, said Damodaran, are doing a great service in all corona care centres by imparting confidence to both health professionals and patients.

What makes Veena happiest about her first experiment with a pandemic during her ten years of service is the complete recovery made by a 21-year-old pregnant woman just before her scheduled delivery. The patient, who was just 21 years old, had contracted the infection from her husband, who had returned to Kasargod from Dubai and was stressed out.

"In the initial days in the isolation ward, she was and hesitant even to have food and water. It was a great struggle to infuse confidence in her mind and to impart scientific knowledge about the virus to her. She delivered a baby boy exactly two days after her complete recovery. Another challenge was handling a two-year-old boy who tested positive. In keeping him engaged for two weeks, I virtually turned into a close family member for him,'' said Veena, who also hopes to return to the fight against the pandemic with renewed vigour after the statutory quarantine.

An ambulance driver of Ernakulam medical college puts on gears up with protective apparel as he prepares before going to pick a suspected virus patient, in Kochi on February 4, 2020.

HuffPost India spoke to around 12 nurses who work in the corona care wards of Kerala and almost all of them said that Puthussery was a source of inspiration.

For male nurse Josi Jose, who has been working in Pariyaram for the last 13 years, the biggest loss was the death of a 71-year-old patient from Mahe in Puducherry, who was under his care. "He was under treatment for some other diseases at a private hospital in Kannur before shifting here at the last minute after confirmation of Covid-19 positive. His condition was very serious while being admitted here. If there was an early diagnosis at the private hospital and he was shifted here in time, he might have been saved. But my satisfaction is that sixteen others who were under my care had turned negative and returned to their homes,'' he said with pride.

Health minister Shailaja said that more than 70 nurses and other medical professionals from the private sector in the state have also contacted her, expressing their willingness to work free of cost in the corona care wards of government medical colleges. "They all are aware of the risks involved. But the state feels blessed because of their readiness to treat the affected without considering the possible risks,'' she said. [8]

XVI. Success of Kerala in a bird's eye view

When Indian Prime Minister Narendra Modi announced a nationwide lockdown on March 24, Kerala had the most cases of any state. Yet today, it ranks low on the list of confirmed cases, and high on the list of COVID-19 recoveries. Moreover, the state's fatality rate is the lowest in India, and it has managed to limit the spread of the virus without inflicting any of the human suffering seen in other parts of the country. Kerala's formula for success has been straightforward. Public-health authorities have prioritised early detection through extensive testing, widespread contact tracing, and 28-day quarantines for all those infected (the rest of India, following the World Health Organisation's guidance, has required only 14 days).

"In addition to having the highest literacy rate in India (94%), Kerala also boasts a declining birth rate, higher life expectancy, more empowered women, and stronger welfare support for the indigent and the marginalised. People do not beg or starve in Kerala."- Shashi Tharoor [9]

Since issuing its initial COVID-19 alert on January 18, the state has screened all arrivals at its four international airports, and immediately hospitalised or quarantined suspected cases. On February 4, Kerala declared COVID-19 a state-level disaster, and shut schools, restricted public gatherings, and instituted lockdowns in early March. By the time the central government had followed suit weeks later, Kerala had already deployed more than 30,000 health workers and placed tens of thousands of people in quarantine.

Kerala's COVID-19 response emerged from a template that long preceded the current crisis. Among Indian states, it is unique for having allocated significant resources to public-health infrastructure, devolved power and funding to village-level bodies, and established a social system that promotes community participation and public cooperation.

The state offers universal access to health care and medical information, and respects all residents as rights-bearing citizens. No one is treated as a mere subject. Throughout the current crisis, Kerala's educated populace has behaved responsibly, limiting community transmission, cooperating with authorities, and seeking prompt treatment as needed. This institutional and political culture is not the result of some one-off policy. Kerala has spent generations creating the infrastructure to support social development, placing it far ahead of the rest of India on many key indicators.

In addition to its rights-based welfare system, it has a vibrant civil society, free and independent media, and a competitive political system. Its robust form of social democracy reflects the contributions of alternating coalitions of Communist and Congress-led governments over time.

As a result, Kerala was able to impose restrictive measures far more humanely. When Keralalites under home quarantine reported that they had no one to bring them essential supplies, the police promptly delivered what they needed.

When schools were closed, poor parents who rely on school lunches to provide their children with proper nourishment received the meals at home. Before the central government had even declared a lockdown, Kerala had announced a comprehensive economic relief package for citizens in need.

Meanwhile, Kudumbashree, a Keralan grass roots network of local organisations and women's self-help groups, has helped the state's containment strategy by producing two million masks and 5,000 litres of hand sanitiser in the first month of the national lockdown. Some 1,200 community kitchens were established to feed the indigent and unemployed, and Kudumbashree has already served 300,000 meals a day.

When <u>migrant labourers</u> became restive, they were given free accommodation and food, and urged to wait in place. These instructions were delivered in migrants' own languages, and duly followed.

Kerala has maintained regular communication with the public about health risks, broadcasting precautionary messages through official channels to dispel fake news. Unlike other states, Kerala's response has centred on people's participation.

Kerala is among India's most densely populated states, which makes its success in combating the pandemic all the more remarkable. Moreover, an estimated 17% of its population works or lives elsewhere (their remittances account for 35% of the state's annual income), more than one million tourists visit each year, and hundreds of Kerala students' study abroad, including China.

All of this mobility makes the state more vulnerable to contagious outbreaks, and yet it is weathering the crisis with flying colours. In achieving such impressive results, Kerala has built on its tradition of decentralised governance, transparency, public trust, and governmental accountability. It offers clear lessons for the rest of India, both in responding to the current crisis and in preparing for the next one.

XVII. COVID-19 in US- a bird's eye view

COVID-19 spread to the United States on January 19, 2020 and the first confirmed case of local transmission was recorded in January and the first known deaths happened in February, although there were unreported deaths. By the end of March, cases had occurred in all 50 U.S. states, the District of Columbia, and all inhabited U.S. territories except American Samoa.

The Trump administration declared a public health emergency on January 31 and on February 2 began to prevent the entry of most foreign nationals who had recently travelled to China, but did not ban entry of US residents, and no testing was implemented to screen those looking for to enter the country. The initial U.S. response to the pandemic was otherwise slow, in terms of preparing the healthcare system, stopping other travel, or testing. A lack of mass testing masked the true extent of the outbreak. For much of February, manufacturing defects rendered many government-developed test kits unusable, commercial tests were disallowed by regulations, and strict testing requirements were in place. The U.S. tested less than 10,000 people by March 10. Meanwhile, President Donald Trump was optimistic and just cheer-leading the country, dismissing and restraining the hazard posed by the virus and demanding that the outbreak was under control, by mocking "China virus". Only by February 25, the Centre for Disease Control and Prevention warned the American public for the first time to prepare for a local outbreak.

A national emergency was declared on March 13and in early March the FDA began allowing public health agencies and private companies to develop and administer tests, and loosened restrictions so that anyone with a doctor's order could be tested. By the end of the month, over 1 million people had been tested i.e. 1 per 320 inhabitants. Trump administration largely waited until mid-March to start purchasing large quantities of medical equipment and medicines. In late March, the administration started to use the Defense Production Act to direct industries to produce medical equipment. Federal health inspectors who surveyed hospitals in late March found shortages of test supplies, personal protective equipment (PPE), and other resources due to extended patient stays. Inconsistent numbers of cases have been observed among black American populations, and reports of racism against Asian Americans, some of them allegedly committed by Trump himself. Clusters of infections and deaths occurred in nursing homes, long-term care facilities, prisons, other detention centres, meatpacking industries, worship centers and urban areas; large gatherings also accelerated transmission.

17.1 Abandoned and delayed efforts to improve mask and ventilator supply

In 2015, the federal government has spent $9.8 million on two projects to prevent a mask shortage in the event of a pandemic, but abandoned the projects before completion.

Previous respiratory epidemics and government planning indicated a need for a stockpile of ventilators that were easier for less-trained medical personnel to use. By mid-March, the need for more ventilators had become immediate, and even in the absence of any government contracts, other manufacturers announced plans to make many tens of thousands.

Compared to the small amount of money spent on recommended supplies for a pandemic, billions of dollars had been spent by the Strategic National Stockpile to create and store a vaccine for <u>anthrax</u>, and enough <u>smallpox</u> inoculations for the entire country. [10]

17.2 Beginning of outbreak and supply shortages

The day after the first known case on January 21, 2020, the owner of the medical supply company Prestige Ameritech wrote to officials that he could produce millions of N95 masks per month, but the government was not interested. "We are the last major domestic mask company," the business owner informed the government in a follow-up letter on January 23, without success.

A random Army briefing document, on February 3, projected that "between 80,000 and 150,000 could die" and the estimates also correctly stated that asymptomatic people could transmit the virus, that military forces could be provided with the task of providing logistics and medical support to civilians, including PPE (N-95 Face Mask, Eye Protection, and Gloves) to evacuees, staff and others. Trump administration officials declined the offer for congressional coronavirus funding on February 5.

National Geographic reported that as of March 3, 2020, the "U.S. has only a fraction of the medical supplies it needs to combat coronavirus." An additional 300 million N95 respirators and surgical masks could be required to protect health workers. Vessel manifests maintained by U.S. Customs and Border Protection showed a steady flow of the medical equipment needed to treat the coronavirus being shipped abroad as recently as March 17.

An unexpectedly high percentage of about 20% of COVID-19 patients in the ICU required dialysis as a result of kidney failure and in mid-April, employees at some hospitals in New York City reported not having enough dialysis machines, running low on fluids to operate the machines, and reported a shortage of dialysis nurses as many were out sick with COVID-19 due to lack of sufficient PPE.[11]

XVIII. Conclusion

Amidst the lacking of funding, proper health care facilities, equipment, trained personnel in comparison with the world leader like USA, Kerala- a small state at the southernmost part of India, raised among the first few to contain the virus in an effective way. Kerala was also successful in reducing the no. of deaths due to COVID-19. Though the cases recently in Kerala are spiking in an alarming way, it is the lowest among other states and can be attributed to imported cases and community spread have been actively controlled. Kerala's accomplishment has been applauded both nationally and Internationally. The Govt. of Kerala was highly efficacious in containing the virus, providing proper and free health care facilities, free food both to the quarantined and lower income groups. Health Minister, K K Shailaja, a B.Sc B.Ed, high school teacher by profession was highly successful in proactively implementing a strict contact and trace programme, as cases of COVID -19 emerged. Her unconditional commitment in navigating Kerala's efforts is being incomparable.

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