Report of the multi-disciplinary committee on the

Sudden Convulsions of Unknown Origin in Eluru, West Godavari, Andhra Pradesh

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Members of the Committee as per the GO 1946 GA(SC.I) dept. 10.12.2020

Sl	Designation	Role	Signature
1	Chief Secretary to the government	Chairperson	
2	Spl Chief Secretary to Government, Agriculture, and Cooperation Department	Member	
3	Spl Chief Secretary to Government, Animal Husbandry, Dairy Development and Fisheries Department	Member	
4	Spl Chief Secretary to Government, Environment, Forest, Science and Technology Department	Member	
5	Spl Chief Secretary to Government, Water Resources Department	Member	
6	Secretary to Government, Municipal Administration and Urban Development Department.	Member	
7	Commissioner, Health & Family Welfare	Member	
8	District Magistrate, West Godavari, Eluru	Member	
9	Dr. Mukesh Tripathi, Director & CEO of AIIMS(Mangalagiri)	Member	
10	Dr.Ahmadullah Shariff, HOD Clinical ecotoxicology, AIIMS(Delhi)	Member	
11	Dr.Rakesh K Mishra, Director CCMB	Member	
12	Dr.Chandrasekar, Director IICT	Member	
13	Dr. J JBabu, Scientist NIN	Member	
14	Dr.Jamshed Nair, Associate Professor, Dept of Emergency Medicine, AIIMS (New Delhi)	Member	
15	Dr.Sanket Kulkarni, Deputy Director NCDC (Delhi)	Member	
16	Dr.Avinash, Scientist D, ICMR - NIV (Pune)	Member	
17	Dr.Asish K Satapathy, National Professional Officer, NPSP WHO, South Region, Bangalore	Member	
18	Dr. B Chandrasekhar Reddy, Neuro physician, Govt. of AP	Member	
19	Dr.Malathi, Neurophysician, Siddartha Medical College	Member	
20	Dr. Mohan, Medical Superintendent, DH Eluru	Member	
21	Principal Secretary to Govt., HM&FW Dept.,	Member-Convenor	

INTRODUCTION

On 5th December 2020 afternoon, number of cases were reported at District Hospital, Eluru with symptoms of convulsions and loss of consciousness who had no previous history of seizures or other neurological conditions, fever, headache, vomiting, diarrhoea, head injury or trauma. After 5pm large numbers of cases were reported with similar symptoms. The district medical and health department was alerted immediately after receiving the information from the district hospital.

Critical observations by the district medical and health experts by the end of first day

Convulsions of unknown etiology were reported with sudden onset affecting all age groups with no previous history of illness. The disease is mild in nature, non-communicable lasting for 15-30 minutes. Single episode of epileptic seizures were observed and only about 6-7 percent of cases were identified with recurrent episodes. It was identified that on 4th December few cases were reported at District Hospital with similar symptoms. Population effected were with-in Eluru Municipality. 1-2 members from the same family and few houses in the same locality were affected. Cases reported were not age-specific. Based on the distribution of reported cases within a short duration of time, the source of contamination was suspected to be common drinking water, milk of same packaging, cereals or pulses from a common distribution point, and vegetables of the same produce, i.e., distributed from the same market.

Patients generally did not remember anything since the onset of drowsiness. A few cases sustained injuries subsequent to falls and seizures like tongue bites, head and limb injuries. Clinical findings were consistent and had a similar pattern in majority of cases. In most of the subjects there was a sudden onset of drowsiness, followed by seizures of mostly generalized tonic - clonic type followed by fall and loss of consciousness for 3-30 minutes. Mental confusion was presented in most cases and very few cases had nausea and vomiting episodes during or after the seizures. Pupillary reactions were sluggish in a small proportion of patients. Characteristically recovery from the episode was quick and complete and no residual neurological symptoms were reported. No patient was comatose.

A sudden onset on 4th December with a steep raise and peaking was observed from 5th December to 7th December. Subsequent fall in number of cases was observed on 8th December and there was a gradual decline. From 13th December no further cases were reported. Therefore, it was indicative that the outbreak was a common source single exposure outbreak. In the absence of fever, the possibility of infectious origin was unlikely and toxicity of unknown origin was the primary suspected cause.

The Government involved various departments like Municipal Administration, Zilla Parishad, District Malaria Department, District Public Health Laboratory, and Animal Husbandry for Outbreak Emergency Response and Preparedness planning. All Outbreak Emergency Response and Preparedness activities were implemented with immediate effect on 05.12.2020 in the view of prevention and control for early identification and case management.

Day wise activities were planned and Active Surveillance system was established for ensuring quality and emergency care management. Paramedical teams were deployed to conduct house to house survey. Day wise super sanitation drive was planned. Ambulance services (108) were mapped to multiple areas covering Eluru constituency for shifting of patients in view of emergencies. Elaborate arrangements were made to ensure quality medical care in all village and ward secretariats, UPHCs and PHCs in Eluru, District Hospital-Eluru, ASRAM Hospital, Andhra Hospitals and Chaitra Hospital were all covered.

The Hon'ble Deputy Chief Minister and Hon'ble Minister of Health and Family Welfare A.P, Principal secretary Health, Commissioner of Health and Family Welfare A.P, District Collector and Magistrate; W.G Dist, Joint Collector VSWS & Development; W.G Dist, Director of Health and Family Welfare A.P and State Medical and Health team, State Surveillance Unit, District Medical and Health Officer and team, Medical Superintendent and District coordinator for Health Services and team, District Surveillance Unit, District Municipal and Mandal Administration and other district and state teams came into force for the prevention and control of the outbreak.

EMERGENCY RESPONSE AND PREPAREDNESS

In all 62 wards and 22 village secretariats in Eluru constituency, active surveillance was conducted.24/7 Paramedical teams were deployed to conduct house to house survey. Super sanitation activities like removal of old debris and stilt from drains, Fogging and Spraying, Chlorination tests, Leakage identification and correction, removal of old pipes passing through culverts, disconnection of hand bores which are connected to municipal supply head water works was done. Chlorination was done in all the affected and unaffected areas of the Municipal Corporation.

Specialists, duty doctors and other paramedical staff were deployed to strengthen the Medical and Health services at District Hospital Eluru and ASRAM hospital Eluru as below:

NAME OF THE HOSPITAL	NO. DOCTORS SPECIALITY WISE			GENERAL DUTY DOCTORS	MICROBIOLOGIST	NURSES	FNOs	MNOs
	GENERAL MEDICINE	PEDIATRICIAN	GYNAECOLOGIST					
GGH ELURU	6	6	0	27	1	62	62	62
ASRAM	3	3	0	6	1	18	12	12

Since, the etiology of the outbreak was not known; all major and renowned agencies in the country were reached out by the Government and were actively involved. The following agencies were involved:

LIST OF AGENCIES/LABORATORIES/INSTITUTIONS INVOLVED	
SL NO	**NAME OF THE AGENCY**
1	ALL INDIAN INSTITUTE OF MEDICAL SCIENCE, MANGALAGIRI
2	ALL INDIAN INSTITUTE OF MEDICAL SCIENCE, DELHI
3	INDIAN INSTITUTE OF CHEMICAL TECHNOLOGY, HYDERABAD
4	CENTER FOR CELLULAR & MOLECULAR BIOLOGY, HYDERABAD
5	NATIONAL INSTITUTE OF NUTRITION, HYDERABAD
6	NATIONAL ENVIRONMENTAL ENGINEERING RESEARCH INSTITUTE
7	A.P POLLUTION CONTROL BOARD
8	SIDDHARTHA MEDICAL COLLEGE, VIJAYAWADA
9	NATIONAL INSTITUTION FOR VIROLOGY, PUNE
10	FOOD TESTING LABORATORY, KAKINADA
11	NATIONAL VETERINARY LAB, BHOPAL
12	VENEREAL DISEASE RESEARCH LABORATORY, VIJAYAWADA
13	WHO- NATIONAL PUBLIC HEALTH SURVEILLANCE PROJECT

On 10.12.2020 as per the **G.O. RT. No. 1946**, the government constituted a **multi-disciplinary** committee with the following members to investigate the source of the infection, to rule-out various causes of the incident and to suggest remedial measures to prevent any occurrence of such events in future in the state.

1	Chief Secretary to the government	Chairperson
2	Spl Chief Secretary to Government, Agriculture, and Cooperation Department	Member
3	Spl Chief Secretary to Government, Animal Husbandry Dairy Development and Fisheries Department	Member
4	Spl Chief Secretary to Government, Environment, Forest, Science and Technology Department	Member
5	Spl Chief Secretary to Government, Water Resources Department	Member
6	Secretary to Government, Municipal Administration and Urban Development Department.	Member
7	Commissioner, Health & Family Welfare	Member
8	District Magistrate, West Godavari, Eluru	Member
9	Dr.Mukesh Tripathi, Director & CEO of AIIMS (Mangalagiri)	Member
10	Dr.Ahmadullah Shariff, HOD Clinical ecotoxicology, AIIMS(Delhi)	Member
11	Dr.Rakesh K Mishra, Director CCMB	Member
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14	Dr.Jamshed Nair, Associate Professor, Dept of Emergency Medicine, AIIMS (New Delhi)	Member
15	Dr.SanketKulkarni, Deputy Director NCDC (Delhi)	Member
16	Dr.Avinash, Scientist D, ICMR - NIV (Pune)	Member
17	Dr.Asish K Satapathy, National Professional Officer, NPSP WHO, South Region, Bangalore	Member
18	Dr. B Chandrasekhar Reddy, Neurophysician, Govt. of AP	Member
19	Dr.Malathi, Neurophysician, Siddartha Medical College	Member
20	Dr. Mohan, Medical Superintendent, DH Eluru	Member
21	Principal Secretary to Govt., HM&FW Dept.,	Member-Convenor

The Committee had deliberated and exchanged information and the report is herewith submitted to Government

DAY-WISE ACTIVITIES

Day- 1: 05.12.2020

A 6 year old male child reported with seizures and gasping, was referred to GGH, Vijayawada for better intensive care. No further unstable or critical illness was reported on Day-1.Surveillance report said there are similar cases that were reported since 01.12.2020 in local private hospitals of Eluru and on 4th December few cases were reported at District Hospital. Triaging was done and patients were stabilized and shifted to the wards and were kept under observation. Vitals were recorded at the time of admission.

The following treatment protocol was given to the patients reported with convulsions

ADULT	CHILDREN
1) Nil per oral	1) Nil per oral
2) IV Fluids 1 RL I DNS	2) Inj. Eptoin 5mg / kg body weight
3) Inj. Eptoin 500mg start and bid	3) IV Fluids 1 RL (30 drops per minute)
4) Inj. Decadran iv bid	4) Inj.Pantop 1 cc once daily
5) Inj. Pantop 40 mg once daily	5) Inj.Paracetamol 1cc bid
6) Inj. Paracetamol 2cc IM 8 hourly	6) Inj. Decadran 1cc (sos)
7) Inj. Zofer 8mg bid	
8) Tab. Seratiopeptidase bid	

All the cases reported were within the Eluru municipality and majority of the cases were reported from Southern Street, Gollaigudem and Kothapeta. Sanitation activities were conducted rigorously in Eluru Municipality.52 blood and urine samples were collected and 45 CT scans were done. All reports were observed to be normal. District Medical and Health Officer in coordination with the District and State Surveillance Unit developed Outbreak Emergency Response and Preparedness plan and implemented with immediate effect.15 ambulance services (108) were arranged in Eluru municipal jurisdiction at various places for shifting of patients in view of emergencies.

Siddhartha Medical College- Virology lab, Vijayawada.

20 random blood and Cerebrospinal Fluid, 4 blood and 1 Cerebrospinal fluid samples were collected from patients and sent to Virology lab at Siddhartha medical college for Complete Blood Picture, HSV-2 IgM, CMV IgM, Chikungunya IgM, Dengue IgM, Japanese B Encephalitis, and Hepatitis B IgM, bacterial and fungal investigation. It was found that there are 4 Dengue positives, 2 Hepatitis E positives and 1 among the Dengue positives reported positive for Japanese Encephalitis. Culture reports were found negative for known Viruses and Bacteria

Day- 2: 06.12.2020

Siddhartha Medical College, Vijayawada

Expert team from Siddhartha Medical College, Dr. Siva Durga Prasad Nayak- Assistant Professor, Department of Social and Preventive Medicine, Dr. Murali Krishna- Assistant Professor, Department of Paediatrics and Dr.Krishnaveni- Assistant Professor, Department of Microbiology visited District hospital and observed the cases reported. They visited the water treatment plant at Pampulacheruvu, checked the records.

The expert team reported the following observations: More number of cases belongs to Dakshinapuveedi, Fish market area, Padamaraveedi, Sunkarivarithota, Thangellamudi and Vangaigudem. The team haven't concluded about any suspected cause/source for the outbreak.

All India Institute of Medical Sciences, Mangalagiri

Expert Team from All India Institute of Medical Sciences Mangalagiri, Dr. Rajesh Kakkar, Medical Superintendent, Professor & HOD, Department of Community & Family Medicine-Chairman, Dr.Mangayarkarasi, Additional Professor & Head, Department of Microbiology, Dr.Sathiyanarayanan.S, Assistant Professor, Department of Community & Family Medicine, Dr.Vamsidhar Chamala, Assistant Professor, Department of Anaesthesiology & Critical Care, Dr. K. Vamsi Krishna Reddy, Assistant Professor, Department of Hospital Administration & Administrative Officer (I/c) and Dr. M. Rajasekhar, Senior Resident, Department of Anaesthesiology& Critical Care visited the District Hospital, Eluru, West Godavari.

The expert team reported the following observations: patients reported with a single episode of seizure lasting for about 2-8 minutes with or without vomiting. About 10% of patients developed a second episode of seizures. Out of 20 patients interviewed by the team, around half of them reported change in colour/taste of drinking water in the recent past. Some of them reported that there was greenish/muddy discoloration of the household water supply.

Measure taken for control of the outbreak

62 medical camps were conducted in all 62 ward secretariats in Eluru municipality. Active surveillance was conducted and it was identified that, on 4th December few cases were reported at District Hospital with similar symptoms. 24/7 medical camps were established with Medical and Paramedical staff. Super Sanitation drive was continued in both affected and unaffected areas in Eluru constituency. 6 General Physicians and 6 Paediatricians, 15 Interns, 10 FNO and 10 MNO were deployed from ASRAM hospital to District Hospital to render health services round the clock. Three scan/diagnostic centres were arranged for CT scan and other essential investigations. (Andhra Diagnostics, Jayanthi Diagnostics, Vamsi scan centre). Further water, milk and serum samples were sent for heavy metal analysis to Centre for Cellular and Molecular Biology and Indian Institute of Chemical Technology, Hyderabad for analysis. A Letter addressed to the National Institute of Nutrition to investigate source of outbreak.

Door to Door Surveillance Report					
Secretariats covered	Total House Holds	Total Population	Survey Completed		Total cases referred
			House Holds	Population	
62	57863	156714	57863	156714	492

AP Pollution Control Board

Ambient air and water samples were tested by the AP Pollution Control Board. It was found that the quality of air was within the desirable limits and no heavy metal was found in water.

Centre for Cellular and Molecular Biology, Hyderabad

20 blood, 16 urine, 8 stool, 13 Vomitus, 40 water samples were collected and sent for heavy metal detection to Centre for Cellular and Molecular Biology, Hyderabad. It was found that **no organism which can cause the reported phenotype was identified.**

Centre for Cellular and Molecular Biology, Hyderabad

20 blood, 16 urine, 8 stool and 13 vomitus samples were collected and sent for detection of any possible infectious etiology to the Centre for Cellular and Molecular Biology, Hyderabad. It was found that **no organism which can cause the reported phenotype was identified.**

Day- 3: 07.12.2020

Measures taken by the government

Twenty five ambulance services were mapped to 84 secretariats in view of emergency in Eluru constituency. In 22 village and 62 ward secretariats of Eluru, a team of 1 Medical Officer, 1 Staff Nurse, 1 ASHA worker were deputed. Total 84 teams were deployed 24/7 in Eluru constituency for early identification and management of any symptomatic cases. For every 15 Medical officers, 1 Nodal officer was deployed for monitoring and surveillance purpose.27 Medical Officers were deputed to District Hospital, Eluru in view of case load management and quality healthcare services. All triaging management arrangements were made to ensure quality care. Mid Level Practitioners were trained on case investigation forms.

Super sanitation activities like removal of old debris and stilt from drains, Fogging and Spraying, Chlorination tests, Leakage identification and correction, removal of old pipes which are passing through culverts, disconnection of hand bores which are connected to municipal supply head water works, Chlorination were continued in all the affected and unaffected area.

Expert team from Siddhartha Medical College, Vijayawada.

Expert team from Siddhartha Medical College with a Pediatrician, Neuro-Physician, Professor of Social and Preventive Medicine, Psychiatrist and Microbiologist visited the District Hospital Eluru andinteracted with patients. The teamhad taken complete case history of the patients and stated that most of the patients presented with nausea, vomiting, giddiness and alter sensorium. Patients admitted and recovered with conservative management. Vitals were stable and no abnormality detected in all the systemic examinations.

Expert team from National Institute of Nutrition, Hyderabad.

Expert team from National Institute of Nutrition with Public Health Specialists, Epidemiologist, Bio-Chemist and Toxicologist conducted examinations and investigations with the inpatients at District Hospital, Eluru. They collected random blood and urine samples from 67 patients.

All India Institute of Medical Sciences, Mangalagiri

Four cerebrospinal fluid, one hundred and eight RTPCR, six urine, ten blood samples were sent to **AIIMS, Mangalgiri** for analysis. It was found that N-gene positive for 2 patients-suspected for SARS-CoV-2 and other 106 samples were negative. Remaining results were normal.

Indian Institute of Chemical Technology, Hyderabad

Twenty two sera and twenty one water samples were collected and sent to the Indian Institute of Chemical Technology, Hyderabad for biochemical analysis. It was found that **no Organo-chlorine, Organophosphorous**, Carbamate, Synthetic Pyrethroids, Pesticide residues and heavy metals were found in water. **Water was clean and potable** without organic or elemental contamination.

WHO- National Public Health Surveillance Project (NPSP)

Team of two surveillance Medical Officers from WHO NPSP reached Eluru District hospital, participated in the review meeting chaired by Hon'ble Health Minister and joined by all stake holders. Later the team interviewed few patients admitted to war to understand the clinical presentation, exposure history, previous illness etc. Data collection tools were designed to conduct active case search in the community to find out additional cases and share with Director Health Services. Team also supported IDSP team to formalize an outbreak response plan and streamline field investigations.

VIMTA lab, Hyderabad

Twenty one water samples were sent to VIMTA lab and the test results were observed to be within desirable limits.

Day 4: 08.12.2020

Measures taken by the government

Case investigation forms were filled by the deployed duty medical officer/MLPs in the wards from all the IN patients. Door- Door survey and follow-up of discharged patients was done by the teams deployed in 84 secretariats. Super sanitation activities like removal old debris and stilt from drains, Fogging and Spraying, Chlorination tests, Leakage identification and correction, removal of old pipes which are passing from culverts, disconnection of hand bores which are connected to municipal supply head water works, Chlorination were continued in all the affected and unaffected areas.

Expert team from National Institute Of Nutrition

On Day-2 of the NIN expert team visit, house to house survey was done in the top five affected areas and collected thirty seven random water, blood and urine samples. Groceries like rice, dal and oil that were available at home were collected. Forty two milk samples, forty four vegetable samples and water samples from both affected and non affected areas were also collected. All varieties of vegetables half a kilogram each from Pathebada Raitu Bazaar and Main bazaar 1 town area Eluru were collected. From Tangellamudi Gram Panchayat random blood, urine, water and all other samples were collected from five unaffected families. They visited Pampula Cheruvu and the water sample from the water treatment plant and Municipal Tap water from JP colony were collected. The team collected forty two random blood and urine samples from the IN patients at District Hospital. All samples were tested at NIN Hyderabad. It was found that, **Organophosphorous pesticide was detected in blood of 70 percent of the subjects. High mercury was detected in rice samples. High herbicides detected in tomatoes.**

Joint Central Expert Team

A joint team from National Institute of Virology –PUNE, National Centre for Disease Control (NCDC), AIIMS New Delhi and Central IDSP team visited and had a detailed review meeting with the District Medical and Health and State expert teams and learnt about the outbreak. They observed and interacted with patients, studied their case sheets and collected random blood and urine samples among the IN patients. Blood and Urine samples are sent for evaluation to AIIMS, Delhi.

All India Institute of Medical Sciences, Delhi

Seventy one blood, fifty six urine, fifty one water and forty milk samples were sent to AIIMS, New Delhi for further investigations. Seventeen sera samples from the affected persons and fourteen sera samples from the unaffected family members of the affected persons and one raw water sample from Gun bazaar was sent for further analysis.

WHO- National Public Health Surveillance Project (NPSP)

As part of the epidemiological investigation, a structured questionnaire (CIF forms) was developed to interview all cases. Medical officers were trained for systematic data collection through CIF filling and IDSP staff was trained to collect and analyse the data related to the outbreak. They also went to the field along with state officers and monitored active case search conducted in the field of Eluru town. After arrival of the NCDC team they were briefed on the progress in the field investigation and handed over all the tools and explained the progress in data collection, NPSP team participated in all future review meetings and provided inputs based on the analyzed data collection initially. Team also kept supporting IDSP.

Day 5: 09.12.2020

NCDC team visited Animal Husbandry office to understand if animals were also affected. After a detailed review the team collected animal samples. They continued house – house survey and interacted with affected and unaffected families. AIIMS, Mangalagiri team visited water treatment plant at Pampula Cheruvu. SRM expert team conducted house-house survey and collected water samples from the affected areas. District Medical and Health officer and District Surveillance Officer assisted the expert teams during the field visits. NIV team did house-house survey and visited discharged patients to monitor their current health condition.

Super sanitation activities like removal old debris and stilt from drains, Fogging and Spraying, Chlorination tests, Leakage identification and correction, removal of old pipes which are passing from culverts, disconnection of hand bores which are connected to municipal supply head water works, Chlorination were continued in all the affected and unaffected area.

National Veterinary Lab, Bhopal

Thirty three animal blood samples were sent to **National Veterinary Lab, Bhopal** to investigate if animals were affected by this outbreak. It was found that all the observations were normal.

All India Institute of Medical Sciences, Delhi

Repeat samples of ten blood, urine and water samples were collected from same subjects and sent for analysis. It was found that all parameters in blood urine and water are within normal ranges.

Day 6: 10.12.2020

NCDC team continued house-house survey and conducted case investigations for the discharged patients and analysed their current health status. District Medical and Health officer and District Surveillance Officer assisted the expert teams during the field visits. Medical camps and active surveillance activities were continued in all 84 secretariats in Eluru constituency for early case identification and management. Director of Public Health and Family Welfare and the State Surveillance Unit were involved in door-door survey and enquired about health status of discharged patients and did case investigations.

National Institute of Virology, Pune

Forty blood, five Cerebrospinal Fluid, thirty urine, seventeen stool, thirty Nasal swabs were collected and sent to National Institute of Virology, Pune for analysis. It was found that four Dengue, four Chikungunya, one Dengue and Chikungunya and one Influenza- A were detected and all other samples were normal.

National Environmental Engineering Research Institute (CSIR-NEERI), Hyderabad

Three ambient air, ten surface water, seven ground water, four soil samples were collected and sent to National Environmental Engineering Research Institute (CSIR-NEERI) for analysis. All parameters were found to be in permissible levels.

Venereal Biological Research Laboratory, Vijayawada

Five milk, five grass samples were collected and sent to VBRL Vijayawada**. It was found that all parameters are within the desirable limits.**

Food Testing Laboratory, Kakinada

Four fish samples were collected and sent for fish testing laboratory, Kakinada. **It was found that all parameters are within normal range.**

Day 7: 11.12.2020

NCDC team continued door-door survey and also evaluated IN patients medical records in view of the outbreak. Director of Public Health and Family Welfare and the state Public Health and Family Welfare department visited the pump house, verified the records of water treatment plant and inspected the medical camps to ensure quality of health care activities by the District Medical and Health department. District Medical and Health officer and District Surveillance Officer did thorough inspections and monitored the Surveillance activities. Super sanitation activities were continued rigorously and monitored by the District authorities on hourly basis.

Day 8: 12.12.2020

Epidemic Intelligence Service Officers Dr.Purvi Patel and Dr. Sahil from NCDC, Hyderabad were deployed to Eluru, West Godavari for outbreak epidemiological investigation. The EIS officers took detailed case history of random IN patients they studied case sheets, lab and scan reports and learnt the clinical status of the subjects. Detailed case investigations were done to the discharged patients with the support of field medical and paramedical staff. They also analysed and monitored health status of discharged patients. District Surveillance Officer and NCDC team visited top 10 affected areas in Eluru municipality and conducted house-house survey, inspected all the water treatment records, recent past municipal activity records and had a detailed review with Municipal Health Officer and District Malaria Officer. Data collection and data entry of vitals and lab reports was done.

Day 9: 13.12.2020

No further cases were reported since 13th December. The expert NCDC team re- visited pump house in coordination with District Surveillance Unit. They observed and monitored water treatment procedure to identify any cause or source of the outbreak. Ward wise water distribution was mapped to secretariats in coordination with Municipal Engineer. Spot maps prepared by the field staff of all 62 secretariats for the cases reported due to convulsions of unknown etiology for epidemiological analysis. Data entry was continued for the case investigation forms in Epicollect analysis mobile application.

DEMOGRAPHIC DISTRIBUTION

Eluru is a city and the district headquarters of West Godavari district in the state of Andhra Pradesh. It is one of the 10 municipal corporations in the state. The city is on the banks of Tammileru River. The city is well known for its wool-pile carpets and hand woven products. As of 2011 Census of India, the city had a population of 217,876. A brief about the town is as follows:

AREA	11.52 Sq. Kms
2011 CENSUS POPULATION	217876
NO. OF HOUSE HOLDS	55014
NO. OF ELECTION WARDS	50
NO. SLUMS	59
SLUM POPULATION	78634(36.1%)
NO. OF GOVERNAMNET HOSPITALS	1
VEGETABLE MARKETS	2
PROTECTED WATER SUPPLY RESERVOIRS	26Nos
NO. OF HOUSE SERVICE CONNECTIONS	23.694
STORM WATER DRAINS	6.80 Kms
LENGTH OF C.C DRAINS	221.64 Kms
KUTCH A DRAINS	185 Kms
GARBAGE GENERATION/ DAY	82 Mt. Tonnes

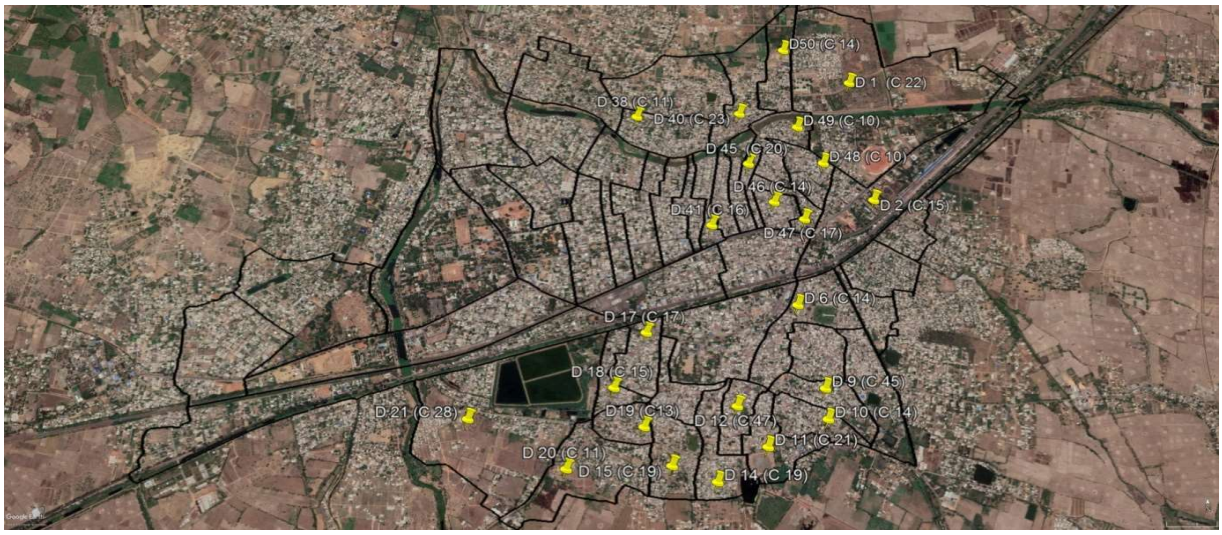
94 percent of the cases reported due to convulsions of unknown etiology are from the Eluru municipality region and remaining 6 percent reported from Eluru rural region, where the source of drinking water supply is not the same as Eluru urban region. However, these 6% cases also had a highly of recent visit to Eluru.

Out of 62 ward secretariats in Eluru Municipal Corporation, majority of the cases are reported from wards 12, 9, 21, 40 and 1 which are Southern Street, Philhouse peta-1, Gollaygudem 1, Sivagopalapuram and MRC colony 1.Of all the 621 cases reported, 1 death case reported from Ward 24- Vidhyanagar.

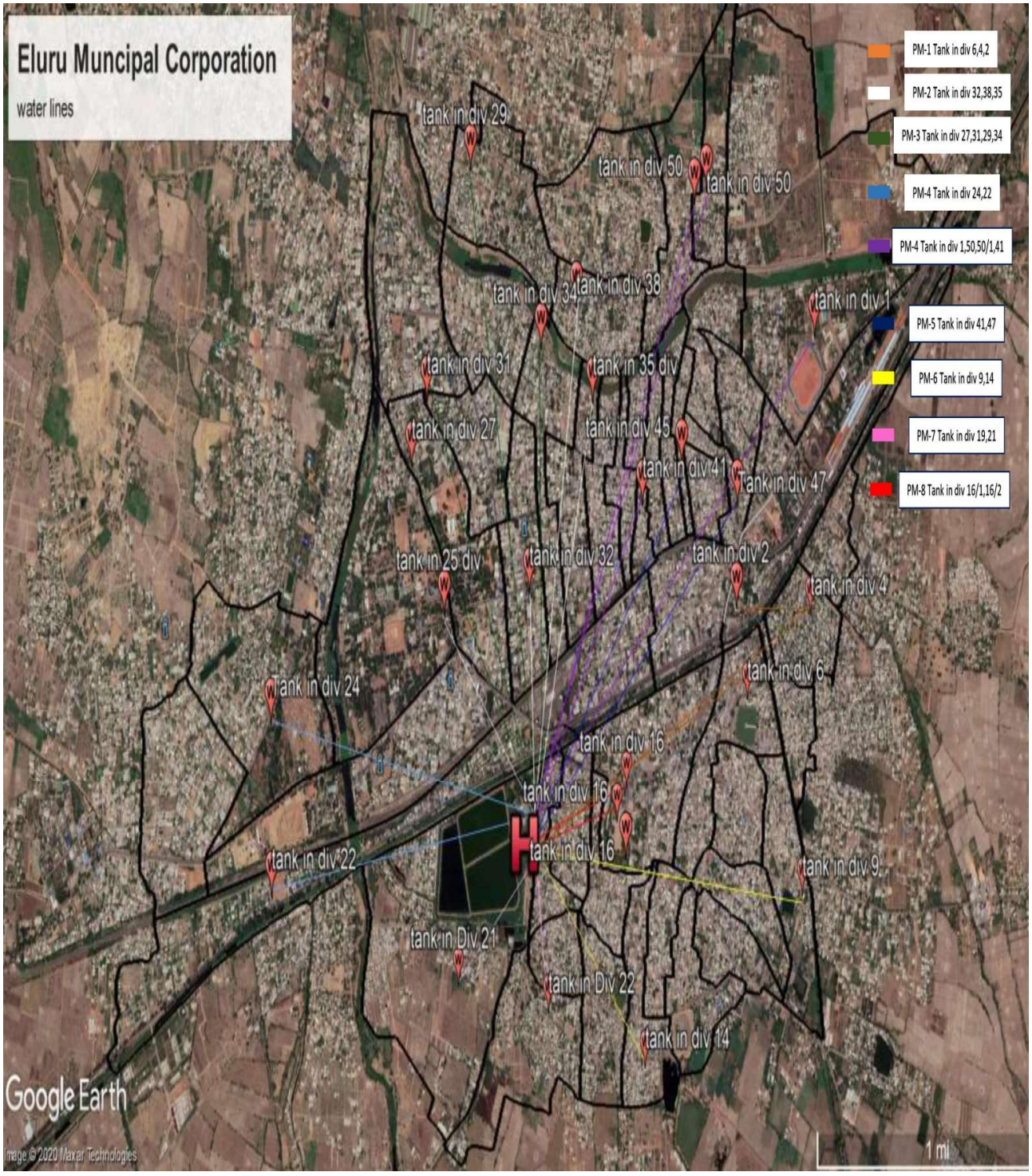
SL NO	WARD NUMBER	NAME OF THE SECRETARIAT	CASES REPORTED
1	12	SOUTHERN STREET	65
2	9	PHILHOUSE PETA 1	45
3	21	GOLLAY GUDEM – 1	28
4	40	SIVAGOPALAPURAM	23

5	1	MRC COLONY- 1	22
6	11	JP COLONY	21
7	45	CHODIDIBBA	20
8	14	ASHOKA CHEKRAM ROAD	19
9	15	WESTERN STREET	19
10	47	KOTHAPETA	17
11	41	PAMULADIBBA	16
12	2	IKP BHAVAN 3	15
13	18	AAS COLONY	15
14	6	THOTAKURA DODDLU-3	14
15	10	VENKANNA CHERUVU	14
GRAND TOTAL			**353**

No of Cases ward wise :

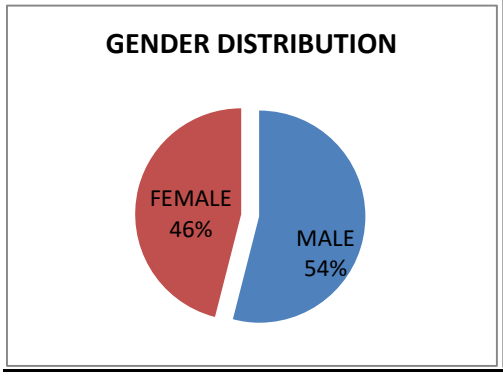


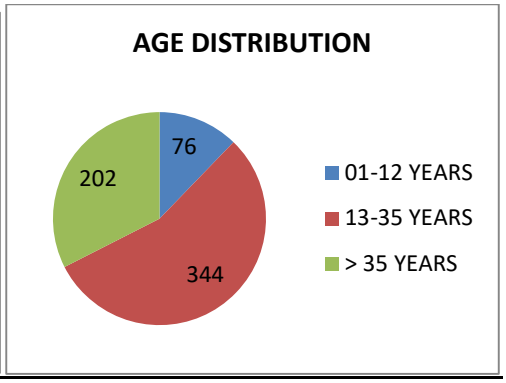
Water Distribution from PumpulaCheruvu:

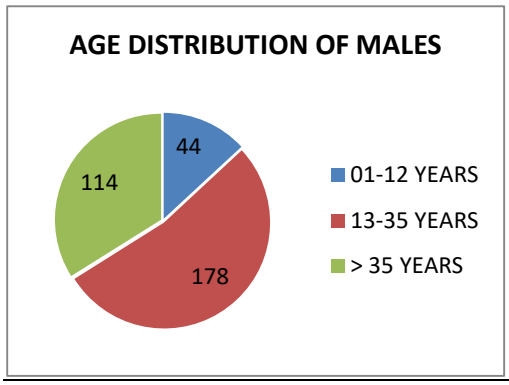


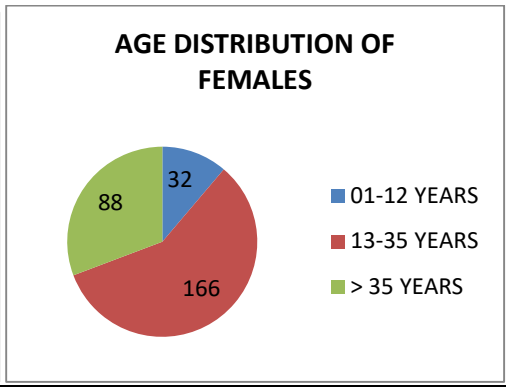
Out of 621 cases reported due to convulsions of unknown etiology, 336 were males and 285 were females. Males and females of 12 to 35 years were more affected than other age groups and males of 12 to 35 years are more affected than females of the same age group. Over all males were more affected than females.

AGE – GENDER WISE ANALYSIS			
AGE GROUP	**MALES**	**FEMALES**	**TOTAL**
01-12 YEARS	44	32	76
13-35 YEARS	178	166	344
> 35 YEARS	114	88	202
TOTAL	**336**	**286**	**622**

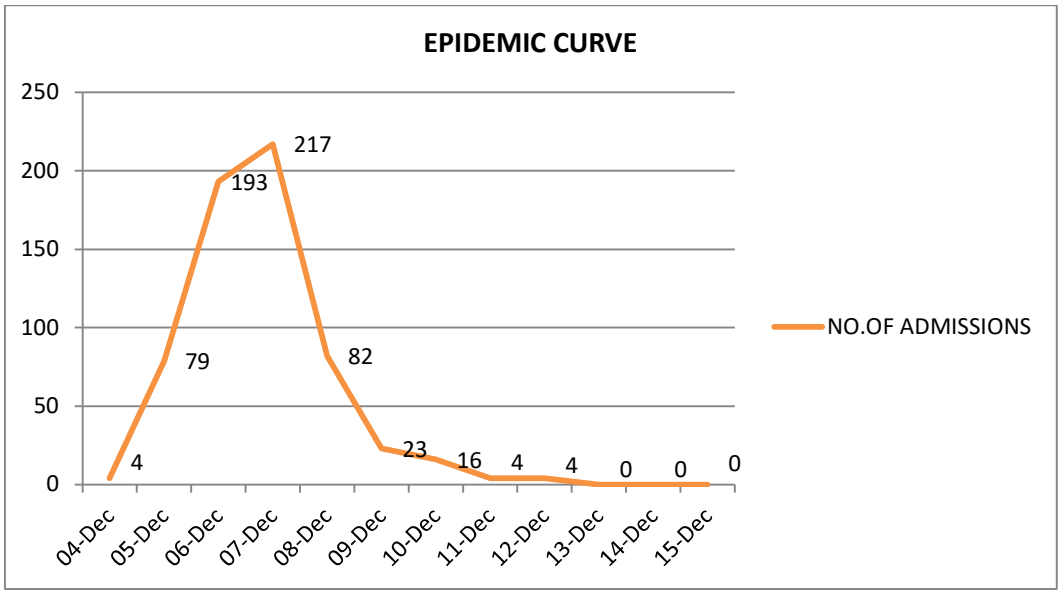








The epidemic curve shows a sudden onset on 4th December and steep raise and peaking was observed from 5th December to 7th December. Subsequent fall in number of cases is observed on 8th December. From 13th December no further cases were reported. It was indicative that the outbreak was a common source single exposure outbreak. In the absence of fever, the possibility of infectious origin was unlikely and toxicity of unknown origin was the primary suspected cause.



SUMMARY OF BIOLOGICAL INVESTIGATION FINDINGS

Siddhartha Medical College- Virology lab, Vijayawada.

20 random blood and Cerebrospinal Fluid, 4 blood and 1 Cerebrospinal fluid samples were collected and sent to Virology lab at Siddhartha medical college for Complete Blood Picture, HSV-2 IgM, CMV IgM, Chikungunya IgM, Dengue IgM, Japanese Encephalitis, Hepatitis B IgM, bacterial and fungal investigation. It was found that 4 Dengue positives, 2 Hepatitis E positives and 1 among the Dengue positives reported positive for Japanese Encephalitis. Culture reports were found negative for known Viruses and Bacteria.

Centre for Cellular and Molecular Biology, Hyderabad

Metagenomic analysis of 36 blood, 16 urine, 13 vomitus and 8 stool samples were conducted. DNA was extracted from all the samples and a total of 13 blood, stool and vomitus were selected for further processing. Next generation Sequencing (NGS) based on metagenome sequencing of the samples was conducted and it was found that **no organism which can cause the reported phenotype was identified.**

AIIMS, Mangalagiri

Microbiological, Pathological and Biochemical investigations were conducted. Direct microscopy of 4 CSF were tested with gram stain(No pus cells and bacteria were detected), acid fast stain (No acid fast organisms found), India ink stain (Negative) and Wet mount stain (No cells and bacteria found)and 6 urine samples were analysed with gram stain (No pus cells and bacteria were detected), acid fast stain (No acid fast organisms found) and wet mount stain (No cells and bacteria found). Oropharyngeal swabs were tested for SARS- CoV-2, it has N-gene positive for 2 patients were suspected for SARS-CoV-2 and all other samples (106) were negative. In biochemical investigations 4 CSF samples were investigated for glucose, proteins, chlorides and globulins, it was found that glucose and proteins were elevated and globulins were negative.

National Institute of Nutrition, Hyderabad.

The team examined cases (103); Active cases (77), Recovered cases (26) and Controls (9) and collected Biological samples (109), water samples (36) and other food samples were collected. The blood and urine samples were tested for 37 pesticides, out of which, **Triazophos (Organophosphorous)** was present in 74% of blood (67 out of 90 samples from affected area) and 8 out of 9 urine samples tested were positive for **Triazophos**, 1 out of 11 blood samples was positive for Triazophos in control area. Vegetables like Tomatoes and Brinjals were tested for 37 pesticides including herbicides, out of which **Metribuzin(herbicide)** was present in all samples of Tomato's and Brinjal's. In heavy metals analysis, 10 heavy metals were tested, out of which lead was present above the permissible limits in 2 blood samples and nickel was present above the permissible limits.

National Veterinary Lab, Bhopal

33 animal samples were sent to National Veterinary Lab, Bhopal for virological etiology. All samples were found to be negative for Rift Valley Fever, Psuedorabies, Porcine Teschovirus, Nipah virus, Japanese Encephalitis virus.

National institute of Virology, Pune

40 blood, 5 Cerebrospinal Fluid, 30 urine, 17stool, 30 nasal swabs were tested for JEV IgM, Dengue IgM, Chikungunya IgM, Scrub Typhus IgM, Dengue & Chikungunya RT-PCR and Influenza- A. Among which 4 Dengue, 4 Chikungunya, 1 Dengue & Chikungunya and 1 Influenza- A were detected.

Venereal Biological Research Laboratory, Vijayawada

5 milk,5 grass samples were analysed **for** toxicological parameters .No Lead, heavy metals and Phosphine were detected.

Food Testing Laboratory, Kakinada

Four fish samples were sent for different parameters like boron, Magnesium, Aluminium, Maganese, Iron, Nickle, Zinc, Arsenic, Selenium, Cadmium, Tin, Barium, Mercury and Lead. The samples of fresh fish were safe for human consumption.

SUMMARY OFWATER & AIR INVESTIGATION FINDINGS

AP Pollution Control Board

Ambient air and water samples were tested by the AP Pollution Control Board. Air samples were tested for particulate matter, arsenic, nickel, lead, ammonia, nitrogen dioxide and sulphur dioxde and water samples were tested for 17 compounds (Organochloro pesticides). It was found that the quality of air was within the desirable limits and no heavy metal was found in water.

Indian Institute of Chemical Technology, Hyderabad

21 water samples were collected from different locations of Eluru city were sent for biochemical analysis. The Samples were analyzed for Organochlorine, Organophosphorous, Carbamate, Synthetic Pyrethroid pesticide residues, heavy metals and water quality parameters. In **pesticide residue analysis**, the samples were tested by two different extraction procedures and analyzed by two different analytical techniques. The results showed the absence of the tested pesticide residues. In **Heavy metals** analysis, the samples were tested for the presence 29 heavy metals including Lead, Arsenic, and Nickel. The results showed contamination of the heavy metals was negligible. In **Volatile organic chemicals analysis,** the samples were tested using headspace GC-MS method. The results showed the absence of harmful volatile organic chemicals. In **Water Quality testing,** the water quality parameters such as pH, turbidity, and conductivity, total dissolved solids and arsenic content were tested. The parameters were within the acceptable limits. In **Microbial testing of water,** the water samples did not show any significant contamination of E-coli and other bacterial or fungal growth. The water samples are clean and potable without organic or elemental contamination.

National Institute of Nutrition, Hyderabad.

Water samples (26) were collected from households (20), reservoir (1), head pump (2) and stored samples (3).Head pump was free from pesticides. JP colony reservoir had traces of pesticide (Triazophos) and all water samples from cases had pesticides (triazophos). No mycotoxins were observed.

National Environmental Engineering Research Institute (CSIR-NEERI)

24 hour basis 3 ambient air, 10 surface water, 7 ground water, 4 soil samples were analysed. In ambient air analysis, concentrations of particulate matter are found to be high and exceeding the NAAQS largely in the study area due to due to vehicular traffic, re-suspended road dust, burning of solid waste, windblown dust, agricultural and construction activities. Heavy metals in the particulate matter were found to be higher in terms of Arsenic, Nickel, Boron, Copper and Zinc. Arsenic concentrations in the particulate matter were exceeding NAAQS at all locations except at Pattebada and nickel concentrations were found to be exceeding NAAQS at Dakshinapu Veedhi. Slightly higher levels of heavy metals like Arsenic, Nickel may be due to the vehicle transportation, waste incineration or burning, oil and coal combustion, and construction activities. In Water analysis Organochlorine, Synthetic Pyrethoids, Organophosphates and Herbicide were tested and were not found in ground water. **Mercury was high and ranged from 1.1 to 26 (permissible: 1 ppb) in**

ground water. High value of mercury of 26 ppb was found at RR peta. Mercury was high and ranged from 1.0 to 17.2 ppb in surface water.

ANMOOR LAB, VIJAYAWADA

9 milk and 21 water samples from the affected areas were tested for heavy metals.
No heavy metals were detected.

VIMTA lab, Hyderabad

21 water samples were analysed for Aluminium, Boron, Calcium, Copper, Fluoride, Iron, Magnesium, Nitrate, Sulphate, Chromium, Bromide, Barium, Manganese, Selenium, Silver, Zinc, Cadmium, Lead and Mercury. Bromide was found to be out of WHO specifications remaining parameters were normal.

SUMMARY OF WATER & AIR INVESTIGATION FINDINGS			
S. No	**Name of the Institute**	**Type & No. of samples**	**Remarks**
1	AP Pollution Control Board	Air Ambient quality, water-12	No Organochlorine pesticide compounds and heavy metal were found in water.
2	Indian Institute of Chemical Technology	Water-21	No Organochlorine, Organophosphorus, carbamate, synthetic pyrethroid pesticide residues and heavy metals were found in water. Water is clean and potable without organic or elemental contamination
3	National Institute for Nutrition	Water-36	All water samples from cases had pesticides (triazophos). No mycotoxins were observed.
4	VIMTA lab	Water-21	Bromide was found to be out of WHO specifications Remaining parameters were normal.
5	NEERI	Ambient Air-24hrs basis -3,Surface water-10 , Ground water-7, Soil-4	**Mercury was high and detected in both ground and surface water**
6	ANMOOR	Water-21	No heavy metals were detected.

<u>OTHER FINDINGS</u>

Pathological investigations

Blood, Urine, Stool, Vomitus, CSF, Nasal Swab, **Water,** Milk, Air, Vegetables, Groceries, Soil, Grass, Oil, Fish, Meat, Ambient Air and Animal samples by various institutions are analysed

for Bacterial/Viral/Fungal pathogens. No suggestive findings were observed in the reports to confirm the etiology of the outbreak.

Neurological investigations

Blood, Urine, Stool, Vomitus, CSF, **Water**, Milk, Air, Vegetables, Groceries, Soil, Grass, Oil, Fish, Meat, Ambient Air And Animal samples by various institutions are analysed for the presence of any neuro-toxic chemicals, heavy metals, pesticides, elevated trace elements, Polychloro biphenyls, volatile organic chemicals, polyclinic aromatic hydrocarbons, synthetic Pyrithroids. Organo-phosphorous pesticide in blood samples and high levels of mercury in rice samples are detected. It was thought to be an accidental finding rather than suggestive finding. So far no suggestive findings were observed in the reports to confirm the aetiology of the outbreak.

Chronology of the Outbreak

DAYWISE/HOUR WISE REPORT				
SL NO	DATE	TIME (HRS)	NO. OF CASES REPORTED	CUMULATIVE
1	04.12.2020	23:59	4	4
2	05.12.2020	12:00	5	9
3	05.12.2020	23:59	74	83
4	06.12.2020	12:00	127	210
5	06.12.2020	23:59	66	276
6	07.12.2020	12:00	64	340
7	07.12.2020	23:59	153	493
8	08.12.2020	12:00	38	531
9	08.12.2020	23:59	44	575
10	09.12.2020	12:00	0	575
11	09.12.2020	23:59	23	598
12	10.12.2020	12:00	0	598
13	10.12.2020	23:59	16	614
14	11.12.2020	12:00	1	615
15	11.12.2020	23:59	3	618
16	12.12.2020	12:00	2	620
17	12.12.2020	23:59	2	622
18	13.12.2020		0	622
19	14.12.2020		0	622
20	15.12.2020		0	622
21	16.12.2020		0	622
TOTAL			622	

SUMMARY OF TESTS CONDUCTED BY DIFFERENT AGENCIES AND RESULTS

BIOLOGICAL INVESTIGATION FINDINGS				
S. No	**Name of the Institute**	**Type & No. of samples**	**Test Result**	**Remarks**
1	Health Department, Govt of AP	Blood-41 Urine-41, CT Scan-40 ECG 200	Normal	-
2	AIIMS New Delhi	Blood-88, Urine-56, and Milk-40		**Presence of lead and nickel found in blood.**
3	AIIMS Mangalgiri	RT-PCR-108, CSF-4,URINE-6	Normal	Negative for Bacteria and fungus. Negative for COVID-19.
4	Virology Lab, SMC Vijayawada	CSF-21	Cell count: Normal.	Culture report found negative for known Viruses and Bacteria.
		Blood-24	Smear Test: Normal	
5	Centre for Cellular and Molecular Biology	Urine-16,Stool-8, Vomitis-13 and Blood-35		No organism which can cause the reported phenotype was detected.
6	National Institute for Nutrition	Blood-42, Urine-42, Milk-42 and Vegetables-44		Organo phosphorous pesticide was detected in 70% of blood samples, Mercury high in Rice Samples.
7	National Institute for Virology	40-blood,5-CSF,30-Urine,17-stool,30-Nasal swabs	Normal	4 Dengue, 4 Chikungunya, 1 Dengue & Chikungunya and 1 Influenza- A were detected. No suggestive findings detected.
8	National Veterinary Lab, Bhopal	Animal Samples -33	Normal	All samples were found to be negative for Rift Valley Fever, Psuedorabies, Porcine Teschovirus, Nipah virus, Japanese Encephalitis virus.
9	Food Testing Laboratory,Kakinada	Fish-4	Normal	Fresh fish were safe for human consumption.
10	VBRL Vijayawada	Milk-5,Grass-5	Normal	No Lead, heavy metals and Phosphine were detected.

DATE OF SAMPLE COLLECTION	SAMPLES											TOTAL SAMPLES	LAB SENT	RESULTS
	BLOOD	CSF	URINE	STOOL	VOMITUS	MILK	NASAL SWABS	VEGIES & GROCERIES	GRASS	FISH	ANIMAL SAMPLES			
05.12.20	11	11	0	0	0	0	0	0	0	0	0	22	SMC Vijayawada	No budding yeast cells seen and no fungal elements seen
06.12.20	13	10	0	0	0	0	0	0	0	0	0	23	SMC Vijayawada	No budding yeast cells seen and no fungal elements seen.
06.12.20	15	0	0	0	0	0	0	0	0	0	0	15	CCMB, Hyderabad	No organism which can cause the reported phenotype could be identified
07.12.20	0	4	6	0	0	0	108	0	0	0	0	118	AIIMS, Mangalagiri	High presence of Lead and Nickel found in blood
07.12.20	20	0	16	8	13	0	0	0	0	0	0	57	CCMB, Hyderabad	No organism which can cause the reported phenotype could be identified
08.12.20	40	0	40	0	0	0	0	0	0	0	0	80	AIIMS, Delhi	Normal
08.12.20	0	0	0	0	0	40	0	0	0	0	0	40	AIIMS, Delhi	Normal
08.12.20	42	0	42	0	0	42	0	44	0	0	0	86	NIN, Hyderabad	Organophosphorous pesticide was detected in blood samples, Mercury high in Rice.
09.12.20	10	0	10	0	0	0	0	0	0	0	0	20	AIIMS, Delhi	Normal
10.12.20	40	5	30	17	0	0	30	0	0	0	0	122	NIV, Pune	Normal
10.12.20	7	0	6	0	0	0	0	0	0	0	0	13	AIIMS, Delhi	Normal
10.12.20	0	0	0	0	0	0	0	0	0	0	33	33	National Lab, Bhopal	Normal
10.12.20	0	0	0	0	0	5	0	0	5	0	0	10	VBRL VIJAYAWADA	Normal
10.12.20	0	0	0	0	0	0	0	0	0	4	0	4	Food Testing Laboratory, Kkd	Normal
11.12.20	31	0	0	0	0	0	0	0	0	0	0	31	AIIMS, Delhi	**Presence of lead and nickel found in blood.**
TOTAL	**187**	**30**	**108**	**25**	**13**	**87**	**138**	**44**	**5**	**4**	**33**	**674**		

Summary of water samples results collected by various institutions						
Sl. no	**Date of collection**	**Institution Name**	**No. Of samples collected**	**Source/point of collection**	**Ward/Area**	**Result**
1	06.12.20	District Public Health Laboratory	9	Tap Water	Southern street, Ashok chakram road, kusthiladoddi, vadiragudem, Mpl.School near Jwalaparameswar temple	Bacteriologically satisfactory for drinking purpose as the MPN count is nill.
2	06.12.20	Anmoor	21	Household	Krishna canal, J.Pcolony, Godavari canal, Pension line area, Ramchandra rao peta, Gandhi colony, ZP colony, Kalpana road, Papasaheb road, venugopal swamy temple road, chappiti vari veedhi, tutavari street, suthernstreet, ashok chakra road, borepureddivari street, yerukala colony chowdidibba	No heavy metals were detected
3	07.12.20	IICT,Hyd	21	Household	Different locations of Eluru city like kothapeta, Thangellamudi, R.R peta, Gunbazar, Lakshmivarapupeta, Ameenapeta, powerpeta, chodidibha, Pathabadha, Ashok nagar, Arundhathipeta, Kummarirevu, N.R peta, Chaitanyapuricolony,Lankapeta,Ramakrishnapuram,Nukalammatemple,Raninagar,Tapimesthricolony,Vasavari Street	Water is clean and potable without organic or elemental contamination.
4	08.12.20	AIIMS,Delhi	32	Household	Lakshmivarapupeta, pathebad, thangellamudi, sanivarapeta, southernstreet, gubbalavariveedi, ramakrishnapuram, kathepuveedi, sainagar, chodidibba, ponangiroad, dasrivariveedi, kankanalavariveedi, medaraveedi, pensionline, kathepuveedi, western street kothapeta, gayathrinagar, sainagar, phiranguladibba, manchinellathota, chanukyapuricolony, pichugunta	Presence of Lead and Nickel found in blood.
5	08.12.20	NIN, Hyderabad	36	Households-20,Controls Households-10,Reservior-1,Head pump (Before filtration)-1,After filtration-1,Stored Water Supplied on 4th & 5th Dec(During outbreak)-3	Reservoir at JP colony, Eluru Pampulacheruvu	Traces of pesticide (Triazophos) were detected. No mycotoxins were observed.

6	08.12.20	AP Pollution control board	12	Elurucanal, Reservoir, Intake well of water treatment plant, before chlorination &after chlorination tank from treatment plant, Water tank, Household, Pond 1&2 of pampulacheruvu	Denduluru(V&M), Eluru Municipal corporation, Kotadibba, 5th Division, Near Postal colony-Eluru	No Organochlorine pesticide compounds and heavy metals found in water.
7	10.12.20	NEERI	17	Ground Water, Surface Water	**Ground water collected from** - Powerpet PCB office,Dakshinapaduveedhi,vangayagudem,ponangi,padamaraveedhi,thurupuveedhi,tangellamudi,kothapeta,lakshmivarapupeta,pathebada ,R.R peta. **Surface Water collected from**- Denduluru godavari canal & storage tank, krishna canal, pampulacheruvu pond-2, Inlet and outlet of treatment plant, J.P colony over head tank	High Mercury was detected in both ground and surface water

CAUSE OF THE OUTBREAK

After analysing the case sheets, reports from different labs and inputs from different expert agencies involved, It can be categorised as a point source outbreak which was non-propagative in nature. It was a case of acute exposure to a substance rather than being a chronic one.

Since the cause of the symptoms in the patients was not known and there is no parallel in the literature which points to similar outbreak, it was difficult for all the experts to pin-point the exact cause of the outbreak. Therefore, elimination mechanism was used to deduce the most probable cause.

All the three possible causes: infections, metabolic and neruo-toxic, were deeply analysed in a systematic way. It was opined that the cause could not have been infectious (either a bacteria or a virus) because none of the patients were presented with fever which is a basic character of an infectious source. Had the source been infectious, it should have taken more time to settle down and mortality should have been higher. The National Institute of Virology analysed the samples of Blood, CSF, Stool and Nasal Swabs and have cleared the samples for any known viruses or bacteria. The Centre for Cellular and Molecular Biology analysed the samples of urine, stool, vomitus, water and blood and stated that no organism which can cause the reported phenotype could be identified. Therefore, it can be inferred with high probability that the cause of outbreak was not infectious (either a bacteria or a virus).

The next cause could have been metabolic in nature. The likelihood of metabolic cause can be ruled out as the Arterial blood gas test and the blood sugar tests do not point to any abnormality.

The third source could have been toxins. There are large number of toxins which when present in the human body can produce the symptoms noticed. Relevant to the present situation, there are two sources namely heavy metals and pesticides which can cause such an activity. As regards the likelihood of the episode being caused by heavy metals, it is important to state that large number of blood samples showed presence of heavy metals (lead and nickel) in the patients. However, Dr Jagdeesh Nayyar, the expert from AIIMS New Delhi, has ruled out the possibility of heavy metals to be the likely cause. He has stated that the heavy metals cause encephalopathy at a very high dose. Also, if the cause would have been heavy metals, the patients could not have recovered in a span of 3-4 hours. The hospitalization would have been for a higher time and the patients could not have recovered with the medication carried out. The expert states that the presence of heavy metals in the blood is incidental in nature and the source of heavy metals entering into human body should be investigated and identified. The heavy metals have a serious impact on the body and cause chronic illness and issues.

The next set of probable cause could have been pesticides. The organo-chlorides and organo-phosphates present in the pesticides have the capacity to cause similar episode. National Institute of Nutrition (NIN) has found the presence of organo-phosphates in the blood of the patients and also in the water samples collected from the house of the patients. However, Dr Jagdeesh Nayyar has opined that the possibility of organo-phosphates as the source is unlikely, since the symptoms associated organo-phosphates like diarrhoea, miosis, bronchia were not seen in the patients. The NIN experts opined that organo-phosphates were the likely cause of the episode.

Coming to organo-chlorides, it needs to be stated that organo-chlorides were neither noticed in the blood samples of the patients nor in the water, vegetable or milk samples. However, Dr Jagdeesh Nayyar stated that the organo-chlorides are most likely to be the cause of this episode. The presence is not found in the samples because the half-life of organo-chlorides once mixed in water is less than 24 hours and it is most likely that the concentration reached below traceable limits till the time samples were collected. The hypothesis is also supported by the nature of the outbreak which quickly dissipated within a few days.

Thus, on the whole, it can be inferred that there is general unanimity amongst all that there was no bacterial/ viral cause of the episode. Overall the water and air samples tested subsequently have been found to be within prescribed norms and there might have been a one-time presence of organo-chloride which could have triggered the episode.

SOURCE OF THE OUTBREAK

According to the experts, toxins are likely to be the most probable cause of this outbreak. Among the toxins, the pesticides are most likely to present similar encephalopathy. Among pesticides also, organo-chlorides are most likely to be the cause of the outbreak.

From the epidemic curve with a sudden onset on 4th December and steep rise, peaking was observed between 5th and 7th December. Subsequently the cases started declining from 8th onwards. There was no case reported from 13th December onwards. After analysing the above epidemic curve, case sheets of the patients, reports from different labs and inputs from different expert agencies involved, it can be categorised as a point source outbreak which was non-propagative in nature. It was a case of acute exposure to a substance rather being a chronic one. It is indicative of a common single exposure source. Another important observation is that whatever was the source is no more there in the system as no case has been reported 13th December onwards.

The likely source of such kind of encephalopathy can be water, milk, vegetables and fruits. Nickel was found in Milk, but nickel cannot cause such encephalopathy and hence can be ruled out. The source cannot be meat or fish as 87% of the patients didn't consume non-vegetarian food in the last couple of days prior to the incident. Vegetables like tomato and brinjal have been found with Metribuzin (herbicide). But had it been the source, the geographical expanse would not have been confined to urban area alone. It would have spread to rural areas as well. So vegetables can be the source only if some contamination occurred after the arrival of the vegetables to the market in Eluru and the vegetables got contaminated after the stock arrived in the market.

Coming to the likelihood of water being the source of contamination. None of the agencies have reported the presence of organo-chlorines in the water samples taken from the source, reservoir and the storage tank. So the central water supply was clean. The water samples collected from the households had some presence of Triazophos (organo-phosphate compound) but the concentration was not too high and also the control samples also found the presence of Triazophos. Thus, contamination of water locally being the source cannot be substantiated or ruled out either. This requires a detailed study of the water supply system of Eluru municipal corporation over the next few months to arrive at a conclusion.

Thus there is a need of Involving reputed national Institutions like AIIMS, IICT, NEERI on a long term basis to find out the exact source and also to prevent the event from reoccurring. The teams will make a deep-dive to unearth the most likely source of the episode. It would require systematic sampling of all likely culprits from origin to human consumption.

Since water test results from all agencies indicated that there is no presence of heavy metals or pesticides beyond the allowed limits, it can be safely said that the present water supply is potable and safe for Human Consumption.

RECOMMENDATIONS

The Committee, after several rounds of in depth deliberations, arrived at several recommendations which can be broadly categorised as short term action strategies and long term preventive strategy.

The preventive strategy will involve following:

1. Involving reputed national Institutions like AIIMS, IICT, NEERI on a long-term basis by the District Administration. The teams will make a deep-dive to understand further the nature of the episode. It would require systematic sampling of all likely sources from origin to human consumption. Water food air and soil analysis on a long term basis need to be done with a proper research design and sample design. Data collected needs to be analysed to arrive at a long term strategy. The study must go beyond the Eluru city and shall include the west Godavari and East Godavari districts due to the similar nature of topography irrigation and agro climatic conditions. Teams from AIIMS, New Delhi, IICT Hyderabad, PHFI with its Indian Institute of Public Health, Hyderabad would conduct these studies which shall be assisted by the District Collectors.
2. A Multidisciplinary Health and Environment Monitoring Framework need to be developed for these studies. A Monitoring cell for this purpose will be opened under the aegis of EFS&T department with representation (not below the cadre of Joint Director) from department of Health, Agriculture, Environment, Animal Husbandry and Municipal administration. All line departments shall give necessary assistance to this multi-agency, multi-disciplinary team.
3. A high level committee under the Chairpersonship of Chief Secretary to the government may be set up with senior officers from department of Health, Agriculture, Environment, Animal Husbandry, Irrigation and Municipal administration.
4. This high level committee shall get action plans prepared by all the line departments for monitoring water, food, air , soil , Agriculture, Aquaculture residues etc. on regular basis. Further, the implementation of these action plans shall be monitored by the High level committee constituted.
5. Surveillance plan of action for identifying source of heavy metals in blood in Eluru Municipal Corporation area needs to be developed by the municipal department in co-ordination with the Andhra Pradesh Pollution Control Board. A statistical database with periodical updating needs to be developed for items like water supply including both surface and ground water at all possible tapping points. All food sources shall also be closely monitored for heavy metals. Further industrial sources including sewerage and solid waste management practises of the Eluru corporation shall be closely monitored for finding out and eradicating presence of heavy metal in the human beings in Eluru area. This activity shall be coordinated by the AP Pollution Control Board.

6. A broad study of the entire West Godavari district with regards to above parameters is required for a comparative study with Eluru Municipal Corporation area. If required both districts of East and West Godavari shall be included in these studies. The AP Pollution Control Board shall undertake this study in coordination with Municipal corporation, Eluru.
7. Since the pesticides are likely to contribute to such episodes, it is very crucial that the banned compounds like DDT, DDE Endosulfan should not reach up to the agricultural fields. Strict implementation by the regulatory authorities is required for this. Department of Agriculture is advised to submit a detailed action plan within one month to achieve this goal.
8. Promotion of organic and nature-based farming should find key place in the agricultural policy. ZBNF wing of agriculture department to identify all villages in and around Eluru Municipal Corporation area for promoting agriculture of vegetables following the organic farming methods. Dedicated outlets to be opened in Eluru Municipal Corporation area for marketing and sale of the organically grown products. Department of Agriculture should also submit a detailed action plan for this within one month.
9. Surveillance plan of action for monitoring the quality of milk needs to be developed by the Animal Husbandry department within one month.
10. Usage of Chemicals for Aqua farming in areas surrounding the Eluru city needs to be reduced in the long run by the fisheries department. Surveillance plan of action for monitoring the aquaculture in the west Godavari district to identify and stop usage of any banned products needs to be developed by the fisheries department within one month.
11. Setting up of state of art labs at Vizag, Guntur and Tirupati under the aegis of Health Department. These labs should have the capacity to detect all kinds of organo- chlorines and organo-phosphates in all mediums like water, food, blood, serum etc., They should also be able to detect all kinds of heavy metals especially lead, nickel, and mercury etc. in all mediums like blood, blood serum, water milk and vegetables etc. further each district also should have one lab for water and food analysis. Samples from different sources, establishments and locations in the entire state need to be randomly checked periodically in these labs. A scientific matrix of sampling needs to be evolved so that regular surveillance on food materials and water is maintained in the district labs. Regional labs should have advanced facilities at par with research institute labs for testing blood and serum.
12. Irrigation Department should take up detailed study to identify possible sources of contaminants / Pollutants in Eluru canal at the earliest.

The steps to be taken up in the short term for immediate action are detailed below

1. Irrigation Department should take up cleaning of the Eluru Canal immediately and also submit an action plan ensuring prevention of car wash and battery residues in the Eluru Canal within one month.

2. The municipal water supply management forms the corner stone. Regular testing along with documentation needs to be ensured. While the water samples tested by the MA&UD indicated that the water supplied by Eluru Municipal Corporation is safe and as per standard, periodic checking must be ensured to rule out any contaminants. Similar system must be brought in place for all municipal water supply systems in the State.
3. The municipal water quality needs to be checked for more parameters like organo-chlorines and organo-phosphates on a periodical basis. Currently the water samples are checked for certain parameters like TDS etc., only.
4. Stand-alone RO units should also be checked for presence of heavy metals in water used by Institute for Preventive Medicine(IPM), AP Vijayawada.
5. Solid waste management in Eluru needs to be analysed for any likelihood of heavy metals leeching into the soil and then reaching to the human food chain through ground water. This task shall be taken up by the Municipal Administration and Urban Development (MA&UD) department.
6. Periodical inspections of prominent Rythu- bazaars and market places and sample collection for heavy metals and pesticides presence should be taken up by the Marketing department.
7. Entire distribution network including pumps, ESLR's and pipelines should be thoroughly checked for material integrity and the same should be done on a regular basis in future. Steps should be taken to keep the entire system under positive pressure at all times in future. This should be done by the Municipal Administration and Urban Development (MA&UD) department.
8. Testing of Pesticides / Weedicides / Fertilizers etc., being used in the district must be taken up by Agriculture department to ensure proper quality.

GALLERY






REPORTS

GOVERNMENT OF ANDHRA PRADESH
DEPARTMENT OF ANIMAL HUSBANDRY

Office of Joint Director (AH),
Veterinary Biological and Research Institute,
Labbipet, Vijayawada- 520010.

Lr. No. 02 / TOX / TFAL / VBRI / 2020 Date: 11/12/2020

Sub: Communication of toxicology analysis results –reg

Ref: 1. Lr. Roc. No.5 / ADDL / 2020; dated 10.12.2020 of O/o of AD (AH), ADDL, Eluru, W.G Dist.

The results of the toxicological analysis are here with Submitted.

S. No	TFAL. No	ADDL Specimen No	Kind of Species	Kind of Specimen	Lead	Heavy Metals	Phosphine
1	106	1	S. Buffalo	Milk	Negative	Negative	---
2	107	2			Negative	Negative	---
3	108	3			Negative	Negative	---
4	109	4			Negative	Negative	---
5	110	5			Negative	Negative	---
6	111	6		Grass	---	---	Negative
7	112	7			---	---	Negative
8	113	8			---	---	Negative
9	114	9			---	---	Negative
10	115	10			---	---	Negative

Joint Director (AH)
VBRI, Vijayawada

To
The Assistant Director (AH),
Animal Disease Diagnostic Laboratory,
Eluru, West Godavari dist.

Mail to addleluru@gmail.com

सीसीएमबी CSIR CCMB
कोशिकीय एवं आणविक जीवविज्ञान केन्द्र
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
उप्पल रोड, हैदराबाद - 500007, भारत
डॉ. राकेश कुमार मिश्र
निदेशक

CENTRE FOR CELLULAR AND MOLECULAR BIOLOGY
(Council of Scientific & Industrial Research)
Uppal Road, Hyderabad - 500007, India
Dr. Rakesh K. Mishra
Director

15-12-2020

The Commissioner
Department of Health and Family welfare
Govt. of Andhra Pradesh

Sub: Metagenomic analysis of samples collected from patients presenting with mystery illness Eluru, Andhra Pradesh

Respected Sir,

We had received 35 blood, 16 Urine, 13 vomitus and 8 stool samples from patients suffering with episodes of loss of consciousness/seizures followed by rapid recovery from District hospital, Eluru with a request to investigate for any possible microbial cause for the epidemic by utilizing latest technologies. DNA was extracted from all the samples and a total of 13 blood, stool and vomitus were selected for further processing. **No organisms which can cause the reported phenotype could be identified by Next Generation Sequencing (NGS) based metagenome sequencing** of the above samples. Taking into consideration the clinical features of the patients, nature of the epidemic and results of the investigations already done, it is unlikely to be caused by a microbial agent.

Thank you for providing us the opportunity to serve the people of our country and kindly let us know if you need any further information or assistance.

Detailed report would follow.

Yours sincerely,

[Rakesh Mishra]

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	Department: Analytical	Location: CMS	
	CSIR-IICT-Analytical Test Report		
	Form No: CSIR-IICT/FORM/TRF	**Total Pages 21**	

Date	:	11-12-2020
Sample Registration No.		2758
Customer Name & Address (with E-mail & Mobile Number of the Contact person)	:	The Director, Institute of Preventive Medicine, PH Labs and Food (H) Admin, Gollapudi, Vijayawada - 521225
Sample ID(s)/Code(s)	:	21 Water samples from different locations of Eluru city, as per the enclosed list
Nature of Samples		Water
Number of samples		21
Sampling plan, if any	:	Sampled by IPM, Vijayawada
Conditions at which sample received (sealed/unsealed/ice box etc.)		Room Temperature
Date of Sample Receipt	:	08-12-2020
Date of Analysis	:	08-12-2020
Test method(s) used for analysis	:	EPA Methods 622, 525, 531, 5021A, IS 3025
Deviations from test method/procedure, if any	:	NA
Additional information, if any	:	Quantitative Result

Results

SAMPLE DETAILS AND RESULTS AS ENCLOSED IN THE ATTACHED SHEETS

*Indicate the specific analyte as a parameter and if necessary indicate the type of analysis performed

Disclaimer:

i. The report pertains to the sample tested only
ii. The submitted samples were not collected by CSIR-IICT
iii. The report shall not be used or produced in fragments
iv. The report shall not be used for any other purpose than declared by the sponsor
v. CSIR-IICT is not a regulatory/certifying agency hence no part of this report should be used for legal purposes under any circumstances
vi. CSIR-IICT shall not be held financially liable for losses incurred by clients on account of inferences and interpretations made on the basis of the test results

Signature of TFM

Signature of Chairperson Analytical Division

	Department: Analytical	Location: CMS	
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ANALYTICAL REPORT FOR WATER SAMPLES (Pesticides and Volatiles)

S.NO	AREA NAME	DOOR No.	Organophosphorus pesticides EPA Method 622	Organochlorine Pesticides EPA Method 525	Synthetic Pyrethroids EPA Method 525	Carbamate Pesticides EPA Method 531	Volatile Organics EPA METHOD 5021A
1.	Kotha Peta	Janapareddy Vari Street	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
2.	Tangellamudi	Sivalayam Temple	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
3.	R.R. Peta	123/20	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
5.	Gun Bazar	18-1-1	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
6.	Lakshivarapu Peta	17-12-30	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
7.	Ameena Peta	26-6-20	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
8.	Chodi Dibbha	20F-12-27	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected

9.	Power Peta	SS-95/A2	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
10	Pathabadha	24B-1-26	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
11.	Ashok Nagar	Old Labour Office	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
12 (4)	Ameena Peta (Pension Line) Yeti gattu	711	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
13.	Arundhathi Peta	Near Marriyama Statue	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
14.	KummariRevu	498	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
16.	Charikaypuri Colony	24C-6-5/8	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
17.	N.R. Peta	KAHL Road	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
18	Rama Krishna Puram	V. Venkatesh House Road	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
19.	Lanka Peta	16B-9-10	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
20.	Nukalamma Temple	20A-1-19	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected

21	Rani Nagar	Ramalayam	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
22.	Tapimestri Colony	176	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected
23	Vasavari Street	23B-7-20/1	NOT DETECTED	NOT DETECTED	NOT DETECTED	NOT DETECTED	No harmful VOCs were detected

Signature of the Analyst

Signature of Scientist-in-Charge

LIST OF PESTICIDES TESTED

S.No.	Organophosphate	Organochlorine	Carbamate	Synthetic Pyrethiod
1.	Ethion	δ- HCH	Thiophanate	Fenvalerate
2.	Anilofos	γ- HCH	Carbendazim	Deltamethrin
3.	Phenthoate	α- HCH	Carbosulfan	α- Cypermethrin
4.	Phosalone	β- HCH	Carbofuran	Allethrin
5.	Malaoxon	Endrin	Fenobucarb	β- Cyfluthrin
6.	Malathion	Methoxychlor	Iprovalicarb	
7.	Pirimiphos-methyl	Heptachlor-exo-epoxide	Benfuracarb	
8.	Edifenphos	Aldrin	Propoxur	
9.	Chlorfenvinphos	Dieldrin	Aldicarb	
10.	Profenofos	γ- Chlordane	Carbaryl	
11.	Chlorpyrifos	Heptachlor	Oxamyl	
12.	Parathion-methyl	4,4'-DDD	Methomyl	
13.	Monocrotophos	4,4'-DDT	Methiocarb	
14.	Dimethoate	4,4'-DDE		
15.	Diazinon	α- Endosulfan		
16.	Acephate	Endosulfan alcohol		
17.	Phorate	Endrin Aldehyde		
18.	Quinalphos			
19.	Dichlorvos			
20.	Fenitrothion			
21.	Imidan			

	Department: Analytical	Location: CMS	
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WATER QUALITY TESTING PARAMETERS

Details of the sample			Parameters with Acceptable Limits					
Sample Code	**Area Name**	**D. No**	**pH (6.5 – 8.5)**	**Total Dissolved Solids < 500 mg/L**	**Conductivity < 0.781 mS/cm**	**Turbidity < 5 NTU**	**Fluoride <1mg/L**	**Arsenic < 0.01 mg/L**
1	Kotha Peta	JanapareddyVari Street	7.28	290	0.46	1.04	0.1	0.00
2	Thangellamudi	Sivalayam Temple	7.49	320	0.45	0.92	0.2	0.00
3	R. R. Peta	D. NO-123/20	7.34	250	0.44	0.81	< 0.1	0.00
5	Gun Bazar	D. NO-18-1-1	7.28	170	0.44	0.41	0.1	0.00
6	Lakshivarapu Peta	D. NO-17-12-30	7.40	220	0.45	0.77	0.1	0.00
7	Ameenapeta	D. NO-26-6-20	7.50	180	0.46	0.80	0.1	0.00
8	ChodiDibha	D. NO-20 F-12-27	9.20	244	0.45	0.83	0.1	0.010
9	Power Peta	E. P. No-SS-95/A2	7.41	270	0.46	0.99	0.2	0.00
10	Pathabadha	D. NO-24 B-1-26	7.50	272	0.46	0.83	0.1	0.00
11	Ashok Nagar	Old Labour Office	7.52	293	0.48	1.26	0.2	0.010
12	Ameenapeta (Pension line) YettiGatu	D. NO-711	7.26	492	0.47	0.94	0.1	0.00
13	Arundathi Peta	Near Marriyama Statue	7.02	294	0.49	0.58	0.2	0.00

14	Kummarirevu	D. NO-498	7.13	302	0.45	0.81	0.1	0.010
16	Chanikyapuri Colony	D. NO-24 C-6-5/8	7.41	320	0.45	0.92	0.2	0.010
17	N. R. Peta	KAHL Road	7.86	500	0.82	1.17	0.2	0.010
18	Ramakrishna Puram	V. Venkatesh House Road	7.11	299	0.42	0.72	0.2	0.00
19	Lankapeta	D. NO-16 B-9-10	7.49	301	0.47	0.82	0.1	0.010
20	Nukalamma Temple	D. NO-20 A-1-19	7.02	291	0.45	1.39	0.1	0.00
21	Raninagar	Ramalayam	7.41	299	0.45	0.87	0.1	0.010
22	Tapimestri Colony	D. NO-176	7.56	326	0.46	1.3	0.2	0.00
23	Vasavari Street	D. NO-23 B-7-20/1	7.32	337	0.48	0.88	0.1	0.00

Signature oftheAnalyst

Signature of Scientist-in-charge

Results of Elemental Analysis from Water Samples

S. no	Sample code	Name of the Element (µg/L)																
		Al	Ba	B	Ca	Cu	Fe	Mg	Mn	Se	Ag	Zn	Pb	Cd	Hg	Mo	Ni	As	Cr
1	Acceptable Limit As per IS 10500:2012	30	700	500	75000	50	300	30000	100	10	100	5000	10	3	1	70	20	10	50
2	1	**127**	38.1	54.9	25630	BQL	35.13	8789	6.778	1.712	BQL	0.9946	BDL	0.239	BQL	BQL	BDL	BDL	BDL
3	2	**141.9**	35.31	53.03	25290	BQL	38.21	8537	6.342	1.168	BDL	9.663	BDL	0.1613	BQL	BQL	BDL	BDL	BQL
4	3	**121.9**	38.45	50.3	25580	BQL	43.35	8531	6.345	2.992	BDL	0.8734	BDL	BDL	BQL	BDL	BDL	BDL	BQL
5	4	**125.3**	39.12	55.33	25610	BDL	32.45	8679	6.865	BQL	BDL	BQL	BDL	0.1281	BDL	BDL	BDL	BDL	BQL
6	5	**118.9**	38.14	50.66	25630	BQL	41.91	8572	5.851	1.947	BDL	BDL	BDL	BQL	BQL	BDL	BDL	BDL	BQL
7	6	**139.7**	35.12	53.37	25210	BQL	33.31	8757	6.346	1.099	BDL	3.917	BDL	0.1862	BQL	BDL	BDL	BDL	BQL
8	7	**131.7**	38.14	53.12	25960	BQL	42.25	8648	7.415	3.352	BQL	1.182	BDL	0.3571	BQL	BQL	BDL	BDL	BDL
9	8	**144.5**	38.24	42.57	19890	6.013	37.52	8962	7.614	BQL	BDL	4.087	BDL	0.2397	BDL	BQL	BDL	BDL	BDL
10	9	**148.6**	35.8	58.31	25890	BQL	39.14	8759	8.238	1.782	BDL	5.593	BDL	0.1646	BQL	BQL	BDL	BDL	BQL
11	10	**143.1**	37.85	56.79	25800	BQL	36.13	8717	6.899	3.708	BDL	3.801	BDL	0.2312	BQL	BDL	BDL	BDL	BQL
12	11	**161.5**	43.8	47.44	21570	6.959	65.71	9455	13.86	BQL	BDL	6.327	BQL	0.1815	BDL	BQL	BDL	BDL	BQL
13	13	**76.77**	97.28	134.8	38230	5.403	20.3	13710	3.732	1.453	BDL	3.325	BDL	0.3967	BDL	1.028	BDL	BDL	2.789
14	14	**138.1**	37.26	55.49	26260	BQL	37.66	8711	7.94	2.069	BDL	1.728	BQL	0.1301	BQL	BQL	BDL	BDL	BQL
15	16	**134**	36.58	55.01	25920	1.183	38.12	8712	7.55	0.6492	BDL	4.044	BQL	0.1733	BQL	BQL	BDL	BDL	BQL
16	17	**88.86**	112.3	141	47530	0.7967	46.93	12790	7.746	7.341	BDL	18.02	BQL	0.2533	BQL	BQL	BDL	BDL	BQL
17	18	**134.3**	35.5	55.89	25690	0.1739	34.18	8523	6.558	1.857	BDL	8.451	BDL	BQL	BQL	BQL	BDL	BDL	BQL
18	19	**135.6**	35.37	55.85	25750	0.4523	34.26	8611	6.698	1.273	BDL	1.316	BQL	BQL	BQL	BDL	BDL	BDL	BQL
19	20	**179.4**	33.17	55.9	25710	0.5743	41.15	8578	6.972	1.731	BDL	1.472	BDL	BQL	BQL	BQL	BDL	BDL	BQL
20	21	**148.6**	35.57	53.6	25560	BDL	41.48	8562	6.712	1.69	BDL	4.101	BQL	0.1878	BQL	BQL	BDL	BDL	BQL

21	22	**187.9**	38.73	55.02	25680	0.5836	67.34	8764	12.37	1.111	BDL	12.31	BQL	0.2043	BQL	BQL	BDL	BDL	BQL
22	23	**141.2**	41.96	59.92	26850	0.3357	46.78	9018	6.869	1.703	BQL	3.024	BQL	0.2071	BQL	BQL	BDL	BDL	BQL
23	LOD(µg/L)	1.273	0.259	0.286	2.026	0.153	0.754	0.144	0.092	0.343	0.535	0.15	1.817	0.041	2.033	0.278	0.409	2.159	0.521
24	LOQ(µg/L)	3.819	0.778	0.859	6.08	0.461	2.262	0.432	0.279	1.029	1.510	0.45	5.452	0.124	6.099	0.834	1.228	6.477	1.565

Signature oftheanalyst

Signature of Scientist-in-Charge

	Department: Analytical	Location: CMS	
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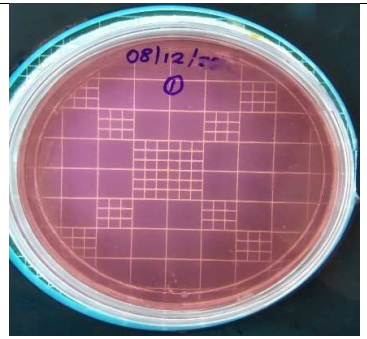
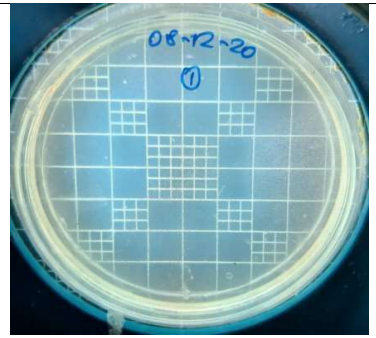
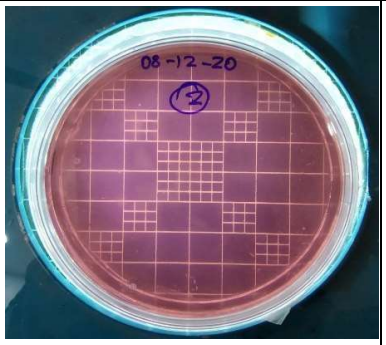
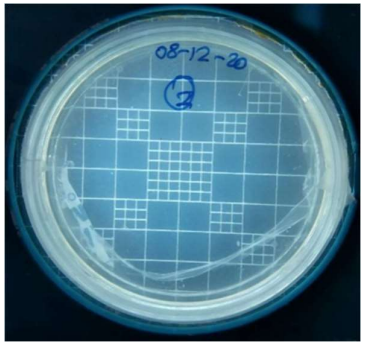
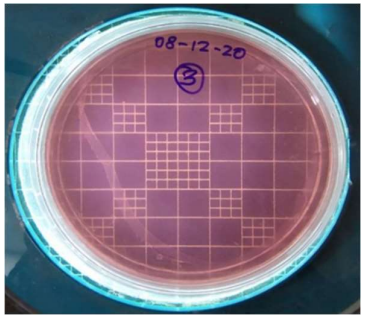
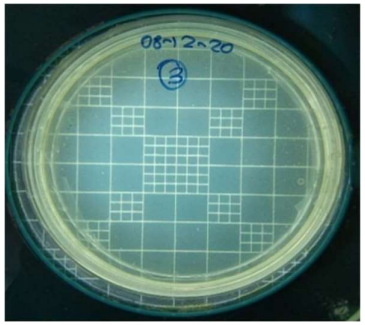
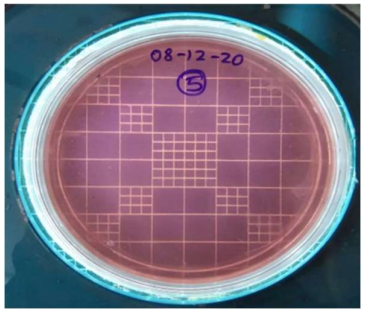
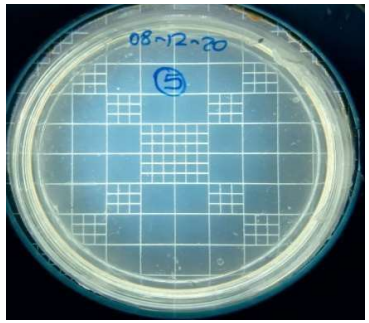
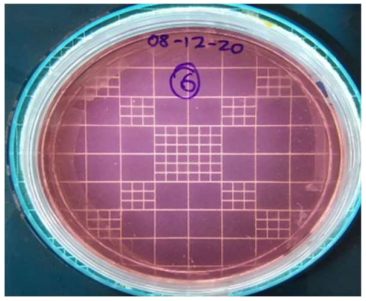
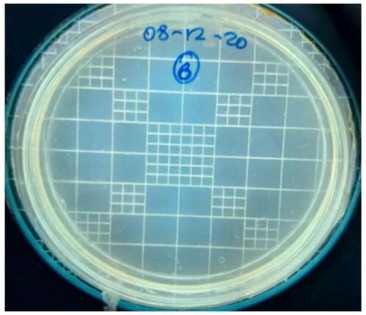
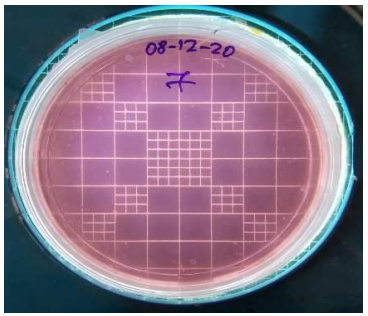
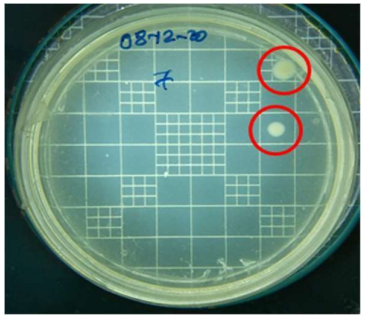
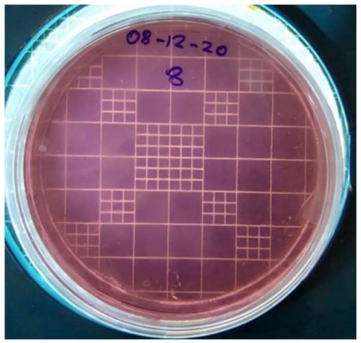
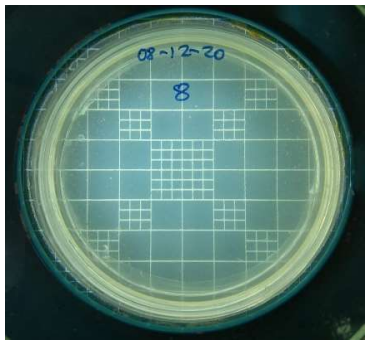
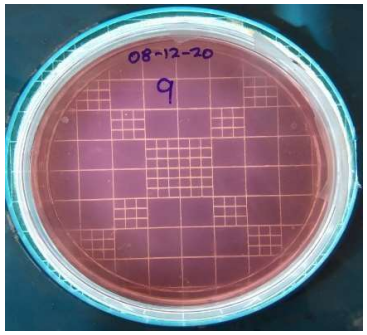
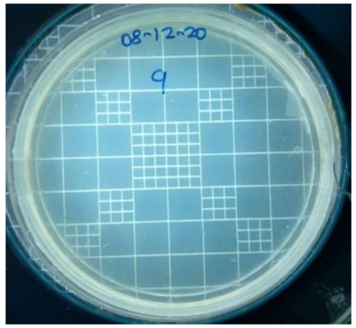
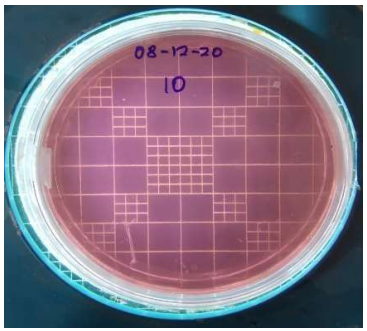
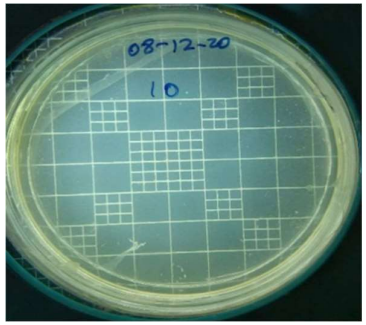
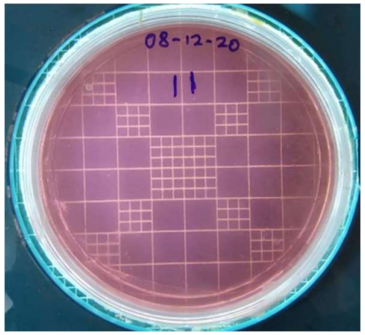
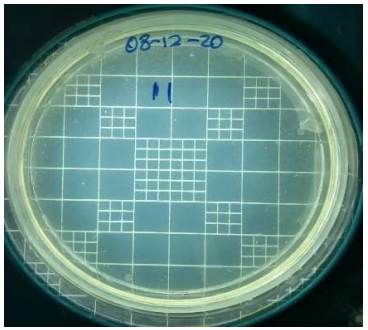
Analytical results of microbial testing of water samples

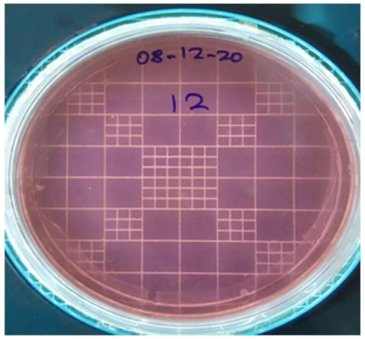
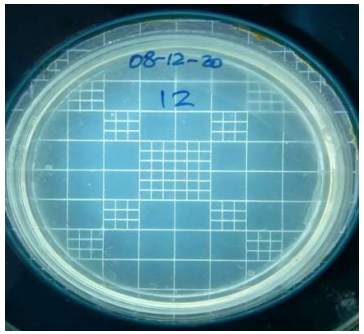
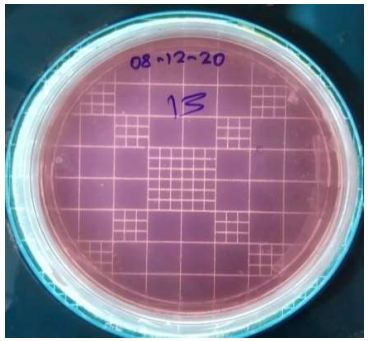
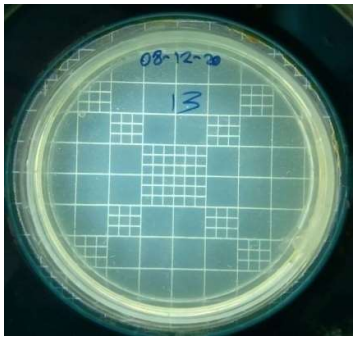
Division: PE&TT			Delivery Date of Report: 09/12/2020			
S. No	**Details of the sample**			**Parameters with acceptable limits**		**Observations**
	Sample Code	**Area Name**	**D. No**	**E. Coli Test**	**Common bacterial test**	
1.	1	Kotha Peta	JanapareddyVari Street			**E. Coli Test:** NIL **Common bacterial test: Nil**
2.	2	Thangellamudi	Sivalayam Temple			**E. Coli Test:** NIL **Common bacterial test:**NIL

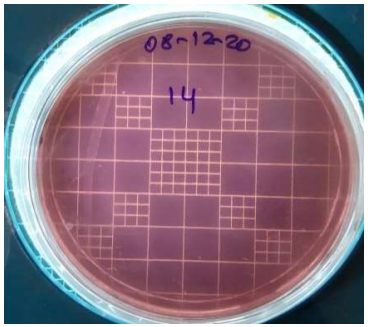
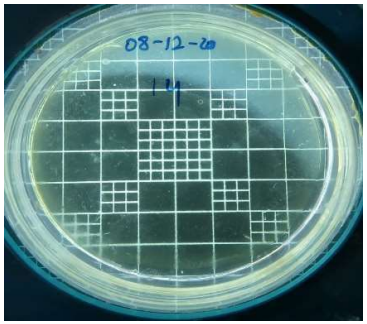
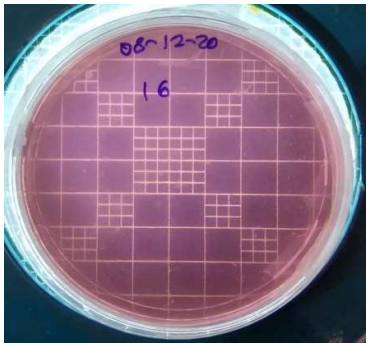
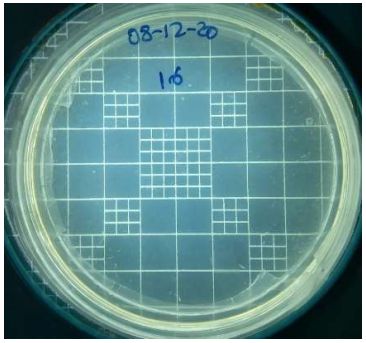
3.	3	R. R. Peta	D. NO-123/20			**E. Coli Test:** NIL **Common bacterial test:**NIL
4.	5	Gun Bazar	D. NO-18-1-1			**E. Coli Test:** NIL **Common bacterial test:**

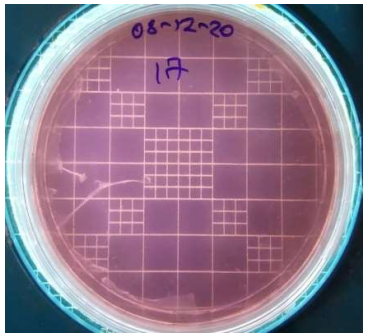
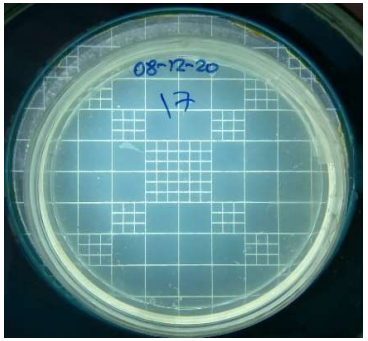
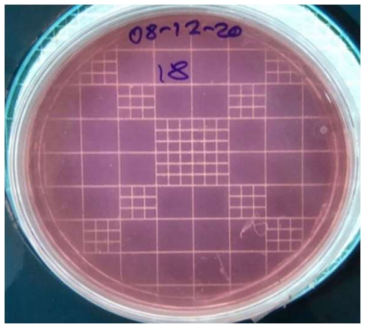
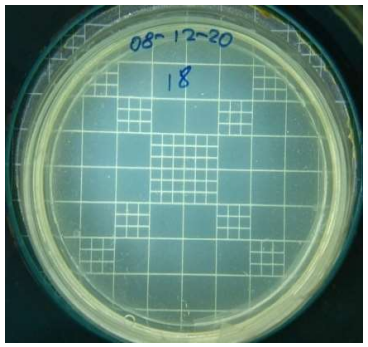
5.	6	Lakshivarapupeta	D. NO-17-12-30			**E. Coli Test:** NIL **Common bacterial test:**
6.	7	Ameenapeta	D. NO-26-6-20			**E. Coli Test:** NIL **Common bacterial test: Mild contaminant**

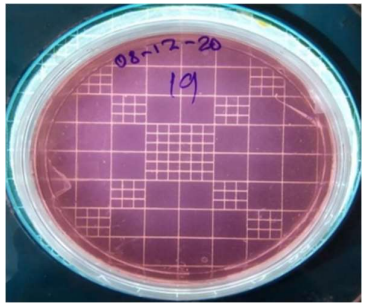
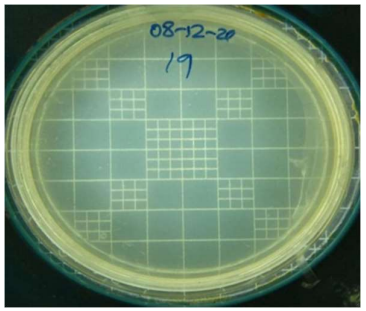
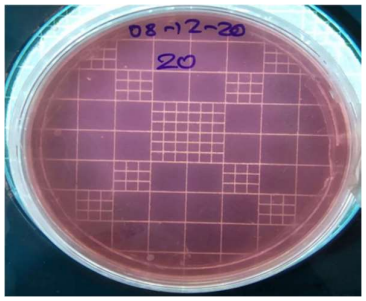
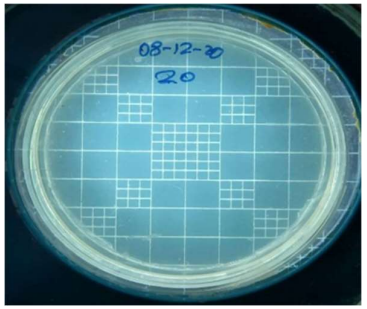
7.	8	Chodidibha	D. NO-20 F-12-27			**E. Coli Test:** NIL **Common bacterial test:**NIL
8.	9	Power peta	E. P. No-SS-95/A2			**E. Coli Test:** NIL **Common bacterial test:**NIL

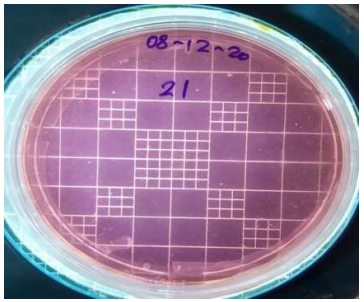
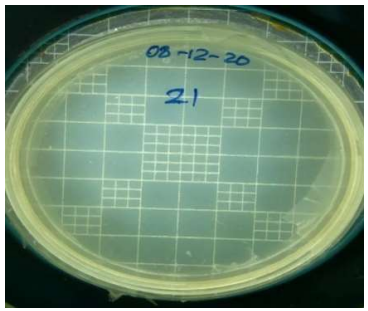
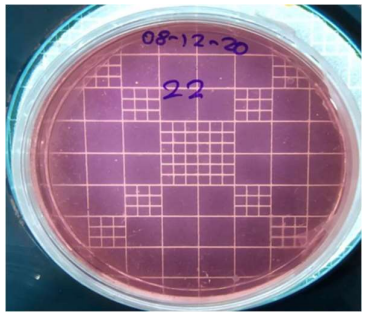
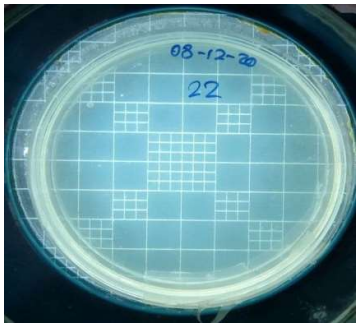
9.	10	Pathabadha	D. NO-24 B-1-26			**E. Coli Test:** NIL **Common bacterial test:** NIL
10.	11	Ashok Nagar	Old Labour Office			**E. Coli Test:** NIL **Common bacterial test:** NIL

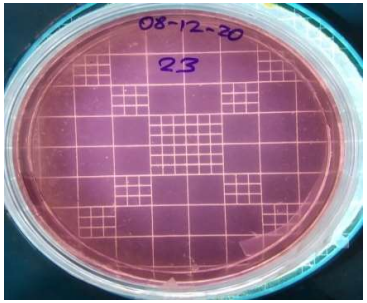
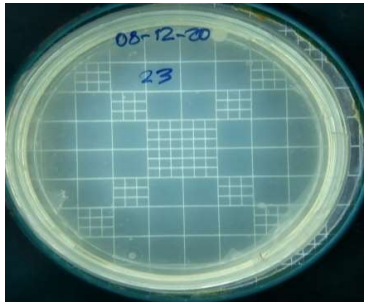
11.	12	Ameenapeta (Pension line) Yettigatu	D. NO-711			**E. Coli Test:** NIL **Common bacterial test:** NIL
12.	13	Arundathipeta	Near Marriyama Statyu			**E. Coli Test:** NIL **Common bacterial test:** NIL

13.	14	Kummarirevu	D. NO-498			**E. Coli Test:** NIL **Common bacterial test:**
14.	16	Chanikyapuri Colony	D. NO-24 C-6-5/8			**E. Coli Test:** NIL **Common bacterial test:** NIL

15.	17	N. R. Peta	KAHL Road			**E. Coli Test:** NIL **Common bacterial test:**NIL
16.	18	Ramakrishna Puram	V. Venkatesh house road			**E. Coli Test:** NIL **Common bacterial test:**NIL

17.	19	Lankapeta	D. NO-16 B-9-10			**E. Coli Test:** NIL **Common bacterial test:**NIL
18.	20	Nukalamma Temple	D. NO-20 A-1-19			**E. Coli Test:** NIL **Common bacterial test:**NIL

19.	21	Raninagar	Ramalayam			**E. Coli Test:** NIL **Common bacterial test:**NIL
20.	22	Tapimestri Colony	D. NO-176			**E. Coli Test:** NIL **Common bacterial test:**NIL

21.	23	Vasavari Street	D. NO-23 B-7-20/1			**E. Coli Test:** NIL **Common bacterial test:**NIL

Signature of the Analyst

Signature of Scientist-in-charge

Summary of Test Report

- CSIR-IICT Received 21 water samples on 08-12-2020
- The Samples were analysed for Organo chlorine, Organophosphorus, Carbamate, Synthetic pyrethroid pesticide residues, heavy metals and water quality parameters
- Pesticide residue analysis: The samples were tested by two different extraction procedures and analysed by two different analytical techniques. The results showed the absence of the tested pesticide residues
- Heavy metals: The samples were tested for the presence 29 heavy metals including Lead, Arsenic, Nickel. The results also showed the heavy metal contamination is negligible
- Volatile organic chemicals: The samples were tested for the presence of volatile organic chemicals using headspace GC-MS method. The results showed the absence of harmful volatile organic chemicals.
- Water Quality testing: The water quality parameters such as pH, turbidity, conductivity, total dissolved solids and arsenic content were tested. The results are in the acceptable limits.
- Microbial testing of water: The water samples did not show any significant contamination of E-coli and other bacterial or fungal growth.

Conclusion: The water samples are clean and potable without organic or elemental contamination

Government of Andhra Pradesh

Directorate of IPM, PH Labs & Food (H) Administration, Amaravathi.

DISTRICT PUBLIC HEALTH LABORATORY

KOTADIBBA, ELURU, W.G.DIST

Sample From: Commissioner, Municipal Corporation, Eluru, West Godavari Dist.
Collected by: Mcnicipal staff.
Collected On: 06/12/2020 Received On: 06/12/2020 at 7.00 AM

REPORT OF BACTERIOLOGICAL ANALYSIS OF WATER

Lab Ref. No	Source	Exact Location	Residual Chlorine mg per liter	MPN of Coli form Bacteria per 100/ml.	Nature of Coli form Bacteria
1530	Muncipal Water	Tap water at D.No.6A-10-18/1, Kayyalavaari putta, southern street, Eluru	1.5	Nil	Nil
1532	Muncipal Water	Tap water at D.No.6A-10-16/1, Kayyalavaari putta, southern street, Eluru	1.5	Nil	Nil
1534	Muncipal Water	Tap water at D.No.6A-11-12, Ashok chakram road, Eluru	1.0	Nil	Nil
1536	Muncipal Water	Tap water at D.No.6B-11-20, Ashok chakram road, Eluru	1.0	Nil	Nil
1538	Muncipal Water	Tap water at D.No.6A-12-03, Ashok chakram road, Eluru	1.0	Nil	Nil
1540	Muncipal Water	Tap water at D.No.6B-11-23/10, Opp.Jwalapahareswara Mpl.School, Eluru	1.5	Nil	Nil
1542	Muncipal Water	Tap water at D.No.6A-11-6, Kusthila doddi, Eluru	1.5	Nil	Nil
1544	Muncipal Water	Tap water at D.No.6A-11-21, Vadira gudem, Eluru	1.5	Nil	Nil
1546	Muncipal Water	Tap water at D.No.6A-11-31, Vadira gudem, Eluru	1	Nil	Nil

Remarks :-

The above given water samples are Bacteriologically satisfactory for drinking purpose as the MPN count is Nil.

DISTRICT PUBLIC HEALTH LABORATORY * ELURU *

B. Srinivasa Rao 8/12/20

Senior Analyst
Dist. Public Health Laboratory
Eluru - 534 001

All India Institute of Medical Sciences
Clinical Ecotoxicology Diagnostic and Research Facility (CEF)
Ground Floor, Convergence Block,
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Nagar, New Delhi-110029
Tel: 011-26549141, Internal No. 8061, Mob: 8527178343,
E-mail Id: clinicalecotox@aiims.edu

Elemental Analysis Report

Patient Name: **Mr. Lova Raju**	CEF Registration No:1006/Ref/2020/UN0B
Sex: Male Age: Years	Ward/OPD/Clinic: Dr K Vamsi Krishna
Fathers/Husband Name:	Consultant-in-charge: C/o Administrative **Officer AIIMS Mangalagiri**
UHID No/Hospital Registration No:	
Phone/Mobile No.	Date: 07/12/2020

Sample	Test name	Results	Units	Reference range	Method
Blood	Cobalt	1.56	µg/L	0.5-3.90	Analyzed by ICP-MS
Blood	Nickel (Ni)	31.15	µg/L	0.14-0.65	Analyzed by ICP-MS
Blood	Arsenic (As)	0.66	µg/L	<62	Analyzed by ICP-MS
Blood	Selenium (Se)	89.75	µg/L	70-150	Analyzed by ICP-MS
Blood	Cadmium (Cd)	2.77	µg/L	<5	Analyzed by ICP-MS
Blood	Mercury (Hg)	0.00	µg/L	<10	Analyzed by ICP-MS
Blood	Lead (Pb)	83.4	µg/dL	<25	Analyzed by ICP-MS
Blood	Vanadium (V)	0.00	µg/L	0.05	Analyzed by ICP-MS
Blood	Thallium (Tl)	0.00	µg/L	<2	Analyzed by ICP-MS
Blood	Antimony (Sb)	0.00	µg/L	<3 (unexposed) 3-10 (exposed)	Analyzed by ICP-MS

Reported by
Dr. Javed A Quadri

07/12/2020

Clinical Ecotoxicology (Diagnostic & Research) Facility (CEF)
All India Institute of Medical Sciences, New Delhi-29

Verified by
Dr. A Shariff

07.12.2020.

डा. ए. शरीफ/Dr. A. Shariff
आचार्य एवं अध्यक्ष/Professor & Head
शरीर रचना विज्ञान विभाग/Dept. of Anatomy
अ.भा.आ.सं., नई दिल्ली, भारत/AIIMS, Ansari Nagar, New Delhi, India

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Nagar, New Delhi-110029
Tel: 011-26549141, Internal No. 8061, Mob: 8527178343,
E-mail Id: clinicalecotox@aiims.edu

Elemental Analysis Report

Patient Name: **Mr. M Rajasekhar**	CEF Registration No:1001/Ref/2020/UN0B
Sex: Male Age: Years	Ward/OPD/Clinic: Dr K Vamsi Krishna
Fathers/Husband Name:	Consultant-in-charge: C/o Administrative **Officer AIIMS Mangalagiri**
UHID No/Hospital Registration No:	Date: 07/12/2020
Phone/Mobile No.	

Sample	Test name	Results	Units	Reference range	Method
Blood	Cobalt	1.34	µg/L	0.5-3.90	Analyzed by ICP-MS
Blood	Nickel (Ni)	40.31	µg/L	0.14-0.65	Analyzed by ICP-MS
Blood	Arsenic (As)	0.71	µg/L	<62	Analyzed by ICP-MS
Blood	Selenium (Se)	92.37	µg/L	70-150	Analyzed by ICP-MS
Blood	Cadmium (Cd)	2.83	µg/L	<5	Analyzed by ICP-MS
Blood	Mercury (Hg)	0.00	µg/L	<10	Analyzed by ICP-MS
Blood	Lead (Pb)	96.87	µg/dL	<25	Analyzed by ICP-MS
Blood	Vanadium (V)	0.83	µg/L	0.05	Analyzed by ICP-MS
Blood	Thallium (Tl)	0.00	µg/L	<2	Analyzed by ICP-MS
Blood	Antimony (Sb)	0.00	µg/L	<3 (unexposed) 3-10 (exposed)	Analyzed by ICP-MS

Reported by
Dr. Javed A Quadri

07/12/2020

Verified by
Dr. A Shariff

07.12.2020

रोगविषयक पारिस्थितिक विषलक्षण निदान अनुसंधान सुविधा
Clinical Ecotoxicology (Diagnostic & Research) Facility (CEF)
अखिल भारतीय आयुर्विज्ञान संस्थान, नई दिल्ली-29
All India Institute of Medical Sciences, New Delhi-29

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आचार्य एवं अध्यक्ष/Professor & Head
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Tel: 011-26549141, Internal No. 8061, Mob: 8527178343,
E-mail Id: clinicalecotox@aiims.edu

Elemental Analysis Report

Patient Name: **R Surya Prakash**	CEF Registration No:1003/Ref/2020/UN08
Sex: Male Age: Years	Ward/OPD/Clinic: Dr K Vamsi Krishna
Fathers/Husband Name:	Consultant-in-charge: C/o Administrative **Officer AIIMS**
UHID No/Hospital Registration No:	**Mangalagiri**
Phone/Mobile No.	Date: 07/12/2020

Sample	Test name	Results	Units	Reference range	Method
Blood	Cobalt	1.3	µg/L	0.5-3.90	Analyzed by ICP-MS
Blood	Nickel (Ni)	20.07	µg/L	0.14-0.65	Analyzed by ICP-MS
Blood	Arsenic (As)	0.72	µg/L	<62	Analyzed by ICP-MS
Blood	Selenium (Se)	84.4	µg/L	70-150	Analyzed by ICP-MS
Blood	Cadmium (Cd)	1.66	µg/L	<5	Analyzed by ICP-MS
Blood	Mercury (Hg)	0.00	µg/L	<10	Analyzed by ICP-MS
Blood	Lead (Pb)	53.6	µg/dL	<25	Analyzed by ICP-MS
Blood	Vanadium (V)	0.12	µg/L	0.05	Analyzed by ICP-MS
Blood	Thallium (Tl)	0.00	µg/L	<2	Analyzed by ICP-MS
Blood	Antimony (Sb)	0.00	µg/L	<3 (unexposed) 3-10 (exposed)	Analyzed by ICP-MS

Reported by
Dr. Javed A Quadri

07/12/2020

Verified by
Dr. A Shariff

07.12.2020

रोगविषयक पारिस्थितिक चिकित्सा निदान अनुसंधान सुविधा
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Elemental Analysis Report

Patient Name: **Mr. G Raghavan Ranga Rao**	CEF Registration No:1005/Ref/2020/UN0B
Sex: Male Age: Years	Ward/OPD/Clinic: Dr K Vamsi Krishna
Fathers/Husband Name:	Consultant-in-charge: C/o Administrative **Officer AIIMS**
UHID No/Hospital Registration No:	**Mangalagiri**
Phone/Mobile No.	Date: 07/12/2020

Sample	Test name	Results	Units	Reference range	Method
Blood	Cobalt	1.4	µg/L	0.5-3.90	Analyzed by ICP-MS
Blood	Nickel (Ni)	40.88	µg/L	0.14-0.65	Analyzed by ICP-MS
Blood	Arsenic (As)	0.34	µg/L	<62	Analyzed by ICP-MS
Blood	Selenium (Se)	92.9	µg/L	70-150	Analyzed by ICP-MS
Blood	Cadmium (Cd)	3.7	µg/L	<5	Analyzed by ICP-MS
Blood	Mercury (Hg)	0.00	µg/L	<10	Analyzed by ICP-MS
Blood	Lead (Pb)	53.5	µg/dL	<25	Analyzed by ICP-MS
Blood	Vanadium (V)	0.00	µg/L	0.05	Analyzed by ICP-MS
Blood	Thallium (Tl)	0.00	µg/L	<2	Analyzed by ICP-MS
Blood	Antimony (Sb)	0.00	µg/L	<3 (unexposed) 3-10 (exposed)	Analyzed by ICP-MS

Reported by
Dr. Javed A Quadri

07/12/2020

Verified by
Dr. A Shariff

07.12.2020

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