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Editor-in-Chief

A novel coronavirus (nCoV) spillover event, with its epicenter in Wuhan, People's Republic of China, has emerged as a public health emergency of international concern. This began as an outbreak in December 2019, and till continue. Since the widespread transmission of COVID-19 in early 2020, we have seen perhaps the greatest ever change in the quantum of travel activity, supply chain, and health sector occur, with the pace of adjustment almost instantaneous as governments have moved to impose varying levels of restrictions. The pandemic clearly has had an impact of commuting activity as more people work from home either by choice or by compulsion, and has delivered a policy lever that previously had never been taken seriously. Although, 'response' to the COVID-19 Pandemic has challenged even robust healthcare systems in high-income countries.

To control the spread of COVID-19 Pandemic, the Ministry of Home Affairs, India issued several guidelines and orders such as National Directives for COVID-19 management, Lockdown Measures and Consolidated Guidelines of MHA on Lockdown measures on containment of COVID-19, Constitution of the Empowered Groups under the Disaster Management Act 2005 and many more. Ministry of Health and Family Welfare (MoHFW) proposed various interventions to combat with COVID-19 Pandemic such as social distancing, travel advisory restrictions and monitoring the cases of COVID-9, Death, Discharge number and state-wise status at daily basis.

As per the mandate of Disaster Management Act 2005, National Institute of Disaster Management has always stridden forward to create disaster resilient India through its trainings, research, documentations and publications. The Institute publishes a bi-annual Journal titled "Disaster & Development" with an aim to provide a common platform to the researchers, academicians and others for publication of their unique and innovative research work on all aspects of the disaster management. The first issue of the journal was released in year 2006.

The current Special Issue on Pandemic is a collection of articles that typically concentrates on the original work of the relevant researchers/stakeholders on various facets of the theme and to help the disaster managers and other think tanks to be prepared for any such emergencies in near future.

Major General Manoj Kumar Bindal, VSM

Editorial

On 11 March 2020, WHO declared Novel Coronavirus Disease (COVID-19) outbreak as a pandemic and reiterated the call for countries to take immediate actions and scale up response to treat, detect and reduce transmission to save people's lives. As of 8 December 2020, MoHFW has 524,824 confirmed cases with 383,866 active COVID-19 cases, 9,178,946 discharged and 140,958 deaths. Globally, the COVID-19 pandemic has resulted in over 61 million cases and 1.4 million deaths at the end of November 2020. Responding to the pandemic has challenged even robust high-income healthcare systems and remains a devastating threat to many low and middle-income countries, especially those affected by conflict. However, much of the published literature on COVID-19 is from high-income countries, with less attention given to countries with weaker healthcare systems (Hariri et al., 2020). The impact of COVID-19 on displaced populations, particularly internally displaced people (IDPs) in fragile and conflict-affected settings, remains poorly understood. The coronavirus disease 2019 (COVID-19) pandemic has posed a significant challenge to national health systems in terms of preparedness and response, where a resilient health system plays a vital role. A resilient health system can effectively prepare for and respond to pandemics while maintaining core functions, informed by lessons learned on an ongoing basis, and reorganise promptly if conditions require it.

The Indian government (Central and State level) is working intensely to minimalise the number of cases and consequences daily and is taking all necessary steps to combat the challenges and threat posed by this growing invisible pandemic war involving public, medical association, nurses, NGOs, police forces, including paramilitary. Earnest efforts of all the frontline workers especially medical doctors, nurses, healthcare staff, sanitation workers, police personnel, volunteers, and active support and obedience of people of India has been the only possible reason owing to the control and treatment of pandemic.

I am thankful as well as congratulate all the authors who have submitted their authentic research work in our journal. Hopefully, together we will be able to tame the risks of COVID-19 Pandemic on our societies and environment.

Prof. Surya Parkash

Public Healthcare and Governance: Two Wheels to Ride the Cart Against COVID-19 Pandemic

Prabuddh Kumar Mishra* and Anuj Singla*

ABSTRACT

Within months of the emergence of the first case in China, COVID-19 has spread around the world like a wildfire infecting millions of population. The world, today, is fighting a war- a war being waged by the most advanced species against tiny microcosms. Public healthcare infrastructure, in these testing times, becomes the most important tool to fight coronavirus. But, when even the most developed healthcare systems are faltering, the plight of countries with weak health infrastructure becomes unthinkable. Here, comes the role of governance. Good Governance enables us to tide over the problem even when the requisite resources are lacking. The paper analyses the vital role played by the governance along with the public health infrastructure in tackling the pandemic especially when the latter is not so strong. It firsts assesses the capacity of Indian public healthcare infrastructure to handle Coronavirus and also discusses the timely intervention and innovation used by the government to make up for the gaps in the public healthcare system thus showing the crucial role of governance. It also uses the case studies of Italy and South Korea in this context along with the example of the United States of America. The paper ends with discussing the future implications of coronavirus on the system and lives of people which can make them better and stronger.

Keywords: COVID-19; Public Healthcare System; Governance; India.

Introduction

Somewhere in December of 2019, the Wuhan city of China started seeing cases of unknown illness among the people. The cases were initially dubbed as pneumonia cases (Zhou et al., 2020). Little did the authorities realise that they were the beginning of a pandemic that was

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soon going to strike the whole world and bring everything to halt. This was the coronavirus. It stems from the family of viruses that is the cause of various diseases in both humans and animals like the common cold or the more serious diseases like Middle East Respiratory Syndrome (MERS-Cov) (Infected 2260 people with a fatality rate of 34.5 percent) and Severe Acute Respiratory Syndrome (SARS-Cov) (infected 8096 people with a fatality rate of 9.5 percent) which have earlier wreaked havoc in the world (Petrosillo et al., 2020). But, the worst was yet to come. Initially speculated to be the recurrence of SARS virus, the scientists soon realised that it was a novel virus, never seen before, with unexpectedly high capacity of spreading and named it 2019-nCoV then (Zhou et al., 2020). It was renamed as Coronavirus because of its molecular structure. The virus has a crown of proteins known as peplomers extending from its centre and so the name(World Health Organisation). Coronavirus Disease 2019 (COVID-19) is an infectious disease caused by a coronavirus.

The source of the virus is not confirmed yet, but it is being surmised that the virus has originated from the wet food markets of the Wuhan city (Murugesan et al., 2020). Since these markets do not fulfil hygiene standards, the chances of the spread of various diseases increase. The original host of the virus is believed to be the bats since these organisms are the storehouses of various zoonotic viruses which include Ebola, HIV and rabies (Li et al., 2005). As the confirmed cases of the disease surged inside and outside China, WHO announced the spread of the virus as a global health emergency on January 30, 2020 (Lal et al., 2020). The disease has spread to more than 200 countries, infecting 45,25,497 and has killed 3,07,395 people all over the world (WHO, 2020). The coronavirus has made its impact in most of the places except Africa. Despite a huge number of travellers from China, Africa has, by large, been able to avoid the disastrous impacts of the virus(Soy, 2020). [1] In India, the number of coronavirus cases till May 19, 2020, stood at 1,11,203 with 3,428 deaths (Desk, 2020). The table below represents top and bottom 5 states and union territories according to the number of positive cases.

Table 1: Top and bottom 5 states according to the number of positive cases

Region with highest number of cases	Positive cases	Region with lowest number of cases	Positive cases
Maharashtra	39,297	Arunachal Pradesh, Dadra and Nagar Haveli, Mizoram	1
Tamil Nadu	13,191	Meghalaya	13
Gujrat	12,539	Puducherry	18
Delhi	11,088	Manipur	20
Rajasthan	6,015	Andaman and Nicobar Islands	33

Note: The tally above includes foreigners who have been infected with COVID-19 and the data is till May 19. Daman and Diu, Lakshadweep, Nagaland, Sikkim reported no cases. (Source: *Deccan Herald)*

The coronavirus has put to test every pillar of the society from economy to social bond and harmony. But, one thing that has been put to severe stress is the healthcare facilities. It is the public healthcare infrastructure which is put into action first, as people start complaining of illness and throng the hospitals. Healthcare systems around the world have been thrown out of order as they continue to face huge shortages of healthcare staff and resources including in the developed countries. In this context, it becomes important and interesting to assess the public healthcare system of India and its capacity to handle the pandemic.

The paper analyses the Indian public healthcare system based on two criteria. Firstly, whether the public health policy or other such policy envisages a possibility of being inflicted with such pandemic and has any plan to deal with it and secondly, the capability of public health infrastructure to fight. It will also briefly discuss the disparity in the state of public healthcare infrastructure and level of preparedness for dealing with the coronavirus among different states of India. The following part studies these aspects.

Legislation and Health Policy Framework of India

India lacks both a legal and health policy architecture required to prevent and control epidemic diseases. In the absence of any appropriate legislation, the government was forced to invoke the archaic and obsolete Epidemic Diseases Act 1897. The century-old legislation was brought into existence by the British India government mainly to help the government control the frequent plagues. However, the Act does not lay any plan-of-action or provisions such as quarantine measures, medical policy to be followed (Rakesh, 2016). All it provides for is the ability of the government to take 'exceptional measures' while remaining silent on outlining the duties of the government and protecting the fundamental rights of the citizens in the face of health emergencies (Tewari, 2020). To fill this vacuum, a Public Health (Prevention, Control and Management of Epidemics, Bio-terrorism and Disasters) Bill, 2017 was drafted by the government, though the same has not been tabled in the parliament yet.

On the policy front, India has equipped itself with the Biological & Public Health Emergencies (BPHE) guidelines, included in the National Disaster Management Plan in 2019 (National Disaster Management Authority). The section provides a set of short term, medium-term and long term goals to be achieved by 2022, 2027, and 2030 respectively to make the country health disaster-resilient. Maintaining stocks of essential medical supplies, developing community-based network, establishing decontamination systems, Intensive Care Units, an inter-agency response plan are some of the goals (National Disaster Management Authority). However, timely implementation of these aims and

the formulation of comprehensive legislation are needed to make the country resilient in the true sense.

Though the policy envisages a situation of being stuck with a pandemic and lays out holistic goals, the goals are yet to be achieved and the existing infrastructure is incapable of absorbing a large number of infections. India's healthcare system is characterised by sub-par infrastructure, deficiency of manpower, and public investment way below the required level to take care of the needs of its huge population.

India's Public Healthcare Infrastructure

One of the major shortcomings is the low doctor to population ratio. The shortage of human resources in the health sector in the country can be gauged by the fact that there is only one government doctor for every 11,039 people (much lower than the recommendation of one doctor for every 1000 people) (Central Bureau of Health Intelligence-CBHI). The doctor to population ratio varies across states to the extent that it is 1: 43,788 in Bihar and 1: 2028 in Delhi. States like Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh have poor doctor to population ratio while relatively developed states like Goa, Delhi, etc. have a better ratio (Sen, 2020).

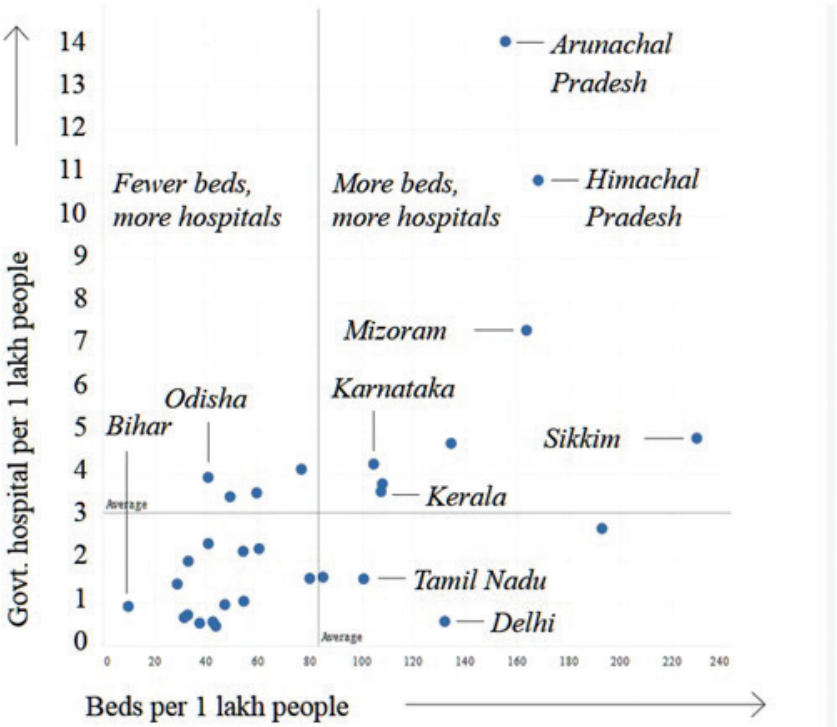
Poor quality of life in rural areas and the lucrative service conditions available in the urban areas distort the distribution of the medical staff to the extent that the urban-rural density ratio of all the health workers is 3.8 which limits the access of the rural population to these services (Anand & Fan, 2016). Lack of the adequate number of healthcare personnel affects the qualitative and quantitative aspects of the services delivered since the available staff is expected to cater to more patients than the ideal number. This becomes more worrisome during coronavirus outbreak as the treatment of patients would require much more number of doctors to give adequate attention to all of them.

The low number of available beds in the country is another major issue. The *Bhore Committee* in 1946 itself had recommended that the country should have an "irreducible minimum" of 1.03 beds per 1000 people (Bajpai, 2014, p. 2). But, even after seven decades of independence, we have managed to make available only 0.55 beds per 1000 population (CBHI). This is a major source of worry as treatment of coronavirus patients requires a large number of isolation beds. It further becomes problematic as out of the total beds available in the country, only 39 percent are in rural areas where more than 70 percent of the population lives (CBHI).

There are approximately 19 lakh hospital beds, 94 thousand hospital beds and 48,000 ventilators available in the country (Kapoor et al., 2020). The number of Government

hospitals and beds per 1 lakh population varies greatly across the states. Though Bihar has the lowest bed to population ratio, many larger and better-developed states too do not fare better on this scale as visible in the graph below (Sen, 2020).

Figure 1: State-wise distribution of public healthcare infrastructure in India



Source: *The Hindu*

Even with respect to the available facilities, their conditions usually paint an abysmal picture. They are poorly equipped with facilities like electricity, water supply and sanitation and are poorly managed which undermines their functioning. Shortages of medicines and consumables, health equipment, ambulances are the things in common in these hospitals (Bajpai, 2014).

India's unimaginably low government expenditure on health at 1.6 percent of the GDP (FY 2020) is one of the reasons for the poor performance of state-run hospitals (Pilla, 2020). The per capita expenditure by the government has been increasing but is still low standing at Rs. 1,946 (Mehra, 2020). The overall spending on healthcare in India is 3.6 percent of the GDP much lower than that of countries like the United States of

America (USA-16.9 percent), Russia (5.3 percent), China (5 percent) and the average for the OECD countries (8.8 percent in 2018) (Mehra, 2020).

Low public expenditure translates into high out-of-pocket expenditure on healthcare which averaged out at 69 percent of the total healthcare expenditures from 2000 to 2015 (World Health Organization: Regional Office for South-East Asia). These payments (exorbitant for the poor) push, on an average, 7 percent of the people below the poverty line annually (Reuters, 2018). The private sector provides better quality of services but their concentration in the urban areas and higher healthcare costs ensure that the services remain out of the reach of the poor masses ("Average medical expenditure at private hospitals seven-times higher than government ones: NSO Survey," 2019).

The shortcomings discussed above point towards the incapability of the system. Many states of India are not equipped well to handle the COVID-19 pandemic. While states like Maharashtra, Tamil Nadu, Kerala, etc. are relatively better prepared and have more testing centres, states like Bihar, Odisha, etc. are in a worrisome situation (Sen, 2020). The disease has highlighted the critical role of a sound and fundamentally strong public healthcare system in guarding the health of people in such unprecedented situations. However, a strong public healthcare system itself cannot help a nation tide over the coronavirus outbreak. As the example of coronavirus outbreak in Italy, USA and South Korea shows (discussed in a later section), weak or indecisive approach by the government can undo the benefits of strong public health infrastructure whereas timely intervention and good governance can help the countries to make up for the poor healthcare infrastructure.

Good governance is expected to provide an organised and holistic response by using the limited available resources in a timely and innovative manner when augmenting the fundamentals of a system is not an option in short-run. It involves swift decision making, showing able leadership and communicating with the people. Using all the resources efficiently and innovatively with the help of technology to ensure that even the last person standing in the line is protected becomes the need of the hour. The local government have to take the frontline approach as they are closest to the people and can understand the issues and problems of the people better (Kapur, 2020). Thus, it relies on the activation of all agencies, with active cooperation and coordination among all of them, to employ all the available resources to fight this pandemic off.

As seen above, the existing public health system of India is not robust enough necessitating the good governance and leadership to effectively utilise the available resources and use innovation and out of the box thinking to generate new resources too. The next part will analyse the various methods used by the Indian government to deal with coronavirus pandemic.

India's Multipronged Strategy

India's response can be called as comprehensive and robust. The country has put a tough front against the disease by taking a multitude of actions such as restrictive measures, medical interventions, using digital technology, economic stimulus and putting the available resources to effective use. India reported its first case on January 30 in Kerala (Ghosh et al., 2020). The country has reported 90,927 cases and 2,872 associated deaths as of May 17, 2020 (WHO, 2020). Unlike some countries, the leadership and healthcare officials showed no delay in decision making. Taking lessons from the experience of dealing with Ebola in 2014 and Nipah in 2018 (Charlton, 2020) and other countries, the government has taken things very seriously and implemented a slew of measures. The following part discusses these various measures.

Lockdown

To protect the people from the disease, 75 districts were locked down initially. Public places and institutions like educational institutions, museums, social and cultural centres were closed. Restrictions were placed on the movement of people. On March 24, 2020, the Hon'ble Prime Minister Narendra Modi announced a nation-wide lockdown which has been in place ever since. Everything except the essential services like medical services has been shut to slow down the rate and extent of disease transmission. Social distancing is being emphasized upon. Districts have been categorised into green, orange and red zones based on risk profiling ("Lockdown: List of what's allowed, what's not in green, red, orange zones," 2020). Since the lockdown cannot eliminate the virus on its own but helps in delaying the community transmission, it is also important that we build up defences, ramp up health infrastructure, and prepare for the worst-case scenario. This exercise is already on.

Medical Interventions and Treatment Measures

Huge efforts are being made towards containing the spread, including strengthening surveillance, laboratory capacity, contact tracing and isolation. COVID-19 testing and treatment have been made available free-of-cost at government-designated testing centres and public hospitals for all. People who fall under the ambit of Ayushman Bharat scheme and Economically Weaker Sections (EWS) category can avail the testing facility from private laboratories for free as per the Supreme Court's direction of April 13, 2020 (Shashank Deo Sudhi vs. Union of India Ors 2020). A total of 472 labs (343 governments and 129 private) have been approved for testing (as of May 9, 2020) which are allowing us to conduct more than 20,000 tests per day (PIB Kolkata, 2020, Indian council of

Medical Research, 2020). According to the released data, more than 700 hospitals, 2 lakh isolation beds and 15,000 ICU beds have been dedicated to the treatment of COVID-19 patients. To ensure the availability of PPE (Personal Protective Equipment) kits, masks, and medical equipment, domestic production is being geared up apart from the imports (PIB Delhi, 2020b). The officials are confident that the country would be self-sufficient in the production of RT-PCR diagnostic kits and rapid testing kits by the end of May 2020 (PIB Delhi, 2020b).

The network of over 6,000 *Jan Aushadhi Kendras* is providing quality and affordable medicines, ration kits and food on an average to around 10 lakh persons every day (PIB Delhi, 2020c). They are also fulfilling the orders placed through Whatsapp and e-mail by delivering the medicines (PIB Delhi, 2020d). At the grass-root level, Primary healthcare centres, ASHA workers have been mobilised. Thousands of teams of these workers have been constituted to collect data and map the potential suspects of the disease. Door-to-door surveys are being conducted for the same. They have also been given the task of spreading awareness among the people about social distancing measures, distributing sanitisation kits to the poor and needy. Private hospitals have also been directed to inform the authorities of any suspicious cases (Ministry of Health and Welfare).

Effective Utilisation of Resources

In the meanwhile, the Indian railways has been converting its rail coaches (5231 coaches as of May 7) into COVID-19 care centres and quarantine facilities to help the states facing shortages (PIB Delhi, 2020f). It will deploy more than 2,500 doctors, 35,000 paramedic staff, and will produce masks and sanitisers (PIB Delhi, 2020f). Starting from the Labour day (May 1, 2020) "*Shramik Trains*" have been running to help the migrants stranded in different parts of the country to reach home. To increase the accessibility to testing, Karnataka has converted the public-owned buses into testing centres (Arakal, 2020). The Ministry of Civil Aviation is also operating "Lifeline Udan" flights to provide the needy states with important medical resources quickly (PIB Delhi, 2020e).

Use of Information and Communication Technology

Digital technology is also being employed in various ways to tackle the disease. A webpage (mygov.in/covid-19) dedicated to COVID-19 on the government site, a multi-lingual COVID-GYAN portal, WhatsApp, telegram, Facebook, TikTok, youtube channels, broadcasting services and helpline numbers are being operated to educate the people about the scientific and factual aspects of the disease. A mobile application – *Aarogya Setu* has been developed which can help the individuals to assess their risk of getting

the virus through the use of Bluetooth, location tracking, and artificial intelligence (PIB Delhi, 2020a).

Economic Stimulus

A 1.70 lakh crore stimulus package under the Pradhan Mantri Garib Kalyan Scheme, and subsequently a 20 lakh crore stimulus package under '*Atma-Nirbhar Bharat Abhiyan*' have been announced by the government to counter the economic effects of the COVID-19 outbreak and to take care of the poor and affected people (Ahmed, 2020. "At 10% of GDP, Modi's *Atma-Nirbhar Bharat Abhiyan* ranks among biggest in the world," 2020). A donation fund – PM Cares has been set up to raise funds from individuals and organisations (Pmcares). Asian Infrastructure Investment Bank has decided to provide an assistance of US$ 500 million to India for the "COVID-19 Emergency Response and Health Systems Preparedness Project" (PIB Delhi, 2020g). Seeing the battered situation of the even capable health systems of the developed European countries and USA, a much worse situation could have been expected in India had it been not for the timely intervention by the government. Not only the central leadership but, the agencies at the local levels have also been activated. The use of ASHA workers, civil defence volunteers provided a local touch with the people which helped build trust. Thus, shows the importance of governance, clarity and leadership in a time of crisis. In the absence of these, the situation can go out of hand in no matter of time. For instance, in the case of the UK, the coronavirus cases including the deaths rose to a very high number because of the lack of clarity in the top leadership over the approach to be adopted. The sources initially hinted on the government intending to go for the 'herd immunity' and the response of the top brass was lacklustre (Kahn & Dunn, 2020). However, with the passing days, the government had to resort to lockdown to contain the spread of the virus (Penna, 2020). The result of this confusion was the high spread of the virus in the population.

Not just the central government, but many states too employed creative strategies to arrest the coronavirus cases. One such state is Kerala. Kerala's plan to deal with coronavirus is now famously called as the 'Kerala Model' and it has got recognition at the international level too. The model focused on rigorous contract tracing and 'route maps' of the people coming from abroad. It involved the community in identifying and isolating the coronavirus cases. It also deployed counsellors to help the people to handle the stress arising out of coronavirus fear (Biswas, 2020). Punjab, on the other hand, came up with the 'COVA App'. This App allows the people to book their groceries, schedule their movements during the lockdown, and post queries to the administration. The App

also gives information about the coronavirus cases in the vicinity so that people are more aware of the coronavirus situation around them (Pahuja, 2020).

Another model of successful containment of coronavirus cases has been presented by the Bhilwara district of Rajasthan. The alarm was raised when the textile city reported 17 confirmed cases of COVID-19 which included the staff of a private hospital and its patients. The authorities ordered a complete lockdown suspending even the essential services in the second phase of lockdown. Subsequently, an extensive screening exercise of the people was undertaken by a troop of more than 3,000 survey teams trained especially for the purpose. The administration made adequate arrangements for contact tracing, quarantining the patients, monitoring the home-quarantine individuals through Geographical Information System (GIS), and even ensured the home-delivery of the essential goods (Mukherjee, 2020). The district's 'ruthless containment' has now become a model approach for the country. The '*Bhilwara Model*' is an example to stress upon the larger point that it is the good governance along with good public health infrastructure that are the key tools in the fight against the pandemic. Even in the absence of a robust public healthcare system, good governance and strategic actions of the government can still save the day. To bring home the above-stated point, the article analyses the case studies of the coronavirus outbreak in South Korea and Italy and the respective responses in both of them. It will also briefly discuss the situation of the USA to back it up.

South Korea — A Success Model

South Korea may not have won the war but it has definitely won the first battle against the disease by 'flattening the curve' of cases. The East Asian nation reported the first coronavirus case on January 20, 2020. The country has reported 11,050 cases and 262 deaths (World Health Organisation, 2020). The growth of new cases gained pace in February and the peak was reached on February 29, 2020, but has been on the decline since. Seoul's efforts for the effective containment of the disease have received international recognition to the extent that other countries are trying to take lessons from it. It has also become the first country to hold national elections under lockdown conditions (Tiwari, 2020).

Random testing has been one of the main pillars of the country's strategy. The government roped in the private sector by asking pharmaceutical companies to develop testing kits. These diagnostic kits were then made available at private clinics, medical centres, health facilities and Centres for Disease Control throughout the country. Testing facilities were also set up at drive-thru and walk-thru facilities like gas stations (Choi et al., 2020, p. 1). This enabled the officials to conduct extensive testing, identify and map

the infected people. According to the data, more than 46,000 tests were conducted by the end of February and 2,70,000 by March 17, 2020. Unlike this, one of the most powerful countries of the world, the USA followed a different approach. Despite increasing numbers, the USA did not ramp up the testing. Resultantly, many cases went off the radar which further spread the disease and left it with a high number of cases (Hasell, 2020).

Another novel feature of South Korea's approach is the innovative use of Information and Communication Technology for tracing and mapping the infected people, collecting and disseminating information and providing telemedicine. The authorities are using Geographic Positioning System (GPS) data, banking transactions records, surveillance cameras, and travel history to trace the past movement of the infected people and create a database consisting of their travel records. This provides information about potential patients. Apart from aggressive surveillance, the government is also taking many steps to disseminate this information to the people. Officials are using websites, applications like 'Corona 100 m', 'Coronavirus 119' and texting service to provide people information about the number of cases in the country and regions, testing status, and telemedicine services (Hur et al., 2020, p. 16).

The trend of new cases saw a drastic decline due to a multitude of actions. South Korea has set an example of governance and leadership in a time of crisis. It showed the world the results of good strategies and thus bring home the central argument of the paper. The case study of South Korea represents a stark contrast to the events in Italy concerning COVID-19 pandemic.

Italy — A Failure

The growing number of COVID-19 cases, rising death toll, collapsing healthcare systems and a nation-wide lockdown – this has been the picture of Italy for the past few months differing strikingly than that of South Korea. Italy has reported 2,24,760 confirmed cases and 31,763 associated deaths. Epidemics like COVID-19 grow in a non-linear fashion – they start slow but take no time to grow to exponential scales. This mandates that preventive measures be taken at the earliest and not when it is too late. It appears that Italy lost the war in the very beginning. The first case was reported on January 31, 2020. The immediate response of the government was to stop all the incoming and outgoing flights with China; which was necessary but not enough to prevent the spread of the virus inside the country's boundaries. In fact, the virus had already spread by then. The situation worsened because of the complacent attitude and reluctance of the policymakers to take strong decisions early when the virus had not taken hold yet. Even when the cases had started emerging

in the southern Lombardy region, the politicians in Milan (also known as the financial capital of Italy) were at the forefront of a social campaign with the message – 'Milan does not stop' (Giugliano, 2020). The failure on the part of the government to warn the people of the gravity of the situation created a false sense of security among the citizens who continued to go around their life as usual. This 'playing down' attitude forced the country to take the most stringent measures in the European region eventually, even though no concrete benefits resulted out of them (Ruiu, 2020).

From then onwards, what the government has been doing can be simply called an act catching-up with the virus. It dealt with the pandemic by taking reactionary decisions, rather than adopting a systematic approach. It continued to issue decrees restricting the movement of the people gradually and only in the areas which reported the high number of cases at the time. This selective approach of applying restrictions proved counter-effective since it only exacerbated the spread of the virus. For instance, when northern Italy was placed under restrictions huge swaths of the population moved to the southern part thus spreading the virus unknowingly. It was only on March 10, 2020, that the whole of the country was declared a red zone and a nationwide lockdown was put in place (Khanna et al., 2020).

A centralised chain of command could also have been helpful. Italy's decentralised approach to fighting the virus led to a situation where some areas were put under stringent restrictions while the others remained unrestricted (Khanna et al., 2020). While Codogno's mayor imposed several restrictions after a few cases were reported, the mayors of neighbouring regions did not take any measures (Pisano et al., 2020). Similarly, the lack of coordination also became visible when the draft of the decree ordering the lockdown of Lombardy region was published in a leading newspaper before it was issued by Prime Minister. The central government should have utilised the 'substitution clause' codified in the article 120 of the Italian Constitution (Constitution of the Italian Republic) through which it could have taken over the control of the administration of the regional and municipal governments and ensured that the central and local governments take the most effective measures through enhanced cooperation. Despite having a good healthcare system, it broke down. All this could have been avoided with better planning and governance.

South Korea and Italy took different approaches to combat the virus and consequently their results are also different. South Korea's success was ensured by a multitude of actions it took simultaneously and in an orderly manner – extensive testing, rigorous contact tracing, community mapping and information dissemination through the use of digital technology, proper implementation of restrictions and effective treatment

of the infected individuals. On the other hand, Italy failed because it did not take the appropriate steps at the appropriate time. The policymakers all over the world should take lessons from both – the former's success and the latter's failure.

COVID-19 is not only affecting our lives in the present but will also have some major implications for the future. The fallouts of the biological disaster are visible in all aspects of human existence be it on the economy, social and cultural sphere, the relation dynamics between the people and the governments, with the health systems bearing the brunt. In the short term the health facilities and workers, which are at the forefront of our defence against the pandemic, have been overstretched to meet the continuously increasing demands. In the long term, India will see some major impacts on the healthcare scenario which have been discussed in the following section.

Future Implications for India

The biological emergency has brought to the forth the shortcomings in our healthcare infrastructure and policy. The healthcare system is in a dire state of disrepair with hospitals lacking basic supplies and medicines, and with unreliable access to clean water, the maintenance of basic sanitation and electrical shortages plaguing the country. The first step should be providing a fiscal stimulus to the health sector in the form of increased government spending as a part of GDP. This should translate into increased per capita public expenditure, reduced Out of Pocket expenditure, better infrastructure and more manpower. On the policy front, the implementation of the guidelines for the management of Biological disasters laid out in the National Disaster Management Plan should receive priority. Inputs can be taken from the first-hand experience of dealing with such a situation which then should be incorporated into the policy framework to make it more practical and effective. This will ensure enough capacity to deal with the emergency situations in the future simultaneously without needing to divert many resources from the usual affairs. As an increasing proportion of the limited resources and energy is being diverted to COVID-19, treatment for other patients has been sidelined which may lead to increase in complications, mortality and burden of diseases in the future. New and innovative ways of providing medical services like telemedicine (use of information technology and related services to provide healthcare services virtually) need to be promoted. Telemedicine can be used as a medium to make healthcare affordable and accessible by catering to more patients and bridging the long physical distances between the doctors and patients. It can be used to conduct training sessions, surgeries and provide other assistance.

On the governance front too, the handling of COVID-19 pandemic gives a lot of lessons to learn. For instance, the migrant labour population issue in India could have been avoided with little more planning. Owing to the lockdown and the unavailability of transport services, many of these workers started their return journey on foot leading to a humanitarian crisis. Apart from starvation, livelihood loss and repression, there have been several reports of the migrants being killed in different accidents (Akhef, 2020). The lack of understanding of the gravity of their problems made them suffer the wrath of the disease disproportionately. Instead of making provisions for their movement weeks after the lockdown, a time-bound plan should have been prepared in advance which could have ensured that these people do not go through the anguish. Shielding the poor, who are one of the most vulnerable sections of the society, is a hallmark of good governance. Anticipating and addressing different concerns of people, including the most marginalised sections of the society, is one of the most important lessons for India to learn from this crisis on the governance front.

The pandemic will also bring behavioural changes by educating the people about social distancing and hygienic practices. Awareness campaigns must be continued with the same zeal so that the behavioural changes become lifestyle changes which will help India in improving the health of its people. Experience of the East Asian nations like Japan, Vietnam, and South Korea can be useful for India in this case. People of these countries have imbibed several lifestyle changes post SARS epidemic of 2003 (Bhushan, 2020). These changes ranging from using face coverings in public, taking precautionary measure by individuals when suffering from cold or cough to better sanitation routines have helped the countries to fight off the coronavirus better.

Developing a strategy to involve the private sector players should be another area of work. Efforts should be made to rope in the private healthcare facilities to develop a collaborative, efficient and coordinated response strategy and healthcare structure. Agra and Bangalore authorities developing teleconsultation facilities for citizens in collaboration with private firms is just the example (Tiwari, 2020). The pandemic has also opened a window of opportunity for India to become the manufacturing hub for the world. India has already made great advances in the production of medical supplies during the crisis. It has gone from complete import of the PPE (Personal Protective Kits) and N-95 masks to the production of more than 2 lakh kits and masks daily (MOHFW, 2020). The ongoing trade war with the USA, increasing labour costs and the pandemic has made the global manufacturers wary of China's suitability for the location of their production facilities (Kannan, 2020). Many Multinational Companies have already hinted at choosing India for the purpose (Ghosh, 2020). Japan has announced an

assistance stimulus package to help its companies to relocate (Kuo, 2020). India should grab this opportunity to become the global hub for the production of goods including pharmaceutical drugs, medical equipments which will also help in making it self-sufficient in terms of the healthcare infrastructure.

The coronavirus outbreak has indeed brought miseries for the world but it is neither the first nor the last to attack the world. We cannot avoid the unavoidable but we can certainly be prepared for it, better every time. It is for us to learn the lessons and seize the various opportunities given by it to move towards the goals of growth and development of all.

Conclusion

The threat of coronavirus to the world is being considered even greater than World War II. But unlike the previous wars, it is not among humans rather it is against them. Though the attackers are just tiny microcosms, the damages that they have inflicted are huge. The stuttering world economy, collapsing healthcare systems, rising unemployment, hunger and deprivations are some of the fallouts of the pandemic. Robust health infrastructure is the first step towards winning the war against coronavirus. It is very crucial to have a developed and affordable public healthcare system which can cater to the needs of people including the marginalised sections. But unfortunately, not every country has this. Further, even if a country has a robust healthcare system, it is not enough unless coupled by strategic actions of the government in the times of crisis. Possessing a weapon is useless unless one knows when and how to use it. Similarly, if the government lacks clarity, decisiveness, foresightedness and strategies, strong public healthcare systems cannot do much. Hence, the importance of governance. On the other hand, though good decision making and governance can make up for gaps in healthcare systems to an extent, it alone too cannot do much. Knowing the technique to use the weapon is useless unless one possesses that weapon too. Hence, the importance of robust healthcare infrastructure.

India does not possess a resourceful public healthcare system. It has tried to make up for its shortcomings through a multi-pronged strategy. But, it is imperative to strengthen our healthcare system for the future. We should continue building our capabilities. What we need is a well-funded health sector built on the adequate number of trained medical staff, professionals, and medical resources, equitably distributed over spatial scales making it affordable and inclusive for all in its nature. This holds not just for India but for the whole world. Coronavirus is indeed a grave threat. But the night is darkest just before the dawn. Both people and the government have to come together. While the

government is doing its work, people must continue to follow the advisories related to social distancing, maintaining hygiene and movement restrictions. If the world stands together, the dawn is not far away.

Acknlowdegements

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Note

1. Scientists are not sure of the reasons behind the low number of coronavirus cases in the Continent. The experts point it to the multiple factors like poor testing, climate, strong immunity of the people, etc.

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India Preparedness on Surveillance and Disaster Management on COVID-19

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Abstract

Unprecedented COVID 19 pandemic has resulted in deaths of nearly thirty thousand people globally. Seeing the seriousness of the outbreak, WHO declared COVID-19 as pandemic and employed six phased approaches to combat with this contagion. Various guidelines globally and at national levels are enforced to mitigate community transmission. Pandemic planning and preparedness resources are being issued by health departments for surviving the pandemic attack. Globally collaborative research activities are undertaken to prepare a suitable drug or vaccine for the COVID-19. Towards these herculean efforts have been contributed by the Indian medical and public health community. Fundings have been successfully raised to cope up with a shortage of protective equipment through collaborative, charity and right financial investment budget sanctioning for strengthening the preparedness in India. Hopes are bright that by self-discipline, proper quarantisation and relentless research, flattening of corona curve in India will soon materialize.

Keywords: COVID-19; Preparedness; Vaccine; Statistics; Community transmission; Economic.

Introduction on Covid Intrusion in Society and History

Covid history dates back to the intake of contaminated seafood items in the Huanan seafood market in Wuhan, China with this virus (Zhou et al., 2020). Several hypotheses by renowned scientist personnel confirms that animal any sort of interaction or consumption by a human. It is also recommended by scientists to beware about interaction with the animal kingdom members is as good as surveillance precautionary

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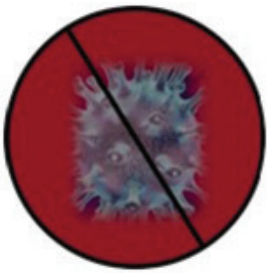
measures. The uniqueness of this coronavirus as compared with other SARS respiratory diseases is capable of infecting both the humans. Corona virus-related illness history dates back to the year 2003, which led to pandemic SARS in China (Li et al., 2005). Second in line is the MERS, Middle East Respiratory syndrome which occurred in Saudi Arabia in 2012. The present scenario sees the upsurge of the new strain of coronavirus. The SARS-CoV, which had unexpectedly spread its web over the world and this led to its reputation as of a notorious pandemic on 11th March, by WHO.

Means of Transmission of SARS-CoV

Close interaction between a person as in gatherings are prone to this infection. Scientific reasoning implicates that while infected person breathes or cough, during his interaction, the tiny droplets spit out in air has an immense probability of being inhaled and ingested by the healthy person in proximity. SARS-CoV like other coronavirus has spike-like structure on its surface, resembling a crown, which substantially facilities tight binding with the human cells.

Undoubtedly the SARS-CoV is contagious, especially at the peak time of the viral cycle in host. A symptom of this infection includes Difficulty in breathing, fever, cough, congested and runny nose, soreness of throat, headache, body ache, chills with shaking, loss/change of taste and smell perception. Usually, these symptoms appear after 2-14 days of infection (Sharma et al., 2020). Recommended guidelines insist on keeping the 6 feet/2 metres safe distance during any interaction. Use of N95 special pore size masks restricting entry of coronavirus and several cloth-based masks are effective in limiting its spread. Regular and long duration (20 sec) of handwashing with alcohol-based sanitisers are good infection preventive tool. Moreover touching any item at public places are strongly prohibited since they can act as agents of infections after being touched by an infected person. Asymptomatic nature of coronavirus is also been detected in a few cases and range about 10 percent. Site of infection of the virus has also ranges from lungs, nose to toes, and eyes. Immunocompromised host, chronic health problems suffering people, heart problems, diabetics, people with blood pressure old people, asthmatic people are more prone and liable to its attack. Day by day active research is going on, which are updating the people about new symptoms and more precaution to be added as a part of a healthy and safe lifestyle. Coronavirus symptoms and the health concerns are more severe and long-lasting than any other illness, especially in regard of death rates, viz., influenza (0.6 percent), SARS (9.6 percent) of cases (Sharma et al., 2020). The scientific reports verify appropriately. Only physical distancing is a most promising measure against the viral infection. Few myths are circulating in various platforms are listed in Table 1.

Table 1: Myths on Coronavirus

Myths busted on Coronavirus (Yeo et al., 2020; Li et al., 2020; Ray et al., 2020)	
	• Houseflies are not able to transmit or carriers of coronavirus • Thermal scanners can also sense a change in body temperature and not the COVID-19 virus. , • Addition of bleach as a disinfectant is inefficient in killing the COVID-19 virus and is rather poisonous. Moreover, the consumption of methanol or bleach does not affect COVID-19 infection. They are only effective against superficial cleaning of objects surface. Indian immune system can cope better with COVID-19 than west: History has clearly proved that India, was hardest hit during influenza infection. Further justifying this fact lies in its present status of being ranked second in diabetics and the 7th most polluted top cities due to its unhealthy lifestyle and air quality. • 5G mobile networks has no role in the transmission of coronavirus, only transmission via physical contact with an infected person or by inhalation of droplets sneezed by patients is possible. • Hot water bath no role in protection against the coronavirus infection • Existing vaccines against pneumonia, viz., pneumococcal vaccine / Haemophilus influenza type B (Hib) vaccine, has no role in protection against new coronavirus.

Results: Unprecedented Impact on Various Spheres of Life

Economic concerns

Since the lockdown, April month has seen the highest job loss in the youth section. As per the CMIE, the Centre for Monitoring Indian Economy (CMIE) report, 2.7 crore youngsters in 20s have lost jobs in March and about 3.3 crore person in their 30s and 3.3 to 30-40s. Although some improvement in the agricultural sector and reopening of the small scale business in the rural sections of the country have been recorded. The average jobless rate is staggering at 24 percent. Section-wise urban unemployment peaks at 28 percent and for 22.3 percent for rural areas. Declining demographics need special attention from both the government and employers.

Long terms serious repercussions on the country prosperity is also seen. Today's era, where the young generations, their innovative ideas are the beaming beacon of bright future of especially as developing country of ours, loss of jobs of such young people will definitely thrash the dreams and their impeccable courage. Young India people savings dream lies in darkness and serious insecurity in their hearts and minds can prevail for a longer time, if continued. The pandemic impact generated job loss which will make

the present generation lag behind by a year because of surprised disruption in work and other hand competition will be intensified for them with the upcoming young working force. Last financial year shows the employment figure of 3.4 crore and this April, it drastically changed to 2.1 crore (Ray et al., 2020).

Coming to the dilapidated and heart-rendering present scenario of migrants, huge suffering and pain had been added unwantedly into their daily lifestyle. Long hours of walking in unhealthy conditions seem to be inhuman and injustice on their part by nature. Food and cash crisis has severely impacted this section. Seeing and reviewing their difficulties Prime Minister Modi has allotted a major tranche of their 2020 financial budget overwhelming economic package 20 lakh crore (10 percent GDP). Moreover, 15 special trains by name of Shramik special express for helping migrants to reach their native place has been started. Country's economic status depends largely on their export and import variables. Pandemic has made the India trade record to decline due to sealing of the borders to control its spread. Out of the 30 main export items; iron and pharma showed growth of 17.55 and 0.25 percent respectively. Imports shrank to 58.7 percent leading to a trade deficit of 6.8 billion dollars (data from the Ministry of Commerce). Records released by power ministry electricity generation shrank to 6.8 percent and manufacturing output plunged to 20.6 percent. Massive retrenchment in nearly all the valuable goods generating sectors is being noted.

Food Consumption and Health

People with a record of existing coronary or respiratory disease are more prone to illness even with coronavirus in the mild preliminary stage. People with heart disease or if infected with COVID-19 also shows severe complications, Diabetics with high blood sugar levels has weakened immunity and hence increased chances to catch the infection. Nearly 25 percent of corona infected people hospitalised, were the ones who had a history of diabetics (Xu et al., 2020; Sungnak et al., 2020).

Rate of Consumption of household products has shown drastic dropdown. The underlying given chart also depicts the percentage figures in the rural and urban sections of society. Lack of cash is the prime constraint in the purchasing power of food items even the essentials. Second is the health concern which led to boycotting readymade products or restaurant cuisines. Thousands of people could not afford a time meal especially the migrants, labour classes, stray animals. The continuation of lockdown has seriously impacted and distressed migrant workers. Farmers are not able to harvest, sell, or forced to sell agriculture products at lower prices. Taking in consideration the

infectious spread of this virus, harvesting of ripe crops were also suspended, leading to enormous loss of standing crops (Huang et al., 2020).

To cope up and also compensate for the agricultural products and farmers' loss, economic reforms have been executed by the Finance minister under the *Atmanirbhar Abhiyan*. Severe long term policies like waiving off of loans, compensation of crop loss due to COVID-19 are given. She has also announced the deregulation of prices of 5 major food items; pulses, edible oils, oilseeds, potato and onion.

Discontinuation of Transport facilities

India has closed all international flights and domestic flights since March 23 to prevent further community transmission. Thousands of immigrants were forced to stay at foreign places without any prior preparation to deal with the crisis. Public transport was also halted seeing the corona outbreak. It is expected that after 18th May, resuming of public facilities with new rules and restrictions will soon materialise, in green and orange zones only said by public transport Minister, Mr. Nitin Gadhkari. Road ministry has reported that the lockdown. Especially, Road transport showed a decline to 10 percent. Among the road transport, trucking halting had led to the serious disruption of the global supply chain for medical and food facilities.

Our incoming Indian migrants who are been rescued are kept under the quarantine period of 14 days and are suggested to avoid any non-essential travel. A strict instruction has been released by the government for citizens to refrain from travelling to countries like Germany, France, Saudi Arabia, US during this outbreak. Although under the *Vande Bharat Abhiyan*, flights resumed from 17th May, to help our distant people.

Environmental Impact

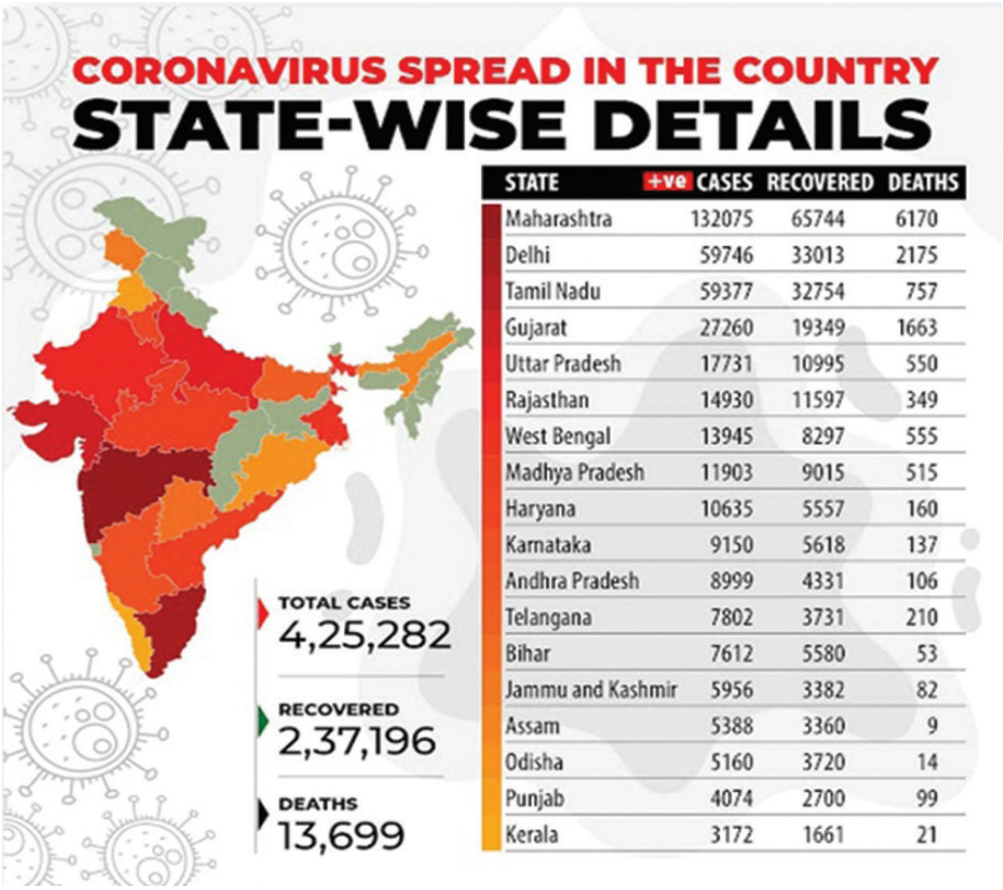
The pandemic crisis has led to clear skies, re-emergence of wildlife in its natural clear waters, butterflies, migratory birds visiting often, is a sheer eye treat. Conservationists debate that nearly 5 percent decline in carbon emissions (25 percent Nitrogen dioxide) has been recorded during this time, although it is not sufficient for effectively solving the environmental issues generated due to human activities (burning of fossil fuels). They also fear that when life retains its normalcy after the post-pandemic, then this recovery will be volatilised in very less time. Likelihood of green future, alternative future will be few days wonder. Points to ponder during this time are to search for means of energy generation which are sustainable. Coronavirus based pandemic economic concern has the direct ravaging effect on the environment green settings. Excessive exploitation

of natural resources has a positive effect on the economy of the country in short term aspects. EPA reports released clearing mention the pollutants clearing out from all types of ecosystem, air, water and soil. India's *Janata Curfew* observed on march 22 EPA reports tell pollution levels in air showed a significant drop across various parts of the country. Metropolitan cities, Delhi, Kolkata, Bengaluru and Lucknow displayed the AQI, average quality index in two-digit figure. Another trend-setting example is of Punjab state India on 3rd April, when clarity of skies became a retreat for people. For the first time, residents could have a sight of Dhauladhar mountain (213 km from Punjab) scenic beauty. The nationwide lockdown has led to the significant clearance of water bodies, Yamuna and Ganga. CPCB, central pollution control board monitoring data was taken in real-time analysis, also confirms that average water quality improvement of 25 points has been observed, and is now appropriate for the dissemination of wildlife. Globally 0.3 percent slashing in green-house emissions, 25 percent reduction in air pollution was recorded (Tribune report).

State-wise Corona Tally (Data may vary from time to time)

Since the first Covid case in Kerala, the tally is increasing exponentially, which is a prime concern for all. Latest reports issued by the Union health ministry states that 56,316 active cases, nearly 36,823 people successfully cure. Among the 5 major states where maximum corona cases upsurge seen, Maharashtra tops the list and is the hardest hit followed by Gujarat and Tamil Nadu. Goa and Mizoram made their mark by standing at corona free status because of stringent self-discipline among residents and continued to be apt for tourist and tourism, even after lockdown.

Figure 1: Corona statistics for highest cases in the different states over the country



STATE	+ve CASES	RECOVERED	DEATHS
Maharashtra	132075	65744	6170
Delhi	59746	33013	2175
Tamil Nadu	59377	32754	757
Gujarat	27260	19349	1663
Uttar Pradesh	17731	10995	550
Rajasthan	14930	11597	349
West Bengal	13945	8297	555
Madhya Pradesh	11903	9015	515
Haryana	10635	5557	160
Karnataka	9150	5618	137
Andhra Pradesh	8999	4331	106
Telangana	7802	3731	210
Bihar	7612	5580	53
Jammu and Kashmir	5956	3382	82
Assam	5388	3360	9
Odisha	5160	3720	14
Punjab	4074	2700	99
Kerala	3172	1661	21

Source: Ministry of Health & Family Welfare

Surveillance Activities in India

Considering the havoc created by the COVID-19 pandemic, government authorities are keeping no reservations in making people safe and treating the infected ones at its priority. Disaster management ministry issued the curricular highlighting the severity of infection in different zones of the country. Colour code been assigned for different zones and delineated as districts within states as a red, green, orange zone. The red zone shows the highest rate of infection and the doubling rate of merely 4 days are areas where total movement is restricted. An orange depicted zone has fewer cases green zones shows no report of a single case for the past 21 days. Latest health ministry Lockdown 4 release

list states; 130 districts in the red zone, 284 in orange, 319 in the green zone on the latest incident cases reported for corona.

To mitigate the effects of novel coronavirus infections, IoT-internet of things provides the relevant platform for connecting heterogeneous information/variables with the internet for effective outsourcing of e healthcare facilities. IoT also shows potential in predicting infections for a defined location much before the infection has erupted. IoT based smart thermal devices in crowded locations are also effective in monitoring temperature changes, body temperature difference and thus predicting the cases of any possible viral infection (Banach et al., 2009; Sohrabi et al., 2020).

Covid Tracking–Aarogya Setu App

The union health ministry has made compulsory for returnees, migrants and returning NRI. Surveillance activities have been ramped up for detection of any respiratory illness symptoms, SARI along with coronavirus in its earliest stage for effective containment. Technology gifted app makes easy and immediate medical help and its intervention, if symptoms arise. Questionnaire and update about the nearest COVID-19 cases are updated at the app to each user.

Other Covid trackers such as AYUSH Sanjivini, an initiative of the Ministry of AYUSH, keep the user updated about preventive measures and remedies for counteracting. Protection against corona, in isolation conditions at home. Health ministry is also focussing on and directing the states for making Covid tracker App compulsory, for adequate serological testing, contact tracing at the earliest stage, on-time treatment, quarantisation required at right time. Special attention to timely testing of returnees at the time of their disembarking to the country is kept in check.

Collaboration Activities to Combat COVID–19 Pandemic

Several local agencies are actively manufacturing face protection mask for corona and distributing to the fellow citizens voluntarily. Thousands of face masks (N95) and rapid detection kits from china were also imported but were not reliable for precise detection purposes as confirmed by Indian doctors. The face masks imported also did not meet the required medical standards. US President Donald Trump has also announced the donation of ventilators to cope up with the situation (Gillim-Ross et al., 2006; Popov et al., 2020). India, being a democratic country and under the headship of Prime Minister extended supports for collaboration in research activities to develop Covid vaccine.

Many renowned indigenous companies have voluntarily denoted a handsome amount in the PM cares fund to speed up the research efforts, to provide food

packages to poor, immigrants. Hundreds of NGOs are also been associated with the volunteering work at this eleventh hour. E-rickshaws are being deployed to provide essential commodities door to door. Medical and testing at home in red zones are also provided.

Figure 2: Present strategies for combatting COVID-19 Pandemic

Indian Institutes at their Best Services

ICMR has already announced guidelines for community-based serological surveys for determining the existence of SARS-CoV2 infection in the population. Other dedicated institutes national centre for disease control, National Institute of Research in Tuberculosis (NIRT) in Chennai, National Institute of Epidemiology (NIE), various state health departments are actively involved and cooperating with Health Ministry. Other institutes National institute of nutrition and NIMHANS joined hands in the Covid testing by performing 5,249 and 3,134 tests respectively. Cumulative Covid tests as per data release from May stood at 1,00,986. Maximum tests were done in densely populated regions as part of surveillance and protective measures.

Various cross-sectional survey sat household level conducted over 4 districts for 24,000 adults for Covid infection. Certain random testing over selected 69 districts and 21 states were also performed under the aegis of ICMR. This survey comprised of collecting the venous blood sample from random individuals (400 per household) from selected 10 clusters in the concerned district. ICMR has increased its tests to 1 lakh in May as compared to 500 tests in April, after considering the seriousness of the situation. AS of now, nearly 1 million Covid-RT PCR tests have been performed. Around 19th April, CDSCO approved the proposal of ICMR for the clinical trial Plasma Therapy for COVID-19 treatment. In Convalescent plasma therapy, antibodies developed as an immune response from the serum of recently recovered patients are administered to the COVID-19 infected personnel. DRDO has also installed a full body disinfectant chamber

unit at AIIMS for personnel sanitisation enclosure along with face protection mask. Various movable lab, vehicle research and development at Ahmednagar, Gujarat for one person at a time sanitisation with installed soap dispenser, mist spray of hypochlorite for a defined time limit and operated on foot pedalling system.

Serum taken from these individuals further tested for the presence of Antibody, IgG, using instant ELISA test kits designed at the ICMR-NIV, National institute of virology, Pune. The resultant survey acts as an indicator for the spreader transmission for SARS-CoV-2 in different areas of the country. Another initiative is, the hospital-based surveillance facility for monitoring changing trends for infection in all targeted districts. Virus doubling rate, of 10.9 (past 14 days), has shown improvement by 2 percent as told by Union Health Minister Harsh Vardhan. Possible hidden infection and timely containment are very well coordinated and conducted by these surveillance measures. *Ayushman Bharat* program on health and wellness centres has been directed for screening diabetics, cancer and also providing the required medicine and immune-boosters at the time of testing. People with Preexisting illnesses as mentioned are quite prone to corona infection, so the parallel screening of such diseases becomes an integral part of testing and surveillance.

Hurdles in Rolling Out the Vaccine

Asymptomatic and Changed Behaviour

The COVID-19 surprising and discernible findings make this corona pandemic hard to halt down. After a typical incubation period of 14 days also, no symptoms of fever, chest congestion and throat soreness is observed, tests are negative, still, the corona took toll of lives. Pro-active efforts need to be taken, especially physical distancing and regular sanitisation to beat any asymptomatic transmission and infection shown in Figure 3. The first case of such asymptomatic behaviour was reported for 20-year old women in Wuhan. In India (around 18th April), 80 percent of cases showed an asymptomatic response, which made the community transmission faster? Community spreaders are increasing at a very higher pace because of this hidden response observed in people, making the quarantine measures or treatment non-futile (Weingartl et al., 2004).

Figure 3: Accelerated efforts towards the development of Corona Vaccine

Source: Rosfoto, http//:hindu.com

Corona infection arises during the exposure of the human body mucous membrane s of mouth, nose and eyes via respiratory droplets expelled through an infected person. Infection propensity can range from mild to severe symptoms. Along with the regular symptoms and sites of the COVID-19 infection on the human body, certain new sites of infection are also been reported. Covid toes are explained as the clogging of the vessels and subsequent discolouration, especially in kids. A Corona eye shows pink eye symptoms or conjunctivitis (Anand et al., 2002).

Mutation

Every virus shows the tendency of regular mutation as a part of its life cycle. This new coronavirus is a type of RNA virus which is packed with protein. RNA virus responsible for flu measles as compared with DNA virus (smallpox, Herpes, HPV) shows more tendency of getting mutated. Latest reports by dignified researchers estimated 14, such viral strain under the COVID-19. So the vaccine in trial or information should be manufactured keeping such mutative strain. Although this new virus has mutated many times, still because of the slow rate of mutations, chances of effective vaccine preparation are quite high (Ren et al., 2013).

Corona Vaccine Candidates and its Challenges

The reemergence of the SARS virus as SARS-Covid has led to the global emergency and necessity to search for the suitable therapeutic or preventive tools for succumbing of this virus. Still, wait for the coronavirus panacea is in the pipeline. Corona vaccine the ultimate solution lies in testing various forms such as in inactivated coronavirus or S

protein peptides. Vaccines are being undertrials on the animal model. The probable mechanism of transmission is the binding of the virus with the Antibody and Fc receptors to form immune complexes, which can lead to enhanced disease when a titer is low, using S protein peptide. Inactivated virus is also being tested for its efficacy against Covid. Preparation of such a vaccine is essential for biosafety level 4 precautions while handling the high titers of infectious SARS-CoV, poses a high risk to the production workers. Incomplete inactivation is more potent in causing new SARS outbreaks and disruption of immunological response (Czub et al., 2005).

Live Attenuated Coronavirus

At present, vaccine identification is at the preliminary stage of research. Whole-genome sequence of Coronavirus has been deciphered and its CDNA has been generated, still thorough genetic analysis is in progress. Recombination of live attenuated virus and its wild type counterpart is also extensively researched.

S Protein-based Corona Vaccine

S protein is one of the structural proteins of SARS-CoV, helps in membrane binding and fusion process. S protein, an elemental antigenic component is responsible for inducing the host immune response. A vaccine based on such S protein is employed for inducing antibodies to block the Virus binding, its fusion and ultimately neutralising the infection. Although it is quite effective in eliciting the protecting immunity and neutralising Antibody. Its harmful side effects on the liver limits its usage.

DNA vaccines however had been successfully tested in animal models, but human trials still need to be researched. Vectored Vaccine evaluation of using other viruses as vectors for SARS-CoV proteins, such as Rabies virus, Chimeric parainfluenza virus, demonstrates sufficient induction of S protein-based Nab production in animal models. Combination vaccines are primarily useful in augmenting the immune responses towards the SARS-CoV (Hoffmann et al., 2020). Herein, the step protocol is followed; first, the DNA vaccine with S protein is administrated, followed by subsequent immunisation with the inactivated virus. Such a combination vaccine is more potent than using either type of vaccine singly. Various challenges in each probable corona vaccine candidate and still the ultimate protective efficacy of these vaccines are in question.

Relentless Efforts for Vaccine Creation around the world

Globally, Covid cases have touched he 4.8 million marks, in India, it has crossed 100 thousand cases. Empirical cure or the suitable vaccine for this life-threatening disease is

still under trials. Current therapeutic strategies are being focused on relieve patients with pneumonia and maintain oxygen levels. Covid disrupts the functioning of vital organs, lungs, blood vessels, and intestine. The virus primarily targets the pneumocytes, (mucous lining lungs) leads to stress and collapse of the respiratory tract, leading to death. It also interferes with the binding of the heme protein of haemoglobin making the oxygenation process inside blood cells to a halt. Moreover, reports confirm that preexisting illness patients especially with heart disease and diabetes are most susceptible to corona. Patients with heart disease and diabetes are more susceptible to this disease.

Keeping these facts in mind, scientists and medical officials are actively involved in synthesizing the appropriate medicine and vaccine for this contagion. Initially, the two anti-viral drugs like Lopinavir and Ritonavir used in the treatment of HIV were also employed in the Covid treatment. Later the combination of drugs like chloroquine, an anti-malarial medicine for corona was also proposed by scientists as immediate relief (Wang et al., 2020). The approved and safe drug requires undergoing thorough research and long clinical trials (years) before it comes in the market.

Collaborative initiatives for Development of Vaccine

Collaborative attempts were undertaken by the Serum Institute of India and Sanofi Pasteur, France by using antibody generating approach. RNA based vaccine approach was employed by the German Enterprise, Cure Vac. Nearly 6 Indian companies are actively engaged in chalking out COVID-19 vaccine. About 70 vaccine probable candidates have been tested on a global scale and only three has been chosen for clinical trial stages. Biggest upset has come with the incapacity of oxford vaccine ChAdOx1 nCoV-19 in controlling the Covid pandemic. Still, the studies are in different phases of trials mandatory for human use. Around 2021, we can see some light in the form of COVID-19 vaccine (Lescure et al., 2020). A brief overview of the different clinical trials and attempts in progress around the world is clearly mentioned in the table given.

Table 3: The Companies clinical trials and attempts to develop vaccine

Company	**Approach**	**Stage**	**Strategy**
Gilead Sciences	Treatment	Phase 3	Remdesivir
AscletisPharma	Treatment	Phase 1	Cocktail of Danoprevir and Titonavir
Moderna Therapeutics	Vaccine	Phase 1 RNA	vaccine (mRNA-1273)

Arcturus Therapeutics	Vaccine	Preclinical	Engineering RNA with nanoparticle
CureVac	Vaccine	Preclinical	man-made mRNA
Eli Lilly	Treatment	Preclinical	Antibody Treatment
GlaxoSmithkline+ Clover Biopharmaceuticals	Vaccine	Preclinical	Engineering adjuvants with proteins
Inovio Pharmaceuticals	Vaccine	Preclinical	DNA Vaccine
Johnson & Johnson	Vaccine and Treatment	Preclinical	Deactivated virus
Regeneron Pharmaceuticals	Treatment	Preclinical	Cocktail of antibodies
Sanofi	Vaccine and Treatment	Preclinical	Chimera of RNA viruses, Kevzara drug
Takeda	Treatment	Preclinical	Plasma of treated patients
Vir Biotechnology	Treatment	Preclinical	Viral replication inhibitor

Future hope and Conclusion

Globally, the numbers of COVID-19 cases showed an exponential increase in over 130 countries except in lockdown period. Various data released around the world states that COVID-19 pandemic has led to the loss of over 10 trillion dollars, accounting to 0.8 percent of total GDP as an economic burden to the global economy. In India only, over 43 lakh corona cases have been reported. Lockdown measures adopted have effectively curtailed the Covid cases, except April month where cases mounted to 1 lakh. Incidence of COVID-19 is also a reminder of interconnectivity between the world and animals. Diseases can easily transmit from animal to humans and so taking care of animals also becomes a responsibility, if a harmonious life is dreamt or expected. The ramping-up strategy has been adopted by various developing countries which involves deliberately infecting volunteers with coronavirus antigen. Furthermore, its immunological response is checked and volunteers serum shows the production of viral-specific antibody. The major limitation of this initiative lies in ethical perspective and high probability of unwanted and unaware community spread. Still, the prime hit is the developing countries due to major hurdles of inadequate funding, scarcity of protective equipment for supporting the population through its fragile health care industry. Collaborative

attempts at a global scale and large database of volunteers findings can effectively help us in cope up with this pandemic. Moreover, new therapies based on monoclonal antibodies can speed up the trials and specificity of treatment. As a responsible citizen, abiding by the government rules for community transmission can be quite helpful.

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COVID-19 Pandemic Trend vis-à-vis Best Practices: A Case Study from Kerala, India

Raju Thapa*, Surya Parkash*, Harjeet Kaur* and Anil Kathait*

Abstract

In India, the first case of the COVID-19 pandemic was reported in Kerala in Thrissur on 30 January 2020 which by 6 April peaked at 266 numbers. As of 26 May, there are a total of 963 confirmed cases of COVID-19 in the state with 542 cases that been recovered with a recovery rate of 47.6 per cent. Among all the states in India, the mortality rate of Kerala is the lowest at about 0.75 per cent. Kerala has implemented several timely steps such as voluntary service, contact tracing, break the Chain, repatriating Keralites etc in containing COVID-19 has been widely praised both nationally and internationally.

Introduction

The new decade started out as any other but rapidly unfolded into a scenario that the world will remember for decades to come. In the health policy world, we often use the phrase "diseases know no borders" and COVID-19 can attest to this. The virus spread, through the inevitable consequences of globalisation, from Asia to Europe and beyond at a rapid pace and within three months the world neared 1 million cases as healthcare systems struggled to carry the sudden burden. Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered coronavirus causes coronavirus disease COVID-19. COVID-19 is an infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019. The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have

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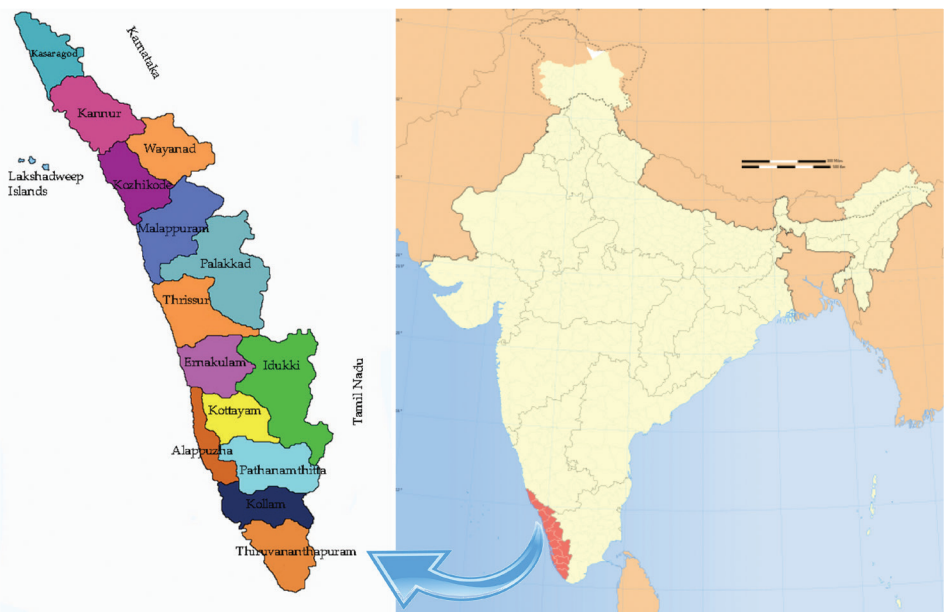
aches and pains, nasal congestion, runny nose, sore throat or diarrhoea (MoHFW 2020). These symptoms are usually mild and begin gradually. Some people become infected but don't develop any symptoms and don't feel unwell. Older people, and those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness. People can catch COVID-19 from others who have the virus. The disease can spread from person to person through small droplets from the nose or mouth which are spread when a person with COVID-19 coughs or exhales (MoHFW 2020). In our present study, an attempt has been made to understand the spread, chorology and affected area by COVID-19 also highlighting the initiatives taken by Kerala to fight against the COVID-19.

Study Area

The state of Kerala, on the southwestern Malabar Coast of India, spreads over an area of 38,863 km^2 and share its political boundary with Tamil Nadu to the east and south, Karnataka to the north and northeast and Lakshadweep Sea to the west (Figure 1).

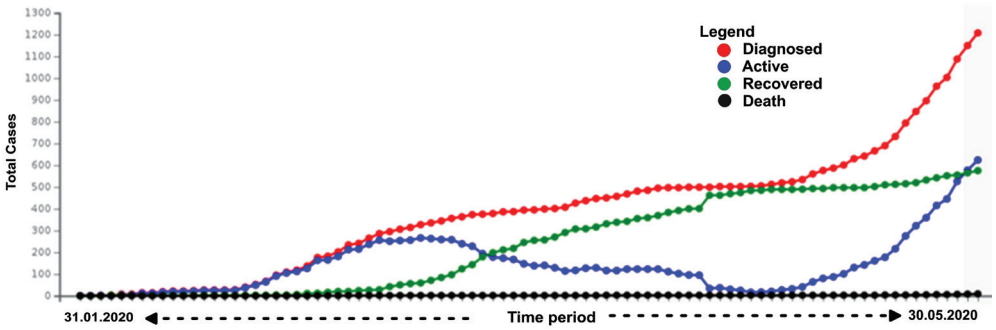
Figure 1: Map showing the study area



Chronology of COVID-19 Pandemic in Kerala

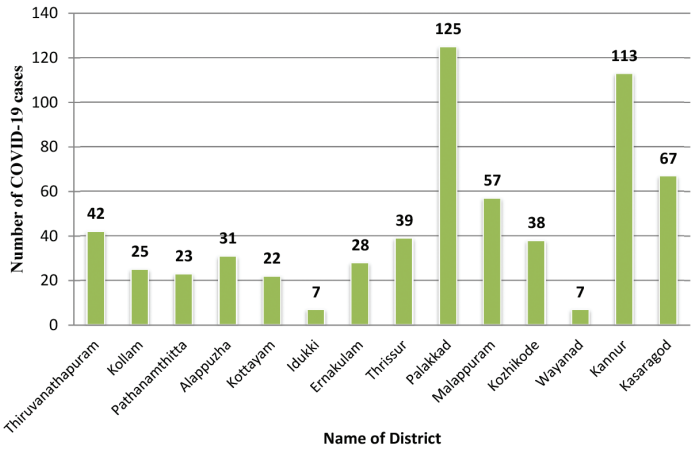
On 30 January 2020 first confirmed cases of the COVID-19 pandemic in Kerala were reported from three students of Kerala origin belonged to Thrissur, Alappuzha and Kasargod districts of Kerala who returned from Wuhan province of China. Wuhan province is considered as the origin point of COVID-19. Two students who returned were pursuing medical studies in Wuhan. Following contact tracing, more than 3000 peoples who were suspected to have come in contact with the affected were placed under quarantine where 45 were placed in hospital quarantine. Kerala declared state calamity which was withdrawn after 4 days when the three positive individuals recovered and no further cases were reported. The first death case occurred on 28 March 2020 in Ernakulam. In the representation below (Figure 2) daily number of diagnosed cases, active cases recovered cases and number of death has been represented.

Figure 2: COVID-19 daily graph by the total number of cases, recoveries and death



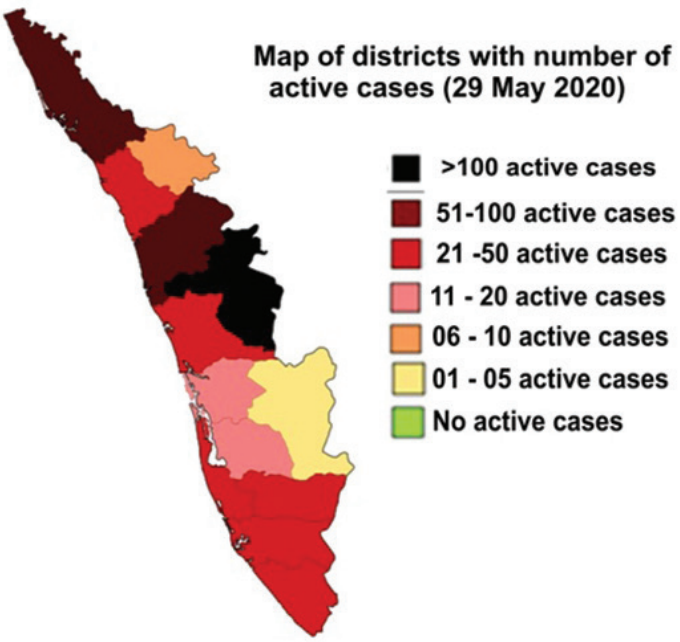
However, on 6 April the number of COVID-19 cases peaked at 266 which later begin to decline. With the return of Keralites to their hometown from outside state or countries, the total COVID-19 cases spiked up in May with total 624 Positive cases as on 30 May 2020 (Supplementary Table S1). Palakkad district is one of the most affected districts with 125 cases followed by Kannur 113 cases and Kasaragod with 67 confirmed cases (Figure 3).

Figure 3: District wise distribution based on hospital admission



Idukki and Wayanad districts are the list affected district with 7 confirmed cases each. The map of districts with the number of active cases up to 29 May 2020 is represented in Figure 4.

Figure 4: The map of districts with the number of active cases up to 29 May 2020



Graphical representation of the number of persons under Surveillance (as on 30 May 2020) such as number of Persons under observation, number of persons under home/institutional quarantine and number of symptomatic persons hospitalisd are represented in Figures 5(a)-5(c).

Figure 5(a): Graphical representation of the number of Persons under observation as on 30 May 2020

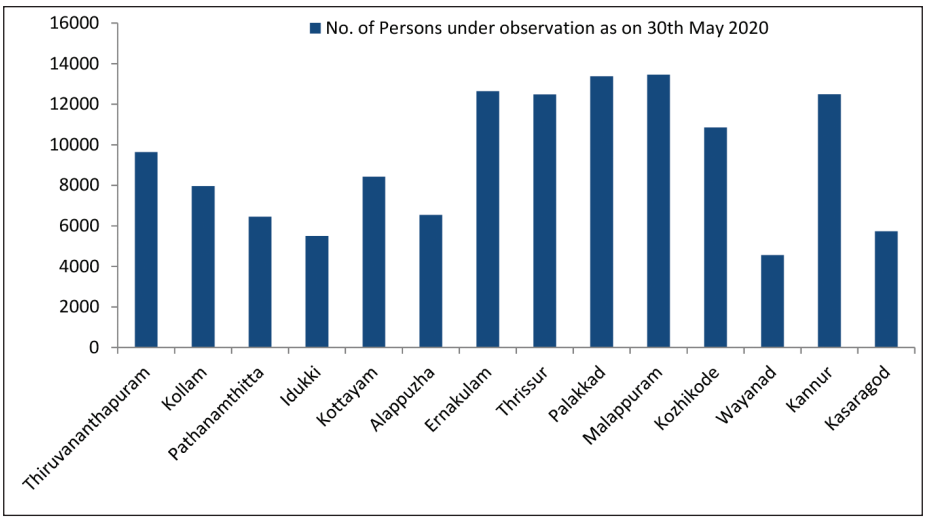


Figure 5(b): Graphical representation of the number of Persons under home/ institutional quarantine as on 30 May 2020

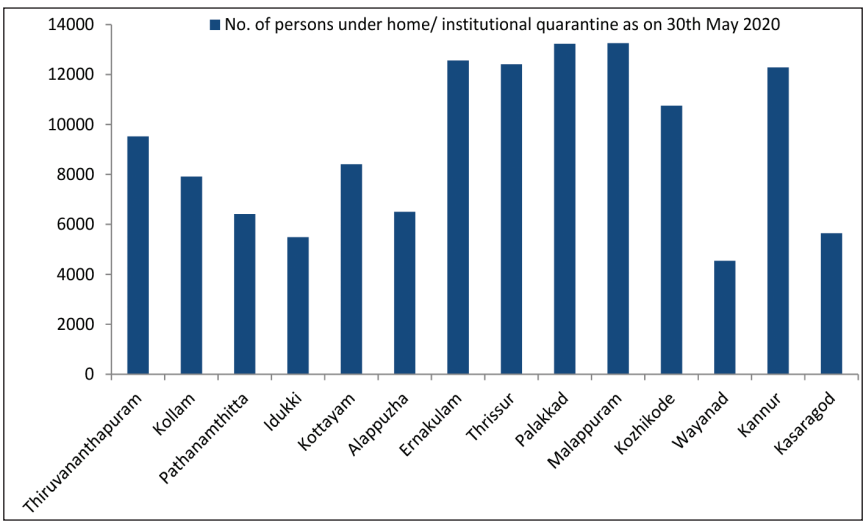
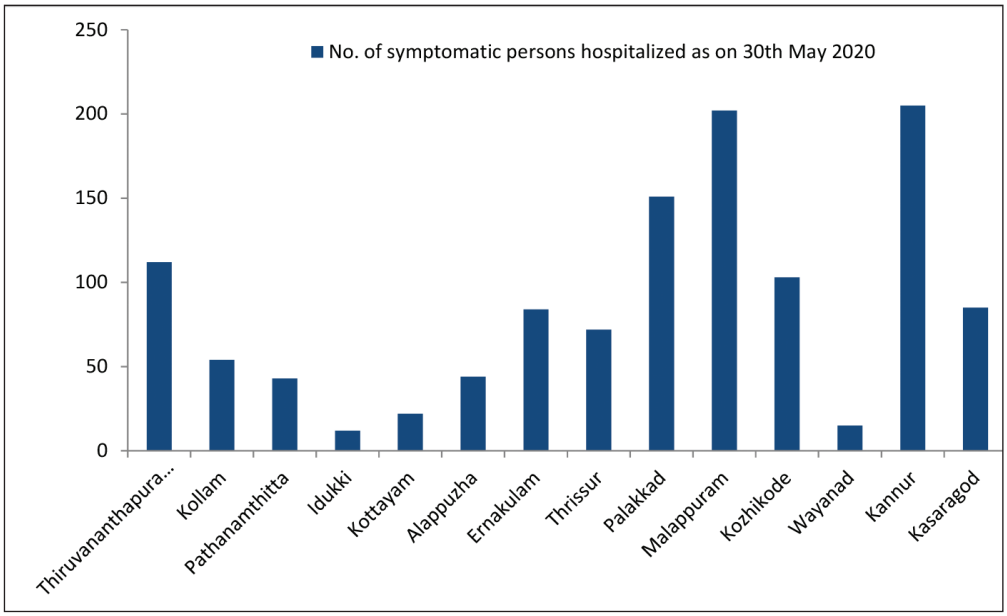


Figure 5(c): Graphical representation of the number of symptomatic persons hospitalised as on 30 May 2020



Innovative Solution/Best Practices

- **Call Centre Setup**
  A 24x7 call centre has been set up in the Directorate of Health Services at the state level as well as at each district before the end of January 2020 (Government of Kerala, 2020). In order to strengthen the services provided by the State Call centre, three additional lines have been provided which bring the call centre capacity to a total of six lines. http://dhs.kerala.gov.in/
- **Isolation Facilities**
  As on 1 February 2020, a minimum of two hospitals with isolation facilities have been identified in each district of the state.
- **Apex Committee of SDMA**
  The Apex Committee of SDMA was conducted on 03.02.2020 by the chief secretary. It was decided to declare the nCorona Virus epidemic as state calamity and take all necessary steps to ensure the outbreak is effectively controlled.

- **Timely Home Isolation**
  Strict home isolation for 28 days for persons who have arrived from the corona affected countries from the date of arrival in India, irrespective of whether they are symptomatic or asymptomatic was announced on 1 February 2020. As on 1 February 2020, a cumulative number of asymptomatic passengers under home isolation and observation were 1723 and 1793 respectively. By the mid of May (on 20 May 2020) the cumulative number of asymptomatic passengers under home isolation and observation increased to 56,362 and 56,981 respective.
- **Tele-counselling Services**
  For providing Psycho-Social Support, the tele-counselling services supports have been extended and by 25 May 2020, 1107 personnel were working. About 2,94,090 people have been extended the psychosocial support calls. This support was provided to the general public, Elderly People living alone, children who need special cares, Labourers, mentally ill patients, etc. with a total of 8,78,617 Psycho-Social Support and Counselling Calls provided as of 30 May 2020.
- **Squads for Ensuring Home Isolation**
  Special squads were formed to ensure the home isolation of people who were asked to remain home quarantine. This squad includes health staff, volunteers, police, etc.
- **Infrastructure Facilities**
  Adequate infrastructure facilities have been ensured at all designated isolation facilities.
- **Establishment of Single Window Communication Channel**
  As on 4 February 20202, single-window communication channel was established with all districts control rooms for high priority communication, headed at the state by the state control room. Automated data capturing formats for real-time data capturing fro, all districts were also established.
- **Human Resource Management Teams**
  Human resource Management Teams had been constituted at the state and district level (as on 04.02.2020). Adequate HR had been ensured for isolation, airport surveillance, transport, isolation services, contact tracing and call centre.
- **Contact Tracing**
  Following contact tracing, more than 3000 peoples who were suspected to have come in contact with the affected were placed under quarantine where 45 were placed in hospital quarantine.

- **Formulation of Training Monitoring Unit**
  A training monitoring unit has been formulated at the state and district levels for content development and capacity building. As on 5 February 2020, more than 1293 elected representatives, 2544 kudumbashree volunteers, 206 other volunteers and 243 staff from other department were given training (Supplementary Table S2).
  When the novel coronavirus was reported for the first time, the training division boosted its effort to enable the machinery of health services. Later training was extended to all line departments, doctors in private sectors, ambulance drovers, etc. these efforts were amalgamated at all levels to enable Kerala to tackle the health issues. Awareness classes conducted for both, public, LSG representatives under the leadership of PHC medical officers. Details of training provided to various persons are represented in Supplementary Table S2.
- **Voluntary Service**
  The Department of Health and Family welfare called out for the participation of the health practitioners to join hands with the state in the fight against COVID-19 for offering voluntary service at the Isolation facilities in hospitals/ homes, patient management inwards, screening at airports, seaports, railway stations and bus stations.
- **Kerala Health Online Training**
  For training of Staff of Health Department and other line departments, several training videos were prepared and disseminated by the Directorate of Health Services (https://www.youtube.com/c/keralahealthonlinetraining).
- **WhatsApp Chatbot**
  In order to give authentic information and general awareness regarding COVID-19, Health Department released a WhatsApp chatbot. The WhatsApp number for the same is 9072220183 (http://dhs.kerala.gov.in/)
- **Break the Chain**
  A mass campaign was introduced by the Kerala government to spread the awareness of handwashing and the campaign was named as **"break the chain"**. This campaign aims to spread awareness and educate the general public about the hygiene aspect especially in COVID pandemic scenario (Fig. 6). This mass movement was inaugurated by Smt. K. K. Shailaja, Health Minister of Kerala.

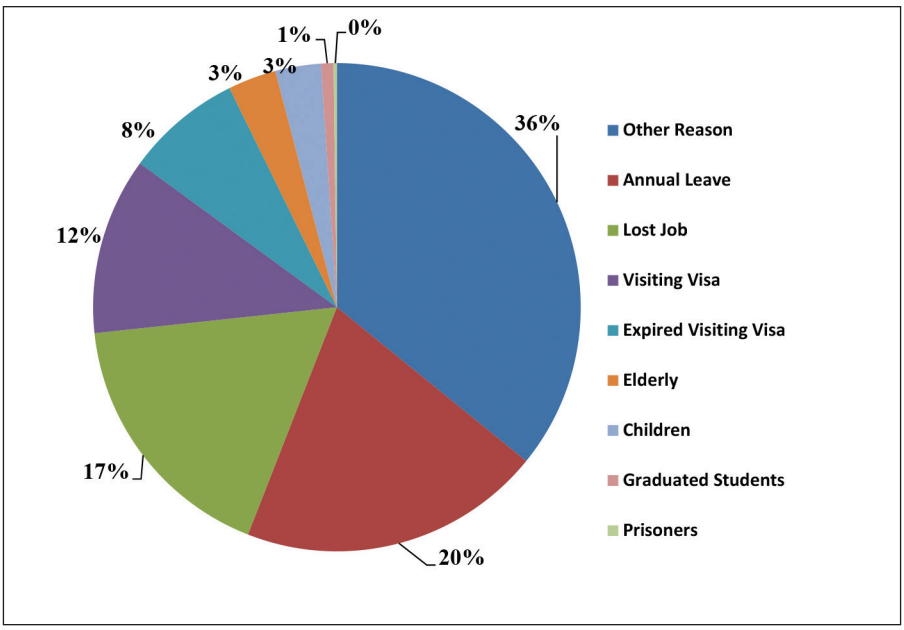
Figure 6: Picture of Kerala Government initiative of mass handwashing campaign

Source: Asianet news 2020.

- **Quarantine**
  The state of Kerala took quarantine very seriously and mandated 28 days of home quarantine while the national guidelines for India were only 14 days. Everyone returning from red/high-risk zones or foreign countries affected with coronavirus were mandating to follow these guidelines.
- **Use of Aerial Technology**
  During the spread of coronavirus, Kerala government implemented the use of drone technology to monitor the successful implementation of lockdown. This technique was quite successful and help in preventing people from coming out of the home to quite some extend.
- **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, the 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 (Figure 7). According to reports, around 1.69 lakh people belong to the priority categories (Supplementary Table S3). The sequence of contamination in Kerala is represented in supplementary Table S4.

Figure 7: Data of 351,636 NORKA registered expatriates based on their included type



Source: Asianet News 2020

Conclusion

The success of Kerala lies in battling the pandemic lies in its understanding of the idea of and secular sensibilities. The anti-coronavirus actions undertaken by the state attracted both national and international attention. The first case of COVID-19 was reported in Kerala in January and Kerala recorded highest COVID-19 cases in India from January to March. However, Kerala seems to have conceived the best strategy to fight against the spread of Coronavirus as a result of which the mortality rate is very low in Kerala and also the recovery rate is very high. It is also important to note that due to recent returning of Keralites to their native place from both national and international regions, the state is facing tremendous challenges.

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Comparing the Actions of Maharashtra and Kerala Governments in Mitigating the COVID-19 Pandemic

Himani Tiwari*, Julfikar Ali and Shams Tabrez***

Abstract

Background: *The outbreak of COVID-19 has posed a major threat to the whole nation with its varied impact from state to state. The major concerns revolve around the administrative actions of the respected governments at various levels. Kerala and Maharashtra were the first two states affected by COVID-19. Since the detection of the first case of Covid-19, Kerala and Maharashtra have taken immediate action and adopted a multifaceted strategy to fight against covid-19.*

Aims/Objectives: *This paper aims to study the various actions and mitigating strategies taken by the state of Maharashtra and Kerala to effectively deal with the COVID-19 crisis. Through the means of graphs and calculation of positivity rate, it analyses how the state of Kerala has contained the spreading of virus and minimises human loss while in case of Maharashtra both numbers of cases, as well as death toll, have been rising.*

Methodology: *The methodology used in this research is content analysis. Graphs are also being used to understand the trend of confirmed cases and deaths in the two states so as to link with the various policy measures*

Results: *The positivity rate of Maharashtra is as high as 19 percent in the month of August as against that of Kerala (6 percent). Comparing the two states on the basis of mitigation strategies, Kerala's model proved to be more effective than Maharashtra, holistically.*

Keywords: National Disaster Management Authority (NIDM); State Disaster Management Authority (SDMA); District Disaster Management Authority (DDMA); Disaster Management Act (DM Act); World Health Organization (WHO); Village Social Transformation Fund (VSTF); Inter-Agency Groups (IAG); Indian Council Medical

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Research (ICMR); Real-Time Reverse Transcription-Polymerase Chain Reaction (RT-PCR); Cartridge based Nucleic Acid Amplification Test (CN-NAAT).

Introduction

The Outbreak of Coronavirus Disease-19 has posed unprecedented challenges to the world. It resulted from the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections. Coronavirus was first detected in the City of Wuhan of China and soon after it spread across the countries and became a global phenomenon. With its global impact on 216 countries, about 27.9 million cases of coronavirus and 9,03,640 deaths have been confirmed till the first week of September (World Health Organization, May 2020).

Owing to the existing problems of poverty and limited health infrastructure the impacts are even more devastating on developing countries like South Africa, Peru, Brazil, India, Bangladesh and so on. India is a country of vast population which poses serious administrative challenges to deal with this ongoing pandemic of such a great magnitude.

To effectively deal with a pandemic of such great intensity, emergency planning is a prerequisite which includes the various stages; preparedness, mitigation, coordination among the various institutions at all levels, the participation of various stakeholders, putting a comprehensive legal framework for effective implementation, risk communication and so on.

Disaster management Act 2005 provides an institutional mechanism and financial arrangement to deal with such biological disasters. The act provides the formation of NDMA at Centre level headed by PM, SDMA at state level head by CM and DDMA at the district level by DM. Disaster management Authorities at all levels primarily concern with plans, policies, issues guidelines, regulations and laid down minimum standards of relief such as providing various types of concessions, grants, etc. In addition to this, at the national level Ministry of Home Affairs as a nodal ministry to issue guidelines and having administrative control as well as Ministry of Health and Family welfare as a nodal ministry to deal with the biological disaster. Coordination and participation among the stakeholders such as political class, administrations at all levels and civil society organisations are very essential in mitigation as well as providing food materials, communicating risks, managing migrants workers, organising relief camps.

However, in 2013 the report of the "task force to review DM Act 2005" was constituted under the chairmanship of former agriculture secretary Mr. K P Mishra. It has noted that the structure of various authorities constituted under the DM Act of 2005 are not

conducive, lack of transparency in the selection process and its objectivity and selection, therefore, there is a need to redesign the structure of NDMA. It has further mentioned that Authorities under the DM Act have been primarily focusing on the relief and rescue rather than mitigating, though they have achieved success in issuing useful guidelines, orders and regulating activities and so on.

Hence, this study focuses on actions taken by the governments of Maharashtra as well as Kerala and response of the various institutions associated with mitigating the pandemic because coronavirus first caught in these two states. And both states have migrants' issues i.e. Maharashtra is a receiver while Kerala is outsourced migrants. In addition to this, both states have unique demographic features, population density, level of urbanisation, socio-economic indicators, working of local institutions and participation of civil society organisations and so on. Indeed, it checks the effectiveness of our statutory system and institutional mechanism to deal with unprecedented challenges.

Research Questions

- To compare Maharashtra and Kerala Government's model on the basis of mitigating strategies to fight against COVID-19.
- To compare and analyse the positivity rate of the states.

Methodology

The methodology used in this research is content analysis. Content of the government reports, journals, research papers and newspapers have been thoroughly surveyed. The indicators chosen for the study are administrative actions, risk communication and management of Migrants' vulnerability.

Graphs are being used to understand the trend of confirmed cases and deaths in the two states so as to link with the various policy measures and also analyse the positivity rates of the two states.

Kerala

Demographic Details

Kerala is a state located in the Southern part of India with 14 districts. It has a population of 3.3 crore and a population density of 859 per sq. km (Census, 2011).

Past Experience

Kerala is renowned for its 'model' of development focused on improving health care facilities, quality of life and education system for the people. Investment in this model

created the transformation in terms of a decrease in birth rate, mortality rate and population growth. Kerala has achieved a positive sex ratio of 1084 females per 1000 males (Census, 2011) and the best literacy rate of 93.91 percent among all the states (Census, 2011). Kerala's Model of health is often described as 'good health based on social justice and equity' as it is able to provide good treatment facilities to people from all the sectors of the society (Ekbal, 2017).

Kerala has faced several communicable and non-communicable diseases over the period of time like chikungunya, rat fever, Nipah Virus, cancer and many others. This led to the mushrooming of private hospitals with increased and better health care facilities and infrastructure in the state (Nikarthil, 2015). In 2016, Health Minister K.K. Shailaja reformed the health facility in Kerala. Since the beginning, education and awareness among the women played an indispensable role in transforming the development of the health sector. Kerala's government effective response to the Nipah virus in March 2018 set an example for the others and the state's 'strong health system' and 'emergency preparedness' earned great praise from the World Health Organization (WHO) (Press Trust of India, 2018).

As Kerala has one of the topmost healthcare systems in the country, it is widely emphasized today that Kerala has executed plans to mitigate COVID-19 and it is the reflection of accomplishment learned during the outbreak of Nipah virus.

COVID-19 Scenario in Kerala

Kerala reported the first COVID-19 confirmed case on January 30, 2020, when a student returned from Wuhan, China. Figure 1 and Figure 2 shows the cumulative confirmed cases and deaths respectively. In Kerala, 89,489 confirmed cases and 372 deaths have been reported till September 8, 2020.

COVID-19 Testing in Kerala

In Kerala, different types of testing are conducted on a daily basis like RT-PCR Open Test, CB-NAAT, True NAAT and Rapid Antigen Card Test. Figure 3 and Figure 4 shows the graph of day-wise and cumulative COVID-19 testing conducted in Kerala. In Kerala, there are about 79 operational laboratories (Gov.: 31 and Private: 48) conducting tests on a regular basis (ICMR, 2020). Figure 5 shows the graph of confirmed cases vs. testing conducted per month till September 8, 2020. The positivity rate obtained by dividing confirmed cases is a powerful indicator of assessing the current level of Coronavirus transmission in the community and for assessing whether we are doing enough testing for the number of people who are getting infected.

Figure 1: Cumulative COVID-19 confirmed cases in Kerala till September 8, 2020[1]

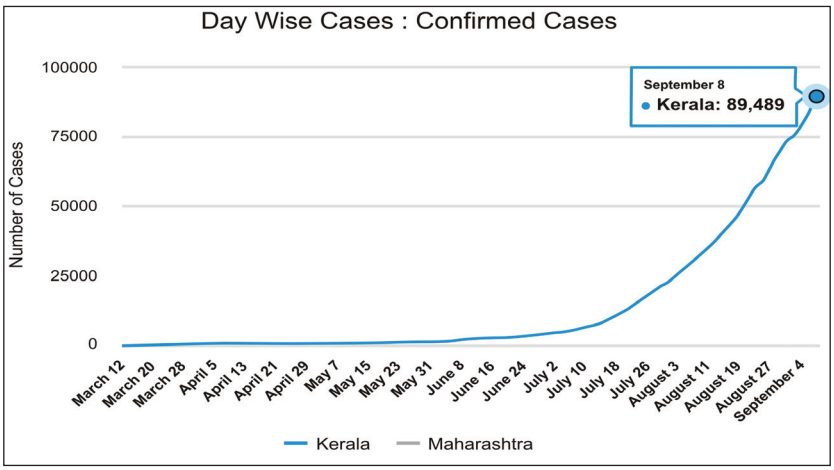


Figure 2: Cumulative COVID-19 confirmed deaths in Kerala till September 8, 2020[2]

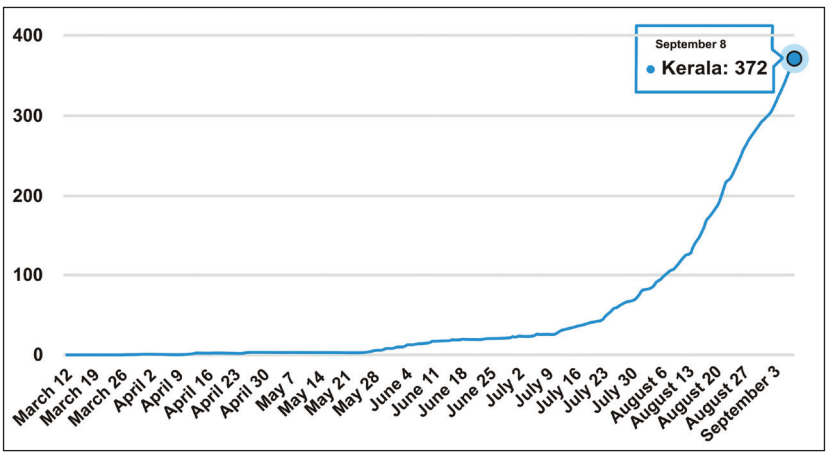


Figure 3: Day-wise Covid-19 testing conducted in Kerala till September 8, 2020[3]

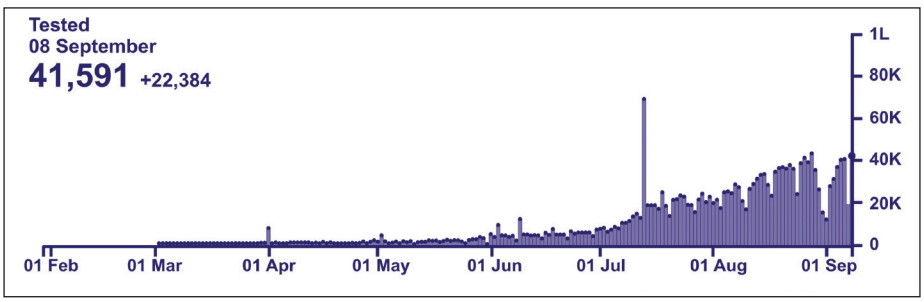


Figure 4: Cumulative COVID-19 testing conducted in Kerala till September 8, 2020[4]

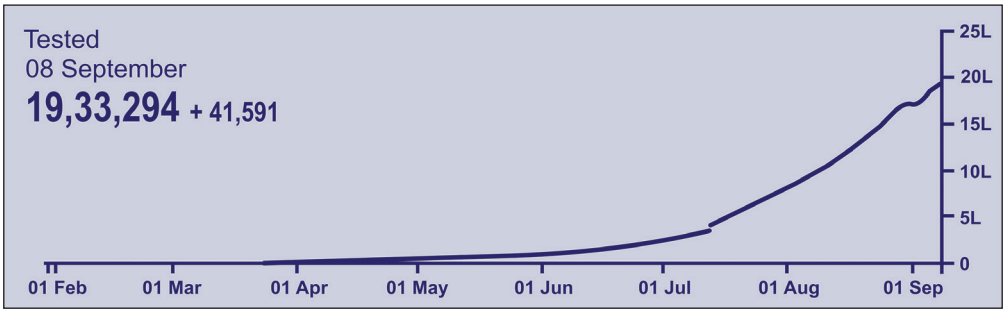
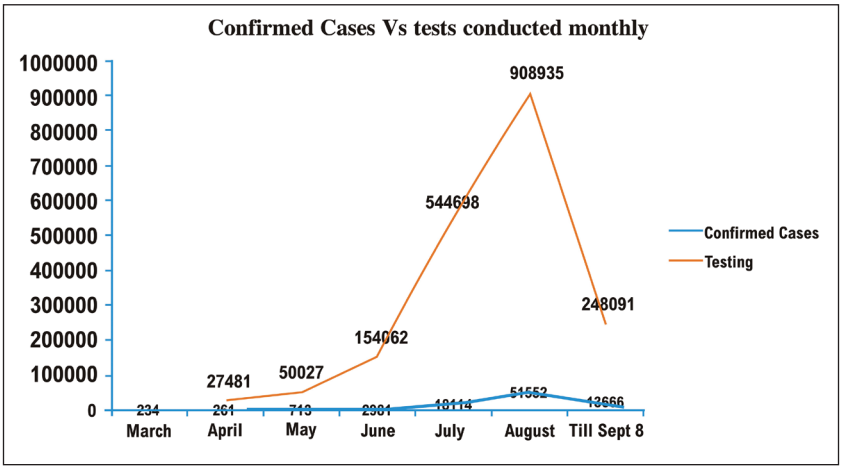


Figure 5: Confirmed cases versus testing conducted monthly in Kerala[5]



Mitigation Actions

Initial phases of responses by the Kerala government were aimed at surveying, identifying and conducting contact tracing of all the passengers arriving from China and abroad. After the confirmation of two or more COVID-19 cases, the state government on February 3, 2020, declared the situation as a 'Health Emergency' in the state. The health department of Kerala also predicted the situation well about the high chances of an increase in the number of patients, perceiving the high epidemic potential of COVID-19.

Administrative Mitigation Measures to Respond to COVID-19

- **Role of Kerala State Disaster Management Authority (KSDMA)**
  On February 4, 2020, a State Executive Committee (SEC) meeting took place in which norms of relief assistance were discussed for allocation. After COVID-19 was declared

a notified disaster by the Government of India on March 14, 2020, which permitted the use of State Disaster Response Fund (SDRF), Kerala Government allocated funds worth 224 crore for the financial year 2019-2020. Assessing the situation, the KSDMA on March 17, 2020, requested the government to use the funds and hence was allowed to use 35 percent of it. Out of this, 25 percent was allocated for quarantine measures, sample collection and screening and 10 percent was allocated for procurement of essential/labs for COVID-19 response. Following this, the Government of Kerala, after considering the report of the Health Department and Economic slowdown, declared COVID-19 as a State Specific Disaster (Government of Kerala, 2020). After perceiving the probability of the strong COVID-19 outbreak, the Kerala Government exercised powers under section 2 of the Epidemics Diseases Act, 1897 along with the provisions of the Disaster Management Act, 2005 and hence notified lockdown in the entire state. This was followed by issuing guidelines for strict compliance by all departments, offices, law and order forces, Local Self Government, and many in the state under the power vested on Section 24 of Disaster Management Act, 2005 (Government of Kerala, 2020).

The government of Kerala also did an effective utilisation of technology. KSDMA used Geographic Information System (GIS) in the initial phases to track the most optimised route for the COVID-19 affected patients to reach with minimum exposure and in the shortest time. Predictive analysis using mathematical models were conducted to assess the number of beds required, the runout capacity after considering the current scenario. The government of Kerala set up round the Clock War Room to monitor and supervise the COVID-19 situation in the state. Different departments like Health, Police, Revenue, Local Self Government, Transport and Food and Civil Supplies Department nominated the officer at the top-level management to facilitate management at the war room. Keeping into mind the twin burden of responding to floods and COVID-19, KSDMA quickly teamed up with the health experts to devise a detailed plan to effectively respond to the two disasters (Mohan, 2020).

- **Role of District Disaster Management Authority (DDMA)**

  Funds of Rs. 50 lakh were allocated to every district of Kerala to the respective District Collectors from the State Disaster Response Fund (SDRF). KSDMA made it compulsory for all the DDMAs to compile a daily report of actions and also ensured minimal staff at Local Self Government Offices for COVID-19 operations (Government of Kerala, 2020). To ensure district-level preparedness, compulsory registration of all foreign returnees was conducted by the District Administration/District Police.

- **Role of the GramPanchayats/Local Government**

  Local governments assessed the availability of essential commodities which were

further categorised, ensuring available response mechanisms, such as, material resources, volunteers, medical resources etc. This was possible through humanitarian support by the NGOs and Civil Society Organisations (CSOs). The Inter-Agency Groups (IAGs) supported by the Kerala State Disaster Management Authority (KSDMA) helped in strengthening the partnership between the NGOs and local Government. During COVID-19 preparedness, the IAGs mobilise volunteers at the ground level for better coordination among different NGOs activities. A well-known initiative, 'Community Kitchen' of the Local Self Government Department (LSGD), provided more than 8,651,627 free meals to the labourers, quarantined people, destitute and other needy persons. This distribution of millions of cooked meals and provision of free ration comes under the Public Distribution Scheme, hence reflective of a well-thought relief strategy by the government of Kerala.

COVID-19 Risk Communication

Kerala's ArogyaSetu Portal has become an effective tool of Risk communication. Kerala Police Social Media Cell and State Police Media centre have been working relentlessly to create awareness about COVID-19 through videos, posts, memes and trolls on social media. In Kerala many awareness programs were organised by the Kerala Health Minister such as, 'Break the Chain' initiative in which many cartoons were painted on the walls to spread awareness among the communities regarding washing hands using soap or sanitizers, wearing masks and maintaining social distancing. The 'Break the Chain' dancing video of 6 policemen posted by Social Media Cell was watched by about 3 million people. Besides this, the Kerala police played a great role in tracking the 'Fake News'. To stop the rumours and busted myths regarding COVID-19, a 'Corona Media Cell' was set up to monitor and tackle the threat of fake news during this crisis. Empowered women self-help groups like Kudumbashree have been working extensively during this period. With the objective to communicate the risk and educate the communities about the safety measures, they formed about 1.9 lakh WhatsApp groups along with 22 lakh neighbourhoods groups.

Management of Migrant Workers in Kerala during COVID-19

Kerala is home to many migrant workers. Kerala has a large number of welfare fund boards for workers working in various sectors. This setup is one of the reasons that the State has a powerful working-class movement in the state. In the initial phase, boards paid financial assistance amounts ranging from Rs. 7,500 to Rs. 10,000 for workers affected by the COVID-19. Boards also paid Rs. 1,000 to 5,000 for workers who are in

living quarantine or hospital quarantine respectively (Dennis, 2020). The government of Kerala allocated funds worth Rs. 56 crore especially for 'Measures of quarantine'. The relief provisions allowed during this period of time are as Rs. 60/adult per day and Rs. 45/child per day for 30 days will be dispensed to individuals under home quarantine and hospital quarantine and also announced to treat the Contractual/Casual/Daily wage/ Outsourced staff on duty on those days in which they are not able to come to the office due to restrictions imposed due to coronavirus. But this remained for a shorter period of time.

Maharashtra

Demographic Details

Geographically, Maharashtra is the third largest state in India with 35 districts and the second most populous state with a population of about 11,23,72,972. The density of population is 365 persons per sq. km. The literacy rate of the country is 82.9 percent and it ranks 12th in the country (Census, 2011).

Past Experience

Maharashtra also has a history of facing deadly epidemics like the Chikungunya Epidemic at Barsi, Maharashtra India in 1973, SARS 2003, HINI Influenza Pandemic (2009) and so on. HINI Influenza Pandemic flu also commonly known as Swine Flu resulted in 9,943 total cases and 937 cumulative deaths by 2nd January 2011, with its main hot spot in Pune. It had the highest reported cases in the whole country. To deal with this pandemic, the state government published the contingency plan in June 2009, which dealt with the institutional framework at the state level and state-district coordination. It was more focused on providing needed action to deal with the pandemic but on an implementation level, it posed a major challenge (Purohit et al., 2018).

COVID-19 Scenario in Maharashtra

Maharashtra reported its first case of COVID -19 on March 9, 2020. Despite various efforts by the Maharashtra government, Covid-19 has posed a major challenge for the state government to cope with this devastating disaster. However, the State government has been continuously taking precautionary measures to contain Coronavirus and reduce the number of cases. Figures 6 and 7 shows the cumulative confirmed cases and deaths in Maharashtra till September 8, 2020. About 9,43,772 confirmed cases and 27,407 deaths have been reported till September 8, 2020.

Figure 6: Cumulative COVID-19 confirmed cases in Maharashtra till September 8, 2020[6]

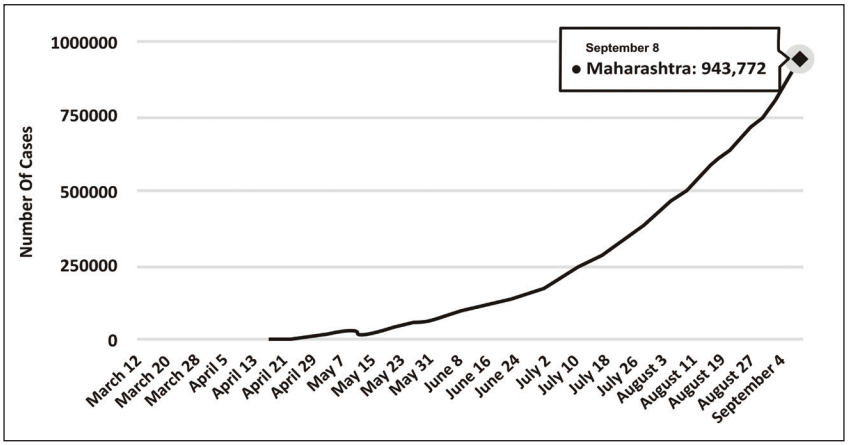
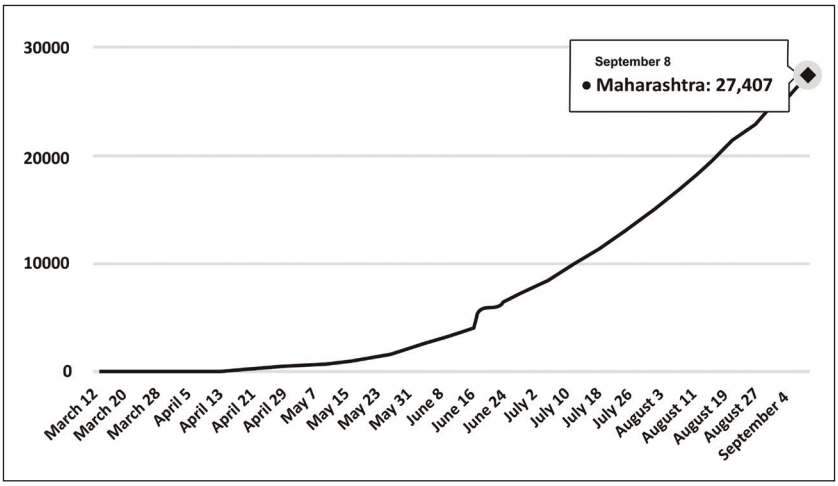


Figure 7: Cumulative COVID-19 deaths in Maharashtra till September 8, 2020[7]



COVID-19 Testing in Maharashtra

In Maharashtra, RT-PCR Open Tests have been regularly conducted. Figures 8 and 9 shows the graph of day-wise and cumulative COVID-19 testing simultaneously conducted in Maharashtra. In Maharashtra as on September 3, 2020, there are about 154 operational laboratories (Gov.: 80 and Private: 74) conducting tests on a regular basis (ICMR, 2020). Figure 10 shows the graph of confirmed cases vs. testing conducted per month till September 8, 2020.

Figure 8: Day-wise COVID-19 testing conducted in Maharashtra till September 8, 2020[8]

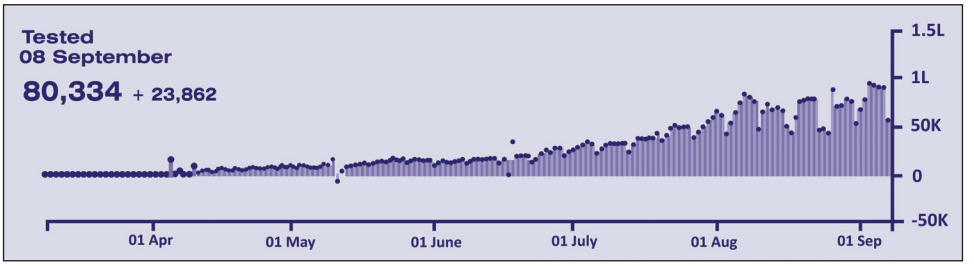


Figure 9: Cumulative COVID-19 testing conducted in Maharashtra till September 8, 2020

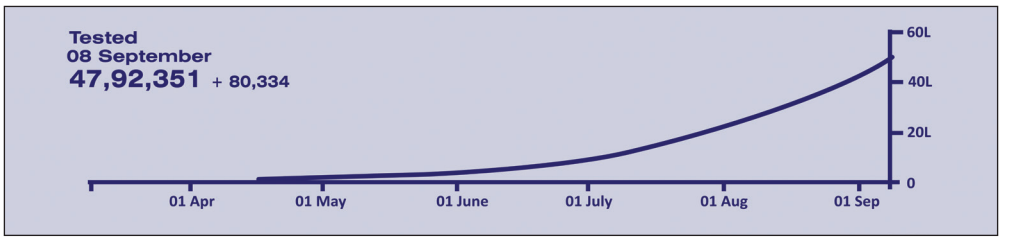
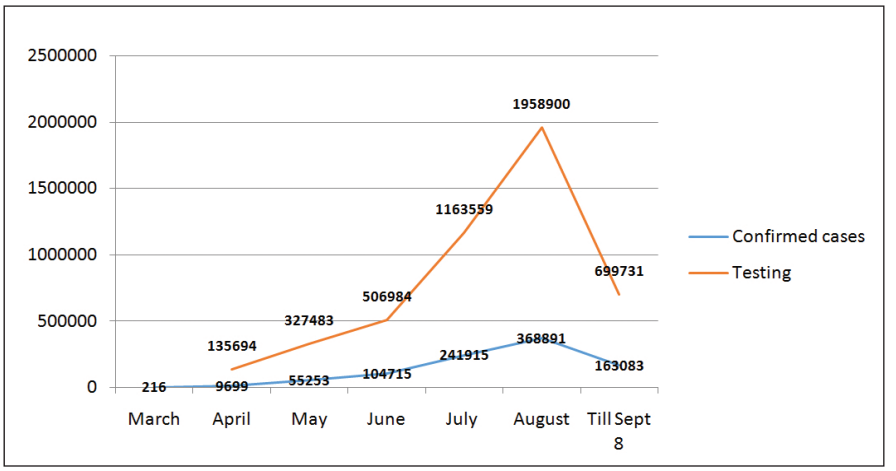


Figure 10: Confirmed cases versus testing conducted monthly in Maharashtra[9]



Mitigation Measures

Early phase of COVID-19

Maharashtra Government invoked the provisions of Epidemic Diseases Act, 1897

after declaring COVID-19 outbreak as an epidemic in the cities of Mumbai, Navi Mumbai and Pune (Press Trust of India, 2020) on March 13, 2020. In the initial phases, the Maharashtra Government notified the COVID-19 regulations on three key areas (a) home quarantining the people with a history of recent travel in the COVID-19 affected countries; (b) Screening the patients affected by COVID-19 in the hospitals; (c) List of procedures in containment zones. On March 15, 2020, the state government announced to increase the laboratory capacity to test the samples of the suspected cases, set up a new laboratory and increase the beds in the hospitals. For example, In Kasturba hospital, laboratory capacity was increased from 100 per day to 350 days (Press Trust of India, 2020). The state government invoked section 144, in Nagpur and Nashik to restrict the movement of people in groups and on March 23, 2020, a state-wide lockdown was declared (Ray, 2020). About 5,000 CCTV cameras and drones have been used in Mumbai as well as in the densely populated areas of Thane district to regularly check that the lockdown is maintained (Express News Service, 2020).

Administrative Measures

- **Role of Maharashtra State Disaster Management Authority (MSDMA) and District Disaster Management Authority (DDMA)**

  Assessing the COVID-19 situation, the government of Maharashtra exercised Power under Section 2 of the Epidemic Diseases Act, 1897 and the powers conferred under the Disaster Management Act, 2005 to extend the lockdown. On March 16, 2020, the Maharashtra government allocated 45 crore rupees to districts with COVID-19 cases (Thomas & Majumdar, 2020). Under the MLA Local Development Program, a special exception was given to use the MLALAD funds for purchasing the medical equipment for COVID-19 during the year 2020-2021.

  SDMAs have a significant role to play in such emergency situations. However, Justice Abhay Oka and Justice MS Sonak considered the response of SDMA and DDMAs in Maharashtra to be quite reluctant and insincere. In addition to this, Mumbai high court in 2017 dismissed the idea of a single Greater Mumbai Disaster Management Authority and bifurcated into the District Disaster Management Authority for city and District Disaster Management Authority for Suburbs. Despite the court directions and pressure from the civil society organisation, District Disaster Management Authorities have met yet and have never discussed any district development management plan and put it in the public domain. The other major problem is with irregular conduction of the meetings.

However, the Brihanmumbai Municipal Corporation (BMC) initiated 'Mission Zero' rapid action plan. This mission is launched to combat the coronavirus outbreak situation in the city, which is severely affected by the disease spread by close contact. Under this programme, 50 dispensary vans will cover different parts of Mumbai for 2-3 weeks to conduct a preliminary examination of patients. This initiative is called the "chase the virus" for the worst affected regions of the city.

- **Role of Gram Panchayat/Local Government**
  One can't ignore the threat of COVID-19 spreading to the villages. The Ministry of Panchayati Raj, Government of India accepted a tool named Mahatma Gandhi Institute of Medical Sciences, Sevagram for the assessment of community preparedness at village level to fight against coronavirus. Online training like Anandvan and Village Social Transformation Foundation (VSTF) started from 24 May 2020, the Department of Community Medicine oriented more than 300 VSTF fellows regarding use of the tool. These volunteers work around 1000 villages of Maharashtra to catalyse community response to COVID-19. VSTF collected this information through its fellows to help the Government of Maharashtra fight the pandemic in a better way.
  In an order of Department of Revenue and forest, Disaster Management, Relief and Rehabilitation of Government of Maharashtra issued on May 2, 2020 mentioned that 33 percent civil defence and home guard works with the local authority. They performed duty as an auxiliary force to the local administration. But the Maharashtra government has not been able to pay their honorarium of Rs. 670 per day which was promised. These civil defence and home guards could have played a key role in the work of aid assistance, distributing food materials and handling migrant's workers, maintaining law and orders, etc. But it was seen that very few people showed interest in becoming part of this group.

COVID-19 Risk Communication

In order to spread awareness among the communities, the Regional Outreach Bureau (ROB) (Maharashtra & Goa region), Ministry of Information and Broadcasting, Government of India initiated a field-based outreach and awareness programme through travelling audio announcement in the rural areas of Maharashtra. Twenty vehicles have been deployed in different COVID-19 affected districts. Staff artists from ROB Pune created audio messages and songs in local languages. Besides this, it also tracked the fake NEWS. Also, there was a lot of involvement with the local videos. WHO also initiated many campaigns in Maharashtra for risk communication? The Maharashtra Government also launched COVID-Madat for tele-screening.

The Community Health Workers (CHWs) like ASHAs, Aganwadi workers, Auxiliary Nurse Midwives also played a great role in spreading awareness regarding COVID-19.

Management of Migrant Workers in Kerala during COVID-19

Maharashtra Chief Minister allocated the fund of Rs. 54.75 crore from the Chief Minister's relief fund. This fund was transferred to the district collectors for the booking of tickets for migrant workers on special trains. The "ShivBhojan" scheme offering meal at Rs. 10 was made available to them at Rs. 5. The state had set up 163 centres across the state to provide food and water to the migrant labourers at the early phases.

Analysis

Graphical Analysis

Kerala and Maharashtra were the first two states in India to have reported the first COVID-19 cases. Even Kerala reported the first case almost a month before Maharashtra. However, comparing the present situation brings to surface shocking results. The total confirmed cases in Maharashtra till September 8, 2020, are about 10 times greater than that of Kerala (Figure 11) and COVID-19 deaths in Maharashtra are about 74 times than that of Kerala (Figure 12). Although, we cannot ignore the demographic differences between the two states.

Testing & Positivity rate of the two states

Kerala has conducted different types of testing like RT-PCR Open Test, CB-NAAT, True NAAT and Rapid Antigen Card Test whereas, in Maharashtra, RT-PCR is the only type of testing conducted. Calculation of the positivity rate for Kerala and Maharashtra (Figures 5 and 10 respectively) obtained by dividing the confirmed cases by the total tests shows that Maharashtra still leads Kerala in terms of positivity rate. As per the calculation, in the month of August, Maharashtra had a positivity rate of 19 percent as against 6 percent that of Kerala. A high positivity rate in Maharashtra is indicative of high Coronavirus infection rates and hence suggests the need to do more testing, and suggests that it is not a good time to relax restrictions. It also highlights the need for taking innovative and proactive mitigation measures.

Figure 11: Comparison of COVID-19 cumulative confirmed cases in Kerala & Maharashtra

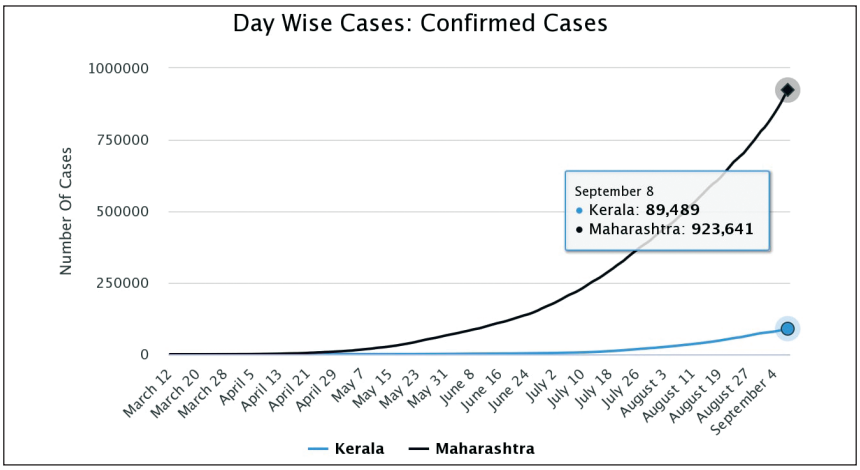
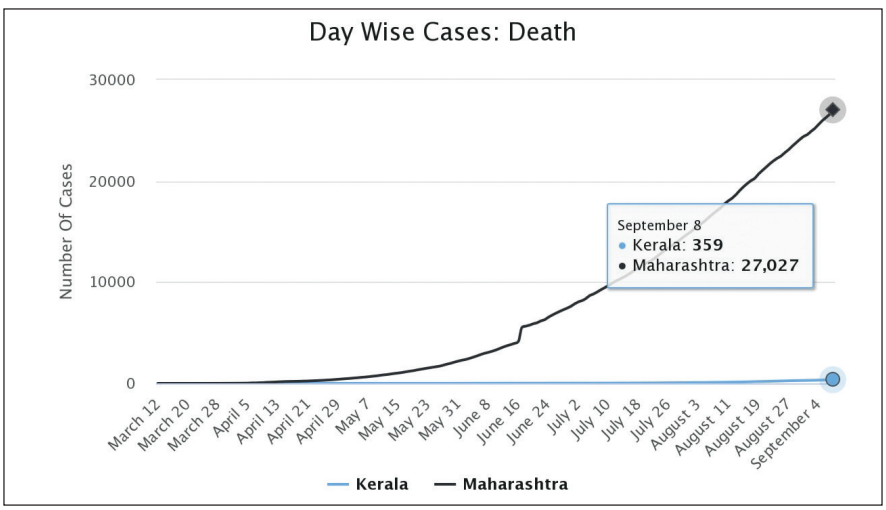


Figure 12: Comparison of COVID-19 cumulative deaths in Kerala & Maharashtra



Analysis on the Basis of Mitigation Measures

Administrative Measures

The analysis of the mitigation measures undertaken at the administrative level highlights the indispensable role that the SDMAs, DDMAs and the Gram Panchayat play while responding to a health emergency of such a great magnitude like COVID-19. Both states have found ways to empower the local government through humanitarian assistance.

However, the content analysis shows that the Kerala State Disaster Management Authority (KSDMA) showed an effective response as compared to the Maharashtra State Disaster Management Authority in proactively allocating the State Disaster Response Fund. KSDMA conducted regular meetings and at the same time monitoring the working of the District Disaster Management Authorities (DDMAs) on a regular basis. Hence, Kerala due to its proactive measures is at a much better situation than Maharashtra while considering the present COVID-19 scenario.

Risk Communication

Communication of risk has become an effective tool in minimising all kinds of losses whether it is economic, social and human. Risk Communication can only happen when you put an effective mechanism in place to reach out to all the stakeholders, particularly local masses and avoid ambiguity. Maharashtra's campaigning against COVID-19 has largely been confined using varying degrees of participation of concerned stakeholders particularly civil society organisations and implementation of policies and orders.

However, the state of Kerala has brought a social revolution to fight against COVID-19 and adopted a bottom to top approach. It has delegated immense power, i.e. financial as well as administrative to the local self-institutions in discharging their role and responsibilities. In addition to this, it has streamlined its decision-making process to avoid ambiguities and incorporated civil society organisations and consulted while formulating any plan, policies or implementing any order and took their suggestions as well. For instance, Kudumbashree acts as a nodal agency working very closely with the community and for the community and helps the government ineffective implementation of the policy at the grassroots level.

Management of Migrant Workers during COVID-19

Both states have faced immense pressure imposed by migrant workers. Maharashtra is the biggest receiver of migrant workers particularly from the North Indian states while Kerala is the biggest outsourcing migrant workers within the country and abroad as well. The migrant community faced the worst humanitarian crisis during this pandemic and they were excessively politicised instead of solving their issues. Maharashtra government has launched a scheme of 'Shiv Bhojan' to provide cooked materials, particularly for migrant workers. Initially, they executed this policy very well but didn't prove to be sustainable. As per the report, there were a lot of discrepancies in the distribution of food materials and migrant workers being asked

to pay for this. While on other hand, the state of Kerala has a large number of welfare fund boards for workers in various sectors.

Conclusion

This study focused on the action of the governments of Kerala and Maharashtra to mitigate the COVID-19. Coronavirus cases are rising very fast in India and evidence shows that COVID-19 cases in the state of Maharashtra are rising and almost all metropolitan areas have converted into cantonment zones while COVID-19 cases have declined considerably in the State of Kerala. However, there is an aggressive control strategy required. A high positivity rate of 19 percent in Maharashtra in August highlights the need for more testing and implementation of strict mitigation measures.

Administrative measures and the role of local institutions, risk communication and management of migrant's vulnerabilities are being highlighted in this paper from March 2020 to September 2020. Though the results of this paper are subject to change with the course of time. From the analysis, it is seen that mitigation strategies adopted by Kerala Government were quite effective as compared to that of Maharashtra.

Finally, COVID-19 has opened up huge opportunities as well. For example, governments need to evolve or rethink the strategy to fight against such pandemic, structural changes like in infrastructure development, putting more resources in research and developments (R&D), investments in human resources development and finding IT-based solutions to the problem. We have witnessed such diseases outbreak year after year hence it is the right time to say that prevention is better than cure.

Acknowledgements

This study "Comparing the actions of Maharashtra and Kerala governments in mitigating the COVID-19 pandemic" is the outcome of the generous help and support by a large number of personalities and we are deeply indebted to all of them.

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Notes

1. https://prsindia.org/covid-19/cases/statewisecomparison
2 https://prsindia.org/covid-19/cases/statewisecomparison
3 https://www.covid19india.org/state/KL
4 https://www.covid19india.org/state/KL
5 https://www.covid19india.org/state/KL
6 https://prsindia.org/covid-19/cases/statewisecomparison
7 https://prsindia.org/covid-19/cases/statewisecomparison
8 https://www.covid19india.org/state/MH
9 https://www.covid19india.org/state/MH

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Containing COVID-19 in the Himalayas: A Success Story from Sikkim

Durga P Chhetri*

Abstract

The World Health Organisation (WHO) has declared the outbreak of the novel coronavirus disease 2019 (COVID-19) a Public Health Emergency of International Concern under the International Health Regulations 2005. To date, the virus has infected more than 52,21,567 people, killing more than 3,35,203 in 215 countries and territories. About half of the world population is currently under lockdown to arrest the spread of this highly infectious disease. This unprecedented number of COVID-19 cases has triggered the alarm for public health to respond to emerging diseases. Against this backdrop, this paper is an attempt to sheds light on the various measures taken by the state government in Sikkim Himalaya to contain the spread of the virus. In other words, this paper analyses the Sikkim's success in containing COVID-19 within its territory.

Keywords: COVID-19; clinical manifestation; transmission; epidemic; strategies; Sikkim

Background

The start of 2020 has been marked by global alarm over the sudden and explosive emergence of novel coronavirus outbreak. World Health Organization (WHO) initially named this coronavirus as the 2019-novel coronavirus (2019-nCoV) on 12 January 2020. WHO officially named the disease as coronavirus disease 2019 (COVID-19) and Coronavirus Study Group (CSG) of the International Committee proposed to name the new coronavirus as SARS-CoV-2. On 11 March 2020, WHO officially declared the COVID-19 pandemic as a Public Health Emergency of International Concern (PHEIC) on the basis of 'alarming levels of spread and severity and by the alarming levels of inaction' (WHO, 2020a). COVID-19 has presented an unprecedented challenge before the world. The initial outbreak was reported in a seafood wholesale wet market, the

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Huanan Seafood Wholesale Market in Wuhan, Hubei, China (Huang et al., 2019) The market was shut down on January 1, 2020, after the announcement of an epidemiologic alert by the local health authority. Within the month of January, thousands of people in China, including many provinces (such as Hubei, Zhejiang, Guangdong, Henan, Hunan, etc.) and cities (Beijing and Shanghai) were attacked by the rampant spreading of the disease. Furthermore, the disease travelled to other countries, such as Thailand, Japan, North Korea, Viet Nam, Germany, Italy, France, United States, Singapore and India. Now all countries of the world are affected by the spread of COVID-19. The first case reported in India was on January 30, 2020, when a student who returned from Wuhan, China was confirmed COVID-19 case. As of May 22, 2020, there have been about 52,21,567 confirmed cases of COVID-19 and about 3,35,203 reported deaths globally (WHO, 2020). About half of the world population is currently under lockdown to arrest the spread of this highly infectious disease.

COVID-2019: Chronological list of global outbreaks

Year	Date	Events
2019	November	Mysterious pneumonia in Wuhan, Hubei, China
	December 1	The first confirmed nCoV case in Wuhan (no Huanan seafood market exposure)
	December 10	The first confirmed nCoV case with Huanan seafood market exposure
2020	January 1	An epidemiological alert by local agency
	January 13	Huanan seafood market shut down
	January 15	The first nCoV case in Thailand (Wuhan history)
	January 30	Public health emergencies of international concern (PHEIC) alarm by WHO
	February 6	28,276 confirmed nCoV cases, 565 deaths, at least 25 countries involved
	February 19	The death toll from COVID-19 surpasses 2,000.
	February 20	Peng Yinhua, a 29-year-old respiratory doctor in Wuhan, dies from COVID-19.
	March 7	The number of COVID-19 cases surpasses 100,000.
	March 8	Over 100 countries report cases of COVID-19.
	March 9	WHO moves closer to declaring COVID-19 outbreak a pandemic.
	March 16	For the first time since the beginning of the outbreak, infections and deaths outside China surpass those within China.
	March 19	Cases of COVID-19 surpass 200,000 globally.
	March 22	Global cases of COVID-19 surpass 300,000.

	March 24	Cases of COVID-19 surpass 400,000.
	March 28	Cases of COVID-19 worldwide surpass 600,000.
	March 29	Global death toll from COVID-19 surpasses 30,000.
	April 2	Cases of COVID-19 surpass 1 million.
	April 6	According to WHO, almost 90 per cent of students globally are affected by school closures - over 1.5 billion children and young people.
	April 8	China lifts its lockdown on Wuhan, the city where the COVID-19 outbreak began.
	April 10	The number of COVID-19 deaths around the world surpasses 100,000.
	April 11	The United States records over 2000 deaths in one day - the highest death rate recorded for any country during the pandemic.
	April 15	The number of COVID-19 cases surpasses 2 million.
	April 19	The death toll in Europe from COVID-19 surpasses 100,000. The death rate in Europe, according to data compiled by Johns Hopkins University, is nearly 9%.
	April 21	The number of COVID-19 cases surpasses 2.5 million globally, and the number in the U.S. surpasses 800,000.
	April 24	2,710,264 total confirmed cases and 190,896 deaths.
	May 2	3,272,202 total confirmed cases and 230,104 deaths.
	May 22	5,221,567 total confirmed cases and 335,203 deaths

Sources: Ravelo & Jerving 2020; WHO 2020

Clinical Manifestations

Symptoms of COVID-19 usually begin with nonspecific syndromes, including fever, dry cough, and fatigue. Multiple systems may be involved, including respiratory (cough, short of breath, sore throat and chest pain), gastrointestinal (diarrhoea, nausea, and vomiting) and neurologic (headache or confusion). Studies by WHO and others found that the common clinical manifestations included fever (88.7 percent), short breath (31-55 percent), cough (67.8 percent), sore throat (13.9 percent) and headache (13.6 percent). In addition, a part of patients manifested gastrointestinal symptoms, with diarrhoea (3.8 percent) and vomiting (5 percent). Older people and people with chronic medical conditions, such as diabetes and heart diseases, appear to be more at risk of developing severe symptoms. People with COVID-19 generally develop signs and symptoms, including mild respiratory symptoms and fever, on an average of 5-6 days after infection (mean incubation period 5-6 days, range 1-14 days).

Transmission

COVID-19 is an infectious disease caused by the coronavirus. As far as transmission of COVID-19 is concerned, there are three different types of transmission: (i) symptomatic, (ii) pre-symptomatic and asymptomatic (WHO, 2019b). Symptomatic transmission refers to transmission from a person while they are experiencing symptoms. Data from published epidemiology and virologic studies provide evidence that COVID-19 is primarily transmitted from symptomatic people to others who are in close contact through respiratory droplets, by direct contact with infected persons, or by contact with contaminated objects and surfaces (Li et al., 2020; Liu et al., 2020; WHO, 2020c). Pre-symptomatic transmission is defined as the transmission of the virus from an infected person (source patient) to a secondary patient before the source patient developed symptoms. This type of transmission occurs through the generation of respiratory droplets or possibly through indirect transmission. Therefore transmission from a pre-symptomatic case can occur before symptom onset. Asymptomatic transmission refers to the transmission of the virus from a person, who does not develop symptoms.

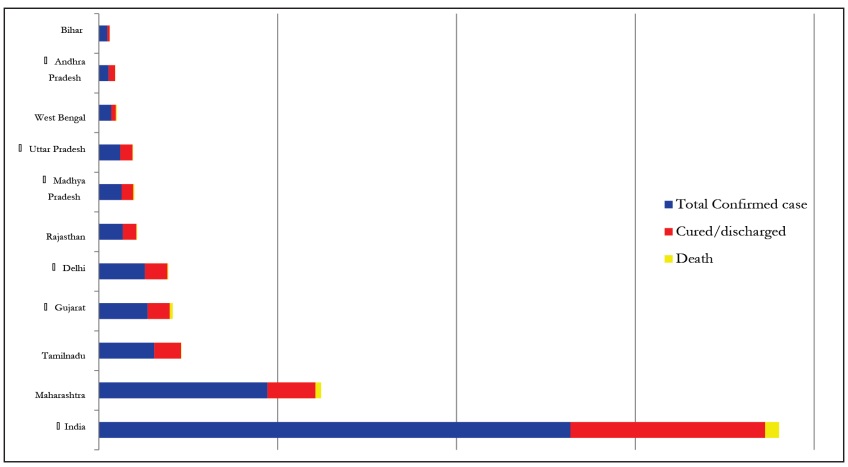
Strategies to Combat COVID-19

Sikkim, an erstwhile Himalayan kingdom, became the twenty-second state of Indian Republic in 1975. It is situated in the western part of the Eastern Himalayas and because of its location, the state has political and strategic importance out of proportion to its size. The state has been hemmed by three international boundaries and a state of West Bengal. In the north and northeast, it is bounded by vast stretches of Tibetan plateau of China, on the east by the Chumbi Valley of Tibet and Bhutan and Kalimpong district of West Bengal, Nepal on the west and the south by the Darjeeling district of West Bengal, India. Sikkim has a total of 350 km international border, 220 km with China, 33 km with Bhutan and 97 km with Nepal. It has a total area of 7096 sq. km, measuring approximately 112 km from north to south and 64 km from east to west. The state has at present a population of 6,10,577 persons with a density of 86 persons per sq. km.

As of May 22, 2020, there is no positive case of COVID-19 in this tiny Himalayan state of India. The COVID-19 virus is a new pathogen that is highly contagious, can spread quickly, and must be considered capable of causing enormous health, economic and societal impacts in any setting. Europe and now the USA is the epicentre of the COVID-19 pandemic. Case counts and deaths are soaring in Italy, France, Spain, Germany and the USA. As of May 22, 2020, a total of 52,21,567 confirmed cases with 3,35,203 deaths globally were documented by WHO involving more than 215 countries and territories. In India, the first case was reported on January 30, 2020, and now there are 1,31,868

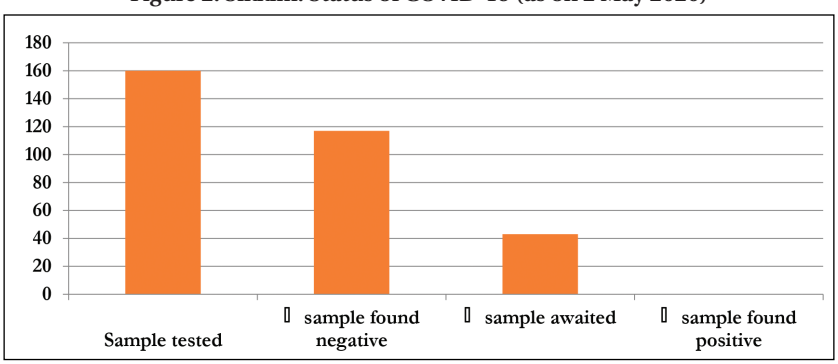
confirmed cases with 3,867 deaths (Figure 1). The statistics show that the country of 1,312.2 million appears to have greatly slowed its epidemic due to the countrywide lockdown announced on 24 March 2020 for 21 days which has now been extended till May 31, 2020. Amid these dire trends, Sikkim, located in the northeastern region of India has emerged as a sign of hope and a model to emulate, as there are zero positive cases of COVID-19 despite the state being surrounded by three international borders including China. As on 2 May 2020, a total of 160 samples were tested in Sikkim and 117 are found to be negative and 43 test reports are awaited (Figure 2).

Figure 1: State-wise breakdown of confirmed cases of COVID-19 (as on May 22, 2020)



Source: MoHFW, GoI 2020

Figure 2: Sikkim: Status of COVID-19 (as on 2 May 2020)



Source: Department of Health & Family Welfare, GoS, 2020

There is no vaccine available to immunise people against COVID-19. As vaccines and specific medications are not yet available for COVID-19, other public health (non-pharmaceutical) and social measures play a vital role in reducing the number of infections and saving lives. To respond to COVID-19, like many other countries, Sikkim is using a combination of containment and mitigation activities. The response strategies include varying levels of contact tracing and self-isolation or quarantine; promotion of public health measures, including handwashing, respiratory etiquette, and social distancing; preparation of health systems for a surge of severely ill patients who require isolation, oxygen, and mechanical ventilation; strengthening health facility infection prevention and control; and postponement or cancellation of large-scale public gatherings. These are the only measures that are currently proven to minimise transmission chains in humans. The Government of Sikkim under the leadership of Chief Minister Shri P.S. Tamang has taken several public health and social measures for combating the spread of COVID-19 at the state or community level. As a result, there is a zero positive case of COVID-19 in Sikkim till date. Sikkim, despite shares a long border and has traded with China through Nathula Pass, appears to have a good hold on the spread of the disease. Thus, Sikkim government, personally the Chief Minister P.S. Tamang, directed and deployed a prevention and control measures rapidly from the early stage to current situations of the epidemic. A combination of extensive efforts includes isolating suspected people and tracing and quarantining their contacts. To further prevent the spread from overseas and other parts of the country, the Sikkim government has been imposed a series of rigorous measures and some of them are hereunder.

- Hotels and tourism accommodation establishments are places where guests stay temporarily in close cohabitation and where there is a high degree of interaction among guests and workers, which requires specific attention in the context of COVID-19. Keeping this in view, the state government acted swiftly and has suspended the entry of all foreign and domestic tourists and migrant labourers into Sikkim state despite the direction from the Union Minister to allow non-infected tourists to visit Sikkim. All hotels and restaurants across the state were closed.
- The state of Sikkim has been hemmed by three international boundaries and a state of West Bengal. It is therefore important to seal all borders to prevent the spread of the virus. Moreover, the arrival location of the index patient was a prime place to cause a widespread outbreak. The state has, therefore, sealed all international borders with China, Bhutan and Nepal and two out of four border check posts with West Bengal even before the announcement of nationwide lockdown.

- All educational institutions across the state have been closed as one of the measures to contain the outbreak. There are more than 1550 schools, 20 colleges and eight universities in Sikkim.
- In an attempt to prevent dispersal of COVID-19, all transport was prohibited in and out of the state.
- Public meetings, conferences, festival celebration and large crowds activities have been cancelled.
- Entertainment venues, casinos, cinema halls, parks, gym, swimming pool, etc. have been closed.
- Suspected cases have been isolated and health checks carried out strictly at all places of Sikkim. Strict regulation has been issued for 14 days mandatory quarantines for anyone arriving in Sikkim from outside of the state. Any individual showing symptoms was quickly moved to an isolation ward for further testing, which could be completed at North Bengal Medical College, Siliguri, West Bengal. They identified cases of suspected person early – fortunately, the state had a limited number – and they got a list of all of the contacts, and they put those people under rigorous surveillance and in quarantine so that they would not transmit the infection to others. More than 13 quarantine centre and one designated hospitals were established across the state as measures to contain the virus.
- All travel prohibited in and out of state and information widely disseminated.
- Civil society organisations have been mobilised to support prevention and response activities. The community has accepted the prevention and control measures and has participated in the management of self-isolation and enhancement of public compliance.
- Chief Minister has announced statewide lockdown for one week (March 24-31, 2020) on the morning of March 24, 2020, which was even before the announcement of countrywide lockdown by the Prime Minister of India on the night of March 24, 2020.
- All public gatherings banned. Social and physical distancing measures that aim to slow the spread of disease by stopping chains of transmission of COVID-19 have been strictly followed and maintained. These measures secure physical distance between people (of at least 1 metre) and reduce contact with contaminated surfaces and infected person.
- The Health Department announces the epidemic situation every day and holds daily press conferences to respond to emerging issues.

Conclusion

As a stable and peaceful state, with well organised administrative and security services, Sikkim has been able to make decisions quickly and enact them promptly. The government acted swiftly to banned foreign and domestic tourists, shut schools and colleges and quarantine new arrivals. By focusing on measures for the safety of Sikkimese people that are within its control, the state has won praise from both the international community and national government. Behind its success so far has been the most comprehensive and well-organised thermal screening programme, combined with extensive efforts to isolate suspected people and trace and quarantine their contacts for the duration of the incubation period. Sikkim has screened more than 1,08,400 vehicles, and 6,05,000 passengers in different check posts of the state. Sikkim's uncompromising and rigorous use of non-pharmaceutical measures to contain the spread of the COVID-19 in multiple settings provides vital lessons for the national response. An unusual and unprecedented speed of decision-making by the Chief Minister, operational thoroughness by public health systems and engagement of civil society and media helps to make the successful implementation of all measures in the state. Behind this success story lies capable, qualified and competent public leaders and institutions that pursued their mission with vigour. The state government under the leadership of Chief Minister P.S. Tamang has able to undertake such a massive effort in a timely manner. This is a spectacular success story that shows to the country COVID-19 can be contained, but we must be clear that we have only won a battle. The war will only end when India is declared free of COVID-19. The key takeaways are, therefore, commitment, coordination, track and monitor. The Sikkimese experience offers a critically important lesson to other states in the country affected by the epidemic as well as to other countries of the world.

The state, however, needs to take following preventive measures to combat the spread of COVID-19 especially after the relaxation of lockdown. All these preventive measures listed below have a significant effect in arresting the spread of the pandemic and contribute to creating a pandemic-free state even after the lifting of nationwide lockdown.

- Sealing of international borders with China, Bhutan and Nepal should be continued till October 2020.
- According to the Government of India, West Bengal has the highest number of COVID-19 hotspots zone with 10 districts under Red Zone (including Kalimpong, Darjeeling and Jalpaiguri districts), the sealing of borders with West Bengal and restrictions of inter-state movements of vehicles should therefore be continued for

another one month. Odisha Government has sealed its border with Bengal since 40 percent of COVID-positive cases in Odisha have travel history to Bengal.

- Ban on the entry of foreign and domestic tourists and migrant labourers should continue for another four months.
- Mandatory 14-day institutional quarantine (no home quarantine) with active surveillance and testing of all the students and teachers who are studying and working in various schools, colleges and universities of Sikkim at their arrival.
- Mandatory 14-day institutional quarantine (no home quarantine) with active surveillance and testing of all the students and persons who are stranded outside Sikkim at their arrival.
- To prevent transmission, all quarantine offenders are subject to fines or mandatory placement according to relevant laws and regulations. The government in consultation with NIC or telecom operators should start GPS tracking of the location of those who are undergoing quarantine or isolation.
- State administration has to develop standard protocols for receiving and sending all stranded persons to make Sikkim Covid free.
- The administration must direct all individuals to do their first testing and thermal screening who stay outside Sikkim during the time of lockdown. Persons showing any type of symptoms of COVID-19 should be treated at the hospital of that state. The separate arrangement has to be made for their treatment in that state rather than bringing them back to Sikkim. Only asymptomatic persons should be allowed to travel Sikkim.
- The administration should make a district-wise proper arrangement for the quarantine of people and identify the sufficient number of quarantine centre at different places of Sikkim preferably at a remote location. All persons should be quarantine only in institutional quarantine centre identified by the administration. Payment based quarantine centre would lead to classism, meaning differential treatment based on social class or perceived social class.
- The odd-even formula should be introduced to minimise the movement of vehicles for at least one month after the lifting of lockdown.
- Social distancing, personal hygiene, wearing a facemask in the general public should be made mandatory.
- Expedite the process of setting up COVID-19 testing laboratory one at STNM hospital, Gangtok and another at District Namchi Hospital, South Sikkim. These hospitals are required to set up special wards or areas to isolate and treat patients individually in these wards/areas to prevent nosocomial infections. In addition to a testing lab, the government should start COVID-19 Rapid Testing Mobile Clinic.

- In consultation with the Ministry of External Affairs, the state should call off this year's Kailash Mansarovar Yatra through Nathula Pass. The external affairs ministry has been organising the Kailash Mansarovar Yatra through Nathula every year since 2015.

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Bridging the Employment Gap in Agriculture Sector: A post-COVID-19 Revival Analysis

Ojasvi Goyal*

Abstract

In the light of COVID-19, the reverse urban to rural migration of Indian workforce is having a far-reaching and contrasting impact on different sectors across the economic spectrum of the country. The productivity in well-endowed urban regions is likely to witness a downturn due to the shortages in labour supply whereas, in the ever vulnerable rural regions, the productivity is likely to gain momentum with a massive influx of workforce. Against this backdrop, it becomes imperative to bring under the lens, the most crucial sector of the Indian economy- Agriculture. In the wake of gloomy forecasts which predict a major economic quagmire in the country, a silver lining persists along with the agricultural sector of the economy. The infusion and absorption of the large workforce into the primary sector during the pandemic entails a structured analysis of the situation in hand. The present study is conducted to address the issue of how India can fully leverage the potential of the agriculture sector to revive the economy in post-COVID phase by eliminating the associated challenges and capitalising on the opportunity. The study presents a critical analysis of the impact of COVID-19 on employment in the agriculture sector and suggests a set of revival measures for the same.

Keywords: Agriculture; employment; labour supply; COVID-19.

Introduction

The COVID-19 pandemic has triggered large scale reverse migration from "destination" to "native source" in all parts of the country. As per the estimates of Census 2011, the total population of internal migrant workers in the country is 450 million and the actual numbers are much higher than what is captured by the data. The migrant labour force is regarded as the invisible driver of the urban economy and broadly falls under

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the informal sector of the economy. Post the imposition of nationwide lockdown to contain the exponential progression of Coronavirus, a gigantic exodus of workers in the range of 50 million to 120 million as reported by various sources has departed to their native places ["Explained: Indian migrants, across India" 2020]. Given the incongruous conditions prevailing in the so-called "native source" regions, the biggest challenge confronting the Indian economy is the absorption of the workforce in the rural economy for quick revival. More than 400 million workers in India who were employed in the urban informal sector are at the risk of falling deeper into poverty during the crisis due to retrenchment strategies likely to be pursued by businesses to cut down their costs [PTI 2020]. The onus for the absorption of erstwhile migrant labour lies in the rural economy and agriculture sector.

Methodology

The paper uses secondary data for analysing and interpreting the results using various reports published by credible sources such as Ministry of Statistics and Programme Implementation, NSSO survey, Census 2011, Periodic labour Force Survey, etc. The paper also deploys an economic model to test its relevance in the post-COVID phase.

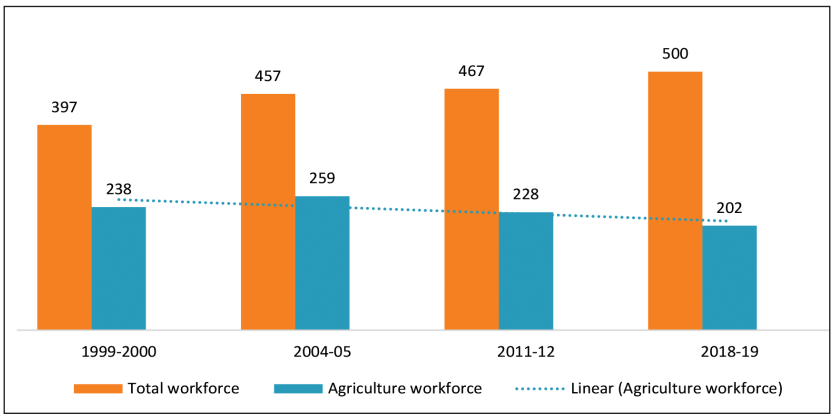
Analysis (pre-COVID Phase)

The study takes into consideration the two major challenges which plagued the agriculture sector in the pre-COVID phase. The first one is related to the shortage of labour faced by the sector and the second is related to the inherent bias and neglect of the sector in favour of manufacturing and services.

- **Labour shortage in Agriculture sector**

In the last two decades, the Indian economy went through a critical phase of development which significantly altered the nature of sectoral employment. The erstwhile surging agriculture sector has been ensnared into a quagmire due to conspicuously high unemployment rate (*Economic and Political Weekly,* 2015). The natural corollary of a booming economy is the exit of the workforce from the traditional sector to gain entry into the modern sector. However, in India, the entire transition process was facilitated at the cost of traditional (agriculture) sector as the trend was not just confined to a declining share of agriculture in employment but also resulted in a huge decline in an absolute number of workers in the sector. According to NSSO's periodic survey, more than 44 million workers left the agriculture sector from 2004-05 to 2013-14.

Figure 1: Year-wise total and agriculture workforce (in million)



Source: NSSO Periodic Survey 2017-18

The figure shows that the percentage of the workforce employed in the agriculture sector has been consistently plummeting from 60 percent in 1999-2000 to a meagre 42 percent in 2018-19. The magnitude and pace of shift away from agriculture has been substantial over the years which has accentuated the dismal state of the sector. The issue of labour shortage coupled with falling marginal productivity and escalating wage bills have made the sector unviable for employment. With the acceleration in economic growth and rapid urbanisation, a set of forceful "pull" factors emerged in the country which resulted in driving away from the workforce to the nonfarm sector.

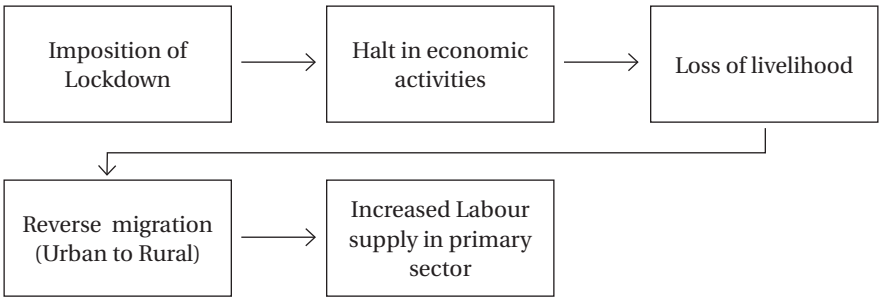
- **The neglect of the Agriculture sector in favour of Manufacturing and Services**

The inception of milestone NEP reforms in 1991 led to a pragmatic shift in the value addition by the agriculture sector (Experiences and Lessons, UNCTAD 2012). The noteworthy reforms resulted in a hike in minimum support price increased foodgrain procurement and a sharp rise in global food grain prices which marked the revival phase of the sector. However, the growth in the agriculture sector was short-lived and soon the interests of high revenue generation sectors industry and services overpowered the interests of agriculture which led to a deepening of agrarian crisis in the country. A large number of empirical studies have criticised the neoliberal policy regime behind the neglect of backbone sector. The neglect was so profound that agricultural indebtedness pushed several farming households into chronic poverty (Sah, Bhatt & Dalapati, 2008). The deceleration in productivity and wages of the sector completely squeezed the employment avenues, it could generate.

The agrarian crisis of India can be intrinsically linked to the inherent policy bias against agriculture. The regime of import substitution policies aggravated the discrimination

against agriculture because the protectionist measures taken to safeguard the industrial sector without commensurate protection for agriculture turned the terms of trade against the latter (Food and Agriculture Organisation, 2012). There is gross inadequacy in the pre and post-harvest infrastructure facilities in the rural areas, which have been leading, not only to inefficiencies but also to colossal wastages. The low value-addition and poor quality standards further make our agricultural products uncompetitive in the international market.

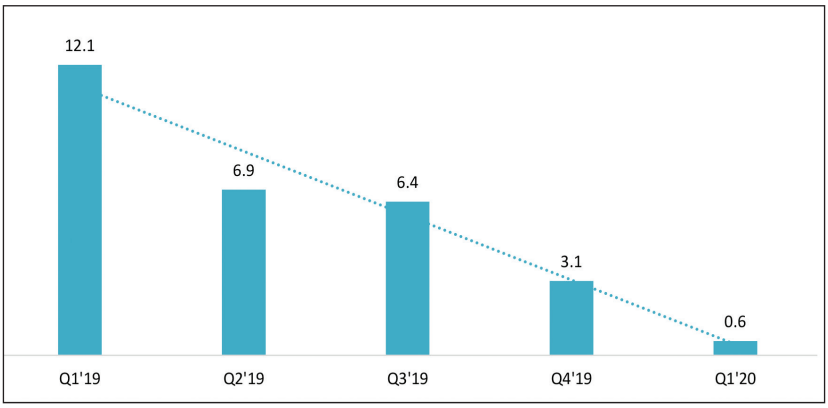
Figure 2: Five-step process followed by the economy



Source: Author

- **Imposition of nationwide lockdown:** Given the rapid transmission rate of COVID-19, a nationwide lockdown was imposed to flatten the bulging curve of infected cases. The rationale behind the imposition of lockdown was lucid and coherent, as to give a full swing implementation to social distancing and reverse the growth rate of the epidemic. Astringent and well-thought decision gained appreciation across the globe. However, the economic devastation which rippled across sectors was totally unprecedented.
- **Halt in economic activity:** Even before the onset of COVID-19, the global economy was going through a rough patch and was facing turbulences on account on disruption in international trade, slackened domestic demand and deteriorating terms of trade due to global uncertainty. The manufacturing sector growth slumped to 0.6 percent in the first quarter of 2020 fiscal as shown in Figure 3 below.

Figure 3: The quarter-wise growth rate of the manufacturing sector (in percent)



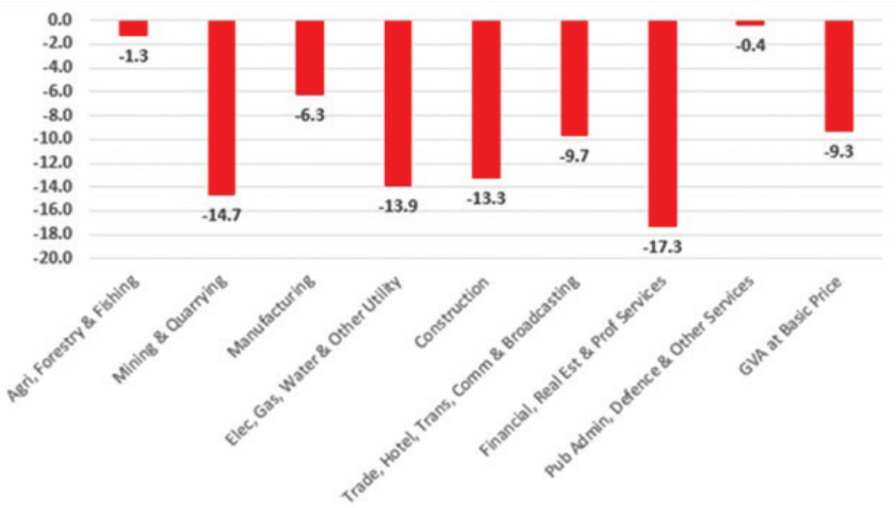
Source: Ministry of Statistics and Programme Implementation

The economic implications of COVID-19 superseded the health risks it exposed. The international organisations such as the World Bank and IMF have downgraded India's growth to a "duck" figure that is 0 percent growth rate for 2021 fiscal. The Indian economy lost approximately 2,000 crore per day during the initial twenty-one days of lockdown (*World Economic Outlook*, 2020).

Since the pandemic originated in China, a country which exerts centripetal force to drive trade across the globe, a major disruption in supply chains was observed in India which further hampered the productivity of essential industries such as pharmaceuticals, electronics, etc.

The major private players such as Larsen & Toubro, Ultratech, Reliance, BHEL temporarily suspended and reduced the scale of operations. The performance of infant industries and startups faced a serious setback due to the lack of funding options.

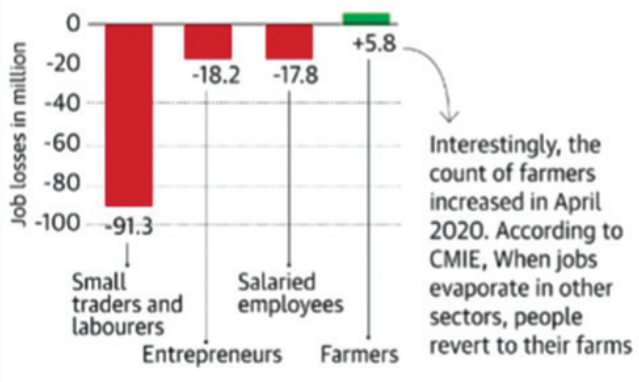
Figure 4: Estimated fall in sectoral growth in Gross Value Added from April-June'2020 (in percent)



Source: Economist Intelligence Unit

3. Loss of livelihood: The most catastrophic and enduring consequence of COVID-19 came in the form of massive job losses. The much-debated informal nature of Indian economy is undeniable, which constitutes 90 percent of country's total workforce (ORF, 2020). According to the report by the UN, the pandemic is expected to wipe out 195 million full-time jobs from India and can push 400 million informal workers deeper into poverty.

Figure 5: Unemployment rate in different job roles



Source: CMIE

The pandemic endangered a grave threat to the existing job roles which has further exacerbated the job crisis in the country. As per CMIE estimates, As per CMIE's data, the monthly unemployment rate in April 2020 reached 23.52 percent from 8.74 percent in March. The figure below depicts the average employment in India witnessed a steep decline from 404 million in 2019-20 to 282 million by the end of April. The impact of lockdown imposition on business enterprises has been colossal and far-reaching, because of which a significant number of small traders, labourers, salaried employees have lost their jobs mainly due to accumulation financial losses in the secondary sector.

4. Reverse migration: The reverse migration from urban to rural areas gave rise to a challenging task of absorbing the migrant workers, both socially and economically. The likelihood of returnee migrant workers going back to urban centres in the near future seems grim. The so-called urban pull factor of migration is unlikely to operate in the foreseeable future as the urban job opportunities are declining significantly due to recession (Ray & Dutta, 2019). In addition to that, the extreme suffering and plight faced by economically downtrodden will act as a further deterrent to moving back to cities. A major issue that has emerged with reverse migration is to reconcile employment in the rural informal sector, which traditionally depended on the urban sector.

5. Increased labour supply in the Primary sector: In the times of pandemic, a striking observation has been realised in the agriculture sector. According to CMIE data, agriculture is the only sector in the economy which has registered a positive employment rate amidst lockdown. The reason behind the same is sought to be the job losses in other sectors has forced people to resort to agriculture for livelihood. So, the agriculture sector has emerged as a bright spot in the entire economic turmoil. The return of migrant workers and their subsequent absorption in the rural economy can prove to be a blessing in disguise if the potential of the primary sector is adequately leveraged (Kundu, 2020). There exists a dire need to identify, evaluate and adopt models which harness economies of scale and deploy a large number of human resources. Since the labour-intensive sectors such as fisheries, horticulture have remained underdeveloped over the years, the COVID-19 crisis offers a unique opportunity to tap on the untapped potential of these sectors. In agriculture, the substitution of labour input for other factor inputs to maintain similar productivity levels can substantially increase the absorption rate of labour.

Another aspect of the increase in labour supply is related to the concept of feminisation of agriculture in India. With the bourgeoning migration by men from rural to urban areas, a considerable number of women are opting for multiple roles as cultivators, entrepreneurs and agricultural labourers. According to the data in

Agriculture Census for the year 2010-11 out of an estimated aggregate of 118.7 million cultivators, 31 percent were women. The estimate of Census 2011 shows that there has been a 24 percent increase in the number of female agricultural workers from 2001 to 2011. Across the globe, the empirical evidence suggests that women play a decisive role in ensuring food security of their households and communities, thereby preserving local agro-biodiversity (FAO, 2017). In the post-COVID period, with a huge influx of males back into the rural economy provides a viable option of men devoting higher proportion of time and efforts to job roles which require more physical strength whereas women can be employed in a cottage or household industries such as textiles, food processing, etc. **Results: How the conundrum of labour shortage can be resolved in Agriculture? (Post-COVID phase)**

Referring to the data provided by Census 2011, about 69 percent of India's population lives in rural areas and 39 percent are internal migrants in the country. In the times of COVID-19 pandemic, the onus lies in the smooth transformation of the rural sector into a matrix of local economies, thereby striking a balance between their diversified local production for domestic needs and trading the surplus. There exists a dire need in the system to re-evaluate and re-vamp the current expenditure and investment patterns in agriculture by various stakeholders involved, in order to accelerate productivity growth of agriculture at the macro level.

As the remittances sent earlier by migrant workers from urban areas is getting dried up, the consumption of non-food items might witness a decline in the rural economy. The wage rate of agricultural can also decline in the initial phase following the influx of job seekers in the primary sector. So, in effect, the rural economy needs to focus on internally exploring new labour-intensive employment avenues to generate viable employment opportunities and hence income. The present study suggests three alternate ways to achieve self-reliance in the sector: First, a two-pronged move to substitute labour input against mechanisation in agriculture which can a render cost-effective alternative and absorb excess labour. The mechanisation was brought as a result of a shortage of labour in the agriculture sector which in turn triggered further migration. The vicious cycle of the interplay between pull and push factors can end if labour-intensive techniques are implemented to enhance productivity and wages.

Second, the establishment of informal micro-enterprises and local community groups by weavers, artisans, craftsmen, etc. to suffice for local demand by local production using local marketing techniques.

Third, giving an impetus to rural employment generation schemes such as MNREGA and encourage local initiatives to build community infrastructure such as water harvesting, canal irrigation, etc. The present situation of centre and state-run schemes and social security nets can be improved to assure timely disbursement of wages and proper maintenance of records. With a decline in the share of remittances, the rural sector might face a liquidity crunch unless government regularly injects money through various government schemes. But a direct consequence of injecting money in rural economy is the outflow of the same money in the urban economy to fund internal transactions. Due to the shortage of money in the rural sector, a paradoxical situation can emerge in rural markets where there is a surplus of agro products but no money in the system to buy those and stimulate demand. A temporary quick fix to the paradox can be to delink and insulate the rural economy from external urban markets.

Therefore, the overarching objective of agricultural markets needs to be reoriented towards fulfilling local and regional needs instead of larger urban markets. There is a need to let go specialisation of crops and adopt diversification in more crops to meet the demand in local and regional markets. A switch to organic farming can also be an important step as the input costs of chemical fertilisers and pesticides are eliminated. This move can make agriculture more self-reliant by reducing its dependence on industrial products like fertilisers, pesticides, etc. As the global economies are all scrapping down the fundamentals of free trade market economy to protect and safeguard the domestic industries, the short-term needs for India is also to focus on inward-looking economy to protect the economy from external monetary shocks. The wheel of economic policy discourse should move in the opposite direction that is Indian should now focus on de-urbanisation and de-industrialisation.

Conclusion

Nevertheless, agriculture sector remains the largest employer in India, hence the future structural transformation in post-COVID phase must take into account the significance of agricultural transformation. Extrapolating from past trends and emerging conditions after the pandemic, India needs to gear up for the next revolution in the sector as long as its employment share is sizeable relative to the output share. To expedite transformation, the country needs to promote long term productivity growth in agriculture and facilitate the upgrading of farms and agro-enterprises within the global value chain. The best way to resolve agriculture versus industry debate is to simply recognise the evolving role of the rural economy in the

general and primary sector, in particular, following the pandemic. At the nascent stage of economic development, a major circular flow of economic activity is confined to rural areas.

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COVID-19 Pandemic: A Global Emergency

Sukhendu Dey*, Palas Samanta and Apurba Ratan Ghosh*****

Abstract

The rapid outbreak of COVID-19 caused by Novel Coronavirus started sometimes in the third week of December 2019 became a serious pandemic disease due to lack of common awareness, sufficient infrastructures and lack of management strategies. As a symptom, it attributes life-threatening respiratory failure and quick outspread as per Public Health Emergency of International Concern (PHEIC). World Health Organization (WHO) provides huge guidelines as mitigation measures to control the community transmission of the disease. Different research institutes across the globe in collaboration with international research organisations are continuously warnings and instructions to prevent community transmission and simultaneously involved to invent the most suitable vaccine for the purpose of COVID-19 prevention. Accordingly, the government of India released additional funding for establishing the modern equipment and infrastructure to fight against this pandemic COVID-19 collapse. Different countries across the globe adopted different mitigation measures to treat COVID-19 infected patients in hospitals, public nursing homes, quarantine centres as well as home quarantine to stop the COVID-19 transmission.

Keywords: COVID-19; Transmission; Prevention; Diagnosis; Treatment.

Introduction

The Novel Coronavirus disease 2019 (COVID-19), a viral infectious disease was first identified in the wet local fish market in Wuhan city, Hubei province in China (H. Lu.et al., 2020). Wuhan is one of the most congested cities in central China with 11 million populations. Initially, the most notable clinical symptoms were fever, dry cough, body

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pain, headache, dyspnea, viral infection in lung and respiratory failure. The first COVID-19 symptoms in Wuhan was identified to those people who are directly involved in trading of fish and a variety of live animals' meat in the wholesale Seafood market.[1] Chinese Centre for Disaster Control and Prevention (CCDC) agency collected the swab samples of affected people of Wuhan to identify the disease type on January 7, 2020 and demonstrated that disease was caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Later on, WHO (WHO, 2020a) named the disease as COVID-19.

World-wide Emergency in Health Sector

WHO declared the COVID-19 outbreak as International Concern of Public Health Emergency, a higher risk to vulnerable health system across the different countries on January 30, 2020. The concerned committees of disease prevention across the globe have stated that the outbreak of the pandemic COVID-19 can only be prevented by quick detection followed by isolation including self-home quarantine for at least 14 days and finally providing proper treatment to the affected people (WHO, 2020b). In this context, different government and non-government organisations/bodies have dedicated to produce scientific articles regarding safety and preventive measures to fight against its transmission COVID-19, and to overcome the pandemic situation. They are devoted to consolidate and disseminate the information through different open access journals by giving their best effort to aware the global people and scientific community (Wellcome, 2020) at large.

Transmission and Spread of COVID-19

Till today, a few numbers of studies are currently able to define the patho-physiological characteristics of COVID-19 and the spreading mechanism. At the present situation, it is believed that the numbers of increasing COVID-19 cases are generally due to human transmission through respiratory fomites (CDCP, 2020). Normally, a COVID-19 patient is more vulnerable, symptomatic when the 'respiratory viruses' become more contagious and possesses higher transmissibility/transferability. Typically, it is proved that the patients belonging to asymptomatic COVID-19 infection with incubation periods between 2 to 10 days become more prone to re-infection through the human body to human body transmission (Rothe et. al, 2020; Li et. al, 2020).

Prevention of COVID-19

US Centers for Disease Control and Prevention (CDC) and WHO recommended to avoid the movement at high-risk areas and not to come in close contact with symptomatic COVID-19 individuals to prevent the COVID infection. They have recommended to maintain the personal hygiene and frequent hand washing by the shop or liquid shop, use of sanitiser, use of PPE and face musk for the medical attendee.

Diagnosis of COVID-19

In general, the COVID-19 symptoms include fever, dry cough, body pain, headache, dyspnea; and this viral infection affects the lung and also causes acute injury of the kidney. The laboratory test must be required for the suspected COVID-19 patients by using two types of test namely viral tests and antibody tests.

Treatment of COVID-19

Nowadays, no proper antiviral or vaccine is available for the treatment of COVID-19 positive patients. So, different countries have adopted their own multi-centre clinical trials to control the spreading and treatment of the COVID-19 positive patients in the current situation. Generally, during the initial stage of treatment medical attendee provides first-aid treatment as antibiotic therapy such as paracetamol for fever, azithromycin for fever and dry cough of COVID-19 patients. Simultaneously, during this stage of treatment, they are provided with healthy food, personal hygiene, isolated medical hospital treatment rooms and beds, and continuous monitoring. The COVID-19 patients having a severe acute respiratory infection or problems are to be provided with immediate oxygen therapy. In the worst situation as a broad spectrum, the antibiotic treatment should also be administered within 1 hour of patient admission for the initial assessment (Rhodes et al, 2017).

Prognosis of COVID-19

So far up to, July 27, 2020, a total 654,181 numbers of death have been reported globally. The total 16,546,775 number of confirmed COVID-19 positive and 10,131,737 number of recovered COVID-19 patients have been reported in different countries, viz., US, Brazil, India, Russia, South Africa, Japan, Italy, China, Iran, France, Philippines, Thailand and Australia (Worldometer, 2020). However, nowadays, the positive COVID-19 cases and death are increasing in different countries. The current mortality rate of COVID-19 is 3.4 percent in the world (Li, 2020). The patients aged ≥70 years are recorded to have a too shorter duration of medical duration, i.e., 11.5 days (from initial symptoms to death), highlighting the vulnerability of COVID-19 pandemic.

Methods of Reduction of Transmission

All types of public transportation including long-distance bus routes, railways, metros and all types of national or international flight are totally stopping for controlling the outspread of COVID-19. All local types of markets shopping mall are closed for controlling the outspread of COVID-19. Finally, to stop the transmission and outspread of COVID-19 in the different countries across the globe announced a nation-wide lockdown. Only the emergency services are allowed in lockdown situations.

Conclusion

The COVID-19 outbreak has emerged as a health crisis of international concern. Globally, COVID-19 cases are growing rapidly day-by-day. Quarantine alone is not sufficient enough to prevent COVID-19 transmission primarily world-wide. Further, future more research are required to find out the exact mechanisms of COVID-19 outbreak and its transmission routes, i.e., from human-to-human or animal-to-human and finally the invention of a vaccine against COVID-19. However, the mode of pandemicity and spreading of COVID-19 are changing the speculations and statistics day-by-day and constantly impregnating to think on the different dimensions to figure out the limitations of this COVID-19 pandemic.

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The Factors behind the Highest Mortality Rate of COVID-19 at West Bengal in India up to May, 2020

Raju Singha*

Abstract

COVID-19 is the worst pandemic worldwide in this century. It originated in China (Asia) but shows the maximum mortality rate in Europe and America. The fatality rate in India is 2.87 percent (up to May 25, 2020) where West Bengal has the highest rate among all the states and UT in India. The advanced medical system is supportive to reduce the mortality rate but it is not the ultimate solution and that's why European and American countries have higher rates. The higher fatality rate in West Bengal probably associated with multiple reasons such as medical mismanagement, admitted at the last moment, less number of tests, physically weak population and geographical position.

Keywords: COVID-19; Pandemic; Mortality rate West Bengal; India.

The most cited word in 2020 is COVID-19 and probably it is going to be the most used word in this century along with the prefix pandemic. The pandemic started in November 2019 at Wuhan, China (WHO, 2020). Though the origin of this pandemic virus is not clear, most reports say that it originated from a bat and spread from an animal market of Wuhan. The virus is called as COVID-19 in short because of the name Coronavirus diseases which was started at the end of 2019. The virus is also known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The coronavirus was there in previous years which causes common cold but some variants also caused severe acute respiratory syndrome (SARS) (ICTV, 2019) and the Middle East respiratory syndrome (MERS) (Groot, et.al, 2013).

The previous variants of this virus were not so dangerous but this COVID-19 is highly contagious and hence spread rapidly throughout the globe. The first report was on November 2019 whereas within three months i.e. at the end of January 2020 it was found

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in about 147 countries and killed more than 7800 people (Sullivan et al., 2020). The age of this virus is about seven months and we know very little about the virus at this point but we do know that the infected persons may have a fever, dry cough, respiratory distress, sore throat, and patient may rapidly deteriorate to the point of intubation (Sullivan et al., 2020) (Gotzsche, 2020). The mortality rate is 6.30 percent worldwide whereas it is only 2.87 percent for India.

In this report, we are going to discuss how the mortality rate varies among different provinces in India and how the situation may be improved for the states with higher rates of deaths.

There are no proper antiviral drugs or vaccines developed for the treatment of COVID-19 infection. Therefore, the cure of a patient depends upon the antibody development within the body because our body has its own mechanism for preventing any disease. The medical support is requiring to extend the life span i.e. it giving time to the body for developing antibody (Gotzsche, 2020). Therefore, we may say that medical support is necessary for COVID-19 treatment but not sufficient. The development of antibodies takes the main role to cure a patient and this can be explained on the basis of mortality rate in different countries.

Figure 1a: Mortality rate in different countries
(Affected more than 20K up to May 25, 2020 are considered)

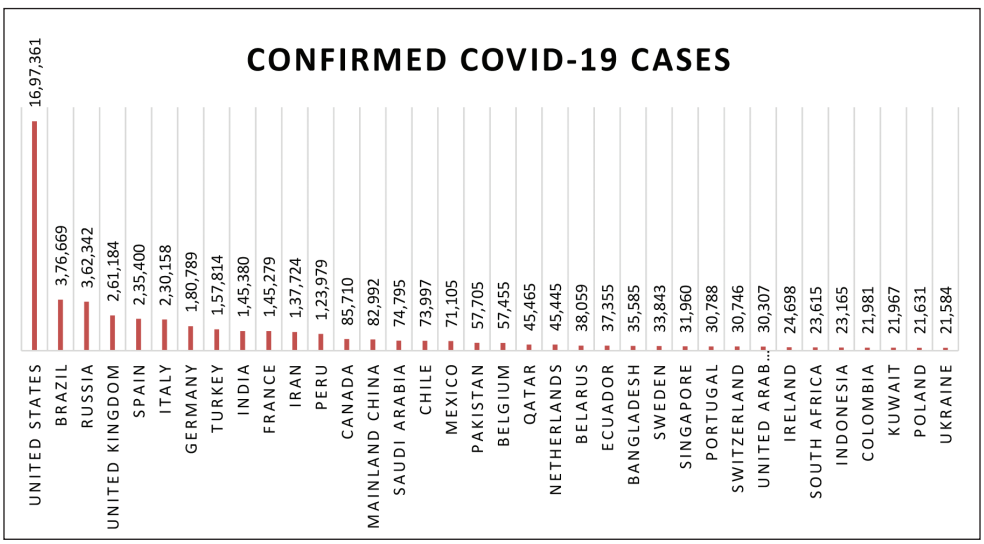
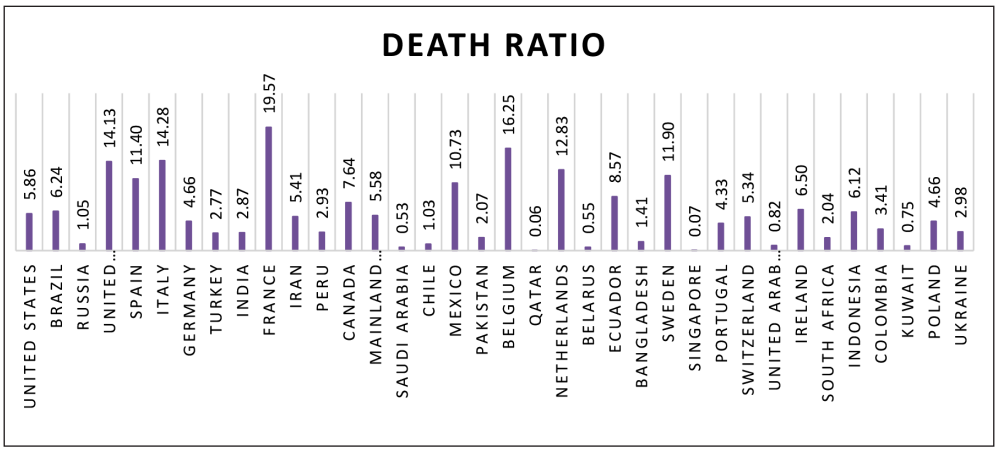


Figure 1b: Mortality rate in different countries
(Affected more than 20K up to May 25, 2020 are considered)



The Figures 1a and 1b says that the mortality rate for the USA, UK, Spain, Italy, France, etc. developed countries are much higher than several Asian countries (India, Bangladesh, Pakistan, Singapore, China, etc.) and African countries (South Africa) (WHO, 2020b). Now we can't say that all these Asian and African developing countries medical systems are much better than those developed countries. The mortality rate in Asian and African countries are less probably because of their 'geo-climate position' (hot regions) and they are little bit habituated with variants of SARS, MERS, etc. viruses and hence the human body has already developed mechanisms to prevent these. Therefore, we can conclude that developed medical systems may be supportive to cure/prevent COVID-19 pandemic but not the ultimate solution.

We are now focusing on the mortality rate in different states of India. We are seeing that the mortality rate for India is 2.87 percent (up to May 25, 2020) and the rate of its different provinces are shown in Figures 2a and 2b (Mygov, 2020).

Figure 2a: No of affected people in different states in India
(Affected more than 300 up to May 25, 2020 are considered)

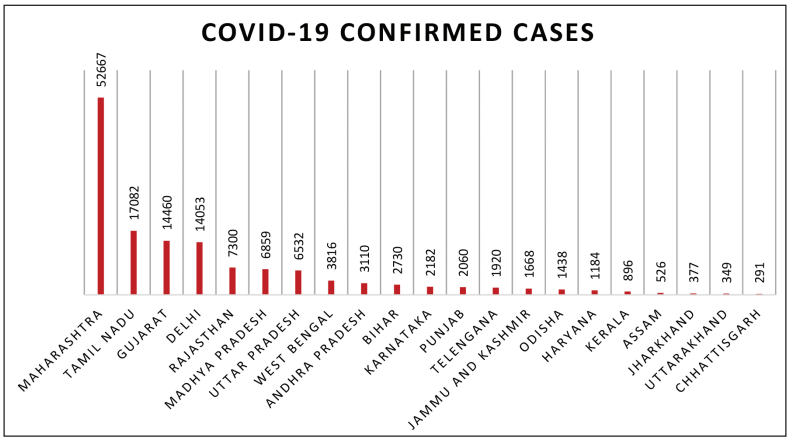
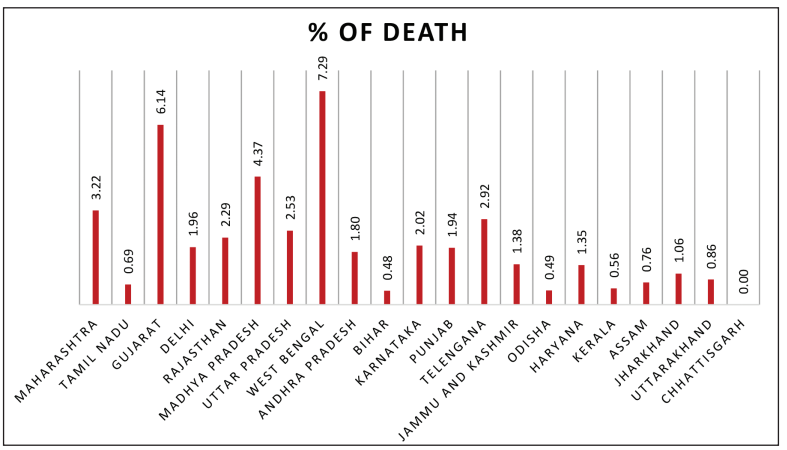


Figure 2b: Mortality rate in different states in India
(Affected more than 300 up to May 25, 2020 are considered)



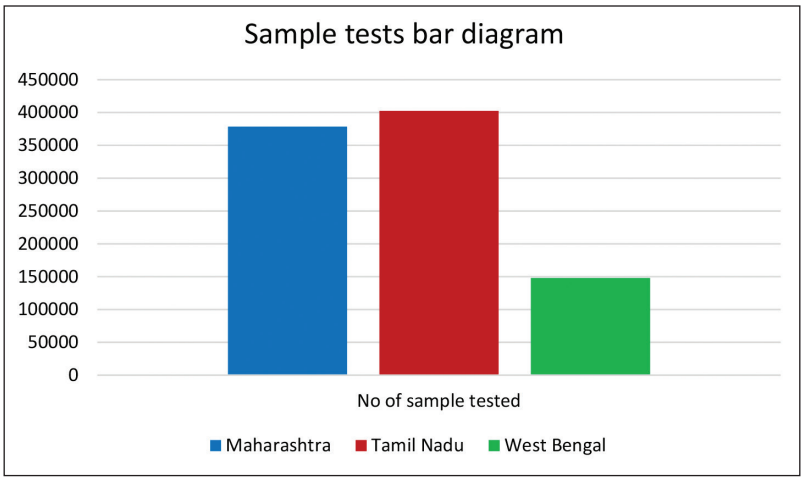
The number of COVID-19 cases is highest in Maharashtra (52,667) and about 14 times than West Bengal (3816) whereas the death ratio is highest for West Bengal. The number of affected cases in Tamil Nadu is second highest (17,082) but its mortality rate is tremendously low 0.69 percent. Gujarat is third in a number of infections (14,460) but second in mortality rate of 6.14 percent. The mortality rate is above 4 percent in three states only and these are West Bengal, Gujarat and Madhya Pradesh. The number of infections is mainly depending upon violating the social distancing (Henry, 2020) however, the mortality rate depends upon so many factors as given below.

Medical mismanagement: Proper medical support enhances the life span in critical situations. As we previously discussed, medical support is required for the patients who take a longer time to develop antibodies (self-defence system). Therefore, medical mismanagement may enhance the fatality rate.

Admitted at the last moment: If ais patient admitted at the last moment in a hospital, then the patient may face multi-organ failure before getting proper treatment in a critical care unit and hence the chances of mortality will be more.

Less number of tests: More number of tests identifies infections in the preliminary stage and therefore prevention of social transmission becomes possible and at the same time a patient will get proper medical support when required. Less number of tests also related to the previous point i.e. admitted at the last moment. The number of samples tested in west Bengal is much less in comparison to Maharashtra and Tamil Nadu as shown in Figure 3.

Figure 3: Comparison of sample testing in West Bengal

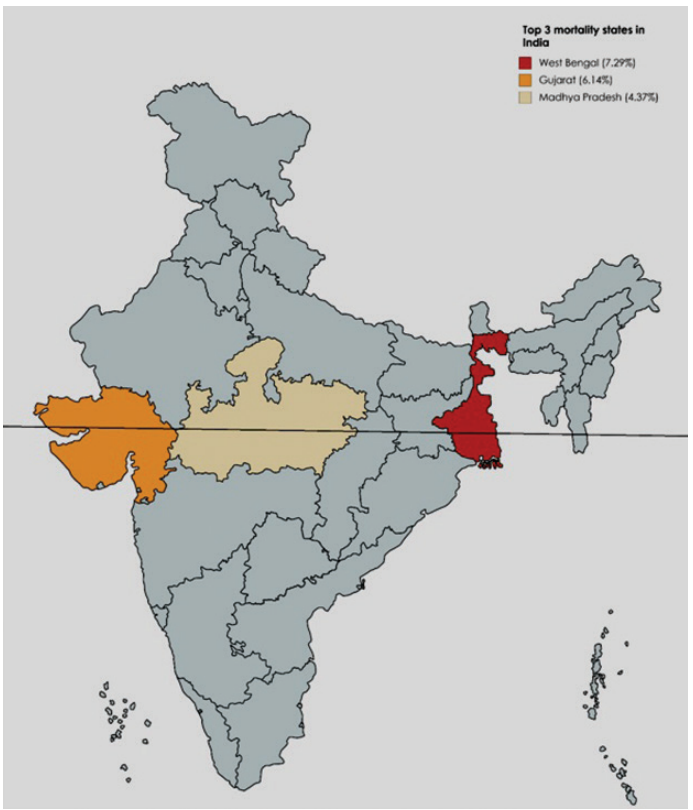


Research also doubts that the low death rate of Africa may be caused by less testing rates, and as of August 2020, the death curve of Europe is found to decrease whereas, for the Asian countries, it is increasing. Therefore, a number of tests play an important role in mortality rate (BBC, 2020).

Physical fitness: The cure of an infected person depends upon how fast the body develops antibodies. Now, a physically fit person with more immunity power gets antibodies in early to go to critical conditions. A physically weak person may go critical conditions before developing the antibody and hence have a higher rate of fatality.

Now West Bengal is mostly ina plain agro-climate zone for which the peoples are physically less fit compared to naturally hard lifestyle people. Therefore, the fatality rate in the plain agro-climate zone is expected to be higher. This is also applicable for Gujarat.

Figure 4: Top three mortality state in India up to May 25, 2020



Geographical region: Previously we have seen that mortality rates in Asian and African countries are less than American and European countries because of their geographical location and corresponding weather. Now West Bengal, Gujarat and Madhya Pradesh lie on a line going through the centre of Indian political map. Therefore, some geographical and corresponding weather may also affect the mortality rate. The report says that the effect of COVID-19 spread observed along the latitude within a country (CEBM, 2020). Although Jharkhand also lies along the line drawn in Figure 4, however effect of COVID-19 is not much strong may be due to its different population density as well as different land surface nature in comparison to West Bengal, Madhya Pradesh and Gujarat.

In conclusion,[11] the higher mortality rate of COVID-19 in West Bengal and Gujarat are associated with multiple reasons and the rate may be reduced by following preventive ways.

- Proper medical management support
- More number of tests and hospitalisation at an early stage
- Social distancing
- Physical and mental health awareness
- Social support system
- Economic security to the marginal peoples
- Spiritual resources i.e. spiritual gathering with obeying the standard operating protocol
- Obligation to others i.e. everyone has to take responsibility
- Willingness to seek help
- Future-oriented professional risk management plan

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Note

1. All the data are collected from the government of Indian and WHO website on 26 May 2020 morning i.e. up to 25 May 2020.

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Role of Professional Social Workers in Biological Hazards

Madhavi Varaprasad Peddada*

Abstract

Biological hazards pose more threat than any other hazards as more number of people in these types of hazards are vulnerable and risk is comparatively more. The impact of a biological disaster is biological, psychological, social, and economical. Biological disaster if not attended with proper preparedness can be an epidemic in countries like India with a huge population endangering the life of the many and putting extra pressure on the resources, finance, and governance. Professional social worker intervention can involve grass-root contribution, collaboration, and resource mobilisation from within the community to promote prompt response and resilience. So a deductive model has been employed to discuss the role of professional social workers in biohazards. The same has been put forth by a non-empirical article to contemplate on the proposed changes to bring a prompt and quick response. The article asserts that professional social workers through their intervention can play a crucial role in all the stages of disaster management.

Keywords: Professional Social Workers; Biological Hazards; Disaster; Preparedness; Mitigation; Restore.

Introduction

Biological hazards also called a biohazard to include viruses, parasites, bacteria, food, fungi, and foreign toxins that pose a threat to the health of living organisms, the security of property, or the health of the environment. It also includes include medical waste or samples of a microorganism, virus, or toxin (from a biological source) that can affect health. The Discovery of new microorganisms and the development of new genetically modified (GM) organisms are the new biological hazards. If the hazard becomes a disaster it is an epidemic having the potential to be pandemic. Biological disasters like

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all other disasters not only impact human and development but put the very existence of human beings under threat.

The impact of the biological disaster is not limited to physical but extends to the psychological, economic, and social aspects of the individuals making them and society more vulnerable. Biohazards further hamper the nation's growth and development. So it's vital to recognise it when it's a hazard and implement a holistic approach to tackle involving each and every member of the society.

When many individuals are involved collectively in an approach proper management of the same becomes essential to avoid herd or mob mentality. As herb mentality would eventually lead to aggressive, escapist, acquisitive, or expressive behaviour. Few vested interest people can utilise it to promote their personal goals.

A professional social worker's role is vital in not only managing and ceasing mob psychology but in ensuring that individuals actively participate and contribute in the approach to achieve the chalked out goals i.e., to either prevent the hazard or minimise the impact through timely intervention. Social Workers are being recommended as the profession is based on six core values which are:

- Service
- Social justice
- Dignity and worth of the individual
- Importance and centrality of human relationships
- Integrity
- Competence

Social work is a profession that had heavily borrowed from other sciences like anthropology, sociology, psychology, criminology, health, economics, philosophy, law, counselling, psychotherapy, etc. With cumulative knowledge from so many fields Professional, Social Worker intervenes in problem-afflicted areas or with problem-afflicted people and tries to resolve the problem by helping an individual to help themselves, treat, cure, or prevent psycho-social and adjustment problems. It not only limits individual challenges but deals with families, groups, and community problems effectively.

Social Workers can play an effective role not only in disaster but also in prediction, early warnings, and in the prevention of a hazard and simultaneously preparing individuals, groups, and community for facing it with minimum loss.

Their contribution can also be crucial in response, rescue, and in relief measures. Involvement in restoration and rehabilitation can also prove beneficial. Apart from

these, they can also prove beneficial in assessing and understanding the impact after the disaster and rehabilitation to deal efficiently with further such threats.

So widely speaking a professional social worker can play an active role in all the stages thus,

- assessing the problem and creating awareness among groups and communities of the risk
- implementing unified preventive measures
- preparing the individuals to deal with the disaster
- mitigating impact by motivating individual full participation and contribution
- undertaking rescue and relief measures effectively by ensuring all strata of the society are covered
- promoting restoration and rehabilitation according to the grass-root requirement
- conducting scientific study and research to understand the impact and identify the drawbacks, if any from individuals opinion
- build theories for further dealing with the situation more efficiently

So a professional social worker involvement at all stages, i.e., commencement, middle, and end-stage is very essential and helpful to not only provide human touch but to mitigate the impact largely.

Methodology

A deductive model has been employed by review of 23 articles to discuss through a non-empirical article a proposal to bring a few changes in the existing disaster management program. The aim of the article is to assist the disaster managers and other think tanks to contemplate the proposed changes to bring a prompt and quick response from the grass-root level involving community members especially the women, youth, and children.

Analysis

Early identification of biological hazards is more vital for a country like India where the population of India is vast and spread across all strata's with more population confided to the base of the pyramid, i.e., the aggregated population of poor, the middle class is more compared to upper-middle and upper class, increasing the ratio of the vulnerable population. A more vulnerable population means the highest impact and downfall on economic growth and development. The biological disaster may push the people on the lower strata further downwards and make recovery, restoration, and rehabilitation a long duration task. Similarly, India has a more young population than the older; proper

use of them and deploying work on a voluntary basis among biological hazards would make them more responsible and accountable. The involvement of young people will also contribute towards more innovative ideas and vast usage of technology to speed up the work. Survey of all the areas in detail would be helpful in not only assessing the risk involved but identifying the resources, and in preparedness planning. A survey needs extensive planning, time and effort, and designing, implementing, and analysing requires a professional as they are crucial aspects. The survey helps to understand the problem from the grass-root level providing more effectiveness in measures taken post-disaster. Professional involvement in the survey would also result in the analysis and interpretation of the data rather than a mere collection of facts and figures.

Community centres under professional social workers should be made mandatory at ward level all over India with running a pilot project. This community centre should be held responsible for dealing with their community challenges, mobilising their resources, and implementation of programs essential or required based on their survey for their community. These centres can play a vital role in not only creating awareness, preparing but also can prove effective in mitigating and restoration. The state can assist in case their resources are falling short, thus making the state government responsible for managing and the ward and centre accountable for execution and implementation allowing the centre governance to focus on more key and burning issues. Along with this decentralisation of power from the state to particular wards would make them accountable, responsible, and prompt while working on their specific area. As discussed earlier would provide more time to state and central governance to focus and address key issues.

Community centres can start preparing once the hazard is identified by training all while keeping women and youth at the forefront. Professionals through involvement in the community, and social action break through the stereotype role of the women and empower them to participate in not only preparedness but also in post-disaster activities. Simultaneously children the further of any nation should be prepared by conducting fake disaster drills and involving in projects that promote thinking and contribution to innovating ideas. Professionals can also contribute actively in other stages of disaster to only promote the active participation of the community but also cater to the special needs of the vulnerable population at times of disaster and take various other measures to mitigate the impact of the disaster.

Results

A study conducted by Yamin, reveals that disaster hinders the process of poverty eradication and sustainable development with poor and developing countries bearing

the most severe impact (Yamin, 2014). A report prepared by SAMHSA discusses that people on low socio-economic status engaged in jobs involving more risk with fewer resources are more likely to be less cognizant of the risks associated with their work and further asserted that they have no clue or plan of preparedness ready. Report highlights that poor sections of the society are unable to respond to official warnings about disasters. Due to which they suffer more serious consequences during impact, from property damage to homelessness to physical and financial impacts contributing to more adversity (SAMHSA, 2017). Young people involved in disaster management can be made at all levels i.e., identifying risks; designing community emergency plans as well as their own; exercising a plan; setting up early warning systems, and implementing response; mitigation; and risk reduction plans (Akeyo, 2010). Researcher Khorram-Manesh highlights that "Youth Are Our Future Assets in Emergency and Disaster Management" (Khorram-Manesh, 2017). Survey assists in disaster management activities: risk assessment, planning of mitigation measures, implementation, drawing lessons, and accommodating them to further mitigation measures, sensitisation, and so on (YE, 2015). Ponto states that survey research is a useful and legitimate approach as several strategies exist to reduce the potential for error. Survey research has clear benefits in helping to describe and explore variables and constructs of interest (Ponto, 2015). An illustration can be given on how the survey can be useful by referring to International Federation of Red Cross and Red Crescent Societies survey which was conducted to draw a report to shed light on potential areas of priority for countries strengthening their rules and procedures for managing disaster relief (IFRC, 2015).

East Asia Summit discussed that as a community play the role of the first responder its crucial to invest in strengthening community (EAS, 2014). UNOCHA, states that community engagement promotes access, avoids conflicts, makes aid more efficient while ensuring recovery and resilience (UNOCHA, 2017). According to Pollitt, decentralisation reduces information overload, which speeds up decision making and makes the public sector more efficient. Another argument is that decisions made closer to the citizens are more responsive to citizens' specific needs. Similarly, administrative decentralisation can reduce political tension since it reduces central governments' political intervention in local matters. It can also promote innovation as new ideas do not have to travel all the way up through the hierarchy to get approved (Pollitt & Bouckaert, 2011). Parthasarathy has further asserted the point of decentralisation but it's limited to state governance. Taking into consideration the key pointers one can conclude that decentralisation promotes a quick and prompt response which is the most essential requirement especially in disaster response (Parthasarthy, 2020).

A researcher suggests strategies to train and educate women in not only performing their expected duties in such an event but in defining their responsibility and input which they can offer for the inculcation of disaster safety culture amongst the society (Gokhale, 2008). Gautam and Mishra reminds us how women's involvement in Swayam Shikshan Prayog (SSP) in the Marathwada region of Maharashtra and in Latur and Bhuj earthquakes not only reduced women's vulnerabilities in emergency situations and the post-disaster but contributed significantly in repairing and rebuilding infrastructure. They further bring it to notice the cultural difference in India and the rest of the subcontinent, i.e., in India, certain women are apprehensive about confiding in or being touched by a male relief worker even in times of crisis (Gautam & Mishra, 2015). Giving the example of a coastal disaster, Nambiar explains how the role of women in disaster risk management is growing (Nambiar, 2019). Researchers asserted that the role of children and youth as potential informants within informal and formal risk communication networks have been significantly underestimated (Mitchell, Haynes, Hall, and Choong, 2008). Another researcher through their article asserted that children are resources that have to be cultivated and mobilised for disaster preparedness, response, recovery, and resilience (Pfefferbaum, Pfefferbaum and Van Horn, 2018). UNISDR in its report recognises Children, as "tomorrow's leaders" and key "agents for change", and identified them as the primary target in education and knowledge for disaster risk reduction (UNISDR, 2011).

The research paper highlights that there is scope to social workers to play an effective role in the preparedness phase, impact phase, disillusionment phase, and redevelopment phase. It also reveals that contributions of social workers in the recovery processes are getting recognition though active participation in redevelopment and social planning is the need of the hour (Wong, 2014). A study conducted in Finland concludes that enhancing social capital in client work, social work's own organisation, and in multiorganisational networking, should be central in disaster social work as many positive impacts have been observed (Rapeli, 2017). Exploring the role of social work in post-disaster researchers had highlighted that workers can solidify, best practices and evidence-based responses at the micro to macro levels to provide greater conceptual clarity for the experiences of disaster survivors among the many others (Bauwens & Naturale, 2017). A paper shows that professional social worker can play the role of the catalyst which includes evacuation, search and rescue, advocating support group, facilitator for fundraising, outreach for social service provider and community health worker, supervisor, volunteer, and coordinator (Kamrujjaman, Rusyidi, Abdoellah and Nurwati, 2018).

Discussions

Based on the above analysis and results following steps for dealing with biological hazard has been drawn which is subjected to the review and contribution of experts.

- Social Worker collaborating with bodies that identify the biological hazard at its early stage providing time to officials and policymakers to build a strong action plan. International Society for Infectious Diseases (ISID) ProMED, Program for Monitoring Emerging Diseases, first reported on what has now been identified as COVID-19 (SARS-CoV-2) out of Wuhan, China on December 30, 2019, when it was still undiagnosed pneumonia: (ISID, 2019). India National Disaster Management team for biological disaster should build liaison with bodies that provide first-hand information about the onset of the disaster like ProMED.
- Professional social workers should work with low socioeconomic groups to create awareness, plan, and prepare for a disaster as a community to mitigate the impact on their psycho-social and economic life. Professional social workers motivating, counselling, and training young people at an early age to involve in risk assessment and preparedness plan to pool innovate ideas and exploit technological usage to the fullest extent. Workers through youth can also assist in keeping a tap on rumours and misleading information that promote disrespect for governance and noncorporation leading to mass agitation and voluntary disobedience putting their lives in danger increasing the ratio of impact.
- Surveys conducted by professionals would not only enhance the quality but also promote human touch and escalate the views, ideas, and requirements of the people to the top planners. National Census around the corner each city, village to be divided based onwards and further divided into areas under each police station. Detailed surveys concentrating on hazards, risk, and vulnerability of masses would prove advantageous in not preparing and mitigating the risk. Simultaneously a survey post-disaster would assist in collecting people's views, ideas, and feedback which would not only provide a clear picture of the impact, but would identify corruption, loopholes, and drawbacks if any in the executed plan. Thus, a survey by a Social worker would not only be professional and cost-effective but assist in improvising and enhancing the existing plan and mitigating the impact further. Simultaneously it would also assist the system while planning out policies for the overall development of the nation and in tracking its implementation.
- Community Centers for each ward under professionals can create awareness, identify risk and vulnerability, prepare, mobilise its resources, raise funds, and implement restoration programs catering to the need of the local people. While simultaneously addressing psycho-social or relational or maladjustment challenges.

- Along with this decentralisation of the power to local authorities i.e., to each ward would make the ward leader and its member more accountable and responsible, who together with professionals can plan, and prepare according to their people requirements and mitigate the impact of a disaster and restore more efficiently by addressing their individualised challenges and ultimately make themselves self-sufficient and resilient to further disaster reducing the burden on central governance.
- Through community centres, professionals can motivate, train, and promote women in disaster preparedness, mitigation, and post-disaster efforts along with youth and other members of the community. This step would help Indian women involvement and reduce their vulnerability ratio while collecting their inputs which might assist in lowering the impact.
- Along with women the professional social worker by visiting schools can conduct fake disaster drills and motivate and train them to contribute their innovative ideas. These would not only ensure the inflow of ideas from young minds but would promote a more responsible and accountable citizen who is ready to face adversities. Children's disaster drill response can be reported by professionals to respective authorities to bring about a change in curriculum to ensure young minds understanding and contribution in preparedness from the early age of their life. Through the drill, the worker can also assess the qualities of feeling, response, responsibilities and accountability towards one's community and promote the same among children through proper activities at regular intervals.
- The professional social workers in disaster response can focus on senior citizens, physically and mentally challenged, less privileged, physically sick, pregnant women, and other vulnerable population of the society by categorising them to different groups. To ensure that their existing challenges do not aggravate, simultaneously provide therapies to the vulnerable group to deal with their psychosocial problems that spring due to disaster. To also ensure that the vulnerable group rights and dignity are not compromised amidst the disaster. The intervention of professional social workers can place an orderly planned preparedness program in place with humanitarian touch catering to the needs of different groups of the society which would ensure an effective response by community members in disaster mitigating the impact. Simultaneously their presence can make the short-term and long-term post-disaster recovery measures a smooth transaction. And with efficient follows-ups and interaction, the psychological post-disaster impact can be minimised to a great extent.

- Among the other vital roles, the workers can also in collaboration with media create awareness, and assist in efficient preparedness and planning follow up. It can also collect inputs of media negative influence on the community and submit to policy-makers to amend laws and regulations to overcome it.
- Professionals can also provide an in-depth report of the entire process to policy-makers to know which efforts are to be strengthened and which to be substituted.
- Professional workers can also be part of the medical team and promote psychological support to the patient and their family members. It would not only save the time of medical staff which can be used to attend more cases but also provide the psycho-social aspect of the patient, history, and little additional information which might prove beneficial in the execution of treatment and gaining quick recovery.

Conclusion

Efforts of Professional social workers can be divided into hazard identification; preparedness, disaster response; and post-disaster measures. In each of these, the workers can play a crucial role and assist the community with its own involvement and resource to identify, prepare, face, and restore with minimum losses. Thus, ensuring that the efforts in put by governance in meeting sustainable development are not futile and the nation's economic development is not pushed downward to a few centuries back hampering the growth of the country and its citizens.

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Preliminary Situational Analysis of Impacts and Risks of COVID-19 Pandemic on Crop Production in Parambikulam Aliyar Basin, South India: Need for Capacity Building

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Abstract

The present paper deals with the risks associated with Coronavirus (COVID -19) pandemic- an infectious disease, faced by the farming communities of Parambikulam Aliyar Project (PAP) Basin areas, Tamil Nadu, South India. The cascading impacts of the pandemic have resulted in a crisis situation for agriculture in many parts of our country. Owing to the severe global crisis imposed by the COVID-19 across India, participatory research work has been undertaken to comprehend and validate the local specific risk in crop production systems in Parambikulam Aliyar Areas. We assess the immediate challenges that COVID-19 has posed to the farm sector and suggest mitigation measures to ensure a sustainable food system in the post-crisis period. Contact details of around 300 farmers were gathered from Regional Coconut Research Station Aliyar, Agriculture offices of Anaimalai, Pollachi north and Pollachi south block of Coimbatore District. Questionnaires were prepared in vernacular language 'Tamil' and responses were collected. Questions related to their knowledge, attitude and practice were prepared and forecasted as SMS through social media like whats-app & messenger. It was also an attempt to understand the technology adoption in these areas whether the farming communities are able to respond to the available agro advisories services. A 4-point rating scale was used for measuring Attitude and Problem Confrontation Index score (AMI & PCI) on COVID-19 risks and impacts on crop cultivation. Farmers were randomly selected and a telephonic survey was also conducted

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for 122 farmers across the grain-producing blocks in PAP basin. As indicated by Attitude Measurement Index (AMI), majority of the respondents were moderately favourable for taking up farm risk management measures and adaptations in these challenging times. Based on the Attitude Measurement Index (AMI) score, using farm machineries for harvest got first ranking as 44 percent of the respondents showed highly favourable attitude towards using it to cope with the challenges of labour shortages. Risks due to cessation of monsoon rainfall got the first highest score (PCI-325), hence it was considered as the 1st ranked problem prevailing in this area. The risk of lockdown on Kharif Production and yield is expected as a serious issue over PAP as many of the respondents have either left their arable lands fallow or utilised only half of their land under Kuruvai cultivation got the second-highest score (PCI-308) respectively. It was found that the pandemic has impacted their farming and posing several risks for the forthcoming cropping seasons. The multitudes of risks may be mitigated through capacity building and timely implementation of resilient strategies.

Keywords: Situational Analysis; Agriculture; Impacts Risks COVID-19; Pandemic; Crop Production; Parambikulam Aliyar Basin; Capacity Building.

Introduction

The health crisis due to coronavirus disease (COVID-19) has impacted nooks and corners of lives in developed and developing countries almost alike (WHO, situation report and scientific brief 2020). Cropping systems in developing countries may have more impacts due to COVID -19 lockdowns induced economic slow-down than those in developed countries, FAO (2020). All spheres of economic activities were shut down and the production and supply of goods and services are disrupted across the world. COVID-19 poses critical challenges for the well-being and normal functioning of all economic sectors.

Along with the pre-existing challenges of the rise in land surface temperature, evapotranspiration, unexpected vagaries in rainfall distribution, increasing desertification, as mentioned by IPCC for dryland areas, IPCC has also cautioned the world of an increasing compound nature of impacts and cascading risks on multiple systems and sectors posed by the climate change (IPCC, 2019, NIDM, 2016, UNDRR, 2017, IPCC, 2012 & 2014)). COVID-19 may worsen the issues for associated economic sectors and livelihood of people (IPCC, 2019; FAO, 2020).

Among the pre-existing challenges, drought is a complex and least-understood natural disaster, the impacts of which often depend upon the nature of socio-environmental

background of an area and affects more people than any other disasters in India (Gupta & Sehgal, 2011). Mohita (2013) reported that more than 68 percent of net sown area in India is prone to frequent drought, which varies temporally and spatially. Agriculture drought was often leading to decline in net sown area, decreasing the production, fall in purchasing power, rising unemployment, water scarcity, inflation, widespread malnutrition and spread of diseases (Adger et al., 2003). More than a billion people currently live in water-scarce regions, and as many as 3.5 billion could experience water scarcity by 2025 (Joppa, 2018). The present study area lies in the state of Tamil Nadu, south India is known for water scarcity and drought that occurs in every 2.5 years. COVID-19 may exacerbate the already existing challenges for such dryland agriculture systems. Novel coronavirus can also be treated as chronic drought-like situation for human bodies as it is chiefly considered as a respiratory disease that affects lungs. However, it is found that the virus also affects the liver, kidney, heart, brain and blood of humans (Puelles, 2020), weakening the entire system. However collective and co-ordinated actions may support in achieving timely resolutions for unprecedented challenges.

IFAD, 2020 has reported the possible impact of COVID-19 on the achievement of the Sustainable Development Goals (SDGs), particularly on SDG-2: food security – both in China and globally. Informal sectors, agriculture and the rural economy of India have also been impacted by the COVID-19 lockdown. World food programme of FAO (2020), reports that India is home to a quarter of all undernourished people worldwide, making the country a key focus for tackling hunger on a global scale. The agriculture sector was already strained and the pandemic is adding-up the impact on the depending sectors. Regardless of high agricultural production, the yield of many crops in India is already lower than in other developing countries like Brazil, China and the USA. According to Food and Agriculture Organisation of the United Nations (FAO, UN), even though India is the second-highest rice producer in the world (as of 2013), its yield is lower than China, Brazil and USA (FAO, 2019).

The demand for food is estimated to grow 50 percent by the year 2050 with reference to the base year 2010 (FAO, 2019, Islam, 2020). Considering that the agricultural sector contributes to about seventeen per cent of the GDP of India and employs about 55 percent of the population, the impact of COVID-19 on India's overall economy would equally affect food security sector. The UN's World Food Program reports (2020) that around 370 million children are at risk of losing school meals due to closures of school which are usually the only meals of millions of children across the globe. The school-going children of our rural population are also facing the same challenges due to closure of school due to the pandemic.

As the stepwise nationwide lockdowns were announced in our country to combat the spread of the covidvirus, the rabi harvest was ready to get harvested in many parts of our country. In South India, especially in Tamil Nadu, rice, maize, sugarcane, groundnut, vegetables and flowers were ready to be harvested. However, harvesting was hit due to the reverse migration of the farm labourers back to their villages. This research seeks to make such an assessment in the context of three agricultural blocks in Coimbatore district in the state of Tamil Nadu. With this existing knowledge on the general impacts of the pandemic on agriculture ecosystems, it was an attempt to assess the immediate challenges that COVID-19 has posed to the farm sector of Parambikulam Aliyar Basin and suggest mitigation measures to ensure a sustainable food system in the post-crisis period.

Methodology

Anamalai, Pollachi north and Pollachi South blocks of Coimbatore district are considered for the participatory research. These blocks come under the Parambikulam Aliyar Basin. The track receives a total rainfall of 802 mm in a year and of this, nearly 300 mm during the south-west monsoon, 333 mm during northeast monsoon and 169 mm during summer. Most of the villagers depend on the coconut, groundnut, sorghum and maize plantation for their livelihood. The main river flowing through this area is Aliyar. ParambikulamAliyar Basin (PAP) has a geographical extension between 10.3617543°N and 77.0920165°E. Parambikulam Aliyar project basin contemplates diversion of surface water from Anamalai hills of Western Ghats to irrigate dry command areas of Coimbatore and Erode districts. The southern part of this region is covered by structural hills – Anamalai hills, Aliyar, Sholayar and lower Nirar reservoirs. Pollachi North and Pollachi south already come under over-exploited category of groundwater developments.

Table 1: Surveyed areas in PAP

Sl.No	Block Name	Area of the block in sq.km in PAP	Full block area in sq km	% of the block in PAP
1	Pollachi North	247.64	285.57	86.72
2	Pollachi South	184.3	206.36	89.31
3	Anamalai with Valparai area	1017.38	1017.38	100

Source: State Statistical Dept, Coimbatore

Table 2: Major Crops cultivated in PAP

Major Crops Cultivated in PAP			
	Total Cropped Area (ha)	**Production (tons/ha)**	**Productivity (kg/ha)**
Paddy	5200	20100	3865
Sorghum	38200	41900	1097
Maize	17500	68500	3914
Groundnut	17050	35600	2088
Sugarcane	2000	270000	135000
Coconut	85831	-	9,000nuts/ha

Figure 1: Study area (a) Use of combined harvesters for Rabi rice harvest; (b) Groundnut and Sorghum Growing Areas in PAP; (c) Aliyar Dam (Photos were taken pre-lockdown period during the field visit)

Materials and Method

The study was conducted in three blocks namely Anaimalai, Pollachi North and South of the Parambikulam Aliyar Basin in Coimbatore district. The study area was

selected purposively for investigation, because a socio-economic vulnerability assessment was already proposed for this area under the DST scheme" "Enhancing climate change adaptive capacity and agricultural productivity in Parambikulam Aliyar Basin areas through ICTs and other technological interventions" for running from the year,2019-2020 (Ref:http://14.139.187.14/directorate-cm/research-projects/). Contact details of around 200 farmers were collected from Regional Coconut Research Station Aliyar, Agriculture offices of Anaimalai, Pollachi north and Pollachi south block of Coimbatore District. Key questions related to attitude and perceptions on COVID-19 impacts were prepared in vernacular language 'Tamil' and English and responses were collected. Simple random sampling was used in selecting the respondents from a total of 300 farmers from the population i.e. about 61 percent of the total population was the sample size of the study. The empirical data were collected using personal telephonic interview method during the COVID-19 lockdown period. It was an interactive community-based descriptive survey conducted during the period of June 10-15, 2020. Questions related to their knowledge, attitude and practice were prepared and forecasted as SMS through social media like whatsapp, messenger. It was also an attempt to understand the technology adoption in these areas whether the farming communities are able to respond to the available agro advisories services.

Measuring the attitude score and problem confrontation score of the surveyed farmers was the focus variable of the study. For this purpose, a 4-point rating scale was used for measuring Attitude and Problem Confrontation Index score (AMI &PCI) on COVID-19 risks and impacts on crop cultivation. The farmers were asked to give their response against 5 selected questions related to impacts. The weights assigned for each response were: 3 for high confrontation, 2 for medium confrontation, 1 for low confrontation and 0 for not at all. The PCI score was obtained by adding weights of responses to the problems and therefore, for making rank order, attitude score and Problem Confrontation Index (PCI) was computed as used by Hossain and Miah, 2011.

Attitude Measurement Index of respondent was computed by using the following formulas:

AMI=AH*3+AM*2+AL*1+AN*0……(1)

The PCI was computed by using the following formula:

PCI=PH*3+PM*2+PL*1+PN×0……..……(2)

[Where, AMI= Attitude Measurement Index & PCI = Problem Confrontation Index; AH and PH = No. of the respondents expressed attitude and problem as "high"; AM & PM = No. of the respondents expressed an attitude and problem as "medium"; AL & Pl =

No. of the respondents expressed problem as "low"; AN & PN = No. of the respondents expressed problem as "not at all"].

Results and Discussion

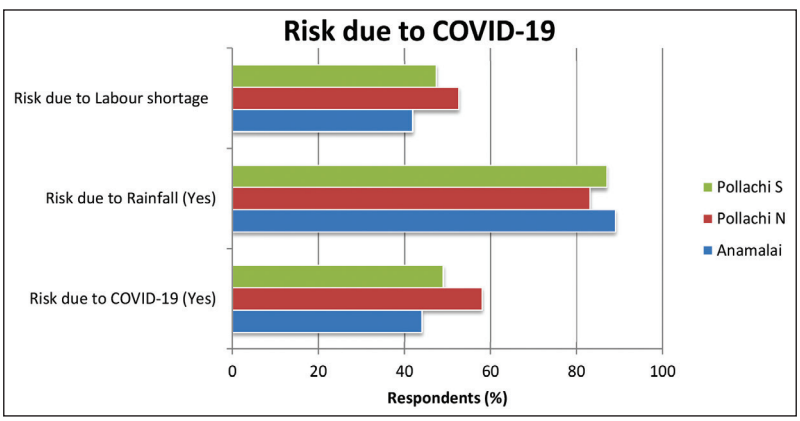
The research employed a combination of quantitative and qualitative methods to meet the proposed objective. Semi-structured in-depth interviews were used as a qualitative tool for data collection in order to get an in-depth understanding of the impacts of a pandemic on PAP's cropping systems. This study brought out that 44.2 percent of farmers had experienced impacts and risks due to the pandemic. The average farm size of the representative farmers was found to be 0.5 Ha to 1.5 Ha categorising them into small and marginal farm structures. In the PAP basin, the surveyed farmers indicated that rice which is a labour-intensive crop is cultivated only in the command areas of Aliyar and Palar dams. Starting from sowing, transplanting till harvest, rice cultivation is labour intensive. In the entire PAP basin, Anamalai block, Pollachi north, Pollachi south and hilly terrains are mostly rainfed and mainly groundnut, maize and fodder sorghum crops are cultivated in these areas. As per the survey, it was clear that land preparations and weeding for the groundnut crop are labour intensive. Especially in a dry land area, land preparation for cultivation is a necessary step for crop cultivation. In perennial crops like coconut, labour is required at the time of manuring, for the timely plucking nuts and for post-processing of the nuts (Copra) for extracting oil and coir products.

An apparent difference in perception levels and the actual COVID-19 impacts were noticed from the survey. Out of the surveyed farmers, 53 percent alone could complete their land preparations during this season for groundnut cultivations with the help of family and community partnership. Almost 81 percent percentage of the farmers expressed non-availability of farmworkers due to lockdown has impacted their current crop cultivation and sale of previous *Rabi* crops. For instance, the entire PAP basin coconut growers faced sweeping fall in the sale of coconuts due to lockdown. Farmers conveyed that they could sell only one-third of their produce. The sale of matured coconut and tender ones were facilitated only through the local intermediaries, as Wholesale traders completely avoided bulk purchases. There was a panic sale at very low cost as people started buying and storing more. Many of the coconut growers have not received value for their sold produce for the past two months. Labour shortage has affected the coconut farmers in PAP. In order to minimise the whitefly menace, the farmers were advised to spray pesticide, due to inadequate farmworkers, it was delayed. Land preparation, sowing, weeding and fertilisation in the current growing

season was negatively influenced by the combined effect of cessation of monsoon rainfall soon after the onset 80.9 percent of the farmers responded that there is an acute shortage of farm labour due to lockdown; however, 19.1 percent responded that labour shortage was not faced in that area. Compared to the respondents of Anamalai blocks, the farmers of Pollachi north and south blocks could perceive the general impacts and risks of COVID-19 on the crop production. Fifty-eight percent of the farmers, among 122 interviewed, had an opinion that COVID-19 lockdown has impacted their livelihood.

The Anamalai block has been suffering severe dry spells even in June 2020 and they fear that combined impacts of COVID-19 and shortage of rainfall may impact their livelihood and local food security. As a matter of precaution from incurring losses, the respondents pointed out that they have either reduced their land area under cultivation or used only half of their arable land for cultivation. This time, the Kharif cultivation is found to be meant only to sustain their individual consumption needs or local sale only. Many of them told that they couldn't travel to the nearby agriculture offices to collect seed supply. Hence they are using their own limited groundnut seeds for sowing. Many farmers completed their farming operations with the support of their communities and family members.

Figure 2: Situational analysis of perceived risks in agriculture in PAP



What is most alarming risk in the current context is the absence of monsoon rainfall after its onset. Hence farming operations are put to a complete halt after sowing of groundnuts and sorghum in all three blocks. Anamalai block is completely dependent upon rainfall as most of them are practicing dryland farming (Figure 2). Respondents

from Pollachi North intimated that COVID-19 has put restrictions on travel, hence the availability of farm labour from nearby locations is hit

Table 3: Timeline/Seasonal calendar of Impacts of COVID-19 in PAP

Crop calendar of PAP that was hit by lockdown in 2020

February	**March**	**April**	**May**	**June & July**
Rabi *(Sambha)* Crop Flowering and grain set for cereal crops in PAP	Rabi rice harvest	Shortage of labourers	Land preparation of Groundnut and Sorghum and Maize crop was hit	Khariff (*Kuruvai):* There were only less area under production *of Kuruvai* crops
	Coconut tree cleaning and nut plucking	Sale of coconut was hit,	Shortage of laboures felt	Labour shortage for large coconut farms
	Rabi groundnut harvest	Sale of groundnut was hit	There were livelihood impacts	Sowing, weeding, fertiliser and pesticide application was hit
	Copra making was hit	Transportation, storage and Sale of rice were hit and transplantation of summer rice was delayed.	Seed supply and seasonal sale and supply of flowers were hit due to lockdown	Cessation of rainfall withered the already sown crops and seedlings in the nursery

The results show that majority of the respondent farmers were not able to appreciate the social distancing norms (Figure 3). Almost unanimously they felt that such things are not possible at farm sites. Very few had responded that they were not bothered about social distancing as family members and friends are engaged in farm operations. It was difficult for many to even comment on social distancing. Hence, it was seen that following the guidelines on social distancing, sanitising and wearing masks may not be practical for primary activities. A few farmers pointed out that a few large scale farmers who have the luxury of deploying technology for harvesting Paddy are relatively more insulated as it reduced their dependency on large numbers of manual labour.

Figure 3: Shows the respondents' attitude regarding following social distancing during farm operations

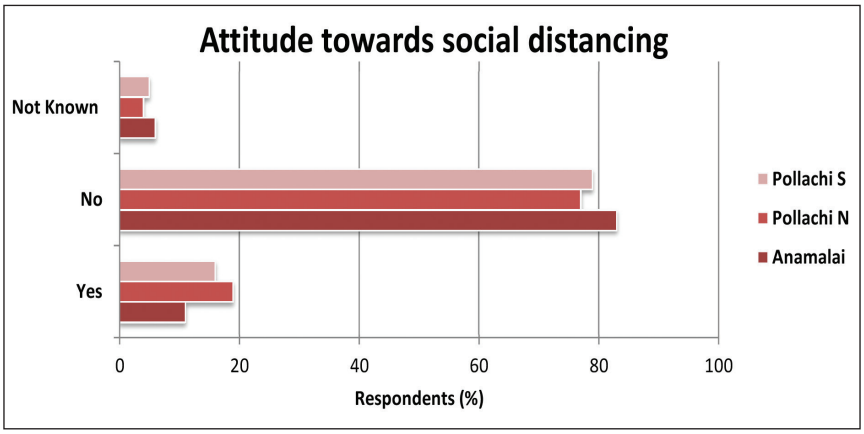
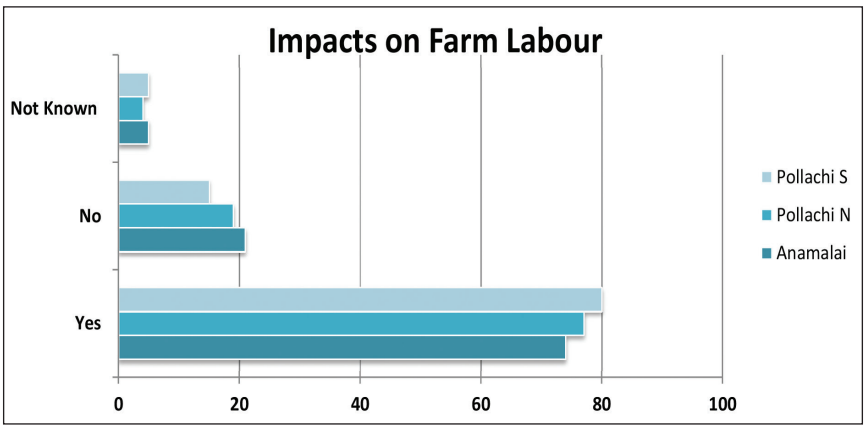


Figure 4: Shows the impacts of COVID-19 on labourers to carry out farm operations



Groundnut and sorghum have been extensively grown in these semi-arid tracts over many years. Farmers are foreseeing COVID-19 and shortage of rainfall as a major reason for the decline in the forthcoming seasonal crop output. The reason for the low yield may be due to inefficient farm operations due to labour shortage, less availability of quantity and quality seed, inadequate farm technologies and farming techniques, small farm size, and irrigation facilities. As the south-west monsoon rains for the month of June shows 52 percent deficiency for Tamil Nadu. In PAP basin, the surveyed areas do not come under canal irrigation.

As reported by Khatam et al. (2010), Attitude Measurement Index (AMI) and Problem Confrontation Index (PCI) score has been calculated. A few of the surveyed farmers have shown a highly favourable attitude towards taking up Kharif (*Kuruvai)* crop cultivation, following social distancing and using farm machineries for harvest amid all risk and challenges. However, majority of the respondents were moderately favourable for taking on-farm risk management measures and adaptations (Table 4). Based on the Attitude Measurement Index (AMI) score, using farm machineries for harvest got first ranking as 44 percent of the respondents showed highly favourable attitude towards using it to cope with the challenges of labour shortages. Very few farmers have shown interest to work in the near-by coconut husk coir manufacturing small scale industrial units.

Table 4: Attitude Measurement Index (AMI) score of the surveyed farmers

	Highly Favorable to not at all Favourable No of Respondents							
Attitude (AMI)	**Problems**	**High**	**Medium**	**Low**	**Not at all**	**Total**	**AMI**	**Ranking**
	Have you taken up *kuruvai* farm operations?	26	79	10	7	122	246	2
	Are you following social distancing?	15	74	14	19	122	207	3
	Are you using farm impediments for harvest?	44	62	14	2	122	270	1

Table 5 shows that "Risks due to the cessation of monsoon rainfall" got the first highest score (PCI-325) and hence were considered as the 1st ranked problem prevailing in this area. The onset of the Southwest monsoon rainfall happened on the expected date, however soon after that, it got stopped. The respondents had an opinion that dry spells during the cropping season are posing havoc for farm operations. Availability of canal irrigation is limited to them only during margazhi months (Rabi Seasons alone). Risk of lockdown on Kharif Production and yield is expected to be the next serious issue over here as many of the respondents have either left their arable lands fallow or utilised only half of their land under Kuruvai cultivation got the second-highest score (PCI-308). The problems may also raise risk of lockdown on Kharif Production and the farmers opined that there is a lack of adequate farm labourers due to lockdown. Impacts due to Labour shortage has got the third highest score (PCI-306). Impacts on the sale of Rabi and Summer Produce has got the fourth-highest score (PCI-301). However when asked

about the general impacts, respondents were not able to connect it as a major problem, hence got the fifth rank (PCI-270). As it is a new pandemic, taking a risk in farming is also a pragmatic learning process (Pontius et al., 2002).

Table 5: Problem Confrontation Index (PCI) among the surveyed farmers

Problem (PCI)	High	Medium	Low	Not at all	Total	PCI	Ranking
General Impacts of COVID-19 on crop cultivation	58	40	16	8	122	270	5
Risks due to cessation of monsoon rainfall	91	21	10	0	122	325	1
Impacts due to Labour shortage	84	19	16	3	122	306	3
Impacts on the sale of Rabi and Summer Produce	77	28	14	3	122	301	4
Risk of lockdown on Kharif Production and Yield	81	26	13	2	122	308	2

Discussion

COVID-19 is a disease that is highly infectious and spreads rapidly through society (Hedberg, 2020). It can be seen that in PAP, commercial Kuruvai cultivation is drastically hit as it is more dependent on labour. The social impressions of COVID-19 may not end all of a sudden with this cropping season. On the contrary, the risk and impacts may be compounded and transferred from this Kharif season and may be extended to the forthcoming Rabi and summer crop productions also. India's Meteorological Department has officially announced, the year 2020 to have a favourable monsoon as it is a neutral phase and anticipating a weaker La. Nina this year (the El-Nino weather phenomenon, that interrupts rainfall in India, is not apparent). This can be treated as a positive thing in the midst of COVID-19 scenario, to gain on-farm productivity and nutritional security and farmer's livelihood. It is significant to propagate sustainable agricultural extension and outreach strategies that goes beyond sharing technical knowledge to the producers but to showcase a leading role in helping small scale farmers, organise themselves for sharing production and protection technologies, marketing and advocacy in such a way that empowers the farming community (David, 2007). Farmers who have taken agricultural loans may face a burden on repaying their crop loans this year. Even though there are many beneficial schemes like providing Rs. 2000 directly to the farmers under the scheme Pradhan Mantri Kisan Samman

Nidhi (PM-KISAN) scheme by Central ministry of agriculture, many of the farmers are waiting for that amount. Another positive move of the government is raising the wage rate for workers engaged under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) by the government to provide them a decent income. Government of Tamil Nadu has also provided Cash worth Rs. 1500 and food grains and groceries to all the beneficiaries through public distribution systems. Farmers who have taken loan have been granted a moratorium of three months as well. Farmers' empowerment has to happen on a regular basis so as to equip them to face multitudes of ever-changing challenges, Nederlof and Odonkor (2004). The extension workers at Krishi Vigyan Kendras (KVKs) can play a major role with their constantly attempt to enhance the cognitive abilities and farm operations as well (FAO, 2015a & b). Government support on Small scale enterprises (SSE) and industrial units are very critical during this pandemic time. PAP being a coconut belt, the coir manufacturing small scale industries in the vicinity can be considered as a good source of diversified livelihood option for the farmers of PAP to enhance their socio-economic resilience during the crisis.

Conclusions and Recommendations

In summary, the situational analysis has helped in attaining a deeper understanding of the ways in which farmers of PAP cope with the pandemic. It can be anticipated that some farmers may not get any surplus produce and income due to limited production levels. In PAP the Kuruvai harvest of sorghum and groundnut may be sufficient for self-consumption alone, but seed availability for the next cropping season may be hit. As a matter of support during the pandemic, Minimum Support Price (MSP) can be fixed by the state government for groundnuts. However, at present, procuring seeds from the seed farms (community-owned seed banks) at a slightly higher price than the market would benefit the local seed farmers in sustaining their livelihoods and getting sufficient local inputs for the forthcoming sambha season. Even for coconut, the price is fixed based on the volatility in the domestic market demands and oil price fluctuation. Like copra, the mature nuts and tender coconuts also should have MSPs to withstand the adverse effects from any disasters; hence, looting by the middle man can be minimised to a large extent. Establishing more number of government procurement centres can play a major role in mitigating the supply chain disruptions. However collective and co-ordinated actions may support in achieving timely resolutions for unprecedented challenges like labour shortages at the time of the pandemic. Farm mechanisation and digital agriculture can play

a vital role in agriculture systems during disasters. Efficient and timely use of farm machineries and instruments especially seedlers, combined harvesters weeding equipment, coconut pluckers, etc. and precision farming may help in sustainable farming in these areas. Establishing a community-owned custom hiring centre at block level will serve in a great way in minimising shortages in the supply of labour and machinery to the farms. As around 44.2 percent of the surveyed farmers had experienced risks due to the pandemic. Collective and integrated farming by farmers' family members, friends as a whole can join hands in carrying out farm operations along with coordinated activities agriculture officer at district, block and village level in a in PAP and minimise impacts and risks due to the pandemic.

In connection with new agrarian order, post COVID-19, agroecosystems in our country should give more emphasis on the food and nutritional security of our population. The pandemic stricken economy must give more attention to building healthy and resilient communities at these crucial hours. Achieving sustainability as proposed in Sustainable Developmental Goals-SDG-13 (climate action), SDG-2 (ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture), SDG-15 (protecting, restoring sustainable use of terrestrial ecosystems), SDG6 (ensuring availability and sustainable management of water is critical during this pandemic times) during this pandemic times requires planned reactive actions at the local level.

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