COVID 19 SENTINEL SURVEILLANCE

COVID-19 (nCorona) Virus Outbreak Control and Prevention State Cell

Department of Health & Family Welfare

Government of Kerala

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Message

I am happy to see that the first volume of report on Sentinel Surveillance has been published by the Department of Health and Family Welfare. The Department is taking various measures to contain the epidemic since the WHO declared COVID 19 as an emergency.

It is an established practice in the medical science to do prevalence and incidence studies of any diseases. As the epidemic was growing and seeing the vulnerability of our state, as sizeable population is abroad and other parts of the country, the department at the outset has formulated the strategy of sentinel surveillance and submitted the proposal to ICMR. However, because of lack of ICMR validated Antibody test kits, it got delayed for a few days. The Department took a decision to go ahead with the sentinel surveillance by using RT PCR test to see whether there is wide spread of infection in the community so as to take appropriate actions well in time.

The report published by the department of the four rounds of the surveillance will give information to all regarding the present status in Kerala as most of the cases are imported cases and their contacts and that there is no community transmission.

I appreciate the works done by the teams and wishing all the success to everybody's efforts in containing the COVID 19 epidemic.

K K Shailaja Teacher
Minister for Health & Family Welfare
Social Justice
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1. Background

WHO has declared COVID-19 as a pandemic. Kerala had reported the first case in India on January 30th 2020. With proper identification of individuals with risk, rigorous contact tracing, ensuring good quality home isolation, testing all eligible individuals and providing high quality care to COVID cases, Kerala state had managed to contain the COVID -19 epidemic till date.

Since January various structures had been put in place for the control of COVID. One of the strong pillars was the setting of laboratories capable of diagnosing COVID-19. Since then the capacity of the laboratories has increased considerably with 16 labs in the state approved by ICMR for RT PCR testing with a per day capacity over 3500. Kerala had performed nearly 2052 tests/ million population till date. Despite high number of tests, percentage of positivity (No of positive tests / Total Tests performed) is coming down in Kerala. Kerala continued to have cases mostly from travelers returning from foreign countries and other states, followed by their contacts. 70% of the confirmed cases in Kerala had a clear history of travel.

The Department of Health and Family Welfare has been taking all initiatives based on scientific knowledge available regarding COVID19. The department has strengthened the response by rigorously following evidence-based practices and decided to set up a sentinel surveillance system with an objective to look for any evidence of community transmission in the state. The sentinel surveillance designed to collect and test 900 samples per week from non-COVID suspects from selected Villages in all districts from all over the state. Since Antibody tests were not available, the process was initiated with RT PCR test.

The objective of this book is

- To explain the process followed to conceptualize the surveillance and its execution
- To study outbreak of cases and evidence regarding community outbreak and make information available to experts and people
- To take evidence-based interventions to control epidemic

2. Strategy and Methods

The strategy applied is a sentinel surveillance with a risk stratified approach. In order to address the question of community transmission, the population had to be risk stratified based on their chance of acquiring the infection including their setting. These individuals were identified and samples taken from them and tested.

The population was stratified according to the following.

Group 1- Patients in the general population with Acute Respiratory Infection (ARI) but NOT a COVID suspect.

Group 2- Health Care Workers in Non-COVID settings

Group 3-Persons with high social exposure;
These persons were further categorized into the following; Food delivery persons, Community Volunteers for COVID, Police personnel in enforcement of lockdown, provisions shop vendors ration shop, wholesale fruits or vegetable vendors.

Group 4- Category A COVID -19 Suspects
This category of persons are those COVID suspects having sore throat or cough or rhinitis or diarrhea and does not require testing unless there is a change in their category.

Group 5- Guest workers. Generally, are those persons from other states who have come to Kerala for the purpose of labor.

Table 1: Description of Samples from each group intended to be collected at state level

Group	Description	Setting	Samples/ week
1	Patients in general population with **Acute Respiratory Infection (ARI)** but **NOT** a COVID suspect	Non- COVID Hospital	200
2	Health Care Workers in **Non-COVID** settings	Non- COVID Hospital	200
3	Persons with **high social exposure**; Food delivery persons / Community Volunteers for COVID /Police personnel/ Provisions shop vendors / Ration Shop/ wholesale fruits or vegetable vendors	Community	200
4	**Category A** COVID -19 Suspects	Community	150
5	**Guest workers**	Community	150

Symptomatic persons (respiratory) were preferred over asymptomatic while collecting samples. Samples were collected within 7 days of onset of symptoms from symptomatic persons.

District wise split up for the number of samples in each category was fixed proportionate to COVID-19 cases/1000 population in each district.

Table.2. District Wise Split up of Number of samples planned to be collected for surveillance / week

	Group 1	Group 2	Group 3	Group 4	Group 5
Alappuzha	5	5	5	5	0
Ernakulam	10	10	10	10	30
Idukki	5	5	5	5	0
Kannur	30	30	30	20	10
Kasaragod	50	50	50	50	10
Kollam	10	10	10	5	10
Kottayam	10	10	10	5	10
Kozhikode	10	10	10	10	20
Malappuram	10	10	10	10	10
Palakkad	10	10	10	5	10
Pathanamthitta	10	10	10	10	0
Thrissur	10	10	10	5	10
Trivandrum	10	10	10	10	30
Wayanad	5	5	5	5	0

Local Self Government areas from where samples need to be collected every week was selected based on the following criteria

- ❖ LSGs reported maximum COVID-19 cases in last two weeks (50%)
- ❖ LSGs with high number of primary contacts (20%)
- ❖ LSGs with high proportion of elderly & COVID 19 active cases (10%)
- ❖ LSGs with active cases in the past (10%)
- ❖ LSGs with no active cases & High proportion of elderly (10%)

Sample size and nature of samples were pre-fixed for every LSG so as to achieve the desired sample size. The LSGs were reselected after two weeks.

Sample Collection Team: The DSO constituted a sample collection team consisting of Medical Officer (1), Nurse/Laboratory technician (1) and Driver (1) for the process of sample collection. The team had been provided mobility support and PPE kits for the purpose of sample collection by the DSO. The route map for each day's sampling site have been identified and visited accordingly. Prior intimation was provided to the sampling sites.

Sample collection & Transportation: Nasal/ Oropharyngeal swabs were collected from the subjects in each group and sent for testing using RT-PCR in the designated laboratory. All infection prevention measures including PPE was ensured. The samples were collected as per the existing guidelines. The samples collected in Viral Transport Media (VTM), packed separately as **"surveillance samples"** and transported to the designated laboratory in the cold chain.

The team collected the person's/patient details as per the surveillance form**.**

Training to the District Surveillance Team

All district Surveillance teams were trained through an online platform regarding sentinel surveillance with a presentation and discussion which lasted for 2 hours. Systems were put in place to timely clarify doubts from the field and ensure timely recording and reporting.

Functions of Laboratories

A total of 14 Laboratories approved by ICMR were selected for the purpose of the surveillance samples testing. The Lab in charge was briefed about the process and the samples were distributed depending upon the capacity of the laboratory to process the samples. The samples were received at the laboratory and standard operating procedures for processing the samples were followed.

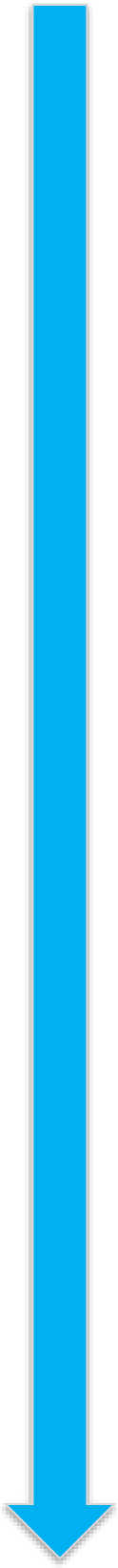
Reporting of labs

The Laboratories were provided with an online platform for the real time reporting of results so that action can be taken at the field level. The Laboratories entered all the details of the sample received including the test result.

Epidemiological Analysis

Whenever a positive case is obtained, detailed epidemiological investigation was undertaken by special teams. Epidemiological samples were collected as 25 per week from the neighborhood areas where a positive sample were obtained for consecutive two weeks. Further decisions were taken based on the investigation and results of epidemiological samples.

Fig 1. Summary of Sentinel Surveillance Process



Sample Collection Teams moves to selected places on fixed days

Community **Hospital**

Subjects for sample collection will be identified from Community and Hospitals

All Samples from field reaches District Surveillance Unit and further transported to Laboratory

Samples Processed at Laboratories

Real Time Data transfer of Results to State and Districts

Clinical Management, Isolation and Public Health Actions at Field Level

Epidemiological Investigation of positive cases, Further drill down in that area with 25 samples each for consecutive 2 weeks

Further actions based on Investigations and Results

Results

Total samples received for Sentinel Surveillance in first four weeks is 4414

Table 4: Demographic Characteristics of the people from where samples collected (N= 4414)

Characteristics	Categories	Number	Percentage
Age Group			
	< 5 years	23	0.5 %
	6-15 years	52	1.2 %
	16-25 years	389	8.8 %
	26-35 years	1113	25.2 %
	36-45 years	1246	28.2 %
	46-55 years	1099	24.9 %
	56-65 years	292	6.6 %
	>= 65 years	199	4.5 %
Gender			
	Male	1519	34.4%
	Female	2895	65.6%

Table 5: Persons from whom Samples tested based on Surveillance Groups

Groups	Numbers Planned	Numbers Actually Collected
Patients in general population with **Acute Respiratory Infection (ARI)** but **NOT** a COVID suspect	800	753
Health Care Workers in **Non-COVID** settings	800	1252
Persons with high **social exposure**; Food delivery persons / Community Volunteers for COVID /Police personnel/ Provisions shop vendors / Ration Shop/ wholesale fruits or vegetable vendors	800	1445
Category A COVID -19 Suspects	600	296
Guest workers	600	668

Fig 2: Distribution of Persons from whom samples were collected based on Symptoms (N=4414)

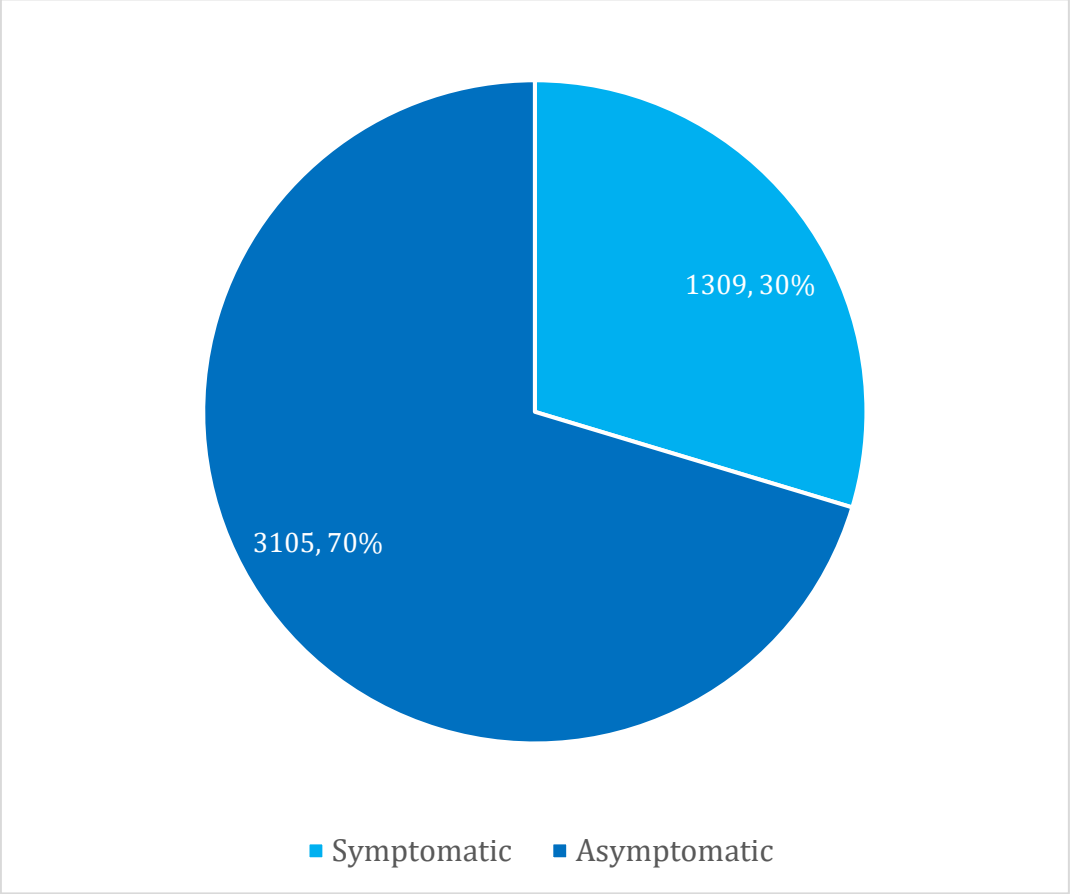


Table 6: Summary of sentinel surveillance

	Week 1	Week 2	Week 3	Week 4	Total
Total samples received	747	1210	1280	1177	4414
Rejected samples	10	4	0	0	14
Total samples tested	737	1206	1280	1177	4400
Positive	2	0	0	2	4
Negative	725	1201	1280	1175	4381
Indeterminate	10	5	0	0	15

Out of 4400 samples tested, 4 samples were tested positive (0.09%).

Fig 3. Graphical Representation of Positivity in sentinel surveillance samples

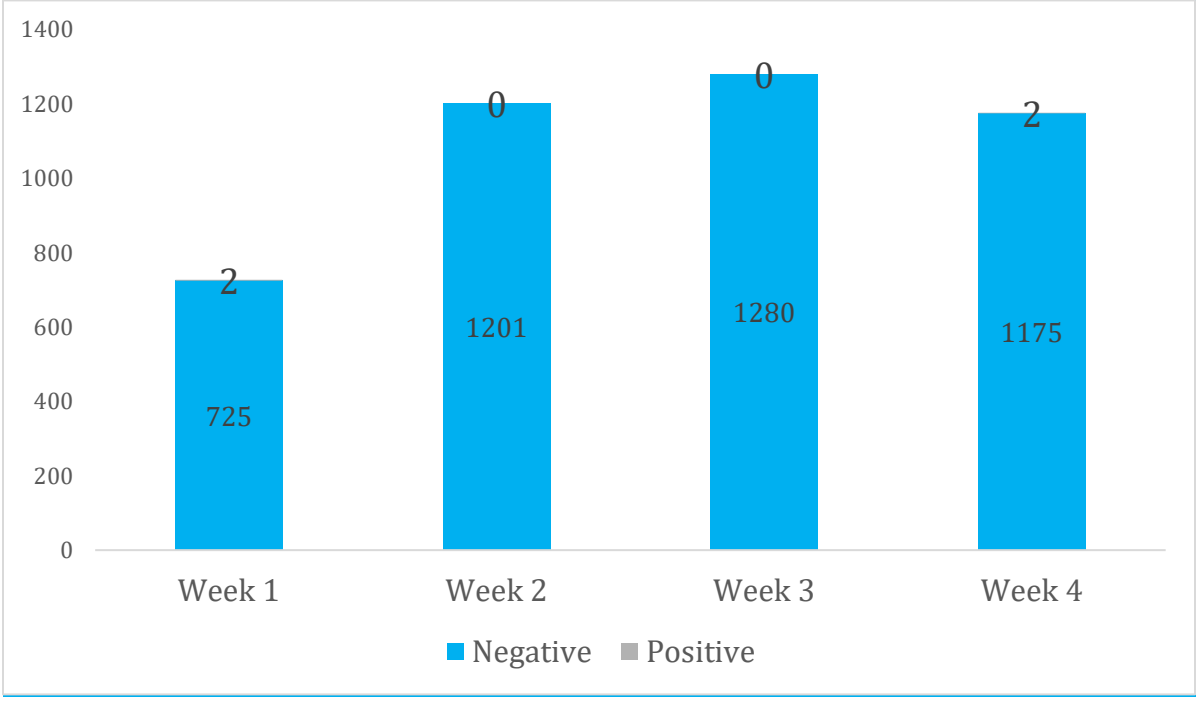
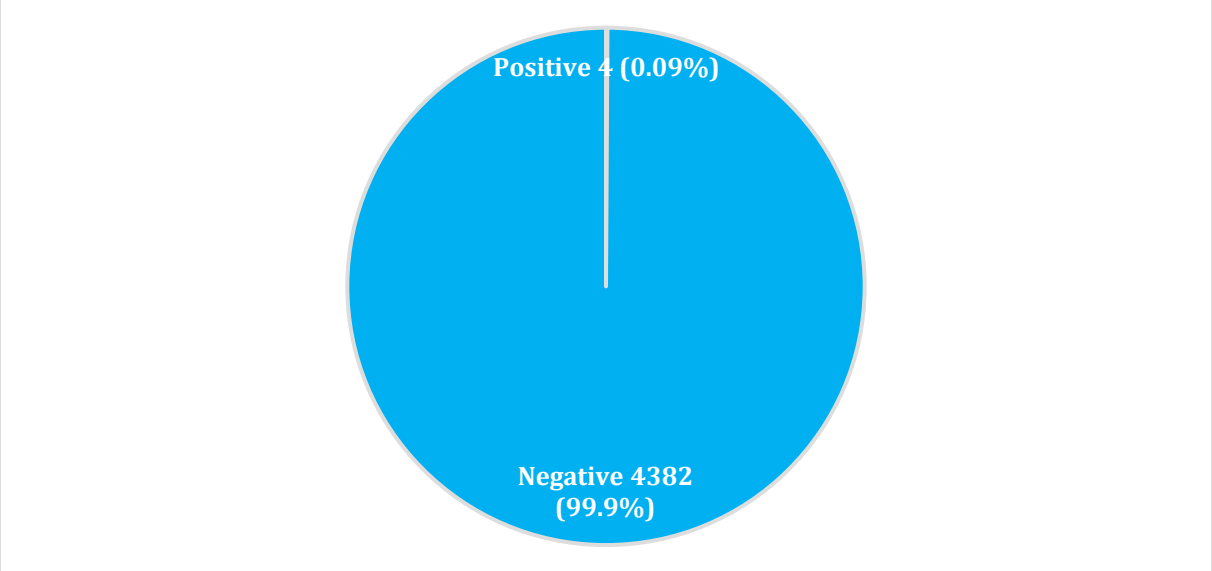


Fig 4. Summary of Sentinel Surveillance Results



Positive Cases identified from sentinel surveillance were as follows

1.Group- 3, a community volunteer from Chathanoor Panchayat, Kollam district.

2. Group 1- Patient in general population with **Acute Respiratory Infection (ARI)** but **NOT** a COVID suspect from Munnar Panchayat, Idukki district

3. Group-3, a person with high social exposure belonging to Vandenmedu Panchayat, Idukki District

4. Group 3- community volunteer from Kalluvathukkal Panchayat, Kollam district.

Epidemiological Analysis

Case 1- Health care worker from non COVID setting Staying in Ward 17 of Chathannur Grama Panchayath was tested who was monitoring of persons on home quarantine. During that period the patient had OP duty in FHC Chathannur once in a month (11.03.2020 & 23.04.2020) as part of Aardram. No history of travel outside Kollam District either for patient or family members. All Sources of infection were explored. Source of contraction might be from a staff of the FHC with history of travel to an affected area. A detailed report is appended.

Case 2- Working at ESAF, Nilambur, was staying at ESAF guest house, Pattikadu. Reached Idukki on 24.3.20 and was home quarantined from 25.3.20 – 8.4.20. Had productive cough on 29.3.20 and C/o Fatigue, Headache and Visited CHC Vandanmedu (without informing of quarantine). Cough persisted and fever, headache and vomiting on 22.4.20, tested positive on 26.4.20 following swab collection on 24.4.20. Contact history with a returnee from Coimbatore, within the potential incubation period.

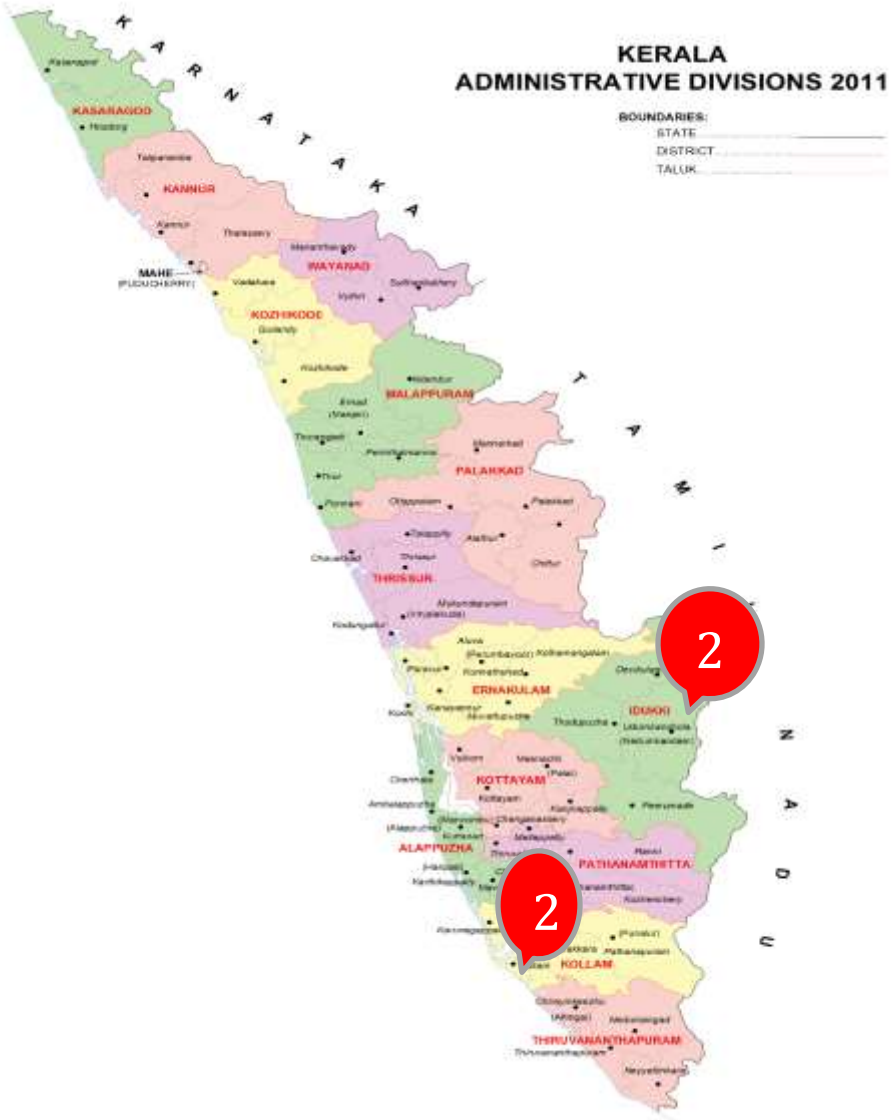
Case 3- Bakery owner. Owing to the shop's location as the first bakery en route from Cumbamettu, many inter-state vehicles as well as vehicles of distributors stop here for refreshments. His close contacts are regular travelers to Tamil Nadu and their swab results are pending.

Case 4: The report is awaited.

Epidemiological Samples

124 Epidemiological Samples were tested from all four panchayats. None of the epidemiological samples were positive for COVID-19.

Fig 5. Map showing Positive Cases Identified through Sentinel Surveillance



Samples from Private Sector & XpertNAT Test

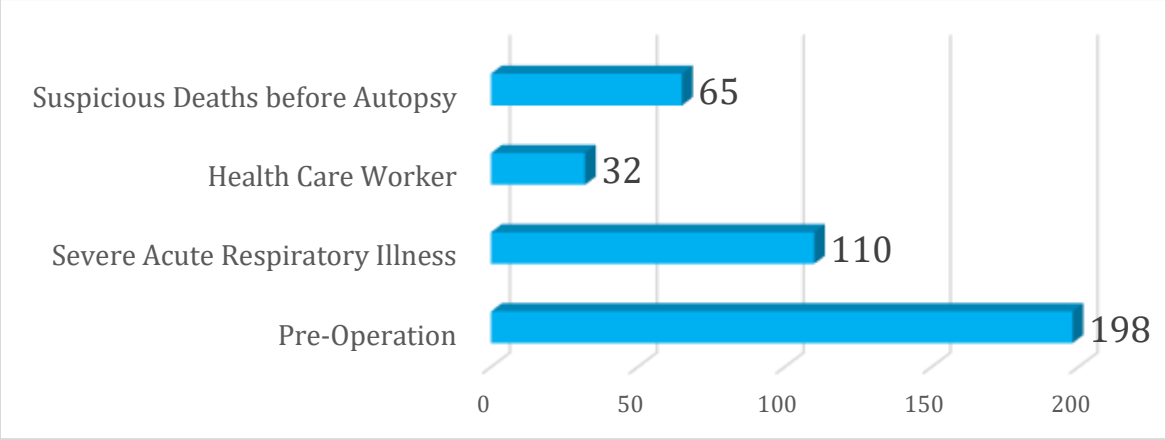
During the same time period, 4 private laboratories were testing samples from private sector. These mainly includes samples from patients reaching private hospitals with Acute Respiratory Illness. A total 3923 samples were tested at Private laboratories between 19.04.2020 to 16.05.2020, of which none turned out to be positive.

Summary of Results from Private Laboratories (19.04.20- 16.05.2020)

LABORATORY	SAMPLES TESTED	NO. OF POSITIVES
ASTER MIMS, Kozikode	802	0
DDRC, SRL Kochi	2764	0
AIMS, Kochi	337	0
Medivision, Kochi	20	0
TOTAL	3923	**0**

4 Xpert laboratories were performing tests between 19.04.20 and 16.05.2020. Xpert was used specifically for 1) emergency surgeries 2) Severe Acute Respiratory Illness requiring emergency testing for clinical decision making 3) symptomatic health care workers & 4) suspicious deaths. 405 tests were conducted in these categories during the time period. None of them turned out to be positive.

Summary of Xpert testing (19.04.20-16.05.2020)



Both these data sets of testing add evidences to the findings from sentinel surveillance that there is no community transmission in the State during this period.

Summary and Conclusions

- COVID positive patients identified through robust sentinel surveillance in first four weeks after examining 4400 samples all over Kerala were 4 (0.09%).
- Epidemiological links could be established for all 4 confirmed cases. None of the epidemiological samples turned positive.
- The results suggest that there is no evidence for community transmission at present in Kerala.

Future Plan

With the inflow of expatriates, the state has decided to further strengthen the sentinel surveillance system by doing around 2500 to 3000 samples testing daily, which will also help in providing early warning signals and epidemiological information about the next phase of the pandemic in the state. The epidemiological gaps shall be filled by undertaking epidemiological studies on confirmed cases identified through surveillance. RTPCR will be used for surveillance till ICMR approved validated antibody test kits are available.

Annexure 1: List of LSGs from where Sentinel Surveillance samples were collected

District	Name of LSG
Alappuzha	Alappuzha (M) Harippad Mulakkuzha
Ernakulam	Kalamasherry (M) Maradu (M) Cochin Corporation
Idukki	Byssenvally Arakkulam Devikulam Elappara Vandiperiyar Kanjikuzhy Edavetti Udumpanoor Karunapuram Vandanmedu
Kannur	Ulikkal Kathiroor Chokli Payyannur Paniyannoor Thalasherry (M) Kannur (C) Koothuparambu (M) Anjarakandi

	Kolayad Chittariparambu Kottayam Mokeri Pattiyom Panoor
Kasaragod	Kumbala Pallikkara Muliyar Ajarnur Uduma Puthugi Kothambelur Kodambelur Kanjangad (M) Kasaragod (M) Chemmanad Chengala Mathur Thrikarpur Madikai
Kollam	Kollam Corporation Kalluvathukkal Punalur M Thrikkovilvattom Chathanoor Mynagapalli Kulathupuzha
Kottayam	Vakathanam

	Kottayam (M) Thiruvarppu Panachikkad Ettumanoor (M) Vakathanam Aymanam Vazhapalli Vijayapuram Thalayolaparambu
Kozhikode	Thiruvalliyoor Azhiyoor Kozhikode Corporation Vadakara (M) Omasherry
Malappuram	Manjeri (M) Thirurangadi Vengara Kaladi
Palakkad	Ottappalam Karakkurishi Puthupariyaram Alathur Kuzhalmannom
Pathanamthitta	Vadasherrikkara Omalloor Ranni Pazhavangadi Aranmula
Thrissur	Thrissur Corporation

	Mathilakam Mattathoor
Thiruvananthapuram	Malayinkeezhu Vellanadu Thiruvananthapuram Corporation Neyyathikara (M)
Wayanad	Mullamkolli Poothadi Kaniyampatta Mananthavadi (M) Sulthan Batheri (M)

Annexure 2: Report of investigation of case of P14 _Kollam

The Report from Dr Zinia T Nujum and team is attached here as a case study. It is a very well written report that can work as a model to report epidemiology studies.

Disclaimer

Certain hypothesis/ findings require more verification like the conduct of antibody testing and hence this report will be subject to alterations.

The participants and patients in the report have been anonymised and portrayed as letters to maintain confidentiality. The investigators have no intentions to dishonour the personality of individuals

The team do not intend to produce any harm to the individuals mentioned and the information shared is for control of the situation

Abbreviations

rRTPCR – real time Reverse transcriptase PCR

DMO – District Medical Officer

DSO – District Surveillance Officer

MO – Medical Officer

JPHN – Junior Public health nurse

DCR – District Control room

FHC – Family Health Centre. In this report the FHC referred to is FHC Chathannoor

GMCK – Government Medical College, Kollam

DH – District hospital, Kollam

HOD – Head of department

RMO – Resident Medical officer

ARMO – Assistant Resident Medical officer

HCW – Health Care Worker

HH – Household

Pseudonymisations

P14 – Patient whose case is being investigated

S1, S2, S3 – Proposed possible sources

T1, T2, T3, T4, T5 – Cases who received infection through transmission from the proposed case

Acknowledgements

Principal Secretary Health and Family Welfare

District Collector, Kollam

State PEID Cell

MO and other staff FHC

Supporting staff at GMCK, DCR and DMO office

Mr. Achu A. L., University of Kerala

Most important – Our affected patients

The Investigating TEAM

GMCK – Principal, Superintendent, HOD and other faculty of Community Medicine, HOD Microbiology , Nodal Officer, RMO, ARMO, PRO

District Control Room – DMO, DSO, DPM and other staff at DCR

Scientists at RGCB

Executive Summary

An ASHA worker from FHC Chathanoor was detected to have COVID 19, through sentinel surveillance. She was admitted to GMC Kollam on 25-04-2020. This ASHA worker had attended OP clinic duty at FHC Chathannoor on 11.04.2020. Subsequently another child who gave a history of going to the outpatient department on 10.04.2020., with history of fever came to GMCK.This child was also detected to have COVID 19. Contact tracing of this ASHA worker resulted in identification of three other COVID 19 positive cases. One was an attender, the second, a main centre JPHN and the third was a local leader who had honoured the ASHA worker.

During investigation to identify source, all other household contacts, quarantined people under the care of the centre, other staff of FHC and community contacts were looked into and found to be negative for the disease at that time point. Since three of the cases in the cluster were FHC staff, the child having history of gone to FHC and the leader with link to FHC staff, FHC was thought as the source. Since the time points of potential exposure of ASHA worker and child, who are not regularly present in the FHC, it is unlikely that a

visitor to the centre could be the source. So, we suspected that a regular staff of the FHC could have been the source. Telephonic interviews and conversations with key stakeholders helped us to identify one staff with a history of travel to Jodhpur AIMS, where cases of COVID 19 were reported at that time. He had travelled via Mumbai and Delhi and returned to the FHC soon after his return on 10.04.2020, without being quarantined. Considering the incubation period and other transmission dynamics it is possible that this could be the source of infection. However, his sample has tested negative for RTPCR which is expected. An antibody testing would help confirm this possibility which was not done due to non-availability.

Five cases of COVID 19 have been identified as a cluster, four of which would not have been picked without sentinel surveillance. All these four were asymptomatic. Using the SEIR model, we have tried to project the burden that could have been picked up by the surveillance to be between 2 to 20%. We also project that around 6300 to 12000 cases would have been aborted because of effective surveillance, quarantine and isolation. All the five cases were discharged by 2.05.2020.

We would like to suggest that peripheral health centres delivering primary care be given more priority for infection prevention and control, in terms of crowd management, appropriate use of PPE. OP services in primary health care settings and monitoring of quarantine also could be done in such a way as to minimise the contact through use of technology. Health care workers by way of their work culture and dedication are the most likely people to divulge from preventive measures like social distancing and quarantine, because of a conflicting psychology between social responsibility to work and social commitment to prevent an infection. Effective implementation among these personnel will require strict enforcement, monitoring and supervision. Facilities for antibody testing would facilitate better understanding of the sero-epidemology not only in this affected area but also in other parts of the state. It will enable a better planning for the future.

1. Background

Sentinel surveillance in Kollam district was done as per order from government. Health care worker from non COVID setting needed to be tested as per this guideline. Hence an

ASHA worker from Chathannor FHC was tested. P14 was tested with rRTPCR accordingly. She was asymptomatic. The test was done on 23.04.2020. Results came as positive on 25.04.2020. She was admitted in GMCK on the same day. A letter form principal secretary was received to do a detailed epidemiological study of the case (appendix 1) on 27.04,2020. The team work was already on to investigate the case and manage the situation. Motivated by the letter, the investigation has been conducted with more rigour into the methodology and the preliminary report is being submitted.

2. Objectives

1. To identify the source of infection to P14
2. To identify all possible cases of infections epidemiologically linked to P14 and facilitate appropriate management so as to prevent further spread
3. To identify the pattern and dynamics of transmission that has occurred in the community
4. To provide support to the people in the area, those involved in the transmission and consultative guidance to the team in managing the situation

3. Methods

3.1. In-depth interview & interactions over telephone with the following persons

1. P14
2. Medical Officer PHC Chathanoor
3. JPHN of P14
4. DPM Kollam
5. DSO Kollam
6. Laboratory experts (from NIV Alappuzha , HOD microbiology)
7. Interactions with other health staff in the FHC through telephone conversations

3.2. Preparation of route map based on telephonic interview with P14 and her JPHN

3.3. Active surveillance / search for more cases

3.3.1. Preparation of line list of primary and secondary contacts was mainly done at the district control room (DCR) in consultation with staff of FHC. Asymptomatic high-risk contacts of P14 including household contacts, the staff of FHC, leaders in the area were traced. They were transported to GMCK or DH and necessary sample collection was

done. Samples were transported to RGCB. rRTPCR tests on throat and nasopharyngeal swab was done.

3.3.2. Line list of people in quarantine who had been allotted to P14 for monitoring was identified. Telephone interview was done was done with involvement of FHC and DCR . Samples were collected if required at GMCK or DH and tested at RGCB

3.3.3.Online Questionnaire based screening in the area prepared based on guidance from GMCK by FHC and DCR team,

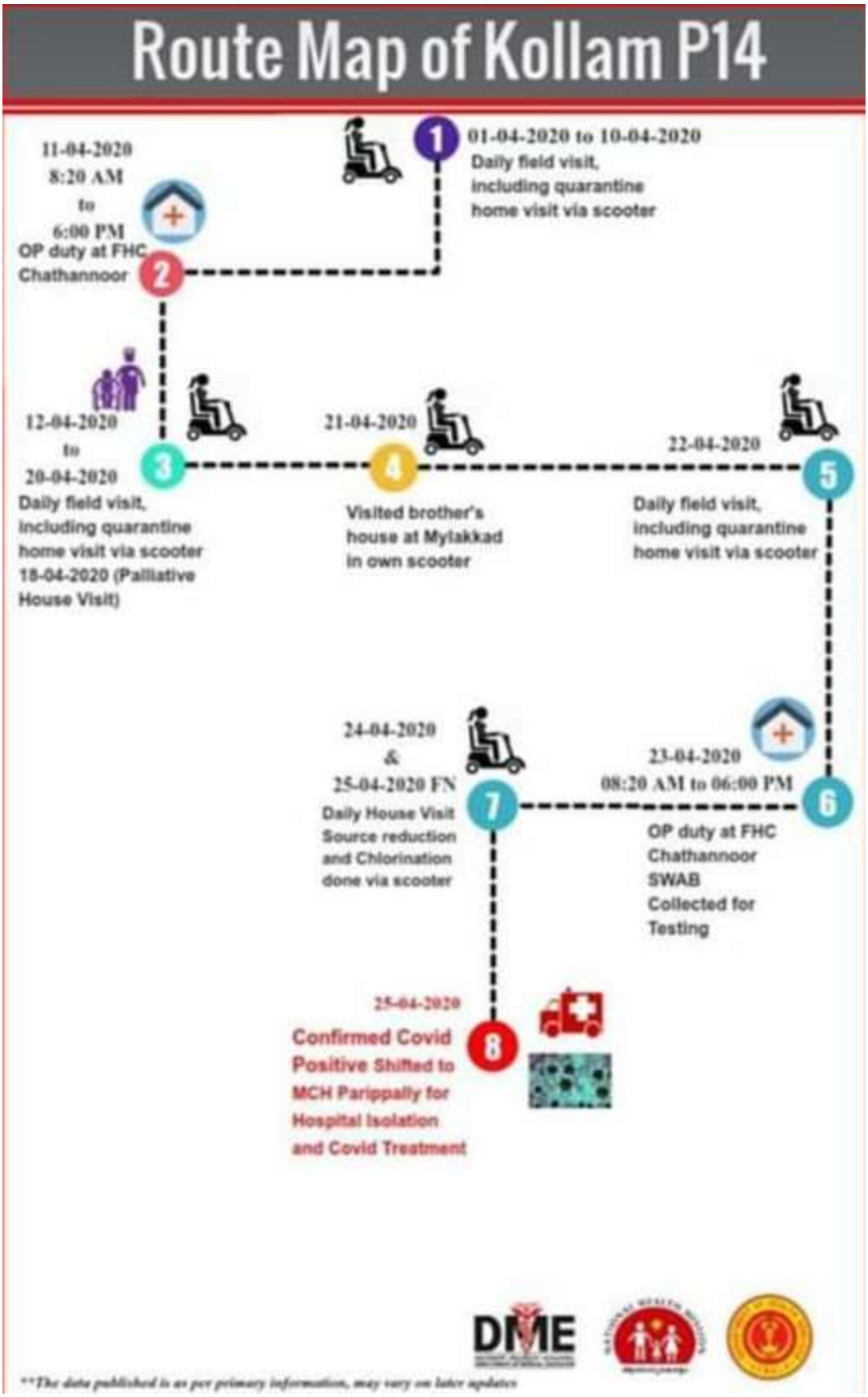
4. Findings and discussion

4.1. Usual Routine of P14 during March 2020 & April 2020

- Staying in Ward 17 of Chathannur Grama Panchayath
- Involved in routine house visits in Ward 15 (499 houses & population of 1884) between 8:00 am and 11:00 am usually
- Monitoring of persons on home quarantine due to travel from Corona Virus affected areas
- OP duty in FHC Chathannur once in a month (11.03.2020 & 23.04.2020) as part of Aardram
- No history of travel outside Kollam District either for her or family members
- Family consists of husband (driver of pick-up Auto) , a son (college student) and daughter (married and staying nearby)
- Involves in Kudumbasree activities near her house

Route map has been prepared and disseminated. See figure 1

Figure 1: **Route map** of P14


Route Map of Kollam P14
1
01-04-2020 to 10-04-2020
Daily field visit, including quarantine home visit via scooter
11-04-2020
8:20 AM
to
6:00 PM
OP duty at FHC Chathannoor
2
12-04-2020
to
20-04-2020
Daily field visit, including quarantine home visit via scooter
18-04-2020 (Palliative House Visit)
3
21-04-2020
Visited brother's house at Mylakkad in own scooter
4
22-04-2020
Daily field visit, including quarantine home visit via scooter
5
23-04-2020
08:20 AM to 06:00 PM
OP duty at FHC Chathannoor
SWAB Collected for Testing
6
24-04-2020
&
25-04-2020 FN
Daily House Visit
Source reduction and Chlorination done via scooter
7
25-04-2020
Confirmed Covid Positive Shifted to MCH Parippally for Hospital Isolation and Covid Treatment
8
DME
**The data published is as per primary information, may vary on later updates

4.2 Contact tracing

352 contacts were traced, 195 were Primary contacts including hospital staff been categorized as high risk. Several samples have also been tested through sentinel surveillance on weekly basis.

Table 1: Type of Contacts identified

Contact category	Number	Percent
Health Care Worker	40	11.36
Household	102	28.98
Community	209	59.38
Co-traveller	1	0.28
Total	352	100

Table 2 : Samples tested

Samples	Result
Tested positive	3
Tested negative	219
Not tested	349
Total	352

4.3. Source tracing

In order to find the source investigations were done on Home Quarantined persons in Ward 15 during March & April 20, Family members of P14, family members of an immediate neighbour, a 72 year old male with history of sudden death, Quarantined people in Ward 17 of Chathannur Grama Panchayath and nearby ward of Chirakkara Grama Panchayath. Among the members of a Chitty conducted near her house. All these suspected sources were tested and found to be negative.

A nine year old boy (later became P15) had come to OP of GMCK on 26.04.2020 with complaints of fever and sore throat. This boy was the son of a pharmacist working in GMCK. He was also taken to FHC Chathannoor for complaints of fever on 10.04.2020. He was also tested and found positive.

We had two hypotheses in mind while looking for the source.

Hypothesis 1 : Child (T3, later p15) being the source of infection to the FHC staff

Hypothesis 2: The origin could be at FHC and the child acquired another infection different from the one for which the visit to the FHC was made.

There was a fever cluster in the child's family also. But later on, we ruled out the first hypothesis by answering the question" Was the child's fever persistent from April 10 th to this time? "The answer was that first episode of fever of the child subsided in two days and the child had no problems till 26th April when fever developed and was taken to hospital. Since these seemed to be two separate events, we came to the conclusion that this event could have occurred following an exposure from FHC when the child went for care on 10th April. So, we went with further investigation and work up with the second hypothesis. The second hypothesis was made more plausible with the result of the pharmacist being obtained as negative.

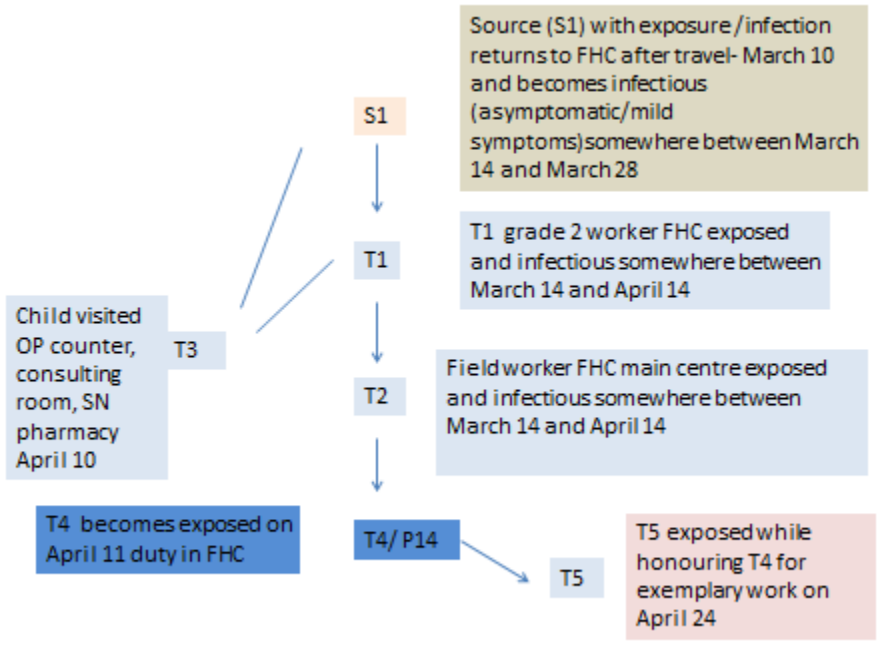
There was a history of a gulf returnee from Dubai, staying in the neighbourhood of T3. There were children in his house who interacts with the child. This gulf returnee had visited the house after his quarantine period was over. His sample has been sent for testing.

From among the contacts of P14, two other staff from the FHC including a JPHN (T2, later P19) and an attender (T1, later P16) were found to be positive and admitted in GMCK on 29.04.2020 and 30.04.2020 respectively. This reaffirmed our second hypothesis . From in-depth interviews with the staff of FHC we understood that there was one staff nurse (S1) who had gone to Jodhpur. S1 gave a history of travel to Jodhpur, Rajasthan for an interview at AIIMS Jodhpur via Mumbai. Return journey was from Delhi. There is no history of definite contact with positive patients. Rajasthan had reported positive cases in early March, Jodhpur and AIMS Jodhpur.

4.3. Possible patterns of transmission

Five individuals have been identified as positive in the transmission chain. Three of them are health care workers (T1, T2, T4), one is a child who visited the FHC for fever (T3) and the one is a local leader (T5) See figure 2 for details

Figure 2: Possible Pattern 1



March 5 to March 10	S1 in travel and infected
March 10	S1 returns to work in FHC
Between March 14 and March 24	S1 diseased
Between March 14 and April 10	T1 and T2 infected
April 10	T3 exposed/infected
April 11	T4 exposed/infected
April 24	T5 exposed/ infected
April 25	T4 admitted
April 28	Last positivity in the series
April 29, 30	OthersT1, T2, T3, T5 admitted
April 29	T4 has two negative samples
April 30	T4 discharged
May 2	All the other 4 have two negative samples
May 4	T1, T2, T3, T5 discharged

P14 has become negative twice in a period of five days following admission. P14 has given the infection to T5 on 24th April. So probably P14 is in the third week after getting exposed and infected. She has been active during the period of communicability. So, we expected more cases among contacts but such transmission was not seen. She could be the third person to have acquired infection from the FHC, fourth in the link, the possible order being T1, T2, T3 and T4

Houses of four out of the five cases (except T2) are in the same panchayat. All the five cases have links to the FHC Chathanoor by way of workplace or visit (see figure 3.)

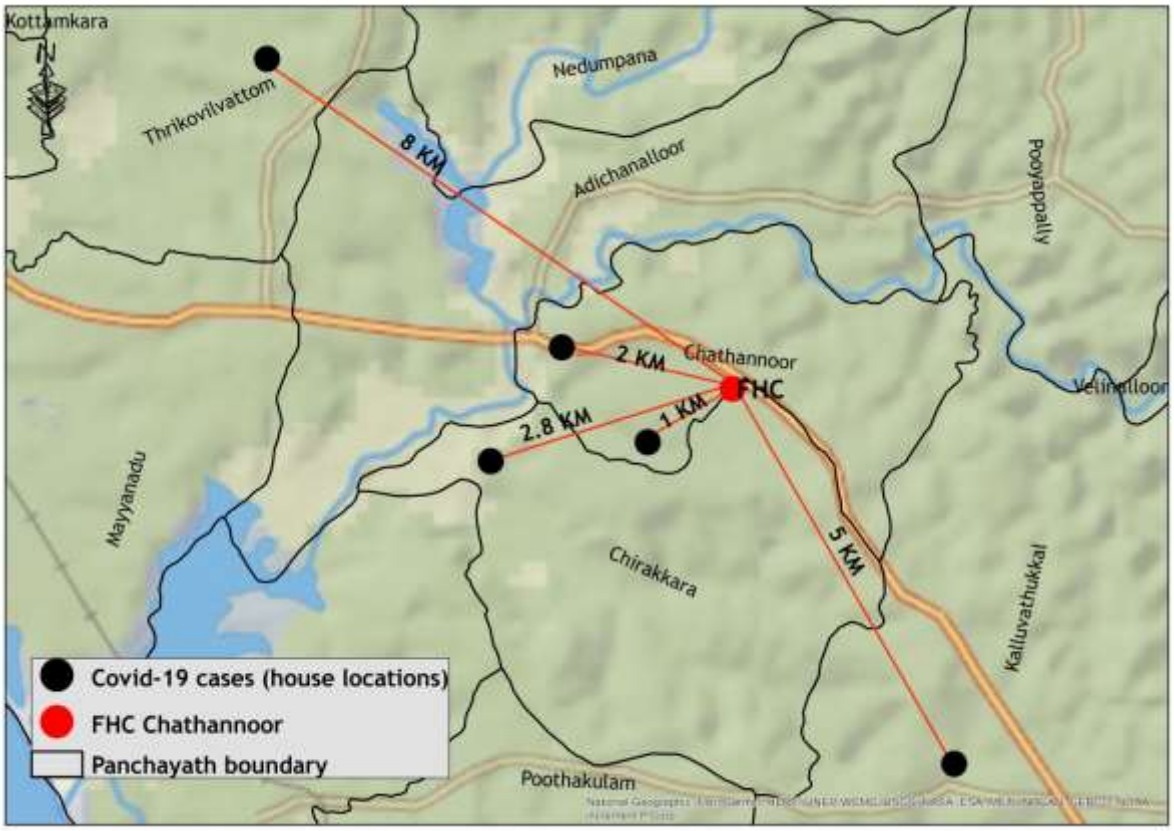


Figure 3: Location map of the cluster of cases

4.4. Other findings/ observations

4.4.1. The family of T3 involving T3, mother, sister and one cousin of T3, had a cluster of fever with the three year old having developed.

4.4.2. Another one-year old child with febrile seizure has reported and admitted in GMCK from the area whose mother sister is an ASHA worker. She had symptoms of fever but has been tested negative. This child is negative.

4.4.3. P14 has been a very active ASHA worker with commitment to her work. She remembers all persons who have been allotted to her for quarantine

4.4.4. This cluster of cases of COVID 19 has emerged because of active surveillance. The approach has been proactive. All cases identified were asymptomatic. In this cluster, four cases were identified through the active surveillance, This approach has been helpful to prevent several cases which would result if the chain of transmission continued uninterrupted without identification

4.4.6. Other than the child, nobody was symptomatic and all turned negative very fast. All patients have only one positive report. This is something unusual when compared to other positive patients admitted here. It could be that the infections were very mild. The fact that there were no other series of cases from this cluster, also points towards this.

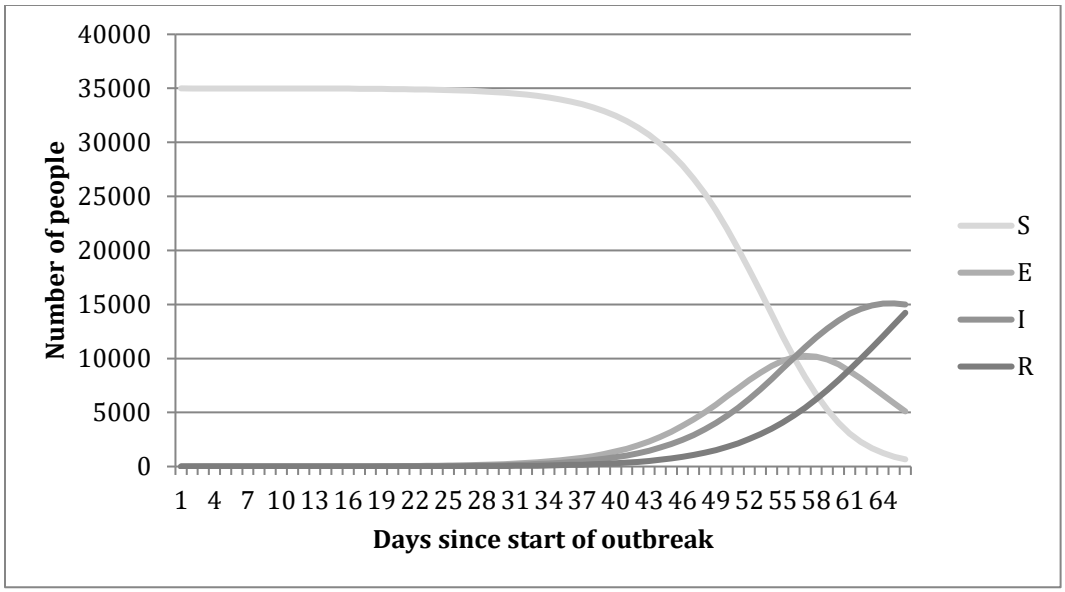
4.4.7. From S1 one wave of infection might have resulted (T1, T2, T3, T4) and there is only one transmission noted in the next wave (T5). From April 24 to May 2nd , there is maximum of three incubation periods possible , so it could also be that S1 gave infection to T1, T2. Then T3 and T4 acquired and T5 acquired from T4.

4.4.5

Using the SEIR model, the worst case scenario (see appendix 2 excel sheet for details) has been computed, with the first infected assumed to be on 24-03-2020, 14 days after return of potential source. So by 25th April, when we admitted the first case, there could be 234 people in the community with illness. Out of this we have captured five, (2% of the burden).

The best case can be considered by retrospectively calculating from the time to viral nucleic acid conversion rate. All 5 have recovered by 02- May -20. Latest admission in the series is 30-April-20, with the last person positive on 28-April-20. Suppose the next two days, the sample was negative, we may take that all five recovered by 30-April -20; there would be 24 with illness and 8 recovered. So we have captured 20% (5/24) of the burden. First case by this scenario would have occurred 10.04.2020

So effectively by surveillance we must have captured between two to twenty percent of the burden. Eight to ninety eight percent of the burden is hidden in the community, if the transmission is ongoing. By 21st of May we would have witnessed the peak of the outbreak (figure 4). But we have not got any other cases in the area, despite surveillance. So, it is possible that we have aborted the transmission by effective isolation of initial cases. If this is true, we have prevented 12000 cases in the best case and 6300 cases in the worst case. (see excel sheet in appendix for how this is arrived at)



Day 1 – April 24, 2020 ; S- Susceptible ; E- Exposed, I- Diseased, R – Recovered

Figure 4: Applying the SEIR model for projected burden and burden averted

4.4.6 Only one out of the five in the cluster has been symptomatic. So, the COVID that has occurred in this cluster seems to be of a less virulent strain. Virulence and transmissibility inversely related, it is likely to be more transmissible.

4.5. Strengths

Team work

Cooperation received from patients and bystanders despite their challenging situation

4.6. Challenges

Since patients were isolated and hospital protocols restrict access for infection prevention, personal interviews could not be done

Conducting telephone conversations and interviews in detail with patients when they are expected to be in affected emotionally, was ethically challenging and difficult

Range issues during telephonic interview in GMCK

5. Actions taken based on findings and after consultations and meeting of relevant stakeholders

5.1. The staff of FHC have been quarantined. Initially functioning was continued with substitute staff but with further cases being reported OP has been closed down

5.2. The FHC has been subjected to disinfection

5.3. GMCK general OP was also temporarily stopped for disinfection purpose

5.4. Additional wards have been opened up for COVID 19 patients. Other resources for starting testing have been initiated. Construction work for the same is in progress and human resource required are being deployed.

5.5. The area has been put under lockdown

5.6. Another swab collection point is being setup in the area opposite to the FHC

5.7 A call centre is also being set up close to the FHC in another building for screening of persons through telephone and also consultations

5.8. Public notice is being planned for reporting of people with ILI/SARI/ travel history for tele-screening and follow up action if required

5.9 Possible linkages through persons who attended OP are being explored

5.10. Possible linkages through family members/ contacts of staff of centre is being explored further

5.11. 24-hour mike announcements in the area for maintaining social distance, frequent hand hygiene and use of masks.

5.12. Daily reviews with collector and political leaders are in progress

5.13. Reports to the state are being submitted

6. Conclusions

6.1. There is a cluster of COVID 19 cases in Chathannoor area with 5 epidemiologically linked case involving three health workers, one child and a local leader.

6.2. Source of infection is most probably through a staff of the FHC with history of travel to an affected area.

6.3. A very coordinated team work with a proactive approach has produced results in terms of early case detection and containment.

6.4. Effective measures for control have been put in place. Adequate resources are available in the area for management of the current situation

6.5. Among all health care settings, primary health care settings and the staff there are most susceptible to acquiring infection with regard to their widespread exposures and limitations of settings.

6.6. Transmission to a bridge population has happened (those who have visited health care settings/worked and are very active in public) but people in houses (contacts of these positive patients) have not acquired the infection. It could be that the viral load transmitted is not enough to create another wave of infection.

7. Suggestions

7.1. There are possibilities of such clustering in other parts of the state. So active surveillance has to be strengthened for identification of asymptomatic transmission and containment

7.2. When antibody tests are available after validation it could be done in P14, S1, S2, for further understanding. This area is to be considered for community screening using antibody test

7.3. Facility for viral culture also to be made available at least in one centre in Kerala

7.4. Earlier experiences from other countries show that 50% of infection are hospital acquired [R2]. This experience is true with SARS and MERS as well [R3]. Primary health care settings are important areas of risk of transmission. Secondary and tertiary settings are more equipped in this regard. So, this event has to be viewed considering the circumstances in the peripheral centres while deciding on action. Instead of punitive actions, these centres need to be supported further since they form a huge army in fighting the battle against COVID 19. The staff who have been and will be affected are most likely to be the most sincere and committed among the lot. So, they need to be psychologically supported at their hour of trouble. At the same time, adequate resources in terms of appropriate PPE have to be made available at the peripheral health centres.

7.5. Field activities during the outbreak phase especially by voluntary workers like ASHA and political leaders have to be kept to bare minimum. Use of social media to be used more in this regard. Appropriate software for the same needs development followed by training.

7.6. The work in the area may need to be supported with human resources from the state level or redeployment if situations get worse.

7.7. By way of work culture and circumstances, health care personnel are the most likely people to divulge from preventive measures like social distancing and quarantine. They are likely to suffer from a conflict of prioritising self and society over their work, especially

wherever there are staff shortages. Effective implementation among these personnel will require strict enforcement, monitoring and supervision.

7.8. Circumstances that lead to exposure its measurement and prevention in all levels of health care settings needs an operational research

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Annexure 3: List of Team members involved in Sample Collection for Sentinel Surveillance

Thiruvananthapuram

Sl. No.	Name	Designation
1	Dr.JOSE.G.D'CRUZ, DSO	DSO
2.	Dr.KRISHNA	Doctor
3.	Dr.GAYATHRI,	Doctor
4.	Smt.SAKEENA BEEVI, DLT	Lab Technician
5.	Sri.SREEKUMAR	LAB TECH
6.	Mrs.SINDHU	LAB TECH
7.	Smt. RENJINI	LAB TECH
8.	Mr.JAYARAJ.L.T	DEO
9	Ms. ANJANA	DEO

Kollam

Sl. No.	Name	Designation
1.	Dr. Saranya K. Babu	Doctor
2.	Smt. Sreekumari. A	Staff Nurse
3.	Deepthi S Babu	Lab Technician
4.	Shri Velraj C	Lab Assistant
5.	Dr. Prabhu K. Namboothiri	Doctor
6.	Smt. Remya R.	Staff Nurse
7.	Shri Manoj M	Lab Technicial
8.	Shri Sundaran	Lab Assistant
9.	Dr. Jith .M	Doctor
10.	Smt. Vimala P.	Staff Nurse
11.	Shri Rajesh M.K.	Lab Technician
12.	Shri Balu M.K.	Lab Assistant
13.	Dr. Lekshmi V.	Doctor
14	Smt. Ligi Beegum	Staff Nurse

15.	Shri Raju P.R.	Lab Technician
16.	Shri Viswakumar	Lab Assistant
17.	Dr. Lekshmisree O.C	Doctor
18.	Smt. Shemi Mol	Staff Nurse
19.	Shri Sreeharsha Dev	Lab Technician
20	Shri Santhosh	Lab Assistant

Pathanamthitta

Sl. No.	**Name**	**Designation**
1.	Dr. Nidhish Issac Samuel	DTO
2.	Dr. Seena Tresa Samuel	Pathologist, RPH Lab
3.	Smt. Bindhu	DLT
4.	Smt. Jaya Thomas	Senior LT
5.	Smt. Shareena	Data Entry Operator

Alappuzha

Sl. No.	**Name**	**Designation**
1.	Dr. Deepu B	Doctor
2.	Dr. Abhishek	Doctor
3.	Smt. Bindhu. S	Nurse
4.	Smt. Roshii V.S	Nurse
5.	Shri Anoop	Lab Technician
6.	Smt. Nimisha	Lab Technician
7.	Smt. Nasiya Nasar	Lab Technician
8.	Shri Prakash P.M	Attender
9.	Smt. Lathakumary	Attender

Idukki

Sl. No.	**Name**	**Designation**
Team	Dr. Josmon	Physician

1	Dr. Mijeesh K.V	Ortho
	Dr. Remeesh Chandran	Psychiatrist
	Dr. Sithara Mathew	Physician
	Smt. Jincymol Mathew	Staff Nurse
	Smt. Bindhu Augustin	Staff Nurse
	Smt. Sarima Soman	Attender
	Shri Muhammad Roofin	Lab Technician
	Smt. Shoba	Staff Nurse
Team 2.	Dr. Jithin M Antony	Asst. Surgeon
	Dr. Manoj Suresh	Asst. Surgeon
	Dr. Jayaram K.	Physician
	Dr. Manu Murali	Asst. Surgeon
	Dr. Nandhu Chandran	Asst. Surgeon
	Dr. Sreeraj R	Dental
	Dr. Shyam	Asst. Surgeon
	Smt. Diphu	Staff Nurse
Team 3.	Dr. Abhilash Purushothaman	Physician
	Dr. Sonia Lawrence	ENT
	Dr. Priya	Physician
	Dr. Eldho Gevarghese	Paediatrician
	Dr. Jishand	Ortho
	Smt. Kekha M.R	Staff Nurses
	Smt. Joycy Chacko	
	Smt. Smitha Kumar	
	Smt. Anju Santhosh	
	Smt. Sinimol Augustin	
	Smt. Smithamol M.M	
	Smt. Arya Chandran	
	Smt. Simi Sebastian	
	Smt. Surabhi	
	Shri. Suresh Kumar	Attender Gr. II
	Shri Tomy Joseph	
	Smt.Lali P.B	

	Smt. Ansamma K.A	
	Shri Rajeesh	
	Smt. Omana K.V	
Team 4.	Dr. Aswathy	Asst. Surgeon
	Dr. Anil Nair	
	Dr. Jimmy	
Team 5.	Dr. Nithin	
	Dr. Suresh Babu	
	Shri. Praveen	Staff Nurse
	Smt. Lissy Mathew	Attender Gr. II
	Shri. Shijimon	
	Smt. Bindhu	
	Smt. Anakha	Staff Nurse
	Smt. Anu	
	Smt. Sincy Sebastian	
Team 6.	Dr. Nikhil Sreedharan	ENT
	Dr. Manikandan	
	Dr. Midhun	
	Dr. Lekshmi	Dental Surgeon
	Shri Arunkumar P.M	Staff Nurse
	Shri Sudeev N.S	
	Smt. Deepa Syriac	
	Smt. Remya Joy	
	Shri Anoop P.S,	
	Smt. Jothimol	
	Smt. Saraswathi V.L.	
	Smt. Praveena	
	Smt. Dais Mary	
	Smt. Remya Mol P.N	
	Smt. Aksa	
	Shri Roji Varghese	
	Smt. Sijimol P. George	
	Smt. Malarvili	

	Smt. Riji Joy	
	Smt. Jancy Philip	
	Shri Manikandan	Attender Gr I
	Shri Reji R	
	Shri Vavachan V.O	
	Shri Brusili. A	
	Smt. Bindhumol N	
	Shri Maybil Sam	
	Shri. Baby C Kochakal	
	Shri Rasheed M. P	
	Shri Sunny K	
	Smt. Usha A.K.	
	Dr. Al Sabah Sherif	Asst. Surgeon
Team 7.	Dr. Briju Ramankutty	Physician
	Shri Finix Baby	Ortho
	Dr. Sweet	Gynaecologist
	Dr. Meera Raman	Paediatrician
	Dr. Sajeev V.S.	ENT
	Dr. Sandeep S.Y	Asst. Surgeon
	Dr. Nagasajeev Kumar	CMO
	Dr. Sreekrishna R	Asst. Surgeon
	Dr. Chacko T Thomas	
	Dr. Mohandas K	Civil Surgeon
	Dr. Shiba Thomas	Ophthalmologist
	Shrri Joy M.P	JHI
	Shri Antony	ATT Gr II
	Smt. Sinimol P.S	Attender
	Smt. Flimy Varghese	Nursing Assistant
Team 8	Dr. Anoop	Superintendent
	Dr. Karol Joseph	Physician
	Dr. Prashand	Asst. Surgeon
	Dr. Rakhi	
	Smt. Juby George	Staff Nurse

	Shri Rejesh Jose	
	Shri Praveen R	Attender Gr II
	Shri Muhammed Mahin	JHI
	Smt. Abhila C Chandran	SN

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1.	Dr.Anupama 9446294178	G.H.Kottayam
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8.	Dr.Raiza Zen 9496324150	CHC Mundankunnu
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Ernakulam

Sl. No.	Name	Designation
1.	Dr Nada	Medical Officer, NHM
2.	Dr Suja Philip	Microbiologist
3.	Dr Jyotsna Nair	Assistant Surgeon

3.	Shri Roopesh	
4.	Dr Manoj Manikyan	Assistant Surgeon
5.	Smt. Ambily	Staff Nurse
6.	Dr Nikhilesh Menon R	Team Co-ordinators
7.	Dr Gowri Kripa	

Kozhikode

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1.	Dr. Michael C.J (9847476700)	Doctor
2	Dr. Suresh T.N (946063570)	Doctor
3	Dr. Dhanya PG (9495934443)	Doctor
4	Smt. Saira Bhanu	Lab Technician
5	Smt. Jisha	
6	Smt. Greeshma P.K.	
7	Smt. Roshma R	Staff Nurse
8	Smt. Ashly Mariya Sunny	
9	Smt. Shimmi Jayara	
10.	Dr. Sindhu Theresa	Doctors
11	Dr. Abdul Azees	
12	Dr. Ramya T.R	
13	Smt. Sindhu M.T	Lab Technicians
14	Smt. Jiji R	
15	Smt Havitha	
16	Smt. Sruthi P	Staff Nurse
17	Smt. Abhitha T.P	
18	Dr. V.K. Syam	Doctor
19	Dr. Prajith	
20	Smt. Reshma K.R.	Lab Technician
21	Dr. Sughosh K	Doctors
22	Dr. Sujith V	
23	Dr. Deepthi V	

24	Dr. Sandhya Kurup	
25	Smt. Shanila Gopinath	Lab Technician
26	Shri Anilkumar V.V	
27	Smt. Shinitha	Staff Nurse
28	Smt. Rani P.G	
29	Shri Anulal K	

Thrissur

Sl. No.	**Name**	**Designation**
Team 1	Dr. Jean Augustin	Doctors, GH, Irinjalakkuda
	Dr. Swapna Pyarijan	
	Dr. Venu	
	Dr. Mithun	
Team 2	Dr. Priya	Doctors, Thaluk Hospital, Kunnamkulam
	Dr. Rekha	
	Dr. Suma	
	Dr. Lonappan Justin	
Team 3	Dr. Sreekumar	Doctors, Thaluk Hospital, Chavakkad
	Dr. Karthika	
	Dr. Thankamani	
	Dr. Libin Ibrahim	

Wayanad

Sl. No.	**Name**	**Designation**
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2.	Shri Abdul Majeed	Lab Technician
3.	Shri Rajesh	Lab Technician
4.	Smt. Dilna	Lab Technician
5.	Shri Rijesh	Lab Technician
6.	Shri Muhammed Yashiq	Lab Technician

Kannur

Sl. No.	Name	Designation
1.	Dr. Latha	Jr. Consultant, Medicine
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3	Dr. Bushara A	Consultant, Surgery
4	Dr. Jithendranath K	Consultant, Ortho
5	Dr. Anju M S	Jr. Consultant, E N T
6	Dr. Anitha S	Consultant, Opthalmology
7	Dr. Shony Thomas	Jr Consultant, Gynaecology
8	Dr. Jayarajan P V	Jr Consultant, Anaesthesia
9	Dr.Bindu. K. M	Jr. Consultant, RPM
10	Dr.Sreejesh N	Jr. Consultant, Dermatology
11	Dr.Thankamani E	Consultant , Gynaecology
12	Dr.Manoj Kumar K P	Consultant, PMR
13	Dr.Sreethakumari P	Jr Cosultant, Opthalmology
14	Dr.Priya K	Jr consultant, Peadiatrics
15	Dr.Rajmohan	Jr. Consultant, Ortho
16	Dr.Sushamakumari K	Consultant, ENT
17	Dr. Greeshma S	Jr consultant, Medicine
18	Dr. Satheesan K	Consultant, Peadiatrics
19	Dr. Mohankumar V K	Consultant, Surgery
20	Dr. Rajeev Raghavan	Consultant, Ortho
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22	Dr. Smitha M P	Consultant, Opthalmology
23	Dr. Ashish Bens	Jr Consultant, Gynaecology
24	Dr. Shobee Krishnan	Jr Consultant, PMR
25	Dr. Rakesh	Jr. Consultant, Cardiology
26	Dr. Deepak Asokan	Jr. Consultanant, ortho
27	Dr. Retnakaran	Jr. Consultant, Surgery
28	Dr. Rajesh O T	Jr. Consultant. Opthalmology
29	Dr. Soya Sudakaran	Consultant, OB&G
30	Dr. Sharmila A P	Assistant Surgeon
31	Dr. Daisy Thomas	Consultant, Dermatology

32	Noufal V	JHI gr I
33	Shijith E	JHI gr I
34	Dr Vikram Raj	Junior Consultant
35	Dr.Ashwathi Dhamodhar	Assistant Surgeon
36	Dr Sruthi K V	CMO
37	Dr Gokul	Asssitant Surgeon NHM
38	Ashitha M Varghees	Staff Nurse NHM
39	Lekha K	HA Gr.II
40	Baiju A	Lab Technician
41	Rekha M	JHI Gr.I
42	Dr Anto Varghese	Consultant (General Medicine)
43	Dr Rejeesh Melekkandy	Dental Surgeon
44	Alice Mathew	Staff Nurse
45	Aleykutty Panakkavayalil	Staff Nurse
46	Surendra Babu	Lab Technician
47	Ajmal	Jr. Health Inspector
48	Pavithran	Jr. Health Inspector
49	Rajan	Hospital Atendant Gr 2
50	Dr. Rahul Krishnan	CMO
51	Smt. Leeba Jopesph	Staff nurse
52	Dr. Nithin Koshy	Jr. Consultant
53	Smt. Litty Mathew	Staff nurse
54	Sri.Karunakaran	HA Gr II
55	Sureshbabu C V	JHI Gr I
56	Saneesh VG	Driver
57	Dr. Deepa K	Asst. Dental Durgeon
58	Dr Sruthi	NHM Dental Surgeon, FHC Kadiroor
59	Akhina	Staff Nurse NHM
60	Jiju	Staff Nurse
61	Uthej Ullas	Lab Technician
62	Bineesh	JHI(NHM)
63	Srithinlal	Driver

64	Ajithan	Driver
65	Deekshitha	Lab Technician, FHC Kadiroor
66	Subair	JHIFHC, Payyannur
67	Anjana	Lab Technician, PHC, Chokli
68	Anitta	Staff Nurse, PHC Peruva
69	Dr. Nithin K	Assistant Surgeon
70	Dr. Sibeesh	Assistant Surgeon
71	Dr. Binjid K K	Assistant Dental Surgeon
72	Jessy P K	Staff Nurse
73	Sherin Augustin	Staff Nurse
74	Muhammed Syed S	JHI
75	Prakasan K	JHI
76	DR.ANEESH	CONSULTANT GENERAL MEDICINE
77	DR.VINU	CONSULTANT GENERAL MEDICINE
78	DR.SASIDHARAN	CONSULTANT GENERAL MEDICINE
79	DR.REMESH BABU M	CONSULTANT SURGEORY
80	DR.SUBEESH	JMC SURGEORY
81	DR.RAGENDU	JMC SURGEORY
82	DR.RASHEED RASAK	CONSULTANT GYNAC
83	DR.POORNIMA PRABU	CONSULTANT GYNAC
84	DR.PREEJA KS	JUNIOR CONSULTANT GYNIC
85	DR.MIDHUN	JUNIOR CONSULTANT GYNIC
86	DR.SIVASANKARAN	CONSULTANT PEADIATRICS
87	DR.MAYA	JMC PEADIATRICS
88	DR.ABDUL SALEEM	CONSULTANT PEADIATRICS
89	DR.KAVITHA	CONSULTANT ANESTHESIA
90	DR.PUSHPARAJ	CONSULTANT ANESTHESIA
91	DR.USHA	CONSULTANT ANESTHESIA
92	DR.ROSHNI	CONSULTANT OPHTALMOLOGY
93	DR.SANDHYA RAM	JUNIOR OPHTHALMOLGY

94	DR.PRAJEESH	JUNIOR OPHTHALMOLGY
95	DR.SAVITHRI	CONSULTANT ENT
96	DR.VINEETHA	CONSULTANT ENT
97	DR.NANDHAKUMAR	JMC ENT
98	DR.VIJUMON	CONSULTANT ORTHO
99	DR.ANANDHAN	CONSULTANT ORTHO
100	DR.SREEJITH	JMC ORTHO
101	DR.VIPIN	JMC ORTHO
102	DR.SREEJESH VIJAYAN	JMC DERMATOLOGIST
103	DR.ABDUL KAREEM	CONSULTASNT RESPIRATORY
104	DR.KALESH	JMC CONSULTASNT RESPIRATORY
105	DR.JITHIN V S	RMO
106	DR.ANAND	CMO
107	DR.SANDHYA	CMO
108	DR.NITHUN KRISHNA	CMO
109	DR.MUHAMMAD THASNEEM	CMO
110	DR.RAMYA EMMANUEL	CMO
111	DR.SAJU NS	JMC DENTAL
112	VIJU	DRIVER
113	STEFINA RAJ E	JHI GR-11
114	VALSATHILAKAN	JHI GR-1
115	ASWATHI KP	LAB TECHNICIAN
116	SUHARSHA R	LAB TECHNICIAN
117	SREEKALA	LAB TECHNICIAN

Kasaragod

Sl. No.	**Name**	**Designation**
1.	Dr Asharani - 9447640999	
2	Ashwini – 9539201467	Lab tech
3	Divyak (S/N) – 7510861797	

4.	Dr. Jibin Moncy (8527604723)	
5	Dr. Mark Jacob (9497306295	
6	Smt. Shyni M (8075040248)	Lab Tech.
7	Smt. Midhuna V.N. (9686299781)	Lab Tech.
8	Dr. Gokul (8892677924	
9.	Dr. Dhanesh (9846216484	
10	Smt. Remya (9562535543)	Staff Nurse
11	Dr. Venu C (9446760385)	
12	Shri Vijesh (9446673734)	Staff Nurse
13	Chithra T (9745427200	(RBSK Nurse)
14	Dr. Mythil -8304812407	
15	Smt. Dhanya S.O8281883993	Lab Technician
16	Smt. Asiya (9847164794)	Staff Nurse
17	Smt. Aswini (9846091337)	Staff Nurse
18	Shri Santhosh Kumble	
19	Dr. Rahul V (9496758460)	
20	Shri Anilkumar	Lab Tech.
21	Smt. Jalaja K.K (9605637119)	
22	Dr. Vivek K (7907210720	
23	Smt. Nikhila P -9745191436	Lab Tech
24	Smt. Anitha K 9446202542	JPHN
25	Shri Unnikrishnan P.K. - 9495865920	JHI
26	Dr. Shincy – 8156899480	
27	Sujeesh – 9526525259	Lab Tech

28	Shri Jobby Jospeh – 8547318501	JHI
29	Smt. Haseena Ismail (9188276105)	Staff Nurse
30	Dr. Fathima A – 9496357230	
31 32	Smt. Praseena – 9496559669 Dr. Elizabeth Lovely (9020653595)	Staff Nurse
33	Smt. Soorymol P (9497138788	Staff Nurse
34	Smt. Soumya (7403251040	

MALAPPURAM

Sl. No.	Name of Officer	Designation
1	Dr. Krishnadas	Junior Consultant
2	Dr. Praveena	Junior Consultant
3	Dr. Aboobacker	Junior Consultant
4	Dr. Muhammed Hussain	Junior Resident
5	Dr. Shakeebar	Assistant Surgeon
6	Dr. Vaheedh	Assistant Surgeon
7	Dr. Anwar Sadath	Assistant Surgeon
8	Dr. Rafeeq Ali	Junior Consultant
9	Dr. Bushara	Junior Resident
10	Dr. Fahadh	Junior Resident
11	Dr. Althaf	Junior Resident
12	Dr. Rajalakshmi	Junior Resident
13	Dr. Fayis	Junior Resident
14	Dr. Abdul Hakeem	Junior Resident
15	Dr. Ashiq Sadath	Junior Resident
16	Dr. Ashitha	Junior Resident
17	Dr. Sayi Soorya	Senior Resident
18	Dr. Navya	Senior Resident
19	Dr. Shereef	Senior Resident
20	Dr. Ajayan	Senior Resident
21	Dr. Fathima Kuloth	Senior Resident
22	Dr. Sabir	Assistant Surgeon
23	Dr. Nishitha	Senior Resident
24	Dr. Anus	Senior Resident
25	Dr. Hafees	Senior Resident

26	Smt. Aparna	Staff Nurse
27	Smt. Geetha	Staff Nurse
28	Smt. Chinchu	Staff Nurse
29	Smt. Saumya	Staff Nurse
30	Sri. Parameshwaran	Cleaning Staff
31	Sri. Sukumaran	Cleaning Staff

Palakkad

Sl.No.	Name of Officer	Designation
1	Dr. Sona	Nodal Officer
2	Dr. Binu Pole	ENT Surgeon
3	Dr. Hemalatha	ENT Surgeon
4	Dr. Ali	ENT Surgeon
5	Dr. Naveen	ENT Surgeon
6	Dr. Arun	ENT Surgeon
7	Dr. Manoj	Nodal Officer (Physician)
8	Dr. Anju	Physician
9	Dr. Asmath	Physiatrist
10	Dr. Sithara	Pathologist
11	Dr. Flemi	
12	Dr. Fasal	
13	Dr. Pameli	Nodal Officer
14	Dr. Raju	ENT Surgeon
15	Dr. Suber	Pulmonologist
16	Dr. Jasmine	Paediatrician
17	Dr. Vinu	
18	Dr. Vipin	
19	Dr. Jyolsna	
20	Dr. Asha (ENT Surgeon)	Nodal Officer
21	Dr. Shyma	Ophthalmologist
22	Dr. Varun	Paediatrician
23	Dr. Rahul Varma (ENT Surgeon)	Nodal Officer
24	Dr. Sarfras	Orthopaedician
25	Dr. Rajesh	Physician
26	Dr. Rejith	Ophthalmologist
27	Shri. Rajesh	Driver
28	Shri. Ananthan	Driver
29	Shri. Vineesh	Driver
30	Shri. Gopakumar	Junior Health Inspector
31	Shri. Vinod	Junior Health Inspector
32	Shri. Rahul	Junior Health Inspector
33	Ms. Livya	Junior Health Inspector
34	Dr. Kailas	Co-ordinator

Annexure -IV: List of Laboratory Personnel

GMC Kottayam

Sl.No.	Name of Officer	Designation
1	Dr. Shobha Kurian	Professor & HOD, Nodal Officer
2	Dr. Vipin Sam Alexander	Asst. Professor, Lab in-Charge
3	Dr. Beena V.G.	Associate Professor
4	Dr. Shanimole P.E	Assistant Professor
5	Shri. Sooraj	Molecular Biologist
6	Shri. Sreejith	Molecular Biologist
7	Smt. Jincy	Lab Tec.
8	Smt. Adithya	Lab Tec.
9	Shri. Anand	Lab Tec
10	Shri. Sneha	Lab Tec
11	Smt. Anupama	Lab Tec
12	Shri. Deepak	Lab Tec
13.	Dr. Aleena	Junior Resident
14.	Dr. Chitra	Junior Resident
15	Dr. Geethu	Junior Resident
16	Shri. Manuraj	Data Entry Operator
17	Smt. Sheeja	Data Entry Operator

GMC Thiruvananthapuram

1	Dr. Sarada Devi. K.L	HoD, Microbiology & Lab in-Charge
2	Smt. Vidhya	Research Assistant
3.	Smt. Sherin	Research Assistant
4.	Shri. Sreejith	Research Scientist
5.	Shri. Anoop	Research Scientist
6.	Smt. Aswathy	Research Scientist
7	Smt. Sukanya	Lab Technician
8	Shri. Arun	Lab Technician
9	Shri. Jasper	Lab Technician
10	Smt. Annie	Lab Technician
11	Smt. Ancy	Lab Technician
12.	Smt. Lakshmi	Lab Technician
13	Smt. Deepa	Lab Technician
14	Dr. Saritha	Associate Professor
15	Dr. Jyothi	Associate Professor

GMC Ernakulam

1.	Dr. Lancy. J.	Professor & HoD (Lab in-Charge
2	Dr. Joana	Associate Professor
3	Dr. Neethu John	Assistant Professor
4	Dr. Binitha	Lecturer
5	Smt. Anna Dominic	Scientific Assistant (Non-medical)
6	Smt. Hannah	Scientific Assistant (Non-medical)
7	Smt. Rubiya	Scientific Assistant (Non-medical)
8	Smt. Akhila	Scientific Assistant (Non-medical)
9	Shri. Afeel	Lab Technician
10	Shri. Arun Joby	Lab Technician
11	Shri. Aswathy	Lab Technician
12	Shri. Abdul Salim	Junior Lab Assistant
13	Smt. Faisiy	Junior Lab Assistant
14	Smt. Mithu	Data Entry Operator
14	Smt. Joicey	Cleaner
15	Shri. Sandeep	Cleaner

GMC, Kannur, Pariyaram

1.	Dr. Rajan Payyappilly, MD, DMV	Nodal Officer
2	Dr. Manasi Ravindran, MD	Assistant Professor
3	Dr. Nitya, PhD	Junior Lecturer
4	Smt. Ajitha Anand, MSC. Micro	Lecturer
5	Dr. Sharanya	PG Resident
6	Smt. Remya Varma	Technician
7	Shri. Mujeeb Rehman	Technician
8	Smt. Jisha P. MSc. Micro	Technician
9	Shri. Santhosh Kumar	Technician
10	Shri. Pramod	Data Entry Operator

MCC COVID Lab Team Details

1	Dr. Parthiban	Faculty
2	Dr. Mohan Doss	Faculty
3.	Dr. Sajani Samuel	Faculty
4	Dr. Deepak Roshan	Faculty
5	Dr. Saravanan	Faculty
6	Dr. Vipin	Faculty
7.	Smt. Ramitha	Technician
8	Smt. Vincy	Technician
9	Shri. Shibin	Technician
10	Shri. Deepak Omanakuttan	Technician

11	Shri. Sreehari	Technician
12	Smt. Gopika	Technician
13	Dr. Zephyrad	Voluntary Staff
14	Dr. Ajeesh	Voluntary Staff
15	Smt. Vijina	Staff allocated from NHM, Kannur
16	Shri. Sandeep	Staff allocated from NHM, Kannur

GMC, KOZHIKODE VRDL

1.	Dr. Beena Philomina. J	Lab in-charge
2	Dr. Priyanka Nair	Research Scientist (Medical)
3	Dr. Prasanth Viswanathan	Research Scientist (Non-Medical)
4	Dr. Dhansooraj	Research Scientist (Non-Medical)
5	Smt. Saritha Sivadas	Research Scientist (Non-Medical)
6.	Smt. Shanmy	Research Scientist (Non-Medical)
7	Shri. Akash. N.P.	Research Assistant
9	Smt. Vimisha	Research Assistant
10	Smt. Keerthi	Lab Technician (Dept. Staff)
11	Shri. Salim. K.K.	Lab Technician (Dept. Staff)
12	Shri. Sabareesh Kumar	Lab Technician (Dept. Staff)
13	Smt. Bijina	Lab Technician (Dept. Staff)
14	Smt. Haseena	Lab Technician (Dept. Staff)
15.	Smt. Namitha	Lab Technician (Dept. Staff)
16.	Shri. Ravi Varma	Junior Lab Assistant (Dept. Staff)
17	Shri. Pramod	Junior Lab Assistant (Dept. Staff)
18	Smt. Arifa	Junior Lab Assistant (Dept. Staff)
19	Shri. Akhil Chandran	Data Entry Operator
20	Shri. Apareesh	Data Entry Operator
21	Shri. Siva Prasad	Data Entry Operator
22	Dr. Kalpana George	Associate Professor
23	Dr. Shabina. M.B	Associate Professor
24	Dr. Fairoz	Assistant Professor
25	Dr. Aiswarya	Assistant Professor
26	Dr. Sheena	Assistant Professor
27.	Dr. Pressy	Assistant Professor

GMC, Thrissur, VRDL

1	Dr. Beena Paul	Lab in-Charge
2	Mrs. Sajitha. K.L	Research Scientist (Non-Medical)
3	Dr. Vimalraj A.N.	Associate Professor
4	Mr. Faris. K	Research Assistant
5	Dr. Andra R. Menon	Assistant Professor
6	Dr. Kavitha Paul. K	Assistant Professor
7	Dr. Irene Jose. M	Assistant Professor
8	Dr. Anu P. John	Assistant Professor

9	Dr. Aiswarya Mukundan	Assistant Professor
10	Dr. Dagny Hari Vengilat	Senior Resident
11	Mrs. Veena. K.V.	Lab Technician
12	Mrs. Sinija. K.S	Lab Technician
13	Ms. Elizabeth Raphel	Lab Technician
14	Mr. Arun. A	Lab Technician
15	Ms. Smitty Thomas	Lab Technician
16	Ms. Drisya Damodaran	Lab Technician
17	Ms. Anupama. C.K	Lab Technician
18	Mr. Jithin Kumar. C.V	Junior Lab Assistant
19	Ms. Nita Rose Robin	Junior Lab Assistant
20	Mrs. Sibi Mol. V.K.	Junior Lab Assistant
21	Mr. Faizal. K.H.	Data Entry Operator
22	Ms. Delna. T.O.	Data Entry Operator
23	Ms. Shimnamol. K.V.	Data Entry Operator

GMC, Manjeri

1	Dr. Anitha. P.M	Lab in-Charge
2	Mr. Niyas. K.P.	Scientific Officer
3	Dr. Pushpa. K	Department Faculty
4	Dr. Sujatha. V.S	Department Faculty
5	Dr. Jasmine K.A.	Department Faculty
6.	Dr. Ameena. K.K.	Department Faculty
7.	Dr. Manal. K	Department Faculty
8	Mr. Faseeh Mukhthar	Lab Technician
9	Mr. Sarath Babu. V	Lab Technician
10	Mr. Fiyas Khan	Lab Technician
11	Mr. Muhammad Suhaib. T.C	Lab Technician
12	Mr. Anwar. O	Lab Technician
13	Mr. Dipin. K	Lab Technician
14	Mr. Abdul Salam. T	Lab Technician
15	Mr. Ashkar	Lab Technician
16	Mr. Athul. A	Lab Technician
17	Mr. Prajeesh	Junior Lab Assistant
18	Mrs. Nishitha	Junior Lab Assistant
19	Mr. Mohammad Fazil.T	Junior Lab Assistant
20	Mrs. Babitha	Data Entry Operator
21	Mrs. Abdul Jaleel. M	Data Entry Operator
22	Mr. Ranjith. N	Data Entry Operator

Inter University Centre for Biomedical Research Centre & Super Specialty Hospital (IUCBRC &SSH), Thalappady, Kottayam

1	Dr. K.P. Mohanakumar	Lab in-Charge & Director
2	Dr. Sathish Mundayoor	Consulting Scientist
3	Dr. Rajesh A Shenoi	Senior Scientist
4	Dr. Usha Rajamma	Senior Scientist
5	Dr. Goutam Chandra	Senior Scientist
6	Dr. Aswathyraj. S	Research Associate
7	Dr. Pramod Kumar. R	Research Associate
8	Dr. Deepthi Varughese	Research Associate
9	Dr. Blessy. M. Mani	Research Associate
10	Dr. Remya. V.R.	DST Women Scientist
11	Mr. Prabin Pradeep	Junior Research Fellow
12	Mrs. Chinthu V. Saji	Senior Research Fellow
13	Mrs. Krishna. S. Nair	Senior Research Fellow
14	Ms. Roana Liz George	Senior Research Fellow
15	Ms. Rinku Raj Mullasseril	Senior Research Fellow
16	Ms. Ramitha. P.A	Project Fellow
17	Ms. Arya Mohan	Project Fellow
18.	Mrs. Renju Madhavan	Lab Technician
19	Ms. Praseeda. R	Lab Technician
20	Mr. Raveendran. C.	Chief Administrative Officer
21	Ms. Merin Susan Jacob	Data Entry Operator
22	Mr. Sreekumar. C	Data Entry Operator
23	Mrs. Shyni. R	Data Entry Operator
24	Mrs. Mayamol Ravi	Cleaning Staff
25	Mrs. Santhamma. P.K.	Cleaning Staff
26	Mr. Shelbi. P.K.	Cleaning Staff
27	Mr. Delphin Thomas	PG Student CPAS/Volunteer
28	Ms. Anju. R. Nair	PG Student CPAS/Volunteer
29	Ms. Jinit Jose	PG Student CPAS/Volunteer
30	Ms. Aswathy Sasikumar	PG Student CPAS/Volunteer

Central University of Kerala, Kasaragod

Sl No	Names	Designation
1.	Dr. Rajendran P	Lab-in-Charge
2.	Dr. Sameer Kumar V. B	Faculty Member
3.	Dr. Rishiram Ramanan	Faculty Member
4.	Prajit J.	Senior Research Fellow
5.	Vishnu R.	Senior Research Fellow
6.	Ranjeet DungDung	Senior Research Fellow
7.	Lathika V.	Senior Research Fellow
8.	Rabina P.Raj	Senior Research Fellow
9.	Dr. Prabitha Mohan	Research Associate
10.	Dr. Lincy Edatt	Research Associate
11.	Neethu M.	Lab Technician
12.	Kshithy M.	Lab Technician
13	Maneesh Mohan M. D.	Lab Technician
14	Ashwin P K	Lab Technician
15	Amal Raj K	Lab Technician
16	Sanil Kumar V	Lab Technician
17	Rajesh R.	Technical Assistant
18	Ratheesh U.	Lab Assistant
19	Muhammed Rizwan A. M.	Data Entry Operator

State Public Health Lab, Trivandrum

Dr S Sunija	Director
Jaichand J	Scientific Officer
Priya R Prabhu	Research Officer
Mayarani T P	Lab Technician
Sheeja Raj	Lab Technician
Aswathy B S	Lab Technician
Lini B	Lab Technician
Sujith SS	Lab Technician
Anjali R	Lab Technician
Soumya S	Lab Technician
Jiji R Gopal	Lab Technician
Anju M A	Lab Technician
Kavitha B	Lab Technician
Sreekumar V	JLA
Latha G	JLA
Shyla Vahida	JLA
Mable	JLA
Sanal Kumar A	H A Gr 2
Arunlal G L	H A Gr 2
Murugan S	H A Gr 2
Suresh Kumar	H A Gr 2
Archana A	Data Entry Operator
Anand Lekshminarayanan	Data Entry Operator
Biji J M	Data Entry Operator

Acknowledgment

The Department of Health and Family Welfare is taking all efforts to contain the COVID 19 epidemic. The Department has planned different management units by giving specific roles and responsibilities. These different management units are working tirelessly in their respective areas. Because of the well laid out structures, processes and roles and responsibilities, the department is able to launch a coordinated response to the epidemic in the State.

The team of doctors developed the methodology and management of the sentinel surveillance with the objective to identify whether there is community outbreak. In this exercise, the field surveillance teams have been taking huge efforts. I appreciate the field works done by various surveillance teams and acknowledge the guidance given to them by the COVID District Surveillance Officers.

I appreciate the contribution of Dr Sandeep Dy Director Health Services, Dr Tony Lawrence, Assistant Professor, Department of Community Medicine, MCH Thiruvananthapuram, Dr Aparna Mohan, Junior Resident, Department of Community Medicine, MCH Thiruvananthapuram and Dr Rakesh PS, Consultant, WHO NTEP. Dr Indu PS, State Nodal Officer Prevention of Epidemic and Infectious Disease and Head of the Department PSM MCH Thiruvananthapuram has coordinated epidemiology studies of the cases.

I appreciate the excellent work done by Dr Zinia T Nujum, Associate Professor, GMC, Kollam and team. The team led by Dr Zinia has submitted the detailed report, which can be studied as a standard model for doing epidemiology studies.

I thank all the officers and people participated in completing the sentinel surveillance four rounds in the first month. I appreciate the work done by all the heads of laboratories and their teams and the Lab testing management unit at the State level.

I solicit the suggestions for improving the Sentinel Surveillance in the State. The series of Sentinel Surveillance reports and Epidemiology studies will guide the department for taking various measures and the report will give information regarding the present situation of epidemic to all.

Dr Rajan Khobragade
Principal Secretary,
Health & Family Welfare Department
Government of Kerala, Thiruvananthapuram