Role of Public Health System Reforms in Combating Covid-19 Pandemic in Kerala

December 2020

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Layout & Design: Crest Kerala 9446942100

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Abbreviations and Full Forms

Abbreviations	Full Form
ADHS	Additional Director of Health Service
ALP	Alappuzha
APL	Above Poverty Line
ASHA	Accredited Social Health Activist
AWW	Anganwadi Worker
BPL	Below Poverty Line
CCC	COVID Care Centers
CFLTC	COVID First Line Treatment Centre
CFR	Case Fatality Rate
CH	COVID Hospital
CHC	Community Health Centres
CKD	Chronic Kidney Diseases
CLD	Chronic Liver Diseases
CLIA	Chemi Luminescence Immununo Assay
CM	Chief Minister
COVID	Corona Virus Disease
CPHC	Comprehensive Primary Health Care
CRD	Chronic Respiratory Diseases
CSLTC	COVID Second Line Treatment Centre
CVD	Cardio Vascular Diseases
DCC	Domiciliary COVID-care centre
DDMA	District Disaster Management Authority
DHS	Directorate of Health Service
DISHA	Direct Intervention System For Health Awareness
DMO	District Medical Officer
DOLS	Department Of Labour and Skills
DPM	District Program Manager
DPMSU	District Programme Management And Support Unit
DSO	District Surveillance Officer
DSU	District Surveillance Unit

Abbreviations and Full Forms

EKM	Ernakulam
FHC	Family Health Centre
GOK	Government Of Kerala
HCV	Health Care Volunteer
HCW	Health Care Worker
HI	Health Inspector
HIV	Human Immunodeficiency Virus
HOD	Head Of Department
HS	Health Supervisor
HWC	Health & Wellness Centres
IAS	Indian Administrative Service
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
ICU	Intensive Care Unit
IDK	Idukki
IEC	Information Education Communication
IKM	Information Kerala Mission
ILI	Influenza Like Illness
IMR	Infant Mortality Rate
JHI	Junior Health Inspector
JPHN	Junior Public Health Nurse
KKD	Kozhikode
KLM	Kollam
KMSCL	Kerala Medical Services Corporation
KNR	Kannur
KSD	Kasargod
KTM	Kottayam
LDF	Left Democratic Front
LSG	Local Self Government
LSGD	Local self Government Department
LSGI	Local Self Government Institutions
MLP	Malappuram
MO	Medical Officer

Abbreviations and Full Forms

MSME	Micro Small Medium Enterprises
NCD	Non Communicable Disease
NDMA	National Disaster Management Authority
NHG	Neighbourhood Group
NHM	National Health Mission
NIV	National Institute Of Virology
NRI	Non Resident Indian
OOPE	Out Of Pocket Expenditure
OPD	Out Patient Department
PCR	Polymerise Chain Reaction
PDS	Public Distribution System
PHC	Primary Health Centre
PHN	Public Health Nurse
PHNS	Public Health Nurse Supervisor
PKD	Palakkad
PPE	Personal Protective Equipment
PRO	Public Relation Officer
PTA	Pathanamthitta
PWD	Public Works Department
RAT	Rapid Antigen Test
RRT	Rapid Response Team
RSBY	Rastriya Swasthya Bhima Yojana
RTPCR	Reverse Transcription Polymerise Chain Reaction
SARS-COV2	Severe Acute Respiratory Syndrome Coronavirus 2
SDG	Sustainable Development Goals
SDMA	State Disaster Management Authority
SDRF	State Disaster Response Fund
SEOC	State Emergency Operations Centre
SPHL	State Public Health Laboratory
SSU	State Surveillance Unit
Supplyco	Kerala State Civil Supplies Corporation
TSR	Thrissur
TVM	Thiruvananthapuram
WHO	World Health organization
WYD	Wayanad

Acknowledgment

The study ***"Role of Public Health System Reforms in Combating COVID-19 Reforms in Kerala"*** was conducted by the research team of Health Systems Research India Initiative Trust (HSRII) with the funding support from **Azim Premji University, Bangalore**. We gratefully acknowledge the support and encouragement of Azim Premji University in this endeavour. We also sincerely thank the State and District officials of Department of Health and other departments of Government of Kerala for their valuable inputs in carrying out the study. HSRII trust also wishes to place on record sincere thanks to our research team comprising of Dr. A. S Pradeep Kumar, Dr. Arsha, Dr, Rajalakshmi and Dr. Sreejini Jaya for their efforts in developing the study report.

Ranjith R Menon
Managing Trustee
HSRII Trust

Executive Summary

The first case of COVID-19 in India was reported from Kerala on 30th January 2020 and since then State's experience of managing the pandemic is widely discussed across the world. The pandemic's global burden as per the latest figures as of December 2020 was about 75 million cases with 1.6 million deaths. Ministry of Health and Family Welfare has confirmed 99,20,214 cases, 94,40,650 recoveries, and 1,45,094 deaths in India in a comparable time. In Kerala, COVID-19 cases started on 30 January 2020 and occurred in three phases with zero cases in between. Though there were 683441 new cases and 2708 deaths by December, the state has the lowest case fatality rate in India (0.35%), compared to the national average of 1.4.

The government of India declared a national lockdown as part of the COVID containment strategy, with wavering degrees of health system preparedness across the Indian states to respond to the pandemic. Since Kerala paved its way to excellence in tackling the COVID-19 pandemic amongst the other states of India, a study was conducted to understand the role of public health system reforms in combating the COVID-19 pandemic in Kerala. A review of literature and in-depth interviews with key officials at state and district levels were used to achieve the desired objectives. A detailed review of policy documents, advisories, and guidelines issued by the health department, GOI, and ICMR and analysis of secondary data on reform processes, analysis of public financing of health services were done. Thirteen in-depth interviews with healthcare providers and administrators were conducted to understand the ground realities in the governance system and to get the additional information and some clarifications. This study brings out the key aspects of COVID-19 management through a responsive public health system in the state. The highest political commitment and bureaucratic action based on the previous experiences in Nipah control and disease surveillance during flood management implemented a variety of interventions as given below.

The early release of technical guidelines on the treatment and management of COVID-19 paved a critical pathway. This resulted in the formation of state and district level committees which helped in development and dissemination of advisories and guidelines to health facilities. Advisories and guidelines were issued for the screening of suspected populations in different locations, laboratory testing, observation in quarantine or isolation, proper treatment was issued on time. The guidance was issued to all line departments for observing COVID-19 protocol in organizing different programs. Testing laboratories were started in the state in early February. State, district, and institutional medical boards were developed for appropriate treatment as per treatment protocols developed and updated by the state medical board.

Prime importance in containment measures was given to awareness generation and information dissemination to the public and officials through various modes. Kerala government introduced a mass handwashing campaign named 'break the chain'; on 15 March 2020 and the slogan was 'SMS', which stands for soap, mask, and sanitizer. All government departments, banks, private institutions, shops and establishments, residents associations, self-help groups, youth,

social, religious, and political organizations, NGOs and other community volunteers were involved as the main stakeholders of this campaign. LSGI lead the campaign with people's participation. A variety of health education materials were developed by health, police, and social justice departments and widely disseminated. DISHA helpline, a dedicated website, user-friendly dashboard, and mobile app namely “GoK Direct,” were developed and put in the public domain for information transfer of authentic data. All health staff were trained, and they sensitized staff involved in other departments. IMA also conducted training programs.

Surveillance was strengthened at airports, seaports, railway stations, interstate bus terminals, and state borders. Rigorous contact tracing was done; route maps were prepared with the help of community, police personals, LSGI, etc, and imposed local containment action. Symptomatic and asymptomatic patients were managed separately and imposed quarantine and monitoring or isolation and treatment. Three-tier patient management system was initiated in the state from March 28 onwards viz COVID Care Centre (CCC), COVID First-Line Treatment Centre (CFLTC), and COVID Hospitals (CH), and guidance were issued for converting hospitals into dedicated COVID hospitals. Specific periods of isolation and quarantine were also fixed for different situations. Tele-consultation services were started along with this. COVID Brigade, a group of trained health care workers and volunteers was constituted in July to power the human resources in CFLTCs, hospitals, and public health system. Nearly 10000 personals and volunteers were posted for duty in the above centres. A total of 1143 mental health professionals, including psychiatrists, psychiatric social workers, clinical psychologists, and counselors have been deployed to provide counseling support to people in quarantine and frontline workers. The service was extended to mentally ill patients, children with special needs, migrant labourers, and elderly people living alone with necessary modifications.

The government started many relief measures to help the migrants and vulnerable groups of people who suffered from the pandemic and subsequent containment measures. Community kitchen initiative for providing free meals with the support of Kudumbasree and LSGI, camps and shelter homes for migrants, janakeeya hotels for supplying budget meals, free ration and free food kits were immensely helpful to them. Migrant laborers were given special care by providing care homes, free meals, free testing, and help for returning home when train services started.

The sturdy political commitment mobilized all departments like local self-government institutions (LSGI), police, education, agriculture, finance, civil supplies, fisheries, labour, transport, animal husbandry, railways, fire force, social welfare, tourism, revenue, PWD, information and public relations and sectors like hotel and restaurant owners' associations, trade organizations etc and all worked together under disaster management authority and LSGD. Media played a vital role in sharing important information regarding COVID-19, spreading awareness, reducing false messages building confidence in society without creating panic. Social media platforms also helped in circulating education materials with proper content across the members of the residential associations, institutions, offices, etc.

Health system reforms over the last few decades through decentralized planning program,

National Health Mission investments, Comprehensive Primary Health Care vision, and Aardram mission activities resulted in developing robust health institutions and governance to take up the challenges like Nipah outbreaks, COVID-19 pandemic, etc. The experience of controlling Nipah virus outbreaks and disease surveillance and management during two floods during 2018 and 2019 also augmented the health system activities. Innovative interventions based on a reformed public health system helped in flattening the epidemic curve of the COVID-19 pandemic in Kerala while the cases have been increasing across the country. Kerala tells us a story of how a resilient public health system can manage a pandemic of this nature through coordinated actions of key stakeholders. The battle is not yet over; we would continue to remain vigilant and keep innovating to make sure that Kerala lives up to the high expectations of our people and the country.

Chapter 1

Introduction

The COVID-19 pandemic has brought the world to a standstill. Health systems across the globe have been adopting different techniques to win the battle against this disease. COVID-19 also known as the Novel Coronavirus is a communicable disease caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Common symptoms of this infectious disease are fatigue, cough, fever, loss of smell and taste and shortness of breath. Most cases show mild symptoms, though a few might result in more severe like viral pneumonia and multi-organ failure. Primarily, the virus spreads by close contact among people through coughing and sneezing.

The cases of COVID-19 were first identified in December 2019 at Wuhan, China. The virus gradually spread globally and as per latest figures there were around 75 million cases and 1.6 million deaths since the start of the pandemic. The United States (US) alone had reported 32 million cases making it the most affected country in the world. Europe ranked second on the list of reported cases of COVID-19 with 23 million cases. Figure1.1 shows the latest situation of COVID-19 outbreak across various regions of WHO.

Fig 1.1: COVID-19 cases and deaths across the Globe as on 20 December 2020[1]

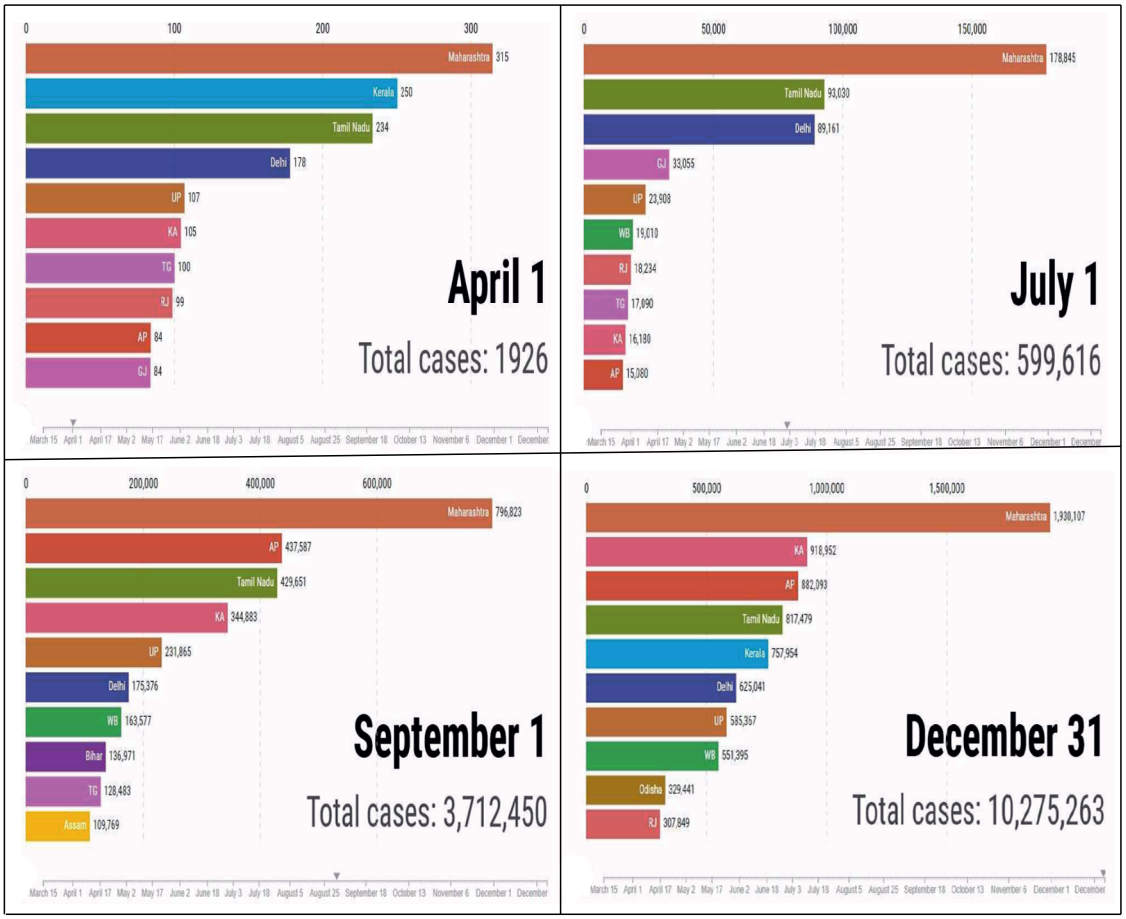
WHO Region	New cases in last 7 days (%)	Change in new cases in last 7 days *	Cumulative cases (%)	New deaths in last 7 days (%)	Change in new deaths in last 7 days *	Cumulative deaths (%)
Americas	2 321 202 (50%)	13%	32 437 597 (43%)	32 397 (41%)	9%	809 105 (48%)
Europe	1 726 941 (37%)	2%	23 691 857 (32%)	36 286 (46%)	3%	522 719 (31%)
South-East Asia	249 007 (5%)	-14%	11 610 444 (15%)	3 968 (5%)	-10%	176 826 (11%)
Eastern Mediterranean	174 325 (4%)	-14%	4 665 285 (6%)	3 852 (5%)	-12%	115 495 (7%)
Africa	94 653 (2%)	27%	1 716 697 (2%)	1 862 (2%)	34%	37 741 (2%)
Western Pacific	46 662 (1%)	3%	1 006 682 (1%)	636 (1%)	18%	18 895 (1%)
Global	**4 612 790 (100%)**	**6%**	**75 129 306 (100%)**	**79 001 (100%)**	**4%**	**1 680 794 (100%)**

Source; COVID-19 Weekly Epidemiological Update, WHO

The first case of the COVID-19 pandemic in India was reported on 30th January 2020, originating from China. As of 15th December 2020, the Ministry of Health and Family Welfare (MOHFW) had confirmed a total of 99,20,214 cases, 94,40,650 recoveries (including cured/ discharged/ migrated) and 1,45,094 deaths in the country.

A comparative analysis of total cases across states is presented in Figure: 1.2 and details statement is given in Annexure 1. Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu and Kerala account for most cases in India.

Figure 1.2: State wise Trend in COVID-19 Cases at different time points between April and December 2020[2]



Source: NDTV COVID Tracker

1.1 COVID Outbreak in Kerala

Kerala had the first case on January 30th, a student who returned from Wuhan and subsequently two more cases on February 2nd and 3rd. This was the first phase of COVID-19 outbreak in the state followed by the second phase in March first week with patients returning from Italy in Pathanamthitta and third phase started in the second half of May and is continuing. As on December 15, the state has a total of 669662 confirmed cases, with 50036 active cases, 616966 recoveries and 2708 deaths.

1.2 Phases of COVID-19 Progression in Kerala

The first case of COVID-19 in Kerala was the first case in India too and was confirmed on February 3rd, 2020 by swab test from the ICMR-National Institute of Virology, Pune (ICMR- NIV, Pune)[3]. The next two cases in Kerala were reported on 2nd and 3rd February 2020, respectively[4]. The first, second and third patients were admitted in Thrissur medical college, Alappuzha medical college and Kasaragod district hospital respectively. All the above three positive cases were students studying in medical colleges of Wuhan in China. They were isolated and took measures to prevent the spread of the disease. All three were recovered completely by 20 February 2020 and no one else was infected from them. This was **the first phase**.

Five new cases reported in Panthanamthitta district on 8th March 2020, marked the beginning **of second phase**. The positive cases were a couple and their 26-year-old son returned to Kerala from Italy. This family escaped from airport surveillance by not revealing the travel history. Two more people who had come in contact with the family also tested positive for the disease. All the primary contacts were put on quarantine. A total of 11 cases confirmed from this Italy-Patahnamthitta cluster. All the positive cases and contacts were admitted in Pathanamthitta general hospital.

In Kerala more than one hundred COVID-19 cases were marked on 24th March 2020. The first COVID-19 death in Kerala reported on 28th March and the second one on 31st March. Hence, 238 cases were confirmed with 21 recoveries in Kerala in this phase by the end of March 2020. The cases started decreasing from 11th April and there were 256 positive cases, 359 recoveries and one death (reported on 24th April) in April. In May 2020, more recovery cases were reported than positive cases. There were days marked with zero cases in initial days of this month. A total of 500 cases, 380 recoveries and three deaths were reported during this phase4. There were 503 confirmed cases, 484 recoveries, 13 active cases and three deaths as on 8th May, on the 100th day of detection in the state[5].

Expatriates from other countries and Keralites from other states started coming in large numbers since 8th May 2020 when interstate and international travel restrictions were relaxed[6]. This marked the **third phase** in Kerala as the number of cases began to rise in the state. There were no reports of community transmission in May and June. Even though the number of cases started increasing, the death rate remained very low in this phase. Only six deaths were reported in May. In July, a large local group of cases were identified at the Kumarichantha fish market in Thiruvananthapuram. There was a third surge of cases after Onam celebrations (the renowned state festival), and reported a large number of new cases in Kozhikode, Malappuram, Ernakulam and Thrissur districts. Active cases peaked to 97,525 in September and then started to show a decline after October. The largest single-day spike (11,755 cases) was reported on 10th October and Kerala had the 5th highest number of confirmed cases in India. Hence the total number of cases, recoveries and deaths in the third phase, till December 15, 2020 were 682938, 621907 and 2705 respectively. Phase wise details are given in Table 1.1.

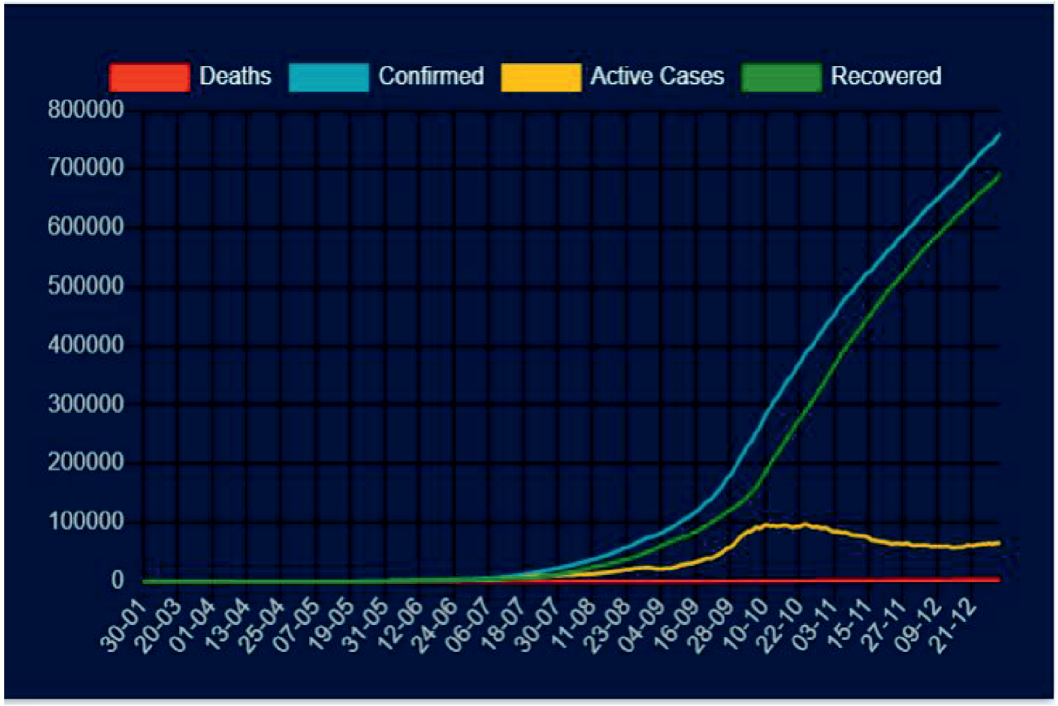
Table 1.1. COVID-19 Case Profile in Kerala

	New cases	Recovered cases	Active cases	Deaths	Remarks
Phase I	3	3	0	0	Zero new case since 4th Feb
Phase II	500	484	13	3	Zero new case in first week of May
Phase III	682938	621907	58326	2705	Phase III continuing
Total till 15thDec	683441	622394	58339	2708	

Source: Government of Kerala, Department of Health Services, COVID Dashboard
https://dashboard.kerala.gov.in/index.php

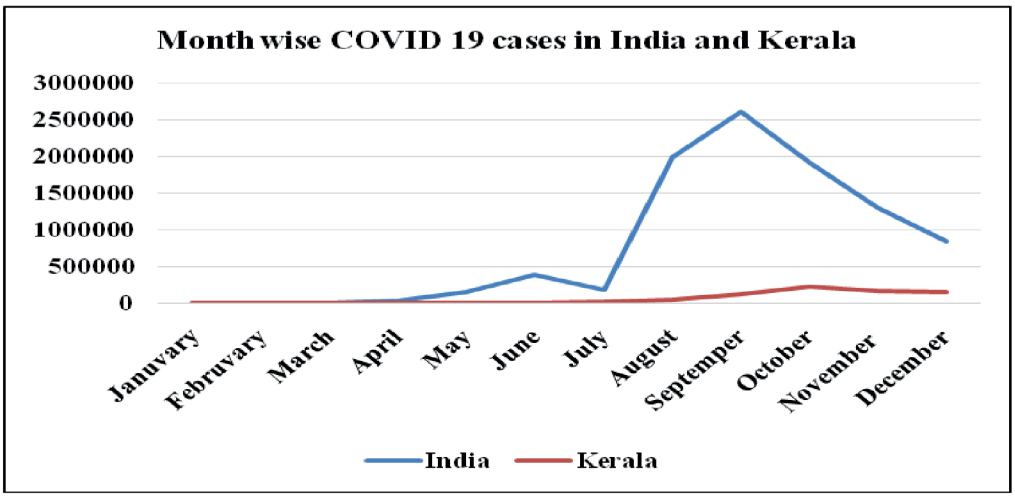
As of December 15, 2020, more than 90% of known cases were due to community spread. Total number of cases, recoveries and deaths in Kerala were 683441, 622394 and 2708 respectively. The confirmed, active and recovered cases and deaths due to COVID-19 in Kerala at different time points are shown in Figure 1.3. The comparison of month wise cases in India and Kerala is shown in Figure 1.4.

Figure 1.3: Overall COVID-19 Status of Kerala from January to December 20207
(Confirmed, active and recovered cases and deaths due to COVID-19 in Kerala)



Source: Government of Kerala, Department of Health Services, COVID Dashboard
https://dashboard.kerala.gov.in/index.php

Figure 1.4: Month-wise COVID-19 cases in India and Kerala



"Source: Indiastat.com, COVID-19 pandemic in Kerala-Wikipedia"

1.3 District wise Distribution of COVID-19 Cases

Kerala was successful in contenting the pandemic during the first two phases. The state has declared a health emergency following the case detection in January. Following the recovery of the first series of cases from Thrissur, Alappuzha, and Kasargod, with no new cases in the state, the health emergency was withdrawn

Table 1.2: District wise Covid-19 cases (total confirmed) as of December 158

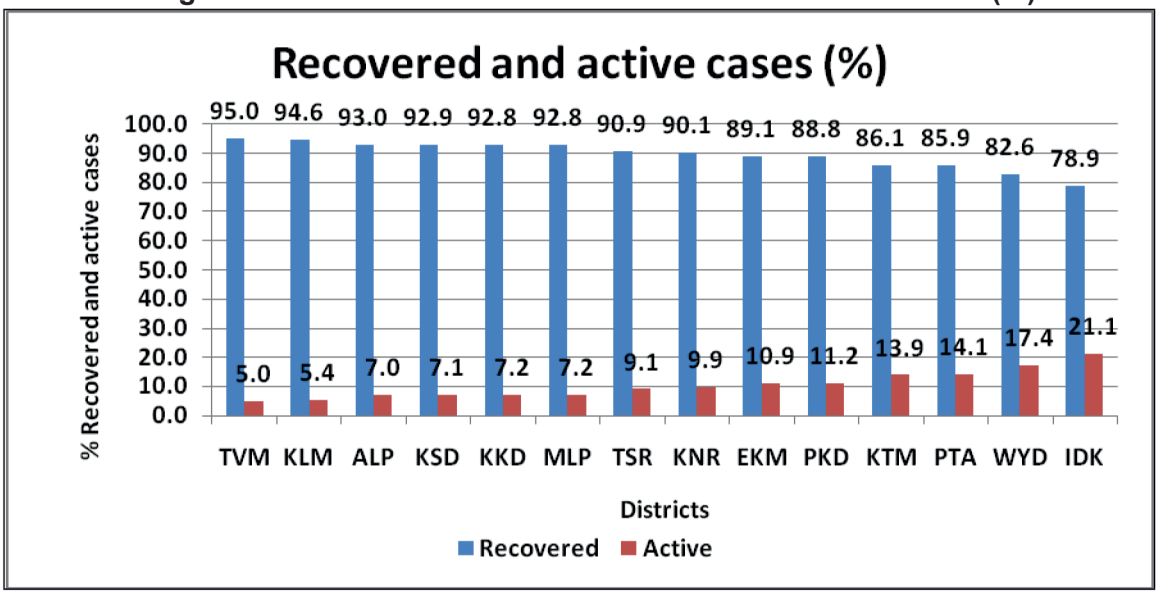
District	Total cases	Recoveries	Death	Active
Alappuzha	52407	48720	208	3479
Ernakulam	74224	66155	273	7796
Idukki	14247	11234	14	2999
Kannur	36167	32594	180	3393
Kasargod	23098	21468	81	1549
Kollam	52970	50112	199	2659
Kottayam	43206	37209	129	5868
Kozhikkode	77612	72060	250	5302
Malappuram	82923	76990	293	5640
Palakkad	43696	38815	106	4775
Patahnamthitta	24472	21011	34	3427
Thiruvananthapuram	77171	73314	601	3256
Trissur	67179	61089	302	5788
Wayanad	14069	11623	38	2408

Source: COVIDIndia.org

Then in March, there has been a cluster of COVID-19 cases formed in the Pathanamthitta district. Kerala was able to limit the cluster in the district itself. After that, the arrival of expatriates and the return of Keralites from other states resulted in more number of cases in northern districts of Kerala as the number of Non Resident Indians (NRI) are more in those places especially in the Malappuram district. Until September, there were no reports of community transmission in the state. About 85% cases were either international travellers or interstate travellers or their family members.

After this, cases were reported in Kollam and Palakkad as people started coming to these places through non monitored secret forest paths. Thus the graph started growing exponentially in Kerala. In June an auto-rickshaw driver from Iranimuttam in Thiruvananthapuram tested positive for COVID-19 along with his family. The health authorities took the necessary steps to avoid transmission. The first time a community transmission reported in the state was in the Thiruvananthapuram district in July. As the lockdown was relaxed, the fishing business was back in action within the state borders. Two clusters were identified in the coastal areas of the state capital (Poonthura and Pulluvila). Then Thiruvananthapuram became the district with the highest number of cases. After October, a downward trend was seen. Onam celebration and local body election programs did not increase the number of cases as expected. District wise cases (total confirmed) as of December 15, 2020 is shown in Table 1.5.

Fig 1.5: District wise Recovered and Active COVID-19 cases (%)



"Source: COVIDIndia.org"

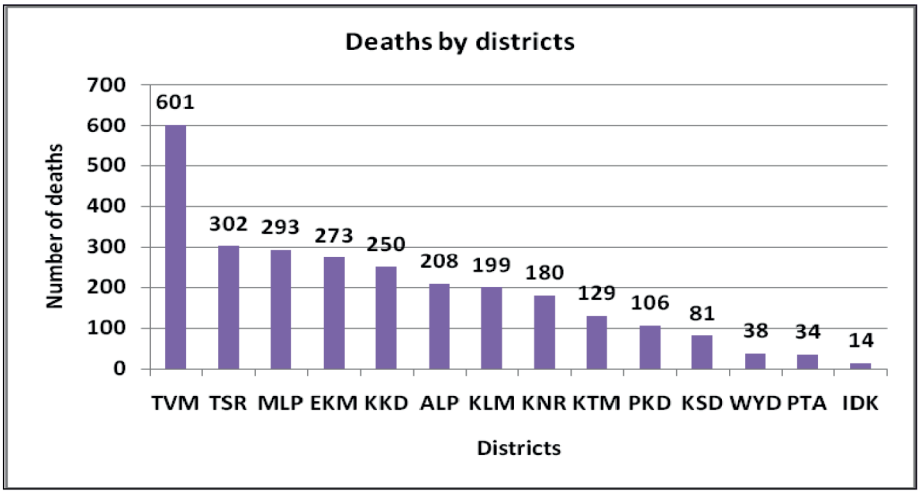
1.4 COVID-19 Deaths in Kerala

The first death was reported in Kerala on 28th March 2020 [4], an Ernakulam native with a travel history to Dubai. As of December 15, Kerala had reported 2708 deaths. At first, deaths were among COVID-19 patients with co-morbidities, but now the pattern has changed. Young COVID-19 positive cases without any other morbidity are also dying.

Though the number of confirmed cases has seen a sudden increase in the last months with the third wave of infections in the state, the state has effectively controlled the case fatality rate. This happened because of the high capability of the Kerala's healthcare system. The state has the lowest case fatality rate in India (0.35%), compared to the national average of 1.4.

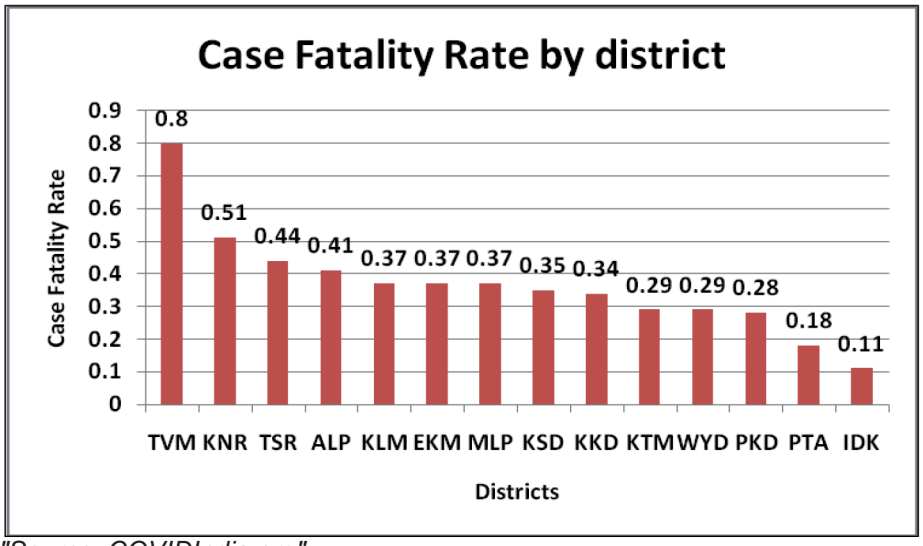
Nevertheless COVID-19 cases increased in proportion with an increase in tests, Kerala had managed to maintain the low Case Fatality Rate (CFR). In May, when the average daily cases were less than 50, the death rate was 0.77. Then the CFR progressively decreased to 0.45, 0.4, 0.38 and 0.28 in June, August, September and October respectively. The latest rate was 0.34.Thiruvananthapuram district showed highest number of deaths due to COVID-19 and highest CFR. The district wise number of COVID-19 deaths, case fatality rates and district wise deaths per million are shown in Figure1.6 to 1.8[9].

Figure 1.6: Deaths by Districts in Kerala (till December 15)



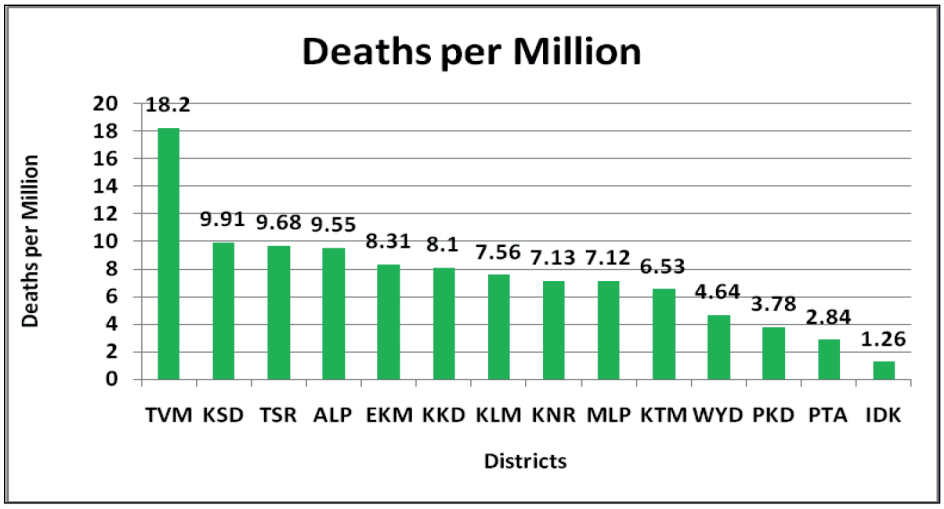
"Source: COVIDIndia.org"

Figure 1.7: Case fatality rate by Districts in Kerala



"Source: COVIDIndia.org"

Figure 1.8: District wise deaths per million (till December 15)



"Source: COVIDIndia.org"

Chapter 2

Study Objectives and Methodology

The COVID-19 pandemic initially started in Kerala during the last week of January and spread across all major states of India by March end, forcing a national lockdown with wavering degrees of health system preparedness to respond to the pandemic. The pandemic exposed the inadequacy of public health systems across majority of states with an exceptionally low level of preparedness in terms of surveillance, contact tracing, health human resources and availability of Personal Protection Equipment's (PPEs), testing kits and supportive equipment. There was also many variation in treatment facilities i.e. bed availability, availability of ICU's, ventilators etc in many districts across the country. In addition to this the pandemic also reflected in inadequacies of primary health care systems such as incompetency on surveillance, contact tracing, quarantine, and managing epidemics such as COVID-19.

But one of the key learnings from COVID-19 pandemic management in India, is the importance of having a structured and effective public health system with adequate primary care services for responding to public health emergencies. While most states could not effectively manage COVID-19 response due to the inadequacy of the public health system, Kerala emerged as a model for India, and the world for effective control and management of COVID-19 pandemic. Kerala's health system known for its quality and service delivery has a very vibrant public health sector and a dominant private sector. But the investments made in the recent past in strengthening the public health infrastructure both at secondary and primary care helped the state in emergency preparedness and management of the COVID-19 situation. The state already had the experience of controlling NIPAH outbreak in 2018 and 2019 by strengthening the public health system by putting together an integrated surveillance, diagnosis, contact tracing, prevention and treatment mechanism that helped Kerala to combat COVID-19 outbreak.

2.1 Scope of the Study

The experience of COVID-19 management proved beyond doubt the role of a resilient public health system with trained public health staff to conduct surveillance, testing, home isolation, contact tracing and treatment. Kerala had initiated a health sector reform plan in 2016 with the launch of two state programs. The first one is **'Aardram"** which aims to provide' Patient Friendly Hospital Services" at all levels of government health facilities. The second one is **Comprehensive Primary Health Care (CPHC)** program aimed at

extending the coverage of primary health care services in the State. The Aardram mission led to drastic hospital improvements through collaborative action with the Local self-government Institutions (LSGI), community organisations and the hospital development committees. The Mission also initiated the standardisation of different categories of hospitals and health care institutions under the department of health, thereby making efficient patient flow and referral possible. CPHC involves developing the primary care institutions in the state to **Family Health Centres (FHC's)** by reorganizing the service delivery to become the foundation and gatekeeper for the entire health care system.

Both the programs mentioned above were part of the health sector reforms focussing on strengthening public sector delivery of health care. As part of implementing both these reform initiatives, the department of health invested heavily on developing all cadres of public health staff's capacity through continuous training workshops, and systematic performance assessment to improve their knowledge and skill set. This process also included the LSGIs which manage the health institutions through decentralised planning system.

This experience of "public health system" led health sector reforms helped the state to manage the COVID-19 more robustly. Early release of technical guidelines on contact tracing, quarantine, isolation, hospitalisation, infection prevention and control, and extensive capacity-building for all cadres of health and other interlinked departments played a critical role in managing COVID-19 situation. Hence it is imperative to document Kerala's health sector reforms to strengthen both curative and primary care services in the public sector. The documentation of this experience would help other states considering health sector reforms in the aftermath of COVID-19.

2.2 Objectives of the Study

The key objective of the study was to develop an understanding role of a "resilient public health care system" in supporting effective control and treatment of COVID-19 pandemic in the state of Kerala. In this respect, the study focused on the policies that have led to creating a strong public health care system with focus on primary care reforms aiding active surveillance, contact tracing, home isolation and treatment of COVID-19 patients in the state of Kerala.

The specific objectives of the study were

- To analyze the role of AARDRAM, a flagship health system reform program of strengthening public health services in facilitating the control and management of COVID-19 in Kerala
- To analyze the contribution of Comprehensive Primary Health Care (CPHC) program and Family Health Center model of primary care reforms in contributing to successful management of COVID-19 at primary care level.
- To review and outline the key steps taken by the department of health in the state and district to respond to the control and treatment of COVID-19 in Kerala
- Mapping out the role of various

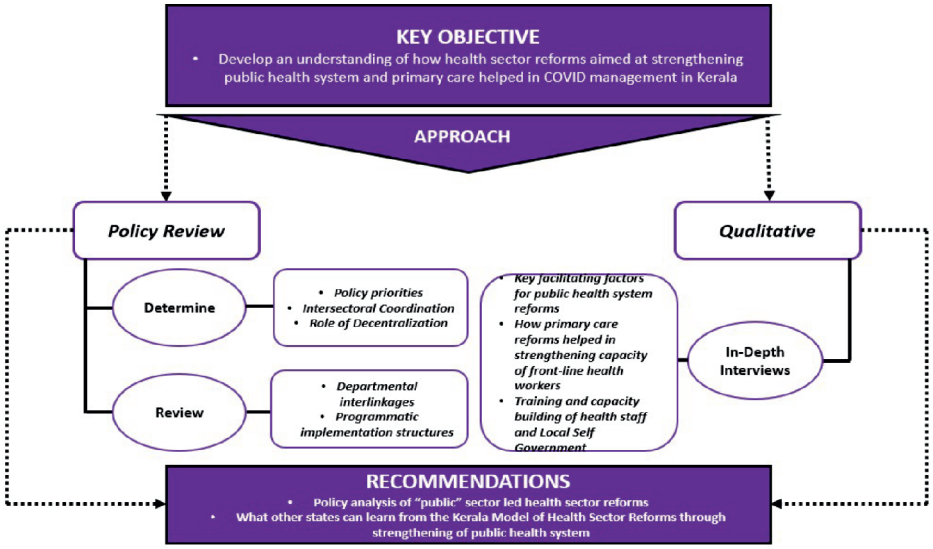
departments which included department of health, revenue, disaster management, home and LSG for supporting multi-sectoral coordination and effective delivery of COVID-19 management in the state of Kerala

- To document the key challenges and bottlenecks faced by the state in the management of COVID-19 and programming the way forward.

2.3 Methodology

A mixed method approach was used while conducting the study. The schematic diagram of methodology is shown in Figure 2.1. Combinations of review of literature and in-depth interviews with key officials at state and district level were used to achieve the desired objectives. The literature review was conducted in October and November 2020. But the data of COVID-19 up to December 2020 is included. A detailed review for policy documents, advisories and guidelines issued by health department, GOI and ICMR and analysis of secondary data on reform processes, analysis of public financing of health services were done. Thirteen in-depth interviews were conducted to understand the ground realities in the governance system and to get additional information and some clarifications. Key informants were healthcare providers and administrators representing the different cadres involved in COVID control programs. The informants were officials from state and districts. The principal investigator (PI) conducted in-depth interviews for key informants with the help of a interview guide (refer Annexure 2). The interviews were conducted in Malayalam after obtaining verbal informed consent from the participants and interviews were conducted at convenient date and time of participants.

Figure 2.1: Schematic diagram of methodology



This was done to understand the role of health sector reforms focusing on augmenting public funding of health services, improving the availability of health human resources, improving the availability of medicines and supplies, community participation through LSGIs which contributed to effective control and management of COVID-19 situation in Kerala. We also documented the institutional structure, including the state and district level committees and how they coordinated the emergency response through intersectoral collaboration. One district (Malappuram) was selected as a case study for analysis.

2.4 Data Sources

Data were collected through literature review and in-depth interview with stakeholders in governments. The government advisories, guidelines, government orders, amendments of health and other departments, government notifications in the state and articles from national and local newspapers were collected. Along with these relevant documents from ICMR and MOHFW were also collected. A detailed review was done and collated the available information.

Data analysis: The in-depth interviews were recorded, and summary notes were prepared. Then content analysis was performed to obtain the findings corresponding to the objectives. The findings gathered through the desk review and stakeholder interviews were triangulated to understand the scenario, trends, service delivery models etc.

Chapter 3

Reforms in Public Health System in Kerala

Kerala's public health system has attracted international attention for its remarkable achievements even though the state's progress on the economic front has been relatively modest. A prime reason for this has been the stewardship role that successive governments, before and after independence, has played. The health gains made in Kerala can be attributed to several factors, including strong emphasis from the state government on public health and primary health care (PHC), health infrastructure, decentralized governance, financial planning, girls' education, community participation and willingness to improve systems in response to identified gaps. Kerala has achieved good health status compared to other Indian states and at par with those of some developed nations.

Table 3.1: Health status of Kerala

Indicator	Kerala	India
Total population (in crore)	3.34	121.06
GDP per capita3 (US$)	1940	2300
Health expenditure per capita (US$)	74	28
Decadal Growth (per cent)	4.9	17.7
Sex Ratio	1084	943
Child Sex Ratio	964	919
Birth Rate	14.2	20.2
Death Rate	6.8	6.3
Infant Mortality Rate*	7[10]	32[10]
Neo Natal Mortality Rate	5	23
Under 5 mortality Rate	12	37
Total Fertility Rate	1.7	2.2
Maternal Mortality Ratio	42	122
Expectancy of Life at Birth	75.2	69

Source: Economic Review, 2019, State Planning Board, Kerala and Sample Registration System (SRS) Bulletins

Kerala's public health system has attracted international attention for its remarkable achievements even though the state's progress on the economic front has been relatively modest. However, it has hardly kept up with the epidemiological and demographic transitions that have happened in the state in the last three decades. Health system in Kerala has undergone reforms over the past few decades, notable among them being the active involvement of the local self-government institutions, (LSGI) and community participation. The Peoples Campaign for decentralized planning initiated in 1996 helped to improve infrastructure and service in primary and secondary healthcare institutions and widened healthcare delivery. Public health facilities were transferred to LSGI at various levels and this helped in identifying and implementing effective changes to respond to local health needs. Following decentralization movement, the implementation of National Health Mission (NHM) and Rastriya Swasthya Bhima Yojana (RSBY) in Kerala, focused on improving the service delivery of public health facilities.

Although all these reforms helped the State to make significant gains in health indices, health system of Kerala is facing major challenges owing to demographic, epidemiological transition and high out of pocket expenditure in health. The decadal growth rate of Kerala's population was lowest among Indian states at 4.9 percent[11]. Kerala, at this time is undergoing an advanced demographic transition as the mortality and fertility levels have come down. The male and female life expectancy at birth in Kerala were 44.2 years and 48.1 years respectively during 1951-60; which advanced to 72.2 years and 78.8 years during 2011-15[12]. The Infant Mortality Rate (IMR) of Kerala, were below 25 in 1989, was further reduced to 10 in 2016[13]. The infant mortality rates is balanced around 10 to 15 for the last two decades enabling an average Keralite to live beyond 72 years at the time of birth, which is highest among the Indian states[14].The reduction in mortality rates and fertility rates in the state likely been a neutralizer to the natural decline in the growth rate of the population of Kerala[12,13]. Apart from that, migration plays a major role in drafting the demographic picture with its characteristic inward and outward migration. Therefore, the state needs a policy shift in making an inclusive policy concerning the native as well as the migrant population with regard to access to health services.

Coming to the epidemiologic transition, which denotes to changes in the pattern of diseases prevalent in a society, studies indicate that Kerala also experienced an active epidemiological transition. With the positive decline in infant, child and maternal mortality rates and high improvement in life expectancy, Kerala is also witnessing a concurrent increase in the morbidity profile[11]. Further Kerala appears to have entered into the fourth stage of the epidemiological transition and lifestyle related diseases are on the rise in Kerala[15]. Kerala is witnessing an increasing burden of communicable and non-communicable diseases (NCDs). Recent emergence of communicable diseases like Dengue, Malaria, Chikungunya, Leptospirosis and H1N1 despite the successful control in the preceding years has led to considerable morbidity and mortality[11]. A study reported that

one in every four persons reported themselves to be sick during the reference period of fifteen days[15]. In Kerala, chronic NCDs have replaced communicable diseases as the most common causes of morbidity and the state is moreover facing high risk burden of NCDs. A community based study in the state of Kerala revealed that the burden of NCD risk factors is quite high and there is an increase in the prevalence of all NCD risk factors with age[16]. The burden from NCDs are likely to increase in the future due to ageing population and changes in the lifestyle and therefore interventions should be made to prevent and control NCDs[11]. The high cost of medicines and longer duration of treatment of NCDs creates a greater financial burden, especially to the lower socio-economic strata[11].

With the unique 'high-morbidity with low mortality' model, Kerala is one of state with the highest out-of-pocket expenditure (OOPE) in health. As aforementioned, the morbidity profile of the state is progressively influenced by demographic transition, double burden of diseases and high health seeking behavior. As per the State Health Accounts 2013-2014, the main source of private health expenditure is the household OOPE (around INR 18763 crores), which was 76% of the total health expenditure in the state[17]. A person in Kerala spends almost INR 6000 a year out of his own pocket to seek care; where the average OOPE in visiting out-patient clinics in the government sector and private sector was INR 4034 and INR 4739 respectively[18]. While the average OOPE on in-patient care, in government and private sector was INR 6267 and INR 30,800 respectively[18].The high cost of treatment and out-of-pocket expenditure in Kerala has contributed as the major reason for people to fall below the poverty line. An imperative approach to reduce the out-of-pocket expenditure of any country is by strengthening the primary health care system. Delivering primary health care systems build on a strong comprehensive primary health care service acts as a policy by which we can reduce the health expenditure significantly.

The increasing burden of non-communicable diseases and issues of an ageing population is taking a toll on the State's health system. Hence it became necessary to bring a paradigm shift in the provision of health services with a focus on the people and priority for primary care. way of looking at policy shift where newer policies can be formulated to strengthen the benefit of the health of the community. Such policy shift through expansion of services at primary health centre level, by improving adequate infrastructure, strengthening human resources, continuous and unvarying supply of medicines and equipment's will further address the wider environmental and social determinants of health. Ensuring these basic norms in a primary health centre can transform the health system from a high cost to a low-cost system can further reduce out-of-pocket expenditure[18].

The Left Democratic Government (LDF) which came to power in 2016, initiated a comprehensive policy shift focusing on strengthening public sector delivery of social services through effective participation of LGSI. The LDF Government introduced inter sectoral approaches to attain SDGs through Nava Keralam Karma Padhathi, a flagship programme of the State government. By this

inter sectoral approach; the government attempts to address the problems faced in health, education, agriculture, sanitation, water resources and housing sector with the active involvement of local self-governments. It embraces four missions, namely the Aardram Mission / Health Mission, Livelihood Inclusion and Financial Empowerment Mission / Housing Mission, Public Education Rejuvenation Campaign / Education Mission and Harithakeralam Mission (consisting of the three sub missions – sanitation and waste management mission, soil-water conservation mission and agriculture development mission)[19].

For addressing the SDG goals in health, the state government has launched an initiative called 'Aardram' in the field of health, as aforementioned for revamping the public health system and providing more patient-friendly health care services as well as to reduce the OOPE in health [19,20]. Beside promoting health promotion and prevention at the primary care level, the mission also focuses on strengthening facilities at the secondary and tertiary levels. The mission aims to improve the efficiency of service and facilities in the government hospitals with a view to extend treatment at a reasonable cost, time and satisfaction. The main objectives of the mission include

1. Patient friendly transformation of the outpatient (OP) wings of medical college hospitals and other Government hospitals.
2. Standardisation of the district and taluk level hospitals.
3. Developing the PHCs into FHCs in a phased manner.
4. Ensuring protocol-based treatment guidelines in the management of patients in hospitals.

The main purpose of Aardram is to strengthen the out-patient department of the government facilities more patient friendly in terms of required infrastructure, strengthen the required human resources, and elaborate the range of treatment and diagnostic services. For this, the existing Primary Health Centres and Community Health Centres (CHCs) are in the process of transformation to the Family Health Centres (FHCs). So, this transformation of PHC to FHC has a policy-wise change, design-wise change and moreover FHCs act as gate keeping to higher centres of care. The government of Kerala had transferred the responsibilities of district hospitals including that of PHC and CHC to the Local Self Governments (LSGs). The role of LSG not only extends to provide strengthening of services at the lower level, but also to address the social determinants of health.

Many a times Comprehensive Primary Health Care (CPHC) has been seen as a way to achieve UHC in the forefront and many a times we have failed to ensure a proper guidance on plotting the way towards UHC. There is no universal custom-made formula for achieving UHC; but as health system professionals it is up to us to decide and design a trail that best fits to our context and country; a trail that we can finance and deliver good quality and affordable health care to all. Therefore, capitalizing to construct accessible, affordable, fair and quality primary health care services is the most practical way for any country or state to achieve UHC. The concept of FHC, in the state of Kerala has gained

appreciation across the nation, and primary care is considered as the mainstay of health care service delivery in India ever since the Bhore committee recommendations of 1946. The implementation of Family Health Centres in Kerala is seen as a recent development for addressing and achieving the Sustainable Development Goals. As implementation of FHCs in the state is in its early stage, studying this phase, of how primary health care is transforming itself through family health centres in the state, need to be explored further. In Kerala, the participation of LSG in providing primary health care services is a unique trailblazer. This participatory approach of LSG, as well as other drivers of FHC functioning, requires further assessment for evidence-based research. Through this study we would like to explore the role of family health centres in primary health care service delivery in its early phase of establishment and the role of the major drivers for the effective functioning of family health centres in Kerala.

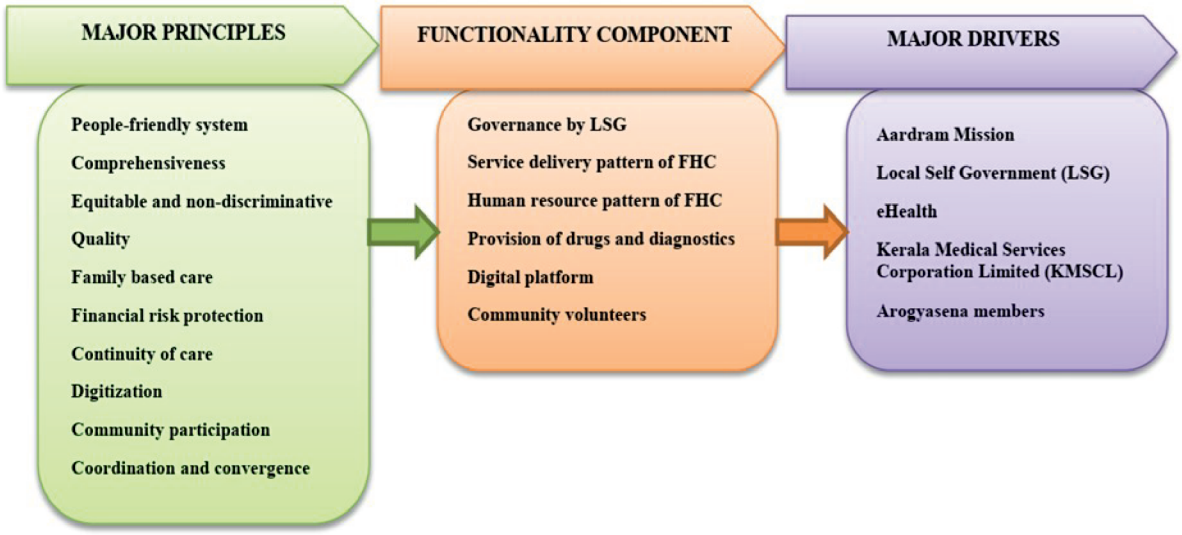
3.1 FHC Framework

Ever since the Alma Ata Declaration on primary health care, in 1978, there has been deliberation about the desirability of accepting comprehensive or selective primary health care. Selective primary health care was viewed as a short-term tactic to begin the process of primary health care execution as the provision of comprehensive primary health care is challenging to attain in poor resource settings. Although a more selective approach can enable short-term gains while a comprehensive approach, we are able to address the fundamental causes of ill health and improve the health outcomes. Grounded on the CPHC initiative in India, Health & Wellness Centres (HWCs) was created by transforming existing Sub Health Centres and Primary Health Centres (PHCs) to deliver universal and free CPHC. The principal aim of CPHC is to provide a seamless continuum of care that ensures the principles of equity, quality, universality and no financial hardship. In Kerala, with the advent of 'Aardram'; one of the Nava Kerala Mission, 'strengthening of primary health care' was taken as a challenge with the initiation of CPHC. The existing PHCs in the state were transformed into FHCs in a phased manner to strengthen primary health care and provide a continuum of care.

This 'FHC framework' gives a brief description of the major principles and drivers of FHC. The significant principles include providing universal, comprehensive, equitable and quality services provided through FHCs without causing any financial hardship to the patients. The major drivers for the effective functioning of FHCs include the involvement with Local Self Government (LSG), community participation and Kerala Medical Services Corporation (KMSCL) FHC related reforms concerning supply and drug procurement. The Local Self Governments will bring in different development sectors; together, FHC will work with other social development sectors like social justice, education, agriculture, water supply and SC/ST development. FHCs are health care service delivery institutions of LSG; and LSGs ensures the smooth

functioning and management of these centres by providing infrastructure, human resources and other logistic support as and when required. Community participation through health volunteerism as 'Arogyasena' will work alongside the existing social structures.

Figure 3.1: FHC Model Framework



The major principles of the FHC model are: (i) people-friendly health delivery system, (ii) providing comprehensive range of health care services; addressing the preventive, promotive and rehabilitative health care interventions of the local community, (iii) providing equitable and non-discriminative way of care and the approach, which will be need based and aims at treating every patient with 'dignity', (iv) providing quality health care at FHCs by provision of quality services, better infrastructure and availing the services of the best doctors and para medical staffs, (v) family based care which is capable of meeting the health care needs of all members of the family, (vi) ensuring financial risk protection through provision of free drugs and diagnostics, (vii) FHCs should act as a first level health delivery point and centres for continuity of care through referral mechanisms to higher centres, (viii) digitization of health centres by providing web based appointment system, virtual queues, patient reception at registration centres through the generation of unique identification and unified health care record for each patient, (ix) community participation is essential for promoting health and well-being and (x) the coordination and convergence of FHCs lie with Local Self Government as FHCs are health care delivery service institutions of LSG and these bodies should ensure the smooth functioning and management of these centres by providing infrastructure, human resources and other logistic support as and when required. The LSG departments will also initiate the convergence of different development sectors for effective functioning of FHCs.

The main functionality component in the FHC model is the governance role played

by LSGs. They support the FHC in terms of infrastructure, human resources, drug purchase and in other functioning matters of FHCs. The service delivery patterns of FHCs are different from the conventional Primary Health Centres, as the former have evening out-patient clinics; pre-check and post-check counselling conducted by nurses and specialty clinics like SWAAS (for respiratory illnesses) and ASWAS (for mental illnesses). Even the human resources pattern are different and an ideal FHC should have three doctors, four staff nurses, two pharmacists and one lab technician. Along with the government, the LSGs also play a unique role in appointing the needed staffs of FHCs. Another important feature of FHC is the free regular supply of drugs through pharmacy and provision of diagnostic facility attached to each FHC. Thus, provisioning free supply of drugs and providing diagnostic facility at free or at minimalistic rate prevent patients from spending out-of-pocket. Digital platform for recording patient data through eHealth provides a kind of generation of unique identification for each patient and unified health care record. This will be helpful for patients to book appointment in any government hospital through this portal. Community participation through health volunteerism as 'Arogyasena' will work alongside the existing social structures.

3.2 Current Status of FHC's and Aardram

The roll-out of FHC's is happening in a phased manner with 170 FHC's identified in the first phase in 2017-18, followed by 504 FHC's in the second phase in 2018-19 and 220 FHC's in the third phase of 2019-20. As part of the launching FHC's around 830 additional posts of health human resources including medical officers, nurses and other paramedical staff were sanctioned in the first phase and 1000 additional posts in the second phase. Service delivery of these institutions in terms of clinical care and public health activities has been augmented and outpatient care is provided in the afternoon up to 6.00 PM. Through the implementation of e-Health project it is expected to further develop individual patient care plan and family health plan based on family health register data. Registration procedure for e-Health services has already been initiated. Ward and panchayat level health plan focusing on preventive, promotive and rehabilitative health care services would be developed in association with panchayats and with public participation. A new health volunteer system called Arogyasena is being launched as part of Aardram mission. Public health interventions focusing on the reorganization of the primary health care system based on the epidemiological needs of the Kerala society especially combating the challenge of non-communicable diseases is a focus area of the programme. Treatment guidelines for 53 common medical conditions to be managed at PHC level have been prepared and made available for Medical Officers.

Chapter 4

COVID-19 Surveillance and Containment

As part of the COVID containment strategy, Government of India declared a national lockdown with wavering degrees of health system preparedness across the Indian states to respond to the pandemic. The pandemic undoubtedly wide-opened the inadequacy of public health systems across most states with an exceptionally low level of preparedness in terms of surveillance, contact tracing, health human resources and availability of Personal Protection Equipment's (PPEs), testing kits and supportive equipment. There were also many variations in treatment facilities, i.e., bed availability, availability of Intensive Care Units (ICUs) and ventilators etc. in many states. In addition to this, the pandemic also reflected on inadequacies of primary health care systems being unable to deliver on surveillance, contact tracing, quarantine, and management of such a large-scale epidemic. Let us look for the key aspects of the COVID-19 management through a responsive public health system in the State.

Interventions for prevention and control

4.1. Early response and preparedness

The early preparations at state and district levels for streamlining and proper implementation are given in Box 4.1.

Box 4.1: Preparations at state and district levels for early response

Preparedness for Early Response

- Political commitment
- State and District level control rooms formed
- Advisories, Guidelines and Guidances issued
- State and District level Sub committees formed
- War Room set up
- Regulatory measure

4.1.1 Political commitment

Political commitment for formulating control strategies and its rigorous implementation was very high. High-level committee lead by the Chief Minister, Health Minister, Chief Secretary and the Principal Secretary (Health) was formed to monitor, coordinate and guide actions for prompt responses. The chief minister with other team members held daily press briefings during the second wave of COVID-19 and disseminated the latest facts, figures, plans, concerns and challenges. Chief minister explained the daily situation in simple language so that everyone could understand but without creating any panic. Thus the chief minister lead from the front and all others worked as a team to control the pandemic and was successful in reducing the cases and deaths substantially.

4.1.2 State and district level control rooms

The State government began establishing control centres to coordinate actions and timely support following the news of COVID-19 contagion in China. State level control room was set up immediately after the news of emergence of COVID-19 in China. An addendum to testing, quarantining, hospital admission and discharge criteria for COVID-19 was issued on **January 5, 2020**. It introduced the hospital protocols to follow in case of a coronavirus suspected person.

On **January 24 2020**, special control room was set up in the directorate of health services. The state control room led by the Principal Secretary, Mission Director of National Health Mission, Director of Health Services, and Director of Medical Education; and various sub-committees started closely monitoring the various aspects of COVID-19 responses. "*The committees were formed proactively by the government of Kerala, much before the central government has issued the guidelines and orders",* state nodal officer, Aardram mission told. District-level control rooms were also opened under the supervision of district collectors on **24 January 2020.** The state and the district control rooms played a key role in formulating advisories and guidelines; and guiding the early interventions focused on saving lives.

Picture 4.1: Corona control room

4.1.3 Advisories, Guidelines and Guidances

Advisories and guidelines were issued for screening of suspected population in different locations, laboratory testing, observation in quarantine or isolation, proper treatment were issued in time. They were modified as and when new information available. Guidances were issued to all line departments for observing COVID-19 protocol in organizing different programs. The outline of first set of guidelines issued on 26 January 2020 is given in Box 4.2

The health system maintained a record of returnees from COVID-19 affected countries and quarantined them and their contacts. All the passengers from China and their close contacts were observed in strict home quarantine for 28 days. About 78 were kept in hospital isolation and 1934 were kept in home isolation. Also restricted public gathering and closed down educational institutions. Testing laboratories were started in the state on **February 2, 2020**. On **February 3, 2020** the state has declared a health emergency following the confirmation of first COVID-19 positive case in the state. No new cases were detected from the identified cohort thus the emergency was withdrawn on **February 12, 2020** by the state. The State Medical board was formed on 3rd February with senior and expert

professors of pediatrics, infectious disease, pharmacology, emergency medicine etc in various medical colleges. They gave technical support to the general, district and private sector hospitals and made changes in the medical management of patients incorporating new information from WHO and ICMR/ GOI. Medical boards were also constituted in medical colleges, district hospitals and general hospitals with senior doctors working in general medicine, respiratory medicine, infectious disease, microbiology, anesthesiology and community medicine. They managed the COVID-19 patients in their institutions and made changes in the medical management of patients in consultation with state medical board.

Box 4.2: nCorona – Guidelines of GOK on 26 January 2020

- Case definitions
- Screening, early identification and notification of suspect /probable passengers
- Safety procedures during sample collection and transport
- Sample collection and transport guidelines for laboratory diagnosis of novel corona virus infection
- Pre hospital preparedness
- Algorithm to be followed in case of suspected corona virus cases
- Management of suspected and confirmed cases
- Principles of infection prevention and control strategies associated with health care with suspected nCoV
- Surveillance and contact tracing guidelines for 2019 n/Corona virus
- Guidelines for asymptomatic persons returning from corona virus affected areas and their close contacts
- SOP for field surveillance of asymptomatic passengers under home isolation
- Guidance note to travel and tourism industry
- Protocol for sending daily health status of passengers under observation

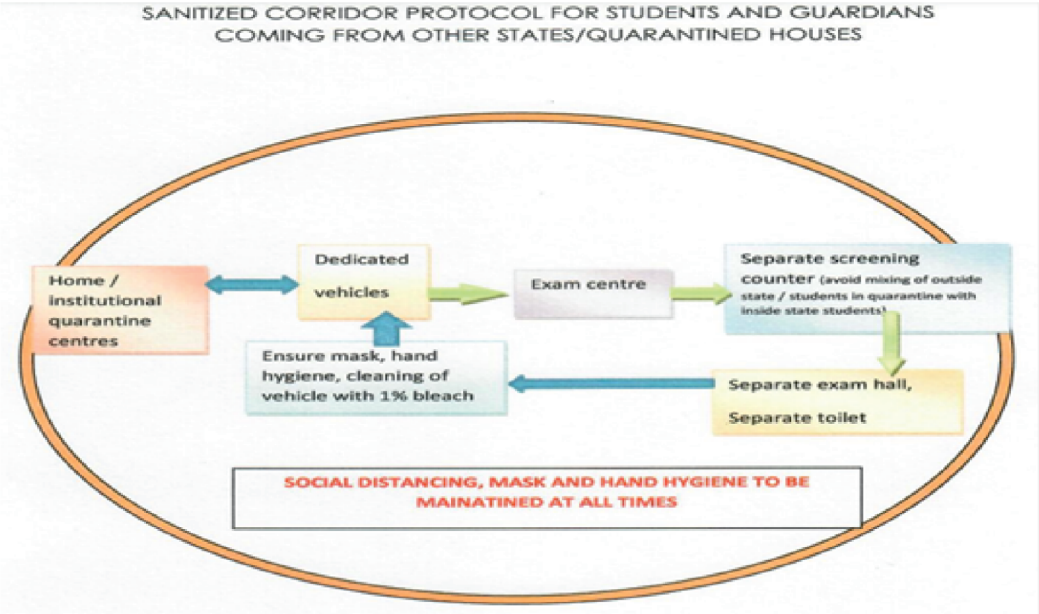
State had issued many other detailed advisories for controlling COVID-19 spreading in various situations and institutions as given below. (Refer Annexure 3)

- in jails[21,22] (on **May 20, 2020** and September 13, 2020)
- among drivers, crew and passengers of taxi[23] (on May 23, 2020)
- for conducting examinations[24–26] (**29 May,10 August & 22 September)**
- **for c**aring of airline accident victims[27] (on **8 August 2020**)
- for conducting Neet examination[28] (**10 August 2020**)
- for conducting legislative assembly[29] (**22 August 2020**)
- for Sabarimala pilgrims[30, 25] (**8 October 2020**)

An illustration of advisories and guidelines in chronological order issued in 3 phases of the pandemic is given in Figure 4.1 and sanitized corridor protocol in Figure 4.2.

Fig 4.1: Advisories and guidelines for surveillance and containment

Fig 4.2: Sanitized corridor protocol



"Source: GoK, COVID-19 Health advisory for students appearing the examination"

4.1.4 Formation of state and district level sub committees

In the state level corona virus control room, 18 sub committees[31] were formed to undertake different tasks and is given in box 4.3 and details given in Annexure 4.

Box 4.3: Sub committees

Sub committees formed in the state level corona virus control room

1. Surveillance team for hospital surveillance, field surveillance, laboratory surveillance
2. Call centre management team for documentation, answering medical queries and handling issues related to logistics and administration
3. HR team for man power distribution
4. Training and awareness team for specific and relevant training, development of modules and distribution of IEC materials to health and other sectors
5. Material management team for monitoring of inventory positions and maintaining the supply chain
6. Infrastructure management team for setting up isolation wards, ensuring strict protocol for infection control and compiling the referral list of contacts from field/ call centers/ DISHA to isolation wards
7. Media surveillance team and sample tracing team to collect media reports and preparing reply; and to collect the information regarding the demand and supply of logistics, human resources etc
8. IEC/BCC and media management team for preparation of IEC materials and daily reports for media and its dissemination to them; and updating the website
9. Documentation team for documenting meeting decisions and communication of all decisions to concerned for proper implementation
10. Private hospital surveillance team to build rapport with private hospitals and for monitoring visitors there
11. Expert study coordination team to arrange and facilitate the visits of expert agencies, their logistical support etc
12. Transportation and ambulance for management of vehicles and to facilitate training of vehicle staff
13. Inter departmental and coordination team for coordination of activities with line departments
14. Field level volunteer coordination team
15. Psychological support team for managing stress of staff, patients, people under quarantine etc
16. Community volunteer coordination team for monitoring the field level activities and arranging food to the needy
17. Data management team for supporting MIS manager to compile data and analysis.
18. Finance management team to pool resources for all possible needs arising from time to time

Media surveillance team and sample tracing team had additional task of monitoring the laboratory activities, answering to the queries and hand holding the district in transportation of samples, filling the formats, collection of reports and intimation of results to the authorities.

4.1.5 Formation of war room

War room shown in Picture 4.2 was started functioning round the clock in government secretariat on **23 March 2020** when there was strong possibility of a widespread outbreak of novel corona virus (COVID-19) and ensuing lockdown in the entire country. War room started functioning under a senior IAS officer and five other IAS officers were placed on duty for round the clock functioning. Moreover, Head Of Departments (HODs) from health, police, revenue, LSGD, transport, food and civil supplies and representatives from their respective departments were also included in the team. This was a mechanism to monitor and supervise the COVID-19 containment activities in the state.

Picture 4.2: War room

4.1.6 Regulatory measure

Enforcement of the Kerala epidemic disease ordinance was implemented on **26 March 2020**[31]. This ordinance gave the power to close down state borders, restrict both the public and private transportation, screen and quarantine persons entering the state by any means, restrict the public gathering, controlling the functioning of commercial establishments, factories, workshops, shops etc and power to make rules and punishing those disobeying this ordinance.

4.2 Awareness generation

Prime importance in containment measures was given to awareness generation and information dissemination to the public and officials through various modes for taking prompt preventive and promotive action against the pandemic. The information given were regarding modes of transmission, preventive measures and the importance of preventing transmission of COVID-19. Awareness was mainly given to the priority groups like old people and palliative care patients, scheduled caste and scheduled tribe, people residing in coastal areas, slum dwellers, people staying in care homes, people under national rural employment scheme, members of Kudumbasree and ayalkoottam, destitute and guest workers. The main activities for awareness creation are given in Box 4.4.

Box 4.4: The main awareness generation activities

Awareness Generation Activities

- Break the Chain Campaign
- To create awareness for frequent hand washing or sanitizing – LSGI responsible
- Keep sanitizer or wash basin with water tap and soap in all establishments – owner or manager is establishments responsible
- Promoting physical distancing and using face mask – everyone, LSGI and Police responsible
- Chief Minister's daily Press meet and press release
- DISHA Help line
- Technological Interventions
- Website of < dashboard.kerala.gov.in>
- Mobile app "GoK Direct"
- Social and Private media
- Training of all categories of staff
- Health Education material development and distribution

The government issued an order that instructing all LSGIs to work along with the health department in spreading awareness messages. "*LSGD helped in spreading the awareness program like break the chain and social distancing protocol. Arogyasena and volunteers in panchayaths played a major role in spreading the awareness,"* said by State nodal officer, Ardram Mission.

4.2.1 Break the chain campaign

Kerala government introduced a mass hand washing campaign named 'break the chain'; on **15 March 2020** to give awareness to the people about the importance of personal hygiene. Health minister of Kerala inaugurated the mass campaign and requested the public to promote the campaign as a safety measure. During this campaign, the government has placed wash basins with water taps and soap solutions at railway stations, bus terminals and other public places through LSGIs [32]. The LSGIs took up the campaigning through community participation and inter-sectoral co-ordination. The campaign's slogan was **'SMS'**, which stands for **soap, mask and sanitizer**. All government departments, banks, private institutions, shops and establishments, residents associations, kudumbasree units, other self help groups, youth, social, religious and political organizations, NGOs and other community volunteers were involved as the main stakeholders of this campaign. Government issued guidelines to LSGIs to undertake various activities along with this campaign in various establishments like residential areas; dry and wet markets; hospitals and clinics; construction sites, prisons, various offices/

institutions, banks etc. This document also detailed the frequency of work and responsible person for each work. The police department was entrusted to enforce the instructions and fine the violators. About 200,000 police personals participated in the drive neglecting the risk of infection. High level of education and health consciousness of people motivated them to comply with the instructions and LSGI supported all efforts of government. As part of this campaign, several health education materials were developed by health, police and LSGD and displayed in public places. Some pictures are shown below in Picture 4.3 to 4.5.

Picture 4.3: Break the chain campaign

Picture 4.4

Picture 4.5

4.2.2 Chief Minister's daily press meeting and press release

Kerala was the only state in India that conducted regular daily press briefing by the chief minister in which various COVID data were shared and the measures taken by the state were announced. During the meeting chief minister released information on district-wise distribution of the number of confirmed, active and recovered cases, deaths in different districts, contain ment zones and hotspots, the status of particular district (red, green, or orange zone), directions for the district authorities, other important incidences etc. This served as a popular platform for information dissemination [33]. The picture of chief minister's press meeting along with health minister is shown in Picture 4.6.

Picture 4.6: Chief Minister's daily press meeting

4.2.3 DISHA help line

DISHA help line was held responsible for providing guidance and counseling to individuals seeking information. It was established in 2013 jointly by NHM and department of health and family welfare to provide guidance and counseling on physical and mental health problems [34]. The helpline numbers are known to the public and they used to seek information during epidemic outbreaks, calamities such as floods etc. DISHA help line was expanded with the onset of pandemic with more number of trained professionals, health workers, and counselors for clearing doubts of people on COVID-19 related issues. The logo and help line number are shown in Picture 4.7.

Picture 4.7: DISHA help line

4.2.4 Social and private media

Social media campaign helped to disseminate messages in the form of catchy slogans, messages and trolls easily digestible way and hence helped in reducing transmission of COVID-19. This also helped in minimizing the stress of those living in the quarantine.

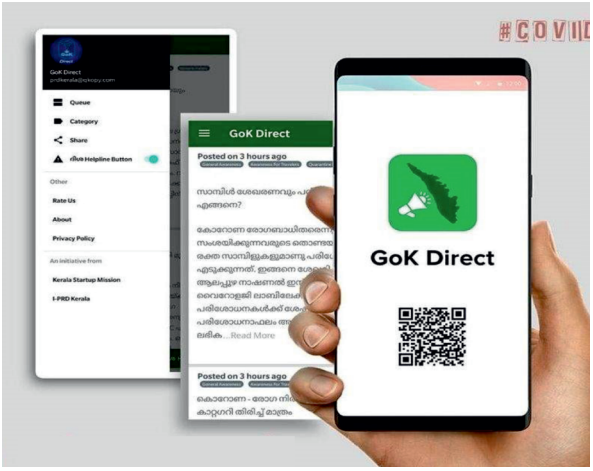
WhatsApp groups were started in the districts for monitoring the activities related to COVID-19. Health care professionals including doctors and psychiatrists also had established whatsapp groups for updating information and to give solutions for the problems of the group members. Since state had already utilized the social media and visual media during the two consecutive floods in 2018 and 2019 and Nipah outbreak in 2018, it was familiar to people. Different media sources were also used to spread awareness, avoiding the fake news and for disseminating the important and real time data to the public. The news paper advertisements and social media campaigns were almost reached the whole community since the literacy rate in the state is more than 90%. The role of visual media was also much favorable. The discussions of knowledgeable people and special debates on news reports were helpful in convincing the need of prevention and methods of prevention. The media spared a lot of time for reporting news regarding COVID-19.

4.2.5 Technological interventions

A website namely "dashboard.kerala.gov.in" was published with all data regarding COVID-19 for the information of public. A structured live data set to make real-time analysis was given and updated daily through a user-friendly dashboard (https://COVID19kerala. info/).

The state government had launched a mobile application to increase the awareness and disseminating real time data to people to prevent spread of fake news. The mobile app namely “GoK Direct,” launched on **12 March 2020** included COVID data, news, government notifications, helpline members, quarantine protocols, awareness to travelers etc.[35] This was easily available in smart phones and related text message was made available in ordinary phones. The visual of the app is shown in Picture 4.8.

Picture 4.8: GoK Direct app



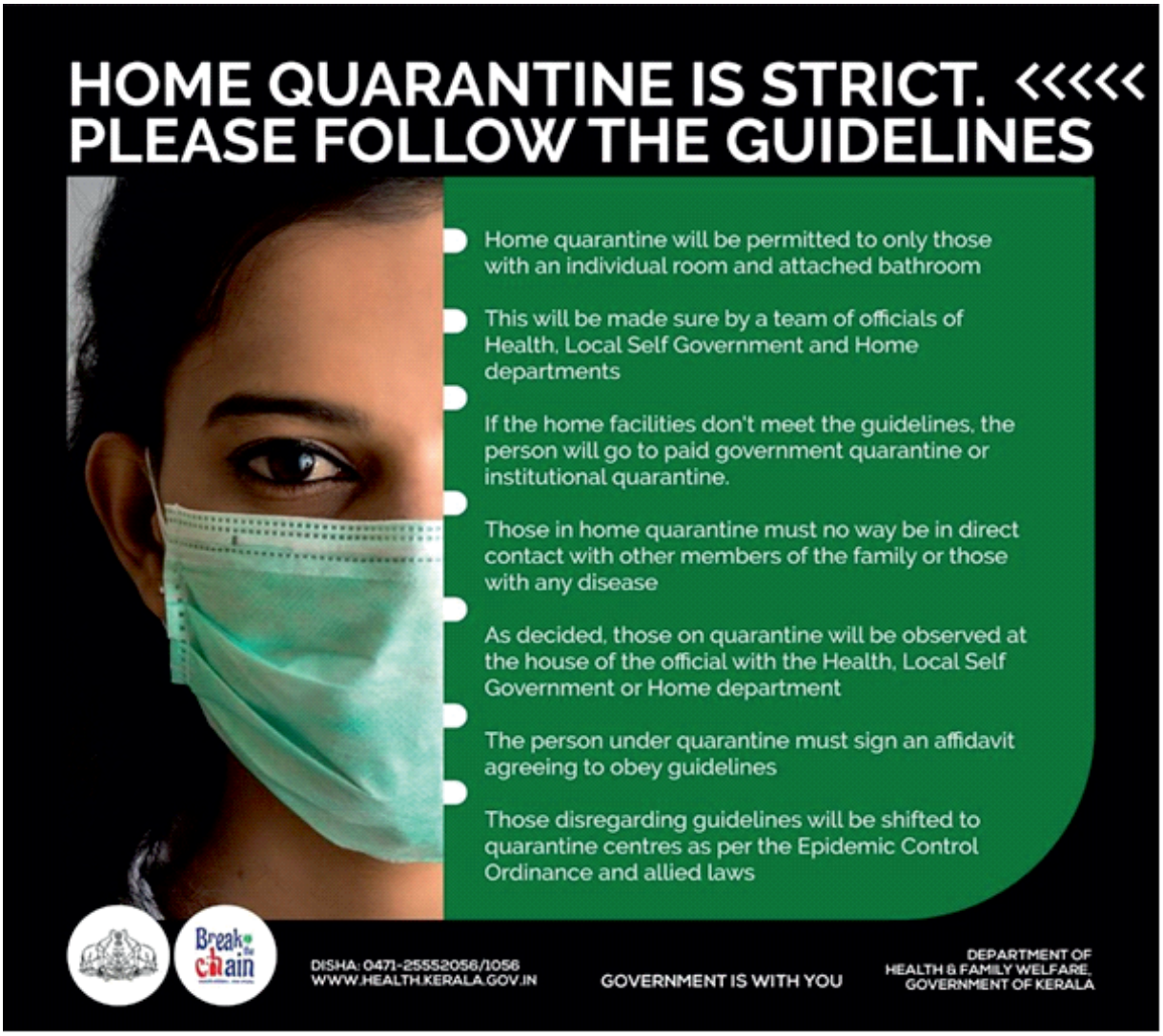
4.2.6 Trainings

Specific and relevant training sessions using modules were given to all category staff in health services. Teams of master trainers were nurtured in all districts and they gave training to others in a cascade method. The staff of line departments, volunteers of all groups, people on duty in call centres etc were sensitized with modules and education materials. Doctors were given specific trainings for providing ventilator support, clinical management, convalescent plasma therapy etc. A series of continuous online trainings were conducted. “*The State had given training for COVID control to all the private hospital staff. IMA has also conducted training classes regularly*” Traing nodal officer, SHSRC told.

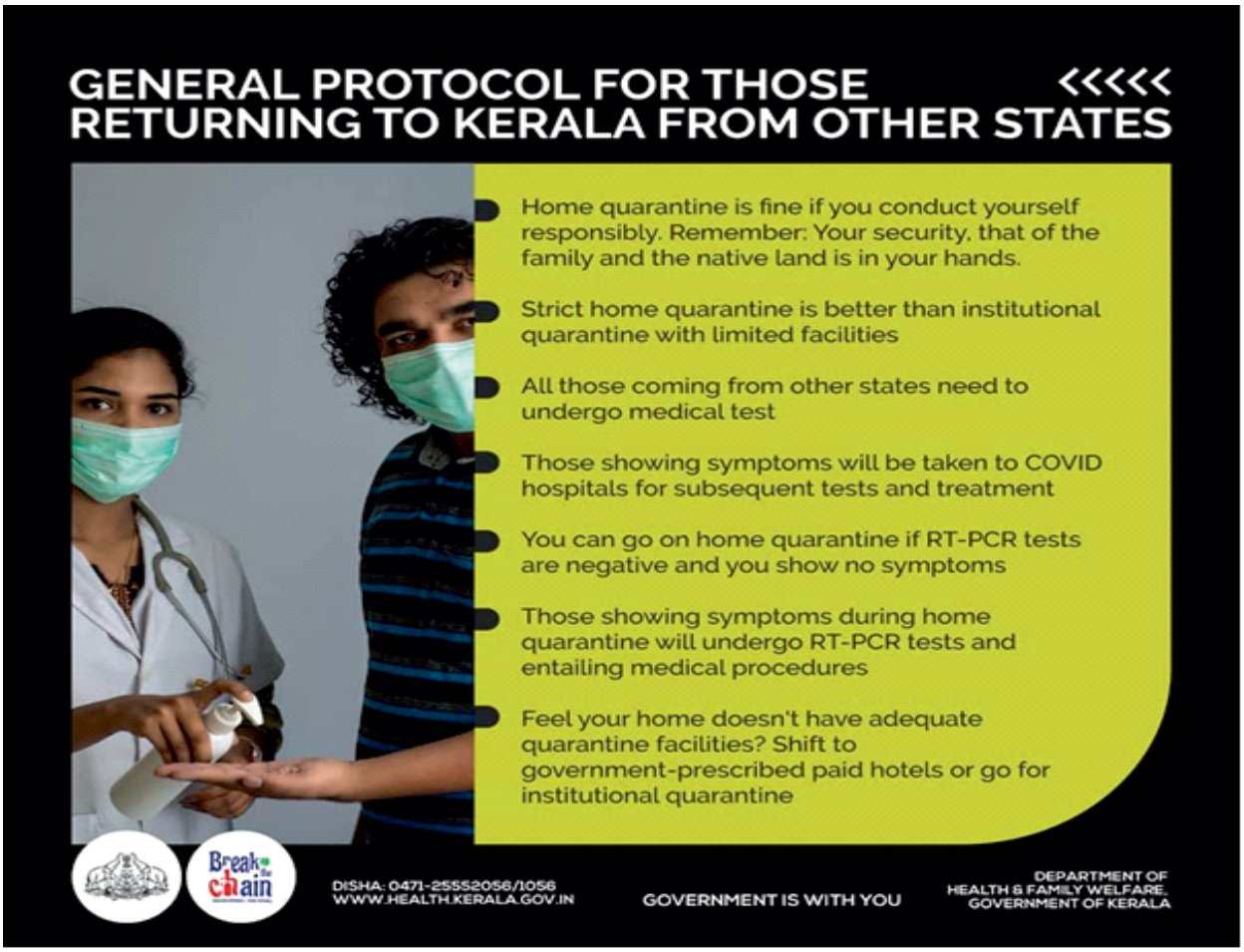
4.2.7 Health education materials

Variety of education materials like posters, palm lets, pictures, CD on different topics were developed and distributed. This was given to staff working in health and other sectors including media and call centre staff. *"All scientific information about the COVID-19, awareness and preventive measures were circulated through print, audio and visual media. This helped in reducing the unnecessary fear among the general population" State nodal officer for training, SHSRC told.* Also health awareness materials were available through the website of the state health department. Some examples for health education materials are given below (Picture 4.9 to 4.13)

Picture 4.9



Picture 4.10



Picture 4.11

Picture 4.12

Picture 4.13

4.3 Surveillance and contact tracing

The different types of surveillance organized are shown in Box 4.5.

Types of surveillance organized

- Community Surveillance at State and District levels
- Air port Surveillance
- Railways Surveillance
- Sentinel Surveillance
  - Octopus model

4.3.1 Community surveillance at state level

On confirmation of first COVID-19 positive case, the state has initiated the surveillance36. Health System was put in place for screening and follow-up of every individual who arrived in the state by air, sea, rail or road from other parts of India or abroad. The symptomatic passengers were taken directly to dedicated COVID-19 hospitals, admitted, tested and treated appropriately. The asymptomatic passengers were advised to follow strict home quarantine, avoid non-essential travel and community/social contact based on the COVID situation of the country of origin of travel and contact history. But travelers from Wuhan were tested since February 1, 2020, even if they were asymptomatic. If any asymptomatic individual developed symptoms they were shifted to the designated COVID-19 hospital for testing and further management. Universal screening of all passengers at all air ports and sea ports were started on 4 March and implemented air port safety protocols. State started promoting use of face masks and social distancing as the cases started rising. Then closed down the educational institutions, restrictions were imposed in offices and shops. The state also went in for lockdown when the country wide lockdown was declared on 24 March.

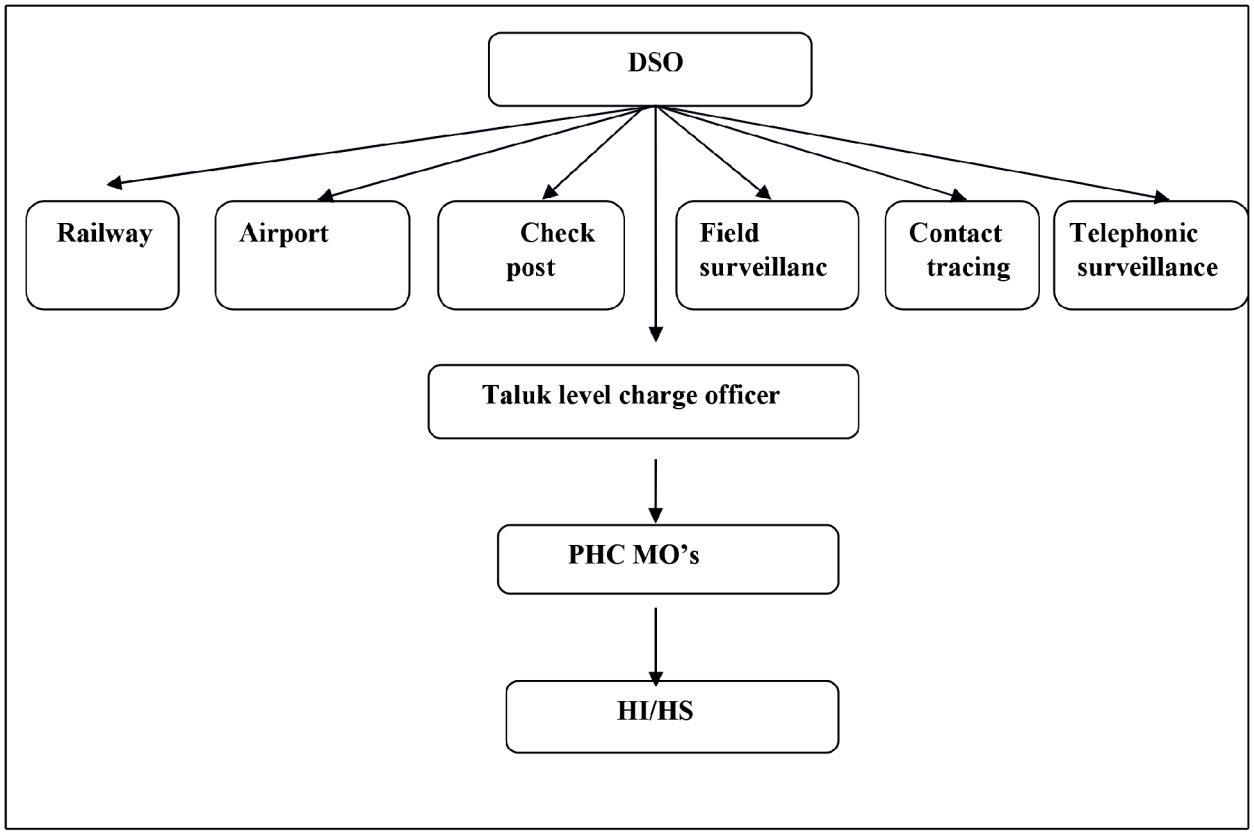
The district administration acted as the central body for implementing the control strategies at the district level. Similar to state level committees, all sub committees were formed in the districts also. These committees were coordinated and monitored at the state level. The ADHS and Director of State Public Health Laboratory (SPHL) coordinated and monitored the activities at the state level. The COVID-19 - District Surveillance Officers DSOs send consolidated daily reports to the ADHS and DHS for supervision at the state level. ADHS also performed a random verification of the surveillance data.

Then COVID-19 Jagratha portal was created on May 7 for real time surveillance and care and support of people affected/ quarantined by COVID-19. The expatriates, international travelers, inter state travelers were advised to register through this portal to get entry pass and to get all information regarding travel protocols.

4.3.2 Community surveillance at district level

The State Disaster Management Authority (SDMA) and District Disaster Management Authority (DDMA) acted promptly for monitoring and coordination of all activities in the state and districts respectively as per the necessary guidelines of NDMA. Under the DDMA, DSO was responsible for monitoring, review and coordination of activities in each district. The DMO and DPM were the other management officers

Figure 4.3: Organizational structure of surveillance system at district level for COVID-19



"Source: District Action Plan, Thiruvananthapuram"

4.3.3 Overall organizational structure at district level

The organization in the district was headed by the DDMA which actively worked with the DMO and DSU. The Block Medical Officer (BMO) coordinated all activities at block level and reported to district level officer. The BMO coordinated the activities with the help of COVID Nodal Officer in charge of each panchayath in the block area based on the reports from medical officer. Organizational structure of surveillance system at district level for COVID-19 is shown in Figure 4.3.

The following existing officers were held with the responsibilities as given below.

- **Ward level RRT** was formed by volunteers identified by the LSG, ASHA & AWW. The team followed up persons under quarantine, ensured strict quarantine, monitored daily health status and entered in COVID jagratha portal (https://COVID19jagratha.kerala.nic.in)
- Health Supervisor (HS) and Public Health Nurse Supervisor (PHNS) were responsible for reporting to BMO.
- Medical officer in charge of PHC/FHC/CHC (2nd Medical Officer of CHC) coordinated the activities at panchayath level with inputs from health inspector, public health nurse as per directions from block and district level officers
- **Block Public Relation Officer** (Block PRO) was responsible for data entry and transportation. He/she shall report to COVID Nodal Officer and coordinated with medical officer in charge of panchayath for data consolidation and transportation with the help of LSGD, Information Kerala Mission (IKM) and Akshaya.
- **COVID Nodal Officer** working under block medical officer helped in coordinating surveillance, COVID sample testing from whole block area, ensuring isolation of suspected COVID persons, proper testing, contact tracing, result collection and liaison with the district surveillance unit.

4.3.4 Airport surveillance

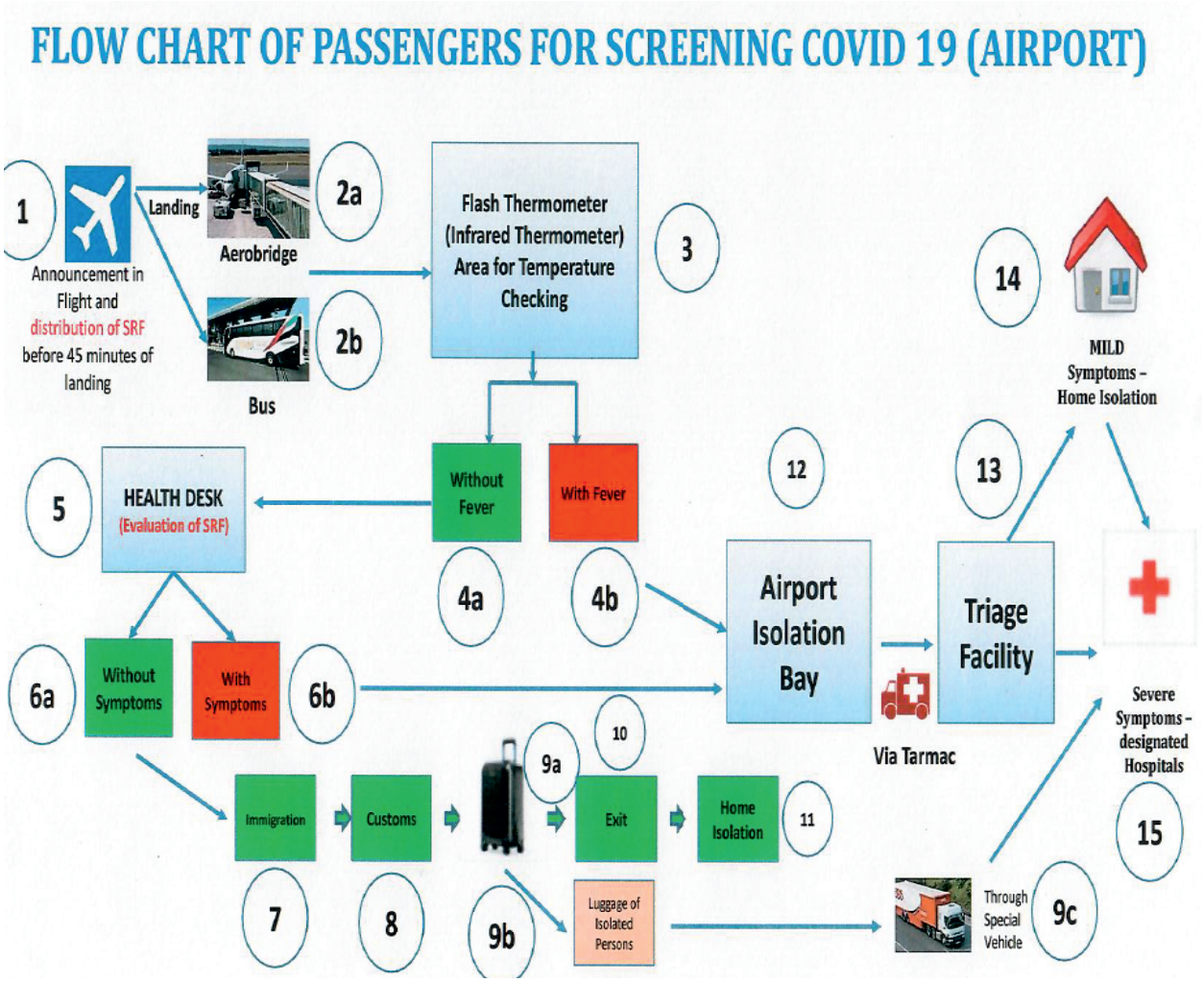
Kerala state has strengthened the surveillance and control measures against the disease through an order on **15 March 2020** due to the inflow of persons from affected countries. By then, 141 countries were declared as affected with COVID-19 by WHO. Then detailed arrangements and sequence of activities were planned in the airports as shown in Figure 4.4, to ensure the safety of passengers. IgM antibody testing of all expatriates at airport at the time of arrival was made compulsory on **24th June** and testing and follow up care strategy of them were revised on **25th June**, as given below.

- All expatriates arriving at airports should be tested for IgM antibody. All laboratories were advised to fast track the samples of expatriates and provide results at the earliest
- All symptomatic were shifted to COVID hospital or CFLTC irrespective of antibody test results.
- All antibody test negative and asymptomatic were sent home observing “sanitary corridor” and with instruction for strict home quarantine

- All antibody test positive were shifted to COVID hospital or CFLTC with individual rooms and attached bath rooms
- All antibody test positive were further tested for RTPCR
- All RTPCR test negative and asymptomatic were sent home following COVID protocol and observing "sanitary corridor" with instruction for strict home quarantine.
- All RTPCR test positive and asymptomatic were isolated and treated in CFLTC.

All RTPCR test positive and symptomatic were isolated and treated in COVID hospital

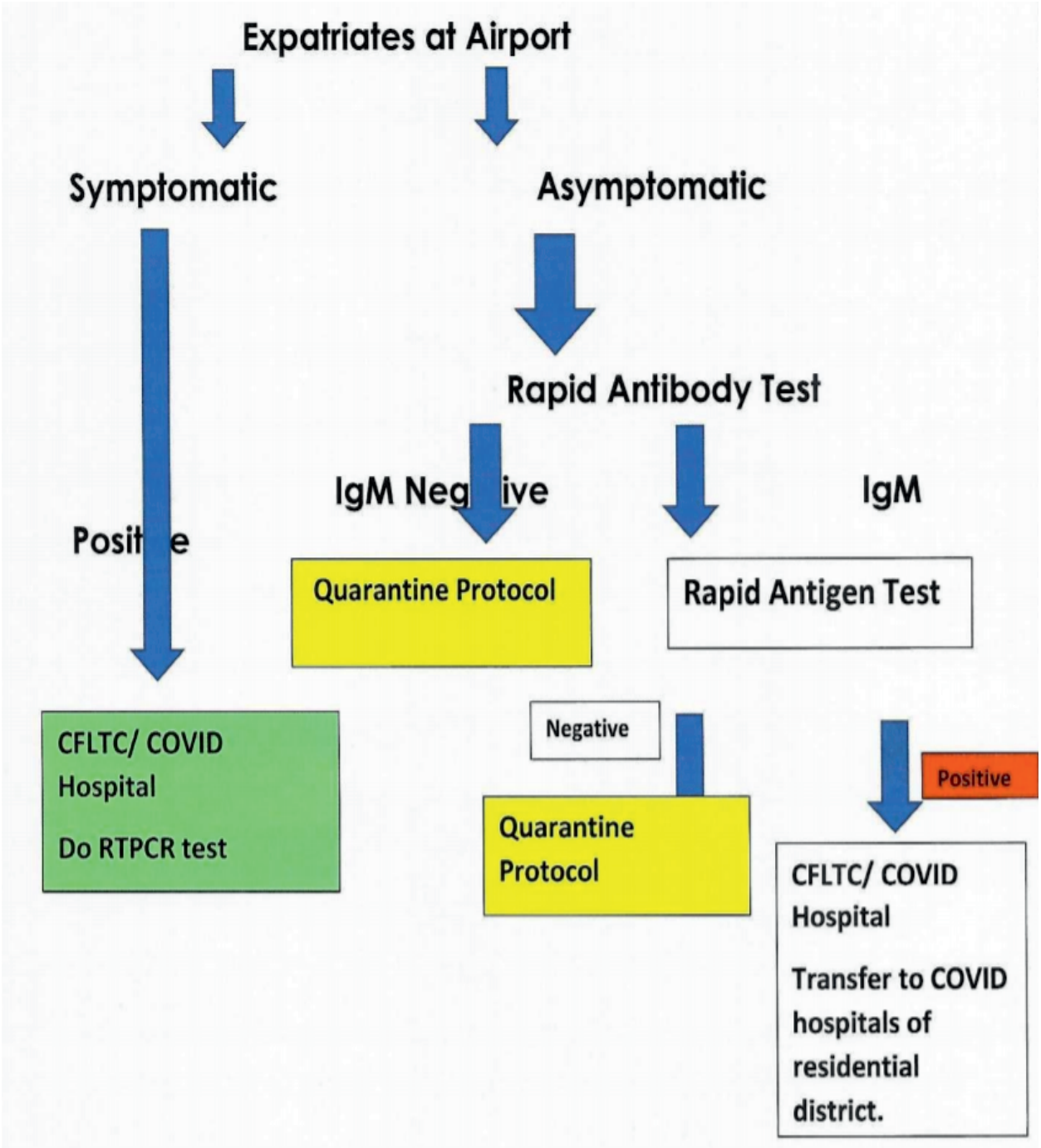
Figure 4.4: Flowchart of passengers for screening COVID-19



"Source: Advisory on COVID-19 sequence of activities at arrival gates at the airport and roles and responsibilities chart"

The minimum turnaround time of RTPCR test was 6 to 7 hours and this caused many inconveniences to the passengers. Hence RTPCR test made compulsory from June 24, was replaced with rapid antigen test (RAT) from July 2. The positive patients were transported to COVID hospital in their own districts in special ambulance after giving psychological counseling. All RAT positive with symptoms were tested for RTPCR either at airport or later at COVID centre. The schematic diagram is given in Figure 4.5

Figure 4.5: Schematic diagram showing testing at airport



Source: Addendum to advisory on testing of expatriates screened positive for IgM at airport

Sentinel Surveillance activity using RT-PCR test was initiated on dated 14 May 2020 to detect community transmission[37]. Samples were selected and tested from all vulnerable and potential risk groups like non-COVID suspects with ARI, health care workers, people with high social exposure, close contacts of interstate truck drivers, residing migrant workers, asymptomatic expatriates and other specific groups like auto drivers.

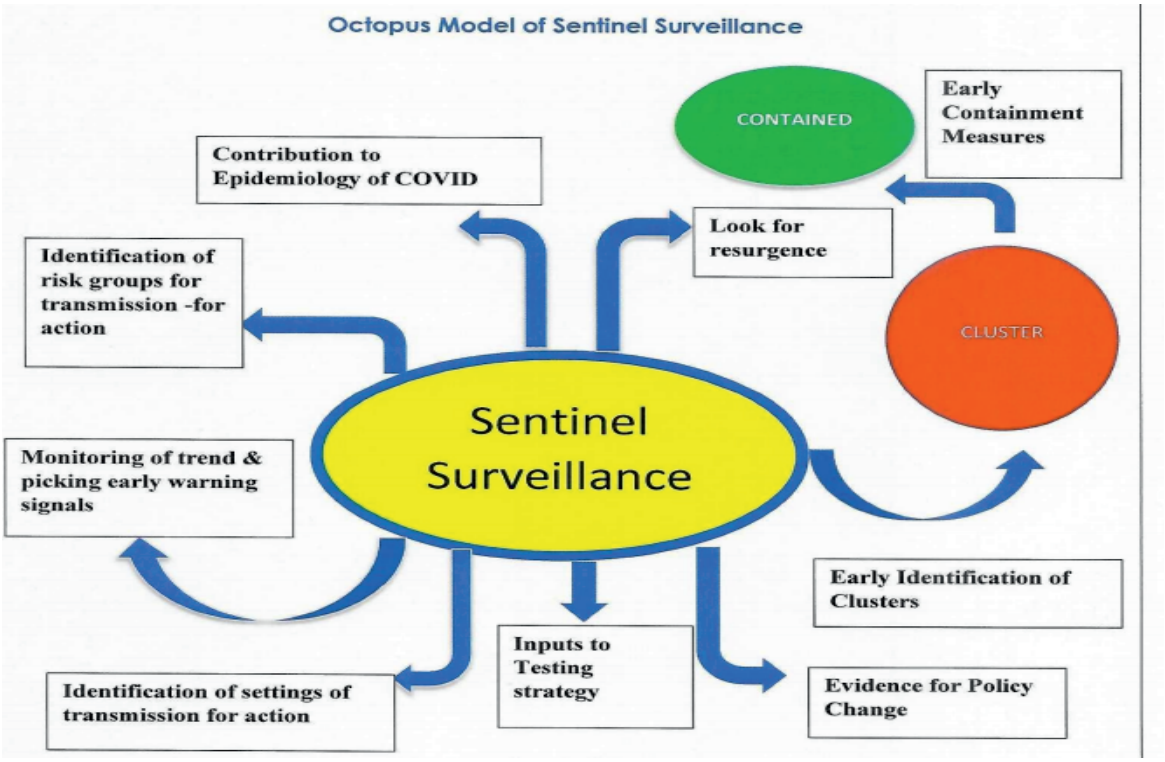
4.3.5 Railway surveillance

Surveillance was initiated on **14 May 2020**, to screen all passengers coming by train from other states to prevent the spread from other states and further spread within the state**.** Those who need to enter the state should need to register on designated web portal with information like arrival & designation details, risk status, isolation place details etc to generate a QR code. All passengers were expected to practice the measures taken by the railway department during the journey. Passengers who were instructed for home isolation should proceed to home in a designated taxi/own vehicle after signing an affidavit. But passenger and driver were only allowed in the vehicle.

4.3.6 Sentinel surveillance in costal, slum & tribal areas

The state further strengthened the surveillance in marginalized population settings like coastal, tribal and urban slums from **14th July** [38]**.** A total of 80 coastal villages, 25 tribal villages and 15 slum divisions were selected randomly and performed rapid antigen assay for detecting the community spread. The testing centres were arranged in PHCs/private hospitals/nursing homes/ mobile medical units etc in the locality and all positive results were considered as confirmed cases. The data were registered with ICMR as well as the Kerala government online portal (Healthmon) by DSO for real time reporting. The ADHS supervised the implementation activities along with the COVID DSOs.

Figure 4.6: Octopus model



Source: Addendum to the advisory on sentinel surveillance

Various types of surveillance which aided in the control and prevention of COVID-19 were sentinel surveillance, ILI surveillance, routine testing, sero-surveillance and testing in clusters. In each district one team was set up with one doctor, one nurse, one laboratory technician, one assistant and one driver to conduct sentinel and sero-surveillance. DMO gave all support and help for smooth functioning. On **27 August 2020,** the state has adopted an **Octopus model** of sentinel surveillance to depict the reach and implications of sentinel surveillance applied for COVID-19 prevention and control. A guideline on supportive supervision and daily reporting of district and state summary of COVID-19 was issued on **14th October.**

4.3.7 Contact tracing

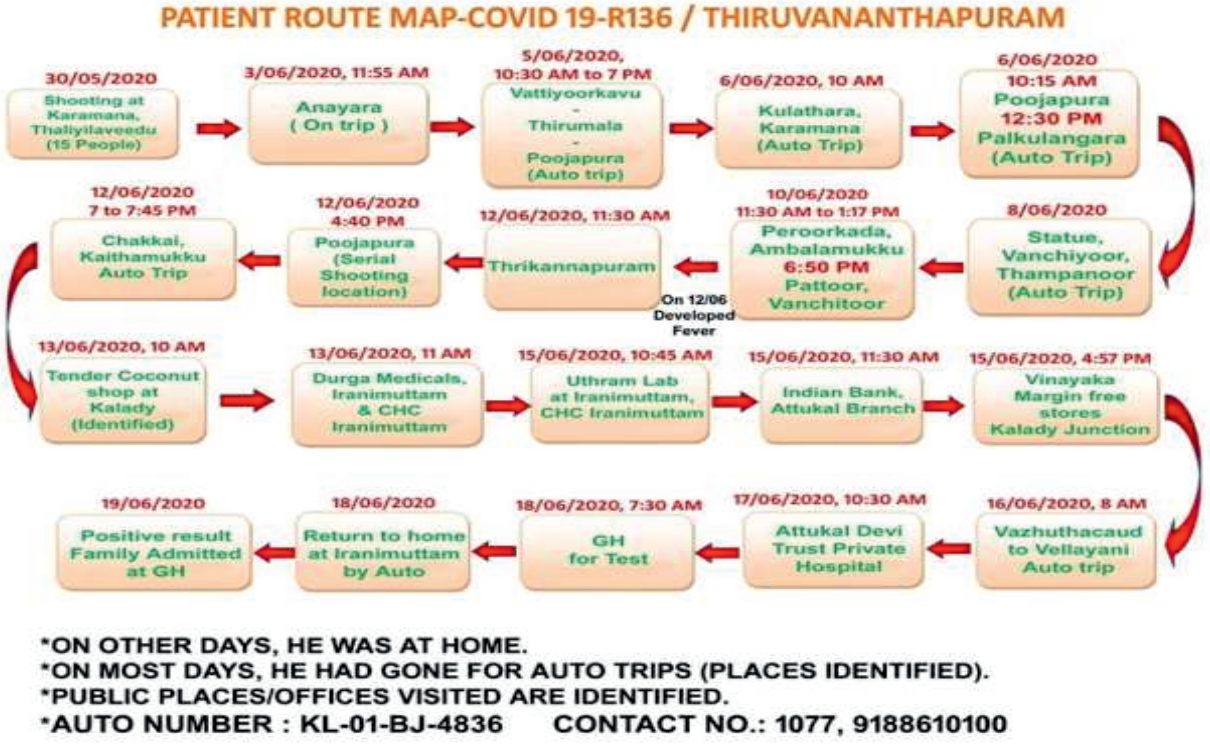
The comprehensive guidelines issued by COVID-19 (nCorona) Virus Outbreak Control and Prevention State Cell, Health & Family Welfare Department on January 26, 2020 included the guidelines for contact tracing and quarantine also[39]. This included the definition of contacts and its classification into high risk and low risk, detailed procedure for contact tracing and subsequent activities to be undertaken etc. District Surveillance Units (DSUs) were instructed to collect details of patients and contacts and to sent to State Surveillance Units (SSU) for state level consolidation of data. The contact was defined and classified as per the WHO definition and classification. guidance note was given to travel and tourism industry to notify all guests to health department through 24x7 help line and to inform specific instructions to all guests for strict compliance. The specific instructions to travellers were also informed them.

The state started the contact tracing from the first confirmed case on 30 January 2020 itself. The health team had protracted patient's journey from Wuhan to identify everyone who came in contact with her. An in-depth interview was conducted to trace her contacts and found that she had 63 travel contacts and 18 community contacts. Route map of contacts was also prepared. The health care officials have identified and contacted the co-travellers and asked them to stay in quarantine for 28 days. The same protocol was also used when new patients were detected subsequently. The government had set up a state level control room for surveillance of COVID-19 patients [40]. These control rooms were effective in identifying primary contacts and were vital in providing alert for traced contacts of other states. Later, under the control of district medical officers, district level control rooms were set up in all 14 districts. Expert groups were selected for the responsibility of contact tracing in each district. The contact tracing team had mainly two wings – team for monitoring passengers by flights and other by trains and ships. They prepared route maps of the patients and identified their contacts [41]. In the last week of April, contacts and unlinked cases increased. The local news channels and social media published the route maps widely and this helped in finding the missing links. Some patients have reported up-to 200 contacts and one had 600 contacts. Then the small centralized team in the initial phase became inadequate and hence

expanded the team motivated trained volunteers mostly non-medical persons and students.

In May unlinked cases further increased and contacts of many auto drivers, food delivery agents, health staff, security staff etc could not be traced since they failed to give any direct contact history. In these cases possible sources of infection only could be identified. The break through case was the auto driver from Thiruvananthapuram city. He pretended innocent with very few contacts but on field investigation many possible contacts could be identified. A detailed field investigation was conducted with the help of community medicine PG students and contact tracing staff. The inhabitants around his home were very much helpful in identifying many contacts. He was a frequent traveller to the neighbouring state and with many contacts. This was the period of lockdown of whole country with many check points at the interstate border. Thus understood the possibility of many unidentified secret paths to neighbouring state without check points. "*Sometimes contacts of patients were so extensive that it may go up to 40-50 contacts per case. So far up to 600 cases were traced for a single person in this district and prepared route map. This was really difficult and challenging," says the district nodal officer, surveillance and contact tracing.* Route map of a patient released by district authority is shown in Figure 4.7. "*In May last week, convicts in Venjarumood jail became COVID-19 positive. This was discussed in meetings since the chance of spread is more because it was a closed community and the source was unknown. The contact number given by the person was a police officer's number. It was a great challenge for the contact tracing group" quote from district nodal officer*. On July 1, just

Figure 4.7: Route map of a patient released by district authority



Source:https://english.mathrubhumi.com/news/kerala/route-map-of-COVID-positive-auto-driver-released-contact-tracing-gets-complex-1.484841

a single case was reported from Poonthura. A fish seller from Kumarichantha, a fish market in the area, who had been travelling to Kanyakumari to get fish had tested positive. But more than 100 people in the area were found positive in one week on screening. government officials declared it as a super spread and contact tracing faced a lot of difficulties in finding out the primary and secondary contacts.

According to the revised quarantine and contact tracing guidelines published on **22 August 2020,** the definition of a contact person was changed. Earlier any person who was in touch with the patient from 14 days prior to onset of illness was considered as a contact person but in the new guideline the period was reduced to two days prior to onset of illness. ASHA workers, police, LSGIs and health inspectors were asked to go to the field to trace the contacts [42]. The extensive route maps, a large number of contacts, hiding the history and forgotten history of travel were the challenges of contact tracing.

4.4 Management of suspects and patients

The passengers and natives were tested for finding the disease status and managed as given in Box 4.6.

Box 4.6 Management of suspects and patients

- Diagnosis and Testing Strategy
- Quarantine strategies and facilities
- COVID Brigade
- Isolation and Treatment

4.4.1 Diagnosis and testing strategy

Identifying the case from the beginning got special attention; intensive training provided to health workers varied from doctors to Asha workers to identify the COVID-19 symptoms. Health check-up booths were established in all railway stations, state borders and airport to check and guide the people coming from outside. **On February 1, 2020** itself state issued guidelines regarding sample collection and transportation for testing n-corona virus from NIV, Pune. Later, testing facility was arranged at virology institute Alappuzha, which is a part of NIV, Pune, for speedier testing. Soon after 12 more testing laboratories were launched in different parts of the state. On **12 March 2020** the state has issued a revised guideline for testing, quarantine, hospital admission and discharge based on risk assessment. Guidelines regarding the distribution of samples to be sent to laboratories were issued on **25 March 2020**. In addition to using the centrally procured real-time polymerase chain reaction (PCR) testing kits, Kerala was the first state to acquire rapid test kits from the Pune-based Mylab. An advisory regarding the rapid testing kit was issued on **28 March 2020.** The number of samples tested per day was below 1000 till the

beginning of May except four times**.** In phase 3, the number of tests was increased to more than 1000 per day due to the return of the people from different parts of the country and the world. The number of samples tested as on 8 May was 35,000 and as on 30 June the samples tested rose to 1 71 846. In addition, more than 46 689 samples were taken from high-risk groups like health care workers as part of the sentinel surveillance carried out in all 14 districts in the state to check the prevalence of a disease in a community or population. Further, 1193 samples have been tested from three districts, Ernakulam, Thrissur and Palakkad by ICMR in Kerala as part of ICMR sero-surveillance study. Later about 50000 to 60000 tests were performed daily. COVID testing Kiosk was also established, first in India.

Tests were conducted optimally with prioritizing the groups to be tested rather than the whole population. This selective approach was taken due to the limiting factors including availability of reagents, PCR equipments, trained staffs, protective gears for each collection and cost (Rs 4,500 per test). Indian Council of Medical Research (ICMR) handed out 100,000 RDKs to Kerala in the beginning. Instead of testing the general population, the Kerala government identified four priority groups for testing and this was appreciated by ICMR[43].

1. Healthcare workers who had served patients with COVID-19 and other patients (25,000 kits).
2. Government staff with public contact, like police personnel, ASHAs, Anganwadi workers and local government staff (20,000 kits), and essential service providers (5,000Kits), e.g., workers of community kitchens, food and grocery deliverers and ration shop vendors etc.
3. People quarantined at home (25,000 kits).
4. Senior citizens (20,000 kits).
5. A wide variety of tests were available and state issued criteria for choosing the tests. The types of tests available for confirmation were RTPCR/ Gene Xpert/ TrueNAAT / CLIA. Xpert-SARS-CoV testing: Xpert-SARS-CoV testing was made available on **24 April 2020** in three government medical college laboratories – Thiruvananthapuram, Ernakulam, Kozhikode[44]. This test was recommended for samples of emergency nature which included emergency surgeries for COVID suspects, high risk HCW, COVID-19 suspected death etc.
6. COVID-19 patients were classified based on symptoms into three categories for proper management [45]. The categories were

- Category A – Mild symptoms- sore throat/ cough/ rhinitis/ diarrhoea
- Category B - Fever and/or severe sore throat/cough diarrhoea or Cat A plus comorbidity/pregnant women/ immunosuppressive patients/ elderly (above 60)
- Category C - Red flag signs like chest pain, haemoptysis etc., children with ILI with red flag signs, deteriorating chronic conditions

4.4.2 Quarantine strategies and facilities

Government had instructed LSG bodies on **March 20, 2020** to undertake specific responsibilities with respect to

1. imparting health awareness among various groups of people,
2. facilitating break the chain campaign by providing sanitizers, soap and water etc,
3. implementing and monitoring other preventive measures like mask use, keeping physical distancing etc,
4. cleaning of public places to prevent communicable diseases
5. arranging essential commodities for people under home quarantine
6. arranging psychological counselling for the people under home quarantine
7. activate all health and disaster related committees
8. ensure the availability of essential commodities including drugs and prevention of hoarding
9. identifying suitable buildings for CFLTC and quarantine and arranging required facilities in them, arrange food from community kitchen to inmates and staff
10. proper reporting to district collector routinely to take necessary preventive and control measures as and when in need of
11. monitoring expatriates and foreign travellers and helping them etc

One of the best effective strategies to prevent the spread of disease is quarantining of all contacts for a reasonable period. GOK adopted the quarantine guidelines very early and practised rigorous implementation. All those who arrived from hot spots were put in quarantine shelters or home for a period of 28 days and those who developed symptoms during the period were tested. All the positives were transferred to COVID hospitals for isolation and prompt treatment. All those who had contact with laboratory confirmed cases (primary contacts) were kept in quarantine and all those who had contact with primary contacts were advised home quarantine with strict instructions for following the three control measures namely hand hygiene, physical distancing and wearing face masks. They were informed to report for testing if develops any symptoms. Health worker monitored all people in quarantine through daily phone calls for any symptoms. Keeping the asymptomatic people for a long quarantine period of 28 days was found to be difficult. But this was successfully practiced for about three months because of the support from various corners. But later the quarantine period was reduced to 14 days.

Three tier patient management system was initiated in the state from March 28 onwards viz COVID Care Centre (CCC), COVID First Line Treatment Centre (CFLTC) and COVID Hospitals (CH) and guidance were issued for converting hospitals into dedicated COVID hospitals. Specific periods of isolation and quarantine were also fixed for different situations.

CFLCTCs were opened in the month of **April** in all districts when the case load increased and almost 10000 doctors and other staff were entrusted with the work. In these centres government gave free meals to all patients in addition to free treatment. All the mild and moderate cases (category A) were treated in identified CFLTCs (Picture in 4.14). These

were the primary centres for treating cases and coded green[46]. The centres were had an observation area (10-25) and treatment area with adequate medical staff. All isolation protocols were followed and essential drugs, logistics etc were made available. All treatment guidelines were visibly displayed in these centres. OPD services were also made available. Data were sent to district control room on daily basis.

CCCs were the blue coded centres for isolation of people came to Kerala. The district administration along with LSGD identified these centres and made necessary arrangements[47]. LSGD ensured the food, water, sanitation, internet facility, waste disposal and cleaning services etc. HI was the person in charge of these centres. At least two Health Care Volunteers (HCV) were always in these centres. HCV checked for symptoms on admission and on daily basis. Symptomatic patients were immediately transferred to the facilities from CCCs. JHI visited these centres on daily basis. CCC can also be upgraded into CFLTC as and when needed.

In the later stages there were 1387 centres and 119913 beds in CFLTCs, CSLTCs and domiciliary COVID-care centre (DCC) altogether. Total of 7789 doctors and 12344 nurses were deployed in these care centres. The occupancy status was about 50%, 40% and 25% respectively as on October 16, 2020. The second level CFLTCs (CSLTCs) were started with the increase in active cases. This was accompanied by improvement of hospital preparedness, ensuring medical and equipment supplies. Roping in services of private hospitals and redeployment of skilled HCWs ith HCVs to critical stations were done.

Picture 4.14: CFLTC

Procurement of pulse oximeters by all LSGs and maintain a stock of finger pulse oximeters by ward level COVID control team was an important strategy. Along with it help desks with pulse oximeter facility was planned to establish at public places. Additional strategies were

- Increased surveillance and testing
- CFLTC and home based management for category A patients
- Level 2 CFLTCs and government hospitals for category B patients. Medium level private hospitals were roped in all zones for management of them. List of such hospitals agreed for treating COVID-19 patients with the conditions offered by government and beds reserved for the purpose were prepared. These hospitals were made part of the government facility for direct referral of category B patients by government doctors.

- Medical colleges and major private hospitals were prepared for treating category C patients. Real time bed - ICU management for smooth referrals between different level of hospitals in both public and private sectors were made through district programme management and support unit (DPMSU)
- Call centre was strengthened for co-ordinating admission and transportation of patient as well as for answering queries.
- Tele-consultation services were started
- Targeted IEC were organized for protection of vulnerable and for self assessment of symptoms
- Reverse quarantine measures implemented through ward level COVID control team.

A revised quarantine and contact tracing guidelines were published on **22 August 2020**. As a measure for tracing these contacts in the community, the government had asked the ASHA workers, police, local self-bodies and health inspectors[42]. In Kerala there are about 26000 ASHA workers and all were mobilized and trained for the purpose. The ASHA workers visited 25-30 houses everyday including those under quarantine. They enquired about the symptoms like fever, cough, body pain etc and ensured regular updates. Police personnel in Kerala were the front runners in ensuring strict lock down and inspecting whether COVID protocols were followed by the public[42]. They were also part of contact tracing as in many cases the route maps were so extensive and often the patients forgets the travel and other contact history. The team also used media surveillance for identifying the needs of people under quarantine. Kerala model of contact tracing was a collective effort from the government, health care workers and administrative personnel.

When home quarantine of suspected patients were allowed in August, health department recommended **reverse quarantine** for all senior citizens. They were requested to remain in their rooms without any outside travel. The other household members were advised to avoid unnecessary contacts with them. The persons in home quarantine were recommended **room quarantine** since many home quarantine people mingled with other members of home. All under home quarantine were daily monitored by ASHA workers.

4.4.3 COVID brigade

COVID Brigade was constituted in **July** to power the human resources in CFLTCs, hospitals and public health system. They were a group of trained health care workers and volunteers for intensifying the fight against the COVID-19. The COVID Brigade, involving volunteer doctors, nurses, paramedical, technical and cleaning staff were deployed at these centres as also other designated COVID hospitals. The state government has sought three types of volunteers aged between 18 and 50 years of age. They were

- medical category (MBBS, dental, Ayurveda and homeopathy), nurses, laboratory technicians, and pharmacists;
- non-medical category (MBAs, MSWs, and MHAs) whose services were sought for technical tasks such as centre management and data entry;
- multi-purpose category (educational qualifications not considered, but willing to take up any task).

State approved for 7678 posts of medical category people and 5666 could be identified and put in place for working.

4.4.4 Isolation and treatment

Kerala has started COVID special hospitals in April with all facilities required to manage patients with any complications and co-morbidities. Two or more such institutions were established in each district and 276 doctors were appointed in one day to manage these hospitals[48]. Initially all positive patients were cared and treated under COVID hospitals [49]. Several private hospitals were identified and entrusted to provide critical care for COVID-19 patients. Government informed all private hospitals to keep aside at least 20 beds for the care of COVID-19 patients and fixed the tariff for care to avoid exploitation. Tele-medicine consultations were also started since many private hospitals were closed initially. On **29 July** Kerala published an advisory for home based isolation of asymptomatic positive health worker. This was following the ICMR guideline as many of the positive cases were asymptomatic and can be managed by home isolation. Kerala decided to begin the home based isolation for health providers in the initial phase as they are more aware. Separate room with attached toilets were required for opting home isolation [50]. Those who interested for home care needed to submit an affidavit. The home isolation was completely voluntary [49]. The state permitted home quarantine for non health care patients on **7 August 2020.** The patient must satisfy the clinical and social eligibility criteria for home based isolation. The patients should not have any underlying disease conditions or psychological problems. A child less than 12 years kept in home isolation can be accompanied by the care taker. In case of red flag signs the patient should seek for immediate medical care.

Appropriate laboratory investigations were recommended for COVID-19 positive cases as shown in Figure 4.8 below[45].

Figure 4.8: Laboratory investigations

At Admission	CBC, RFT, LFT, CRP, RBS, ECG
If clinically Indicated	Portable CXR, HIV, HBsAg, HCV, D-Dimer, Ferritin, LDH, CPK, procalcitonin, Blood culture
To repeat Every 3 days if clinically deteriorating.	CBC, Creatinine, AST/ALT, CRP, LDH, CPK, Ferritin, HRCT
For Immunocompromised patients eg Transplant recipients, HIV	Tests to rule out opportunistic infections like Mycobacterium tuberculosis, pneumocystis jiroveci etc

"Source: COVID 19 interim treatment guidelines for Kerala state"

High risk patients were identified as those with comorbidities like uncontrolled diabetics, hypertension, CVD, CRD, CKD, CLD, HIV, elderly and those on immunosuppressant. Appropriate laboratory and clinic assessment were performed for these patients to assess the risk status[45].

In the initial stage all confirmed cases with mild and severe symptoms were admitted in dedicated COVID-19 hospital and treated. Intensive Care Unit (ICU) and ventilator support were arranged in these hospitals to manage complicated cases. Specially trained doctors and staff were posted here. Later, when the number of cases increased mild cases were admitted in CFLTC or CSLTC and observed. They were shifted to dedicated hospitals when developed any red flag signs or patients with non communicable diseases. In September mild confirmed cases were permitted home care with the condition of reaching hospital in case of any red flag signs. In all hospitals triage system was set up and fast tracking of COVID-19 patients were practiced. Along with this tele-consultation also strengthened to monitor and assist patients on home care.

State and district medical boards were constituted to bring out treatment and discharge protocols and to assess each positive case. Treatment protocol for COVID-19 was developed and updated from time to time. Interim treatment guidelines for different clinical situations were issued on 24 March and standard treatment guidelines for critical care medicine were issued on 15 April. The compassionate use of convalescent Plasma for treatment of patients with severe/critical COVID-19 was practiced rarely for a short period between June and September. Treatment guidelines were revised in 15 August. All these guidelines were made available in all treatment facilities and online training were given to concerned doctors.

4.4.5 Psychosocial support

"There was increased stress for both public and health system staff. The stigma, economic crisis, loss of job etc caused increased stress and mental discomfort for many people. Work overload and continuous duty without holidays increased the stress, and strain of health workers. Counseling was not enough to everyone's problem"; SNO, Aardram mission told.

A new tele-medicine portal, e-sanjeevani, was started to provide psychosocial support to people on quarantine. This project projected the message of "Not alone, we are with you". A total of 1143 mental health professionals, including psychiatrists, psychiatric social workers, clinical psychologists and counsellors have been deployed to provide counseling support to people in quarantine and frontline workers involved in corona outbreak control activities. The service was extended to mentally-ill patients, children with special needs, migrant labourers and elderly people living alone with necessary modifications.

4.5 Material management

State government entrusted Kerala Medical Services Corporation (KMSCL), an associate wing of H&FWD, to procure all necessary materials right from the beginning. They procured and distributed sufficient quantity of PPE kits, face masks, hand sanitizers, gloves, test kits, oxymeters, ventilators etc.

Chapter 5

Social Security Measures

Kerala, which was the first COVID-19 affected state in India, but, set a successful example for the rest of the country. The administers of Kerala took immediate actions to reduce the risk of hunger in poorest population[51]. This is one best social security measure adopted in the state.

Food supply to the needy

5.1 Public Distribution System

Public Distribution System (PDS) is considered one of the poverty relief programmes that provide food materials to the vulnerable population in urban and rural areas. These outlets provide food materials at subsidized rates to the poor and to certain target populations there by reducing their economic burden and relieving them from huge tension. The mental distress and insecurity that arises out of not eating or having to worry about the next meal are thus alleviated by such programs.

The government announced free ration for everyone in the state in April. It provided 35 kg rice to below poverty line families and 15 kg rice for all others through PDS and Kerala State Civil Supplies Corporation (SupplyCo). Besides government had started distribution of food kits consisting of 17 essential items worth Rs. 1000/- for every household, irrespective of income status. It was collected from the SupplyCo and national agriculture co-operative marketing federation of India and distributed through the ration shops from 8th April and distributed every month[52]. There were some innovations in observing COVID protocol while distributing food materials. One such innovation is shown in Picture 5.1. An amount of INR 3,289,151,250 (USD 45 million) was allotted from the chief minister's distress relief fund for this purpose. This scheme was implemented from the first month after the lockdown and still continuing.

Picture 5.1: Observing COVID protocol while distributing food materials in ration shop

5.2 Community Kitchen:

The sudden lock down due to COVID pandemic affected common people especially poor and homeless. Thus Kerala introduced community kitchens in villages across the state to deliver food at doorsteps to all those in need. This helped to tackle the complaints to some extent. It was a first of its kind move to provide cooked food for the needy people. District officials implemented and monitored this initiative with LSGI and support of Kudumbashree in managing the activities. The order for establishing community kitchens was issued on **March 26** and a total of 339 community kitchens were set up in 249 panchayats across the state immediately. The number of community kitchens rose to 1316 in April and more than 2500 on 8 May but then came down to 1097 in end of May. These kitchens distributed 2.5 to 2.8 lakhs free food packets in a day when the demand was highest and more than 86 lakhs free meals were supplied till April. The demand decreased when started releasing the lockdown and migrant labourers started returning to home states. But even on 1st August, there were 1145 community kitchens. By this time, they had provided more than 8.5 million free meals to the laborers, people in quarantine or isolation, destitute and other needy persons[53]. Strict COVID protocols were observed in Kudumbasree canteens where food was prepared and packed and also in camps where the food packets were distributed.

LSGI also mobilized a large number of volunteers in cooking, packing, identifying needy people and delivering the food in door steps. All these activities were organized by keeping COVID protocol strictly. Members of co-operative societies, voluntary organizations and arogyasena (health army) worked together in all above activities[54]. They formed local WhatsApp groups through which they shared information regarding the needy persons and delivered food. Initially, LSGI started the work with its fund but later all the expenses were reimbursed by the state. LSGI could collect fund from the panchayath area from among the business community and good hearted people. The government has also allowed remuneration for some volunteers like cooks, at the rate of Rs. 400 for one-time service or Rs. 650 for the full-day service[55].

Picture 5.2: Group activity in Community Kitchen

5.3 Janakiya Hotels:

Kerala's annual budget for the financial year 2020-21, announced that Janakeeya hotels to serve meals at just Rs 25/- per meal. Then it was entrusted with kudumbashree to run the program and allotted fund. Though it was announced that meals would be served at the rate of Rs.25/-, but the price was reduced to Rs.20/-per meal because of the COVID pandemic. They charged Rs.5/- extra for delivering in home [56]. In some places, the janakeeya hotels and community kitchens were functioning together as a single unit.

5.4 Food material distribution through anganvadi centres

Distribution of free ration and monthly free food kits through Public Distribution Scheme were other relief measures. The government has instructed anganwadi centres in the state to deliver free mid-day meals to the children registered under the Integrated Child Development Services (ICDS) to ensure nutritious foods for children under the age of 6. The Women and Child Development department in the state was informed to supply essential raw materials to the families through anganwadi centres weekly[57].

Government facilitated the door delivery of essential food items with retailer's help under the state agriculture department. Mobile vegetable vehicle services were started by local vegetable sellers to get easy access of fruits and vegetables to families. The government facilitated the initiatives by providing the mobile vegetable trucks to the sellers to ensure door delivery of vegetables. An integrated supply chain management system was also developed by Indian Institute of Technology and Management, Kozhikode, for smooth delivery of essential items.

5.5 Rehabilitation of migrants

Migrant workers faced loss of livelihood and deterioration in social security with the enforcement of lockdown in the country thereby pushing thousands into the streets. Lack of transportation facilities made it strenuous for the migrants to travel back to their own villages and many had been killed by hunger in the country. The southern state of India, Kerala did an appreciable job compared with many other states that had failed miserably in managing this crisis. The migrant worker population in Kerala was about four million. Majority of their hardships appeared during March when the government instructed to close down restaurants, malls and construction sites. This created unemployment of many migrants. Footloose laborers were the other category who was severely affected by the lockdown[58].

The state government had initiated various programs to ensure the availability of essential things for the migrant population with a policy of “leaving no one behind”. Kerala had allowed interstate portability of ration cards for migrant workers from other states to get the ration allocated here. Department of labour and skills (DOLs) issued a circular for identifying the residence of migrant workers. LSGD had made a detailed report of the roles and responsibilities of LSGIs and also instructed them to provide food and shelter to them. The state set up nearly 20,000 camps through LSGIs to accommodate them. The LSGIs were authorized by the state government to provide free food to them through community kitchens. In places where they didn't like the food, gave food materials to cook the food according to their choice.

A mobile screening unit was rolled out by the DHS to test them for COVID-19, which was India's first COVID screening unit. The government along with the NGOs had circulated COVID-19 prevention messages and updates in their native languages among them with the help of pamphlets and through WhatsApp. DHS and DOLS of Ernakulam district used the helpline to deliver the messages in the mother tongue of migrant

workers to relieve their fear and mental tension. Volunteers who spoke the language of the workers were used to interact with them in the helpline. In migrant camps, recreation facilities were also provided. Senior officers of DOLs and Police had visited the migrant camps and enquired about their difficulties. As the central government had organized shramik trains, different departments of Kerala had worked together in screening the migrants and facilitating their return to home. The state government, corporate entities, employers and other organizations had made a collective effort in providing free food, masks, sanitizers and health care services to smoothen their safe journey.

5.6 Community participation:

Jagratha samitis were helped in addressing the issues at the grass route level more effectively. These community volunteers worked along with residence association members, LSGD members, and kudumbasree workers. The COVID control activities were succeeded because of this community participation. COVID control ward level team had contacted the household through telephone daily to enquire about the symptoms, their medical and social needs. This helped in early detection of cases, conforming the quarantine and reverse quarantine to be followed, contact tracing, disinfection etc.

A large number of volunteers registered when government requested the interested people to register in a portal. A total of 491508 volunteers registered and showed interest in participating activities. About 45% were between 20 to 30 years and 22% were 31 to 40 years of age. They were assigned with jobs of their qualification, experience and interest. About one fourth engaged in identification of those who needed assistance and another one fourth in delivering food at the door step. and essential items. Nearly one fifth were allotted the work of procuring locally produced goods and another one fifth engaged in providing emergency assistance at home. The rest joined the call centres to help the regular staff on duty. All of them were given hands on training before start working and all were strictly instructed to obey COVID-19 protocol in all situations. They were given masks, gloves etc to practice.

Chapter 6

Multi-Sectoral Action

Early release of advisories and guidelines on contact tracing, quarantine, isolation, hospitalization, infection prevention and control, and other COVID control measures and actions taken by other departments in accordance with these played a major role in managing the situation. All departments like local self government institutions (LSGI), police, education, agriculture, finance, civil supplies, fisheries, labour, transport, animal husbandry, railways, fire force, social welfare, tourism, revenue, PWD, information and public relations and sectors like hotel and restaurant owners associations, trade organizations etc worked together under disaster management authority in the COVID control activities. The strong inter-departmental coordination inspired by the sturdy political commitment helped to win Kerala's fight against COVID-19.

Table 6.1: Plan of streamlining of activities of other departments in relation to COVID control campaign in districts[59]

Department	Main contribution in COVID control measures	Direct support to COVID control measures	Convergence with other departments	Others
LSGD	Formation & functioning of ward monitoring committee Mobilizing community level volunteers Infection control activity in the offices	Compassionately dealing with social and financial needs of people in isolation and quarantine Setting up of CFLTC Settling the complaints among the inmates of CFLTC	Support to local PHC Posting of staff wherever required	IEC- to overcome stigma against COVID patients IEC to prevent transmission
Police	Implementation of containment zones and lockdown restrictions Ensuring safety of frontline workers	Ensuring supply of, essential commodities Monitoring of recommended preventive measures like break the chain, SMS	Ensuring supply of PPE to staff Keep compassionate behaviour to public	Creating awareness among general public Promoting online services
Electricity	Uninterrupted supply of power to CFLTCs and hospitals	Prompt services at hospitals and CFLTC		Promote online bill payment instead of coming to the electricity offices

General Education	Online classes for students	School children and parents were educated about safety measures of COVID	Training to teachers to make use of them in place of need	Imparting scientific knowledge to community
Agriculture	Ensures markets and fair price for farmers			
Transport	Streamlining of interstate goods movement and monitoring of COVID among its staff	Transport of patients to CFLTCs and COVID hospitals Auto and taxis plying with driver cabin separation KSRTC and private buses follow COVID protocols		
Fisheries	Ensuring COVID protocols among fishermen and in fish markets		Financial help whenever necessary	Awareness among coastal community
Civil Supplies	Preventing hoarding and black marketing Ensures quality and quantity in government kits	COVID protocols ensured in deliveries, take aways and restaurants	Basic essentials are reaching target groups	
IT- Telecom	Connectivity for people working from home	Good connectivity at hospitals and CFLTC		

SC-ST Development	Takes care of any possible exploitation Promoting volunteering of staff in health field	Constant monitoring among the vulnerable tribal population	Adequate supply of goods are ensured Transport arrangements of sick in tribal areas will be ensured	IEC among tribals on COVID control Measures to reduce overcrowding and promoting e-services
Railways	Early screening of all the incoming passengers at train terminal	Ensure COVID protocol of all passengers in special trains for migrant labourers	Thermal screening of passengers in trains, railway stations with the help of health department	
Tourism	Cancel all tour programmes and packages	Started help desks to arrange food, water, and local transport to provide assistance in instance of emergency for tourists who were stuck back in the state		
Fire Force	Disinfection of the containment zones	Disinfection of market places, public places, hospitals and CFLTCs Disinfection of the vehicles carrying goods from other states and those leaving this state .	Support health department to get ambulance services	Deliver food packets to needy people every day during the lockdown
PWD	Facilitate effective quarantining mechanism	Facilitate rehabilitation of migrant workers through contractors		

Source: District Action Plan, Thiruvananthapuram

6.1 Role of DDMA

On February 3, the state government declared health emergency which enabled the state to utilise the State Disaster Response Fund (SDRF). The SDRF, constituted under section 48 (1) (a) of the Disaster Management Act, 2005, is the primary fund available with the state governments for responses to notified disasters. The State Disaster Management Authority (SDMA) and health department worked together traced, identified and collated disease surveillance data of primary and secondary contacts of confirmed patients. This enabled the system to identify the hands to activate the containment measures.

In Thiruvananthapuram, DDMA got involved during the Attukal ponkala (a local but popular temple festival) on 9 March 2020. In addition to crowd management, the DDMA was in charge of maintaining the COVID protocol in the area and supervision of the disinfection of the trains with hypochlorite solution every half an hour. DDMA instructed the program managers and public to observe COVID protocol such as personal hygiene, hand washing and social distancing and also distributed pamphlets for this. They arranged videography and photography at about 25 points in the locality for monitoring the violation of COVID protocol and identifying the contacts. This intervention was done through volunteers also.

The district war room was setup under the district collector as the part of DDMA in the beginning of lockdown itself, for co-ordinating and controlling all activities. All line departments were represented in this forum. During lockdown and there after DDMA involved in issuing pass for interstate travel, supply and management of essential commodities, declaration of clusters and containment zones etc. Thiruvananthapuram DDMA procured test kits, PPE kits and masks (N95) etc using MP fund, first of its kind in the state). DDMA gave necessary support to LSGIs to undertake activities like infrastructure arrangements for CFLTCs, management of isolation and quarantine centres, functioning of community kitchens etc. It maintained the fund flow and provided fund for various activities like infrastructure arrangements for CFLTCs, management of isolation and quarantine centres etc. They monitored daily situation and coordinated and implemented various orders and guidelines of the government.

6.2 Role of LSGI

LSGD participated in all activities of COVID control measures[60]. The activities of the LSGD were executed through different groups of persons and committees involving LSGI chairperson, members, health standing committee chairperson and secretaries. The existing ward health committees, health awareness committees were made functional to serve a multitude of purposes. Also, emergency response teams were formed as part of disaster management.

LSGD constituted a team, to provide care to the people who needed special care and attention such as physically

handicapped, pregnant ladies, people belonging to scheduled castes and scheduled tribes, people residing in coastal areas and slums, inmates of care homes, people working under national rural employment scheme and migrant workers. This community group was comprised of health workers, anganavadi workers, arogyasena members, community volunteers etc under the leadership of the ward member.

This group collected details about bedridden patients as well as patients suffering from other diseases. Availability of ambulance was ensured to patients who needed emergency care. Health system arranged IEC classes and awareness programs with the help of panchayath groups. They played important role in spreading the posters, videos and messages directly and through other means. Organized cleaning of the LSGIs as well as offices, public places like market, bus stands etc where people frequently visits. Also, instructions were given to the public to disinfect and dispose used gloves and masks either at homes, offices or collection centres. LSGIs collected them from the public collection centre, disinfected and disposed.

As per the government instructions, strict monitoring was done with regard to the details of people residing in isolation.

1. Details of people arriving from abroad were collected according to the guidelines and reported to the health department
2. Strictly monitored people residing in home isolation. The family members of the persons residing in home isolation were informed about the guidelines issued by health department and arranged community counselling for them
3. Food items were provided to families who were in needed. The help of volunteers, taxi drivers and auto drivers were arranged for transporting essential commodities to these homes.

In order to avoid the possibility of food scarcity that might occur in the near future, government initiated steps to ensure availability of essential food items by working in coordination with the civil supplies. LSGI worked with them for the same. They also monitored and ensured the availability of generic medicines in medical stores. Community kitchen initiative through LSGD with the support of Kudumbasree provided free meals to the poorest and needy people. Cooked meals distribution and provision of free ration under the PDS to those in need were the caring response and relief strategy measures of the state.

Timely updates about the medical resources, community resource persons (youth clubs and voluntary workers), health care facilities, and accommodation facilities were reported to the district collector for tabulating the resources for proactive measures.

6.3 Role of Media

Media played a vital role in sharing important information regarding COVID-19, spreading awareness, reducing false messages building confidence in the society without creating panic. Kerala government released more than 100 videos to train health workers and to promote awareness in the public about the COVID control measures like hand washing

techniques, social distancing norms, importance of using masks, home quarantine etc. Kerala police and other departments created and released awareness and information videos to spread the messages to stay home and also, “Break the chain” campaign related videos. Videos and audios in other languages were also made for guest workers. The news media was very active in giving instructions to the public while releasing route maps of COVID-19 cases. They regularly reported chief minister's live press meetings every day which was very much helpful in spreading health messages, enlightening the day to day changes in instruction, informing the containment zones and daily disease situation etc. Also, the number of people watching chief minister's live press meetings in television and on major social media platforms like Facebook were huge [61]. In this COVID pandemic time all the media transmitted positive news, e.g.; experiences of recovered patients, reduced death rate when compared to other states, increased testing rates etc.

Social media platform helped in circulating IEC materials with proper content across the members of residential association (e.g., created WhatsApp group with members of the association), institutions, offices, etc. Media also maintained direct communication with the public regarding the regulations and created awareness through press meetings and social media handles. Media also started WhatsApp groups to react to the spread of false information[62].

Chapter 7

Challenges and Recommendations

Interviews were conducted with (1) state nodal officer, Aardram mission (2) DMO (3) state nodal officer training, SHSRC (4) COVID-19 nodal officer, DDMA (5) district nodal officer, contact tracing (6) two physicians in COVID hospitals (7) two surgeons in COVID hospitals (8) associate professor in microbiology, medical college (9) block nodal officer taluk level (10) PHC medical officer and (11) diabetologist and pioneer in tele-medicine consultant. The challenges reported from the field by the above 13 interviewees are included here.

- In the initial phases, people were afraid of the pandemic and were interested in testing. Now there is a misconception among public that it is like a viral fever, less contagious and gets cured within two or three days without any complications. Hence, they weighed the disadvantages of isolation, quarantine, loss of labour and earnings etc against testing and consequences. They avoided testing. These unidentified patients freely mingled in the community leading to spread of disease and community transmission. Hence all people suffering from Influenza Like Illness (ILIs) should be encouraged for screening and room quarantine for at least 8 days. This is important to prevent community spread.
- The address and phone number of all visitors were collected in shops, markets and similar places where people usually visited to identify the contacts, if any other visitor or staff became positive. Incorrect address and incorrect phone number given by the visitor was a big challenge for the surveillance and declaration of containment zone
- Identification of interstate travellers through secret routes from neighbouring states was a real challenge. Some of these routes may be through forests or sea or across the long highway separating the border. Co-operation from community and neighbourhood was useful to get information. One doctor living in a rural village came home secretly after work in a COVID hospital in Tamil Nadu. Actually she travelled to and fro from the border by vehicle and walked across the road to cross the border. The neighbour immediately informed the HCW when she reached home.
- The government itself started celebrating the success of flattening the curve in June and July and relaxed some restrictions. The government allowed all expatriates to return to state. This gave false belief among people that the pandemic was over. They started overcrowding in shops, markets and other public places for buying essential items. Interstate and international

travels increased. It was difficult to control the crowd.

- In June- July many HCW and police personal were affected with the pandemic and there were lack of sufficient man power for monitoring and strict implementation of restrictions.
- They disobeyed the quarantine rules when home quarantine was allowed. Later this was tightened with daily monitoring by HCW and police for imposing strict room quarantine of positive cases and reverse quarantine of elderly. This is recommended even in literate society like Kerala.
- High density of population and overcrowding in urban areas was a challenge to prevent easy spread. In these places frequent screening and quarantine in isolated quarantine shelters may be established.
- Spread of false news and misconceptions confused common people. But various awareness programs helped to overcome this.
- Stress increased during this time for the public and the health system staff due to overload and increased thought about the COVID-19 pandemic. The stigma, economic crisis, joblessness etc caused increased stress and mental discomfort in many people. Counseling is not effective and not addressing everyone's problem.
- The health persons have been working continuously since January. Many vacancies were filled in this year and thousands of volunteers joined in the pandemic control activities. But it was not enough to handle the work since it is prolonging and many volunteers returned for their regular job.
- Many different formats were used by different nodal centres at district and state level for consolidation. They sent 18 different formats for collecting the same basic data from PHCs. Filling all formats and daily submission in time was time consuming and challenging for basic health care workers.

Chapter 8

DISCUSSIONS AND CONCLUSIONS

COVID-19 pandemic that suddenly appeared and spread across the globe in an astonishing speed made quick changes in our lifestyles and habits in a way which has never occurred in the recent history. The different countries and political regimes responded in dissimilar ways against this emergent disease and met with diverse outcomes. When some rich and powerful countries like United States and United Kingdom performed poorly, some other less developed and less developed countries like Vietnam and Cambodia came out with success stories. The small state Kerala also has a victorious story to narrate. This report gives a narration of Kerala model of achievement on the backdrop of effective and vibrant democracy and strong public action.

Box 8.1: Landmark events lead to the success

Landmark events lead to the success

- Highest political and administrative commitment and timely interventions
- Risk communication and community engagement
- Relief measures to migrants, affected community and people
- Enforcement of the Kerala epidemic disease Act
- Surveillance, diagnosis, contact tracing and follow up measures
- Effective quarantine and isolation arrangements and prompt treatment
- Systemic investment in strengthening health infrastructure

8.1 Highest political and administrative commitment and timely interventions

The state has shown outstanding performance in flattening the curve and controlled two phases properly during the 100 days period. The state had developed guidelines for the management of COVID-19 cases in the middle of January 2020, when there was disease alert and was ready to handle the cases since then[63]. The state declared health emergency in the whole state when three cases were registered and strengthened surveillance. Health Department started screening of returning passengers from China and contact tracing of close contacts. State Emergency Operations Centre (SEOC) and SDMA provided support to the health department for all mitigation efforts.

The high level political commitment was crucial in getting support from other sectors. The State Control room lead by top level beurocrats closely monitored day to day activities through various sub committees. Early release of guidelines on contact tracing, quarantine, isolation, hospitalization, infection prevention and control, and extensive capacity-building of all cadres of health services and other interlinked departments played a critical role in managing the situation. The high literacy rate enabled the environment for smooth and easy containment activities. This was also seen during the previous epidemics and flood. The previous experience helped in setting up the tone easy.

8.2 Risk communication and community engagement

An awareness campaign 'Break the Chain' was successful in promoting the importance of hand hygiene, physical distancing and cough etiquette. Hand washing stations were installed in strategic locations, including exit and entry points of railway stations etc. to instill a behaviour change. The **Kerala Arogyam portal** was launched by the Department of Health and Family Welfare with comprehensive information on COVID-19. COVID Jagratha portal and Directorate of Health Services website was launched by the Department of Health and Family Welfare with comprehensives information on COVID-19. The high literacy rate in the state and the empowered women self-help groups - Kudumbashree helped the cause in a big way. Kudumbashree formed about 1.9 lakh WhatsApp groups with 22 lakh neighbourhood groups (NHGs) to educate on key safety measures as advocated by the government during lockdown.

"Break the chain campaign" with the participation of LSGI, line departments including police force tremendously helped in the dissemination of preventive strategies like frequent hand washing or sanitizing, mask use and keeping physical distancing. Through daily media briefings and health bulletins about infected patients, the government ensured people knew the threat posed by the pandemic. Media played a responsible role of disseminating the health messages very effectively in multiple ways to attract the attention of people. Most of the people watched the media daily to know the latest information and instructions regarding COVID-19. In addition to electronic and print media, social media also played a vital role in knowledge dissemination. The co-ordinated efforts with LSGIs, line departments and media happened in the floods. So this was not new to them. Hence all came forward offering co-operation without wasting any time when there was information about the pandemic. Series of trainings and skill developments of HCW since the beginning of NHM mission gave capacity for developing education messages and utilizing the partners for effective utilization for its dissemination.

8.3 Relief measures to migrants, affected community and people

Government started many relief measures to help the migrants and vulnerable group of people who suffered from pandemic and subsequent containment measures. Community kitchen initiative for providing free meals with the support of Kudumbasree and

LSGI, camps and shelter homes for migrants, janakeeya hotels for supplying budget meals, free ration and free food kits were immensely helpful to them. The previous experience of leading the co-operative movements for bringing women to the forefront of community, the long standing co-operation with LSGI and availability of large number of volunteers in hand, it was an easy task for Kudumbasree to run community kitchens and jankeeya hotels.

8.4 Enforcement of Kerala epidemic disease Act

The state made the Kerala epidemic disease act and implemented to control people behavior that was essential to prevent the spread of disease. There were provisions to impose fine for those who violate the law. This was also useful in prevention and control of the disease.

8.5 Surveillance, testing, contact tracing and follow up measures

State focussed on effective and quality quarantine instead of more and more testing. HCW were in forefront in providing counselling, health education and timely support to people on quarantine and other needy people. LSGI and police personals were incorporated in these activities. Health system was successful in providing medical, non medical and psychological support for those under quarantine and isolation and their family members. Police force was mobilized for monitoring quarantine violations. State and district medical boards were formed to develop treatment protocols and its updating. Dedicated COVID-19 hospitals were established in all districts with required facilities including ICU care and ventilator support. This was helpful for providing uninterrupted treatment services even for patients with NCD and other complications. Even though the state was on the verge of flattening the curve in June, the situation changed after mid-September. Despite mounting caseload, the case fatality rate could be maintained very low in the state (below 0.5, against the national average of 1.40). The infrastructure strengthening and availability of additional man power since 2010 under NHM support was an invaluable investment for quick establishment of treatment allied activities.

8.6 Effective quarantine and isolation arrangements and prompt treatment

State focussed on effective and quality quarantine instead of more and more testing. HCW were in forefront in providing counselling, health education and timely support to people on quarantine and other needy people. LSGI and police personals were incorporated in these activities. Health system was successful in providing medical, non medical and psychological support for those under quarantine and isolation and their family members. Police force was mobilized for monitoring quarantine violations. State and district medical boards were formed to develop treatment protocols and its updating. Dedicated COVID-19 hospitals were established in all districts with required facilities including ICU care and ventilator support. This was helpful for providing uninterrupted

treatment services even for patients with NCD and other complications. Even though the state was on the verge of flattening the curve in June, the situation changed after mid-September. Despite mounting caseload, the case fatality rate could be maintained very low in the state (below 0.5, against the national average of 1.40). The infrastructure strengthening and availability of additional man power since 2010 under NHM support was an invaluable investment for quick establishment of treatment allied activities.

8.7 Systemic investment in strengthening health infrastructure

Kerala model of controlling epidemic has its roots in the strong health system built over the years. WHO has been a long-standing partner in the field of public health and the WHO officials were part of control of previous epidemics like Nipha at the state and the district levels. The government has been systematically investing in developing and strengthening robust health institutions and governance over the last many years to take the challenges like Nipah outbreaks, COVID-19 pandemic etc.

- The 74th constitution amendment in 1994 and consequent decentralized planning process, health services department transferred the management of major share of their institutions to the LSGD in 1996. All SC, PHCs, CHCs and government hospitals except super specialty and tertiary hospitals were transferred to the respective LSGIs. In most of the places there was very good synergy between the health services department and LSGIs. There were some positive contributions in infrastructure development for PHCs and CHCs at grama panchayath and block level. A substantial face lifting of these institutions were occurred. However, in the case of sub centers, such a change had occurred only in very few places. Similarly, at the municipality level also in general no substantial face lifting was made possible by the LSGI involvement. The district panchayath level interventions in district hospitals contributed institutional infrastructure development and innovations of diverse nature in many places. These developments have been further strengthening with the introduction of ***AARDRAM*** mission since 2016. This mission has been working in close partnership with the LSGIs for innovative developments of FHCs.

- In 1997, GOK launched the *Kudumbasree* mission a poverty eradication and women empowerment programme. This socio-economic programme is a three-tier community framework comprising neighbourhood groups, area development societies and community development societies. The local government bodies are responsible for the structure and implementation while funds and guidelines were laid down by the state government. Kudumasree were instrumental in the functioning of community kitchens and jankeeya hotels during this pandemic period.

- The people's plan initiative was a six-stage campaign, which included ward sabha where all ward members, activists and elected representatives participated for the planning of annual development action plan for the locality. However, the objective of the meetings was to discuss local development issues and solutions, it played an imperative role in local

governance, strengthening of community participation and awareness generation among citizens. The resident welfare associations also played a crucial role in participatory planning and are now proving helpful in spreading awareness about the pandemic and mobilizing additional resources for community kitchens. The process also helped in mobilizing a large number of volunteers in the event of two floods and COVID-19 pandemic.

- NHM program which started in 2006 with funding support of GOI, opened new opportunities in the development of health institutions. Kerala utilized this opportunity very well in strengthening infrastructure, procuring new instruments and equipments, appointing more number of skilled and specialized man power, capacity building of existing and newly appointed staff. Many new disease control programs could be started with the support of NHM. This was very much useful in quick response of pandemic control activities.
- During Nipah outbreak, the state mobilized all resources in health system in an organized and phased manner. The specialized team comprising of public health experts, police officers, representatives of local bodies worked under district administrations in a co-ordinated manner for contact tracing and awareness generation.
- Training of all categories of health staff in the intervals of Nipah outbreak and floods included the lesions of liaison activities, community mobilization, team building and people friendly approach in community involvement. All these efforts were very much fruitful in rapid initiation of pandemic control measures.
- Disaster control room was set up in DHS and all DMO offices for monitoring and collecting information and arranging relief measures in co-ordination with DDMA and other departments. The experiences of monitoring and evaluation of the public health situation, risk assessment including outbreak-prediction, identification of possible solutions and requirements and co-ordinating the necessary actions were good practical lessons for HCW in working with the present pandemic.
- As part of improving disease surveillance, outbreak monitoring units were set up in all the medical colleges in the state in 2011. When Nipah struck again in 2019, the health authorities could immediately spot, isolate and treat the index case so that no one else was infected. When the COVID-19 alert was sounded, state health system could arouse all these baseline[64] preparations early and easily. The state administration mobilized resources and managed well".

The two health sector reform programs; 'AARDRAM' for providing patient friendly hospital services at all levels of government health facilities and the Comprehensive Primary Health Care (CPHC) program which aimed at extending the coverage of primary health care services in a way helped the state to contest the COVID-19 pandemic.Hence Kerala paved its way to excellence in tackling COVID-19 pandemic better than the other states of India.

8.8 Conclusions

Kerala could flatten the epidemic curve in the first two phases within 100 days. Even though there was some resurgence after August, state could avert a lot many cases with its relentless efforts and could keep a very low case fatality rate than any other states in India and countries outside. Lessons from management of Nipah and recent floods operated as a rehearsal encampment for active community participation, interdepartmental coordination, and social mobilization through women self-help group and the governance role of Local Self Government Institutions (LSGIs). Kerala tells us a story of how a resilient public health system can manage a pandemic of this nature through coordinated actions of key stakeholders. The battle is not yet over; we would continue to remain vigilant and keep innovating to make sure that Kerala lives up to the high expectations of our people and the country.

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ANNEXURE I

State wise distribution of COVID 19 cases in India as on December 15

Sl. No	Name of State / UT	Total Confirmed cases	Cured/Discharged/ Migrated	Deaths
1	Andaman and Nicobar Islands	4,834	4,681	61
2	Andhra Pradesh	8,75,836	8,64,049	7,059
3	Arunachal Pradesh	16,536	16,243	55
4	Assam	2,14,803	2,10,296	1,002
5	Bihar	2,44,245	2,37,996	1,329
6	Chandigarh	18,714	17,698	302
7	Chhattisgarh	2,58,635	2,36,588	3,116
8	Dadar Nagar Haveli	3,359	3,338	2
9	Delhi	6,10,447	5,85,852	10,115
10	Goa	49,566	47,861	710
11	Gujarat	22,97,512	2,12,780	4,190
12	Haryana	2,29,751	2,12,780	4,190
13	Himachal Pradesh	49,761	41,954	813
14	Jammu and Kashmir	1,16,600	1,10,354	1,812
15	Jharkhand	1,11,722	1,09,141	1,000
16	Karnataka	9,03,425	8,75,796	11,984
17	Kerala	6,72,038	6,11,600	2,648
18	Ladakh	9,166	8,426	123
19	Madhya Pradesh	2,25,709	2,09,768	3,425
20	Maharashtra	18,86,807	17,66,010	49,441
21	Manipur	27,292	24,880	327
22	Meghalaya	12,941	12,058	130
23	Mizoram	4,040	3,869	7
24	Odisha	3,24,089	3,19,458	1,864
25	Puducherry	37,513	36,586	620
26	Punjab	1,60,659	1,48,680	5,098
27	Rajasthan	2,93,584	2,75,506	2,568
28	Sikkim	5,340	4,919	118
29	Tamil Nadu	8,01,161	7,79,291	11,919
30	Telangana	2,78,599	2,69,823	1,499
31	Tripura	33,054	32,344	373
32	Uttarakhand	83,502	75,049	1,372
33	Uttar Pradesh	5,66,728	5,39,727	8,083
34	West Bengal	5,23,629	4,93,145	9,100
Total number of confirmed cases in India (Including foreign nationals)		99,20,214	94,40,650	1,45,094

Source: Ministry of Health and Family Welfare, GOI

ANNEXURE II

In-depth Interview Guidelines

As a key official at the state / district level what are your views on the following:

1. How the state's health sector rose to the occasion of COVID-19 pandemic and launched a frontal attack on the infection?
2. Do you think a well-structured health department and its perfect coordination with the local bodies helped to tackle the situation in the first wave of pandemic?
3. What is your view on the decentralisation of power to panchayats and local bodies and how this legislation supported the health institutions under the direct administration of the local bodies, and also provided additional funds for them?
4. Although in the early months of pandemic Kerala has stood out with a classic performance in terms of containing the epidemic and restricting the death toll in the state, partial resurgence of the pandemic occurred later. How do you evaluate this?
5. Which all are the flagship health sector reforms in Kerala which helped in strengthening public health services amidst COVID-19?
6. Please let us know about the government initiative to make healthcare much more accessible at the local level through the Ardram mission and how such a reform helped in tackling COVID-19?
7. What are your views on CPHC (Comprehensive Primary Health Care) model and the growing trend of transformation of PHCs to FHCs in tackling the pandemic?
8. How far the existence of a strong primary health system, community participation and integration into a decentralised system of management at the panchayat/taluk and block levels built on a centralised epidemic control template helped in the success of containment and isolation strategies of COVID-19?
9. The state was capable to give alert even before the first COVID case was reported. According to you, do you think the lessons learnt from the last Nipah epidemic helped?
10. Whether enforcement of lockdown by the local police was considered as an important arm of the containment strategy?
11. Which other departments were involved in comprehending the disease? Please tell us about interdepartmental and inter-sectoral coordination?
12. What was the role of private sector in confronting the disease?
13. Amidst the praise, what challenges are faced currently for combatting the COVID-19 pandemic?

ANNEXURE III

Health advisory for target groups

For newly incarcerated prisoners:

Government of Kerala had issued instructions for controlling COVID 19 spreading in jails[1]. Screening of the newly imprisoned and those returning from parole will be conducted as per government guidelines

Asymptomatic prisoners who return after parole and new prisoners where to undergo pool testing through RTPCR. They will be kept in separate cells and were advised to follow strict hygiene until results are out.
Symptomatic prisoners are provided with RTPCR pool testing and are kept in single separate cells. New prisoners bought into jail will be kept in single cell prisons. Strict institutional quarantine of 14 days is mandatory for asymptomatic prisoners on parole with epidemiological link (COVID 19 suspect for past 2 weeks). Prisoners with COVID 19 symptoms who are on parole went through RTPCR and was kept in strict isolation for 14 days.

Prevention of spread in prisons[2]:

a) Daily symptom surveillance for staffs and inmates; any symptomatic cases are isolated and COVID test will be performed.
b) Isolation of symptomatic prisoners.
c) Quarantine of contacts
d) Revise quarantine for vulnerable groups
e) Facilities for other healthy prisoners
f) Shifts for staffs, designated work area for staffs, three teams- for COVID area, Non COVID area and reserve team.
g) Visitors will be screened
h) Symptomatic inmates will be transferred

For drivers, crew and passengers[3]:

a) Taxis should have a poly-carbon transparent separation between divers seat and passengers seat.
b) Passengers should be placed only in back seat.
c) Passengers were asked to handle their own baggage.
d) All personal hygiene instructions should be followed.
e) AC should not be used. Windows should be kept open

For conducting examinations [4–6]:

a) Students from other states/in quarantine should be given a separate space than others.
b) All personal hygiene instructions should be strictly followed.

c) School/institution authorities should ensure the adequate infrastructure and other resource.
d) Students and other staffs should follow all necessary personal hygiene instructions
e) A training session will be conducted for staffs and invigilators
f) Students and guardians from other states should be in quarantine for 14 days.
g) Exam papers should be deposited in a plastic bag by individually by students themselves after the examination.
h) Monitoring through CCTV will be utilised.
i) A sanitised corridor (red channel) has been created for the students from other states and for those in quarantine.
j) Drinking water, pen and other articles should not be shared among students.
k) Symptomatic students (identified at screening point) -admitted to the sick hall/room for examination.
l) COVID positive – admitted to positive hall for examination
m) Under quarantine (contamination zones) – quarantine/contamination hall
n) Others – admitted to general hall/room.
o) Exam hall should not be air conditioned.
p) Signage and other information should be properly displayed

Caring for airline accident patients[7]:

1. Only one bystander (less than 50 years)
2. Medical bulletin three times – 12 noon, 4 pm and 8 pm
3. VC to relatives basedon patient condition

For conducting Neet exam[8]

1. International/interstate students should submit a negativeRT-PCR test report (conducted 96 hrs before) and a self declaration
2. Those who does not perform COVID test should perform on arrival.
3. International/interstate students/parents should have a qurantine for 14 days.
4. Sanitized corridor protol should be followed

For conducting legislative assembly[9]

1. Disclose their COVID positive / quarantine status
2. Arrangements by DHS for antigen testing and helpline for support
3. Should follow proper sanitation, three layer mask, social distancing (2m)
4. All seating and sanitation arrangements – based on COVID 19 protocol
5. Allow only limited media personals
6. Separate seating arrangement for honourable members from the containment
7. Room to be kept open; AC to put at 26 to 27 if needed

Offices, Public toilets and other indoor and out-door area should be disinfected. The cleaning staff should wear a three-layer mask, disposable rubber boots, gloves etc[9].

For Sabarimala pilgrims[10]

1. All are advised to follow safety precautions – handwashing every half hour, physical distancing (6 feet) and three-layer face mask.
2. Should submit COVID 19 negative certificate
3. All COVID recovered pilgrims should undergo an exercise & pulmonary rehabilitation programme.
4. Temporary stagnation should be avoided
5. Other (drivers, cooks etc. accompanying the pilgrims) should also follow all necessary precautions.

An action plan has been generated by the state government for the Sambarimala pilgrims[11].

1. Staffs has been deployed to 6 government facilities
2. Doctors including specialist were allotted on rotation basis
3. 20 ambulances has been arranged
4. The HR, ambulance and others availability will be monitored on daily basis.
5. The referral care proposed by the government of Kerala for pilgrims

ANNEXURE IV

Committees

State Medical board

Chairman – Prof Paediatrics SAT Thiruvananthapuram

Members

Prof Infectious Disease MCH Kozhikkode

HoD Pharmacology MCH TVM

HoD Prof Emergency medicine MCH Kozhikkode

Hod Prof MCH Alappuzha

Asst Prof Head of Infectious diseases TVM

Activities:

- Patient management in the respective institutions
- Give the technical support to the general and district hospital and private sector hospitals
- Any change in the medical management to be done in consultation with state medical board

Medical board in Medical College, District hospital and General hospital

HoD General Medicine

HoD Respiratory Medicine

HoD Infectious Disease

HoD Microbiology

HoDAneastesialogy

HoD Community Medicine – PEID cell coordinator

State level Corona Virus Control Room - Teams

No	Committees	Activities
1	Surveillance Team	• Hospital surveillance: patients in the isolation ward will be monitored and reports will be analysed. • Field surveillance: discharged patients/ asymptomatic travellers/ contacts will be monitored by field level workers under DSO • Lab surveillance: sample collection, guidelines development for surveillance and management, strengthening and monitoring (at state level) of IDSP, Support system with SMO, district level monitoring on daily basis, inter-sectional collaboration. ➢ Staff from DME, NHM,SHSRC and Stat wing
2	Call Centre Management Team	• 24*7 Operational, documentation, medical queries, issues related to logistics and administration will be addressed. ➢ NHM team
3	HR Team	• District level management of HR, daily data consolidated to verify the adequacy of HR in all levels/facilities. ➢ Team from DHS
4	Training and Awareness Team	• Include a master trainers teams that provide specific and relevant training sections and modules development, distribution of IEC materials to health and other sector workers including mass media and also provide training for call centre staffs. ➢ Team from SHSRC
5	Material Management Team	• Functioning at institutional level. List out all the items required at the institutions, monitoring of inventory positions and maintains the supply chain. ➢ Team from KMSCL and DHS team
6	Infrastructure Management Team	• Identify isolation place in each area for atleast 50 people. • Ensure the required things in the isolation wards in these areas. • Set up dedicated team in each district. • Ensure that strict protocol for infection control is following in each district • Ensure and compile the referrel of contacts from field/ call centers/ DISHA to isolation wards in

		each districts. ➢ (JDME),(Add.med) and team from MCH
7	Media Surveillance Team Sample tracing Team	• Print , visual and social media surveillance with the support of State and district team • Collect the information regarding the demand and supply of logistics, human resources etc. • Validating the information collected from the media for negative outcome and execute timely preventive and control measures ➢ Team from eHealth
8	IEC/BCC and Media Management Team	• Preparation of IEC materials. (Preventive and promoting activities) • Dessemination of same in TV channels, other medias • Timely updating the website. • Preparing daily reports for media ➢ Media team from KSACS, NHM and DHS
9	Documentation Team	• Document all meetings realted to n2019 management at Minister, principal secretary and DHS level • Ensure proper communication of all decisions to public health institution for implementation of the decisions made in the meetings. • Proper communication to the various teams of control room regardind the meeting, guidelines etc.
10	Private Hospital Surveliiance Team	• Team should compile the data regarding the public visiting the private hospitals • Good support should be ensured from the private hospitals
11	Expert study Coordination Team	• They should work with NHM and arraange and facilitate the visits from expert agencies, they should have approval from Head of the institution, letter to principal secretary, their own logistical support etc. ➢ (DME) and team from NHM
12	Transportation and Ambulance Management	• The team should compile the data regarding the availability of spacing, traing of drivers of ambulance and other vehicles carrying patients from home quarentine to hospital quarentine facility and back • Continuous availabilty of vehicles (24*7) ➢ (Dep DHS Med) and (SHTO)

13	Inter departmental and coordination Team	• Regulation connection with all line departments like, LSGD, Tourism, Police, Animal husbamdry, kudumbasree, suchitwa mission.
14	Field level Volunteer Coordination Team	
15	Psychological support team	• Managing post traumatic stress related events and stress during quarentine ➢ DMHP Team
16	Community Volunteer Coordination Team	• Monitoring the field level activities • Collect the information of the contacts and addresses • Prepare food kits to the contacts in home quarentine ➢ (Dep. Director FW), NHM and NUHM staff
17	Data Management Team	• Use all google tools to compile all the dataformats • The technical support from MIS manager NHM should be utilized in the same ➢ Stat wing DHS
18	Finance Management Team	• Dicuss various areas of fund requirement • Pool resources for all possible needs arising from time to time ➢ NHM team

Sample tracing Team

- Monitoring of the all the lab activities and give answers to the quiries.
- The team should hand hold the district in transportation of the samples, filling the formats, collection of reports and intimation of results to the authorities