NIPAH VIRUS OUTBREAK IN INDIAN STATE OF KERALA

Mamatkulova N.
teacher of «Public Health» Department.
International Medical Faculty of Osh State University
Abdimomunova B.
teacher of «Public Health» Department
International Medical Faculty of Osh State University
Abzhaparova A.
teacher of «Public Health» Department
International Medical Faculty of Osh State University
Dilshad K.
student of International Medical Faculty of Osh State University,4th year
Shanavas Sh.M.N.
student of International Medical Faculty of Osh State University,4th year.
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Abstract

A Nipah virus infection is a viral infection caused by the Nipah virus. Symptoms from infection vary from none to fever, cough, headache, shortness of breath, and confusion. This may worsen into a coma over a day or two, and 50 to 75% of those infected die. Complications can include inflammation of the brain and seizures following recovery.

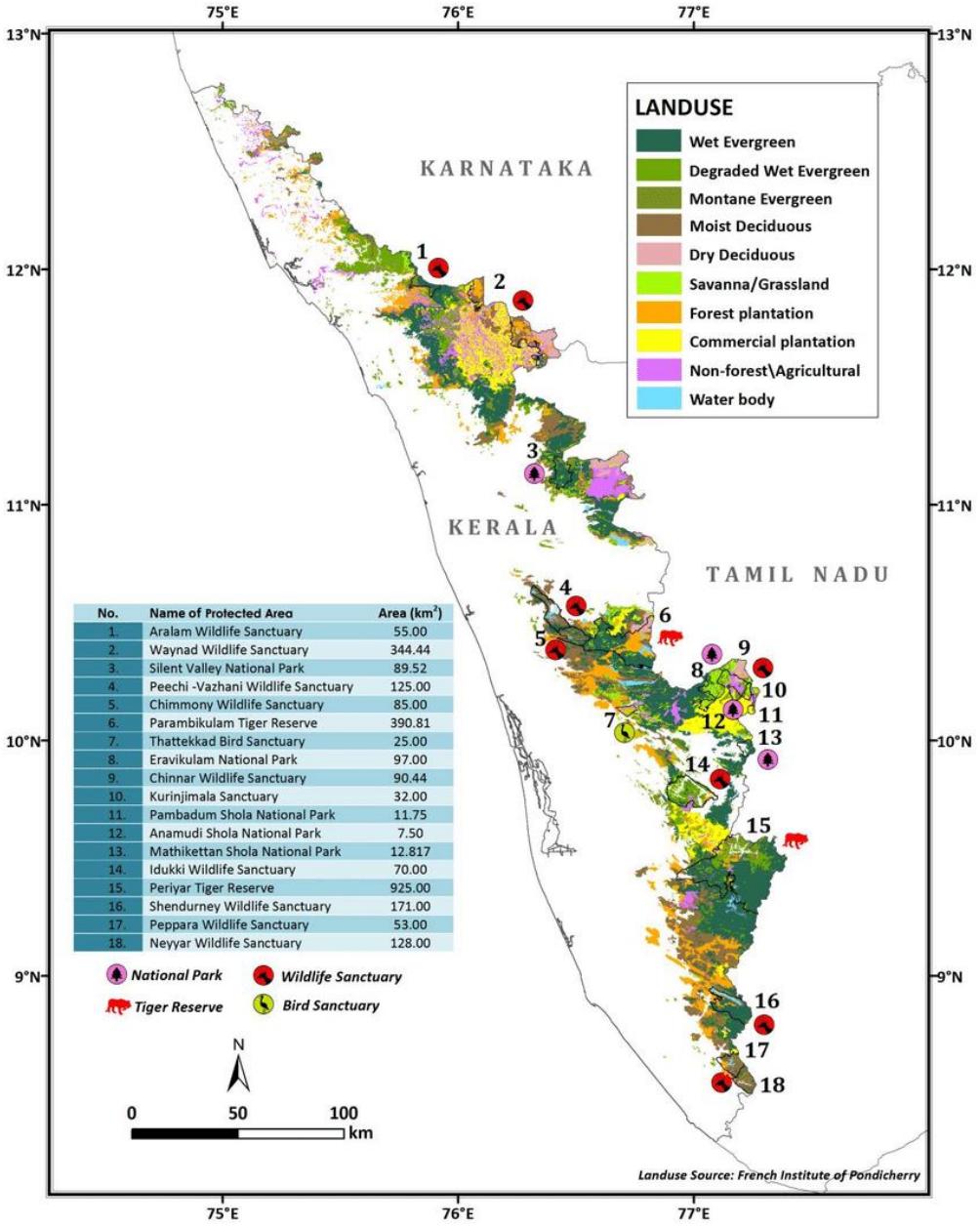
The Nipah virus (NiV) is a type of RNA virus in the genus Henipavirus. The virus normally circulates among some fruit bats. It can both spread between people and from other animals to people. Spread typically requires direct contact with an infected source. Diagnosis is based on symptoms and confirmed by laboratory testing. Management is restricted to supportive care; as of 2021 there is neither vaccine nor specific treatment. Preventive measures include avoiding exposure to bats and sick pigs, and not drinking raw date palm sap. As of May 2018, about 700 human cases of Nipah virus were estimated to have occurred, and 50 to 75 percent of those infected died. In May 2018, an outbreak of the disease caused 17 deaths in the Indian state of Kerala.

Keywords: Nipah virus, infection, state Kerala, analytical data, District Medical Officer, South India.

KERALA

The varied topographical features, high rainfall and geologic conditions have favoured the formation of different ecosystems from shola forests on the mountain valleys to the mangrove forests along sea coasts and estuaries. The most outstanding feature of the State is the formation of tropical rainforests along the windward side of the Southern Western Ghats, which is lying parallel to the west coast. A small extent of area of the State is along the rain shadow region the Western Ghats, where the vegetation is dominated by dry deciduous forests and scrub jungles. The wet lands are mostly confined to the low land region of the state. Champion and Seth (1968) recognised 26 forest types in Kerala of which the major ones are the west coast tropical evergreen, west coast semi-evergreen, southern moist mixed deciduous, southern dry mixed deciduous, southern montane wet temperate forests, southern subtropical hill forests, southern montane wet temperate grasslands and littoral forests (mangroves). Certain edaphic types recognised are Bamboo brakes, Cane brakes, Reed brakes, Euphorbiaceous scrub jungles, laterite thorn forests and Myristica swamp forests. Based on dynamics they recognised secondary forests such as secondary evergreen, secondary moist deciduous, secondary dry deciduous, etc.

Figure 1- Fruit eating bats



No.	Name of Protected Area	Area (km²)
1.	Aralam Wildlife Sanctuary	55.00
2.	Waynad Wildlife Sanctuary	344.44
3.	Silent Valley National Park	89.52
4.	Peechi -Vazhani Wildlife Sanctuary	125.00
5.	Chimmony Wildlife Sanctuary	85.00
6.	Parambikulam Tiger Reserve	390.81
7.	Thattekkad Bird Sanctuary	25.00
8.	Eravikulam National Park	97.00
9.	Chinnar Wildlife Sanctuary	90.44
10.	Kurinjimala Sanctuary	32.00
11.	Pambadum Shola National Park	11.75
12.	Anamudi Shola National Park	7.50
13.	Mathikettan Shola National Park	12.817
14.	Idukki Wildlife Sanctuary	70.00
15.	Periyar Tiger Reserve	925.00
16.	Shendurney Wildlife Sanctuary	171.00
17.	Peppara Wildlife Sanctuary	53.00
18.	Neyyar Wildlife Sanctuary	128.00

Figure 2- Natural diversity and ecological hotspots, sanctuaries of Kerala.

INTRODUCTION

Nipah virus infection is a zoonotic illness that is transmitted to people from animals, and can also be transmitted through contaminated food or directly from person-to-person. In infected people, it causes a range of illnesses from asymptomatic (subclinical) infection to acute respiratory illness and fatal encephalitis. The virus can also cause severe disease in animals such as pigs, resulting in significant economic losses for farmers.

Although Nipah virus has caused only a few known outbreaks in Asia, it infects a wide range of animals and causes severe disease and death in people.

During the first recognized outbreak in Malaysia, which also affected Singapore, most human infections resulted from direct contact with sick pigs or their contaminated tissues. Transmission is thought to have occurred via unprotected exposure to secretions from the pigs, or unprotected contact with the tissue of a sick animal. In subsequent outbreaks in Bangladesh and India, consumption of fruits or fruit products (such as raw date palm juice) contaminated with urine or saliva from infected fruit bats was the most likely source of infection. Human-to-human transmission of Nipah virus has also been reported among family and care givers of infected patients.

MATERIALS AND METHODS

Primary data were attached from DHS Kerala, NCDC and secondary data is from state epidemiologist, IDSP state cell and further details were gathered from WHO official cites and some other recognised relevant sites.

Statistical data were analysed, integrated and represented graphically in MS Word followed by distinctive graphs and tallies for reported cases. Bar diagrams were used to show the number of cases, including the outcomes of the outbreaks. Several diagrams were used to master the transmission dynamics and transmission

cycle of the virus. Geographical map wasgiven for better understating of biodiversity and vegetative vulnerability of Kerala.

KEY FACTS

- Nipah virus infection in humans causes a range of clinical presentations, from asymptomatic infection (subclinical) to acute respiratory infection and fatal encephalitis.
- The case fatality rate is estimated at 40% to 75%. This rate can vary by outbreak depending on local capabilities for epidemiological surveillance and clinical management.
- Nipah virus can be transmitted to humans from animals (such as bats or pigs), or contaminated foods and can also be transmitted directly from human-to-human.
- Fruit bats of the Pteropodidae family are the natural host of Nipah virus.
- There is no treatment or vaccine available for either people or animals. The primary treatment for humans is supportive care.

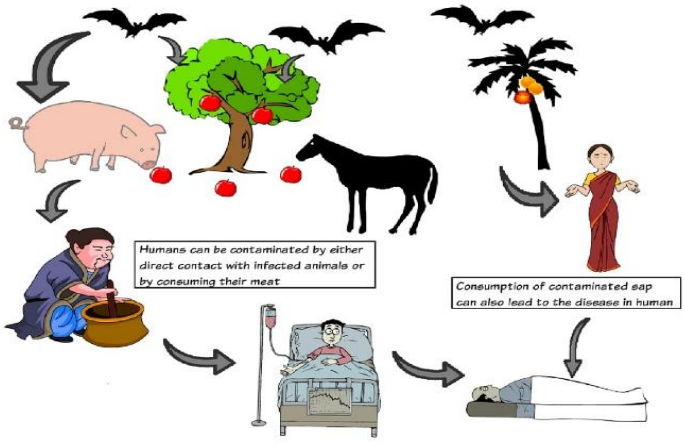


Figure 3- Transmission cycle of NiV

NIPAHVIRUS GLOBAL OUTBREAK

- From 1998 to 2021, more than 600 cases of Nipah virus human infections were reported.

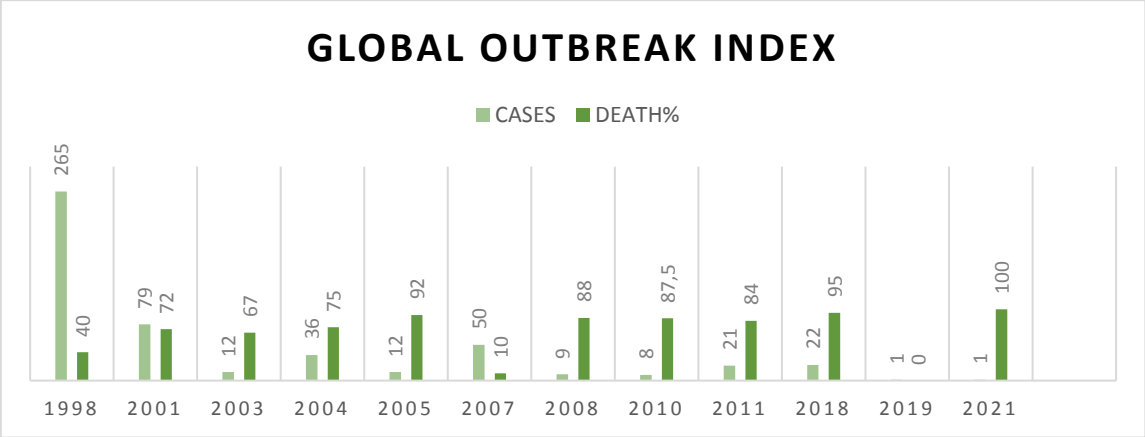


Table 1- Global nipah outbreak index

OUTBREAK IN KERALA

Nipah virus (NiV) is a potential threat to global health security. The first 2 recorded NiV outbreaks reported in India, in 2001 and 2007, occurred in West Bengal. On 17 May 2018, a 28-year-old man presented to a private facility in Kozhikode District, Kerala State, India, with encephalitis. His father and aunt developed fever, body ache, and vomiting on the same day. His brother had died following a similar illness 12 days earlier. The family cluster of encephalitis cases among adults prompted the laboratory to test for NiV in addition to common causes of encephalitis.

Outbreak Description During: 2–29 May 2018, 23 cases of NVD were identified (Figure 1), including the index case (not laboratory confirmed), 18 confirmed cases, and 4 probable cases. Transmission of NiV occurred in 3 hospitals, all in Kozhikode District: Taluk Headquarters hospital, Perambra (hospital 1); Government Medical College, Kozhikode (hospital 2); and the Community Health Centre, Balussery (hospital 3; Figure 2). The index case, a 27-year-old man, resided in Changaroth Village in Quilandy Taluk, Kozhikode District. On 2 May 2018, he developed complaints of fever and myalgia. On 3 May, he presented to hospital 1 with symptoms of fever, myalgia, and vomiting. He was

kept under observation until the next day, when his condition worsened and he was shifted to the 13-bed ward for male patients. During the night of 4 May, he developed high-grade fever (39.4°C), abdominal pain, vomiting, alteredsensorium, and persistent cough. On the morning of 5 May, the patient was transferred to hospital 2 by private vehicle. In the vehicle, he vomited numerous times; his father (case 5) was his caretaker in the vehicle. Once in hospital 2, the patient was referred for computed tomography (CT). Following CT, he was brought to a ward, where he died from the disease during the evening of 5 May.

Of the 22 additional NVD cases identified, 9 primary cases contracted the infection from the index case while he was at hospital 1. An additional 10 primary cases were infected while the index case was in hospital 2. The cases at hospital 1 comprised immediate family members, patients admitted in the same ward, companions of patients admitted in the ward, and caregivers of the index case in the ward during the night of 4 May. The cases who contracted infection from the index case at hospital 2 were patients or companions/caregivers who were present in the emergency department or in the corridor outside the CT room during the period when the index case was waiting to undergo CT. Three other cases were secondary and contracted the disease at hospital 2 and hospital 3 after primary cases sought care.

Epidemiologic Case Investigation

Index Case: The index case (case 1) was apparently healthy prior to this event. He reportedly had limited social contacts and was a nature and animal lover. At the time of his death, he owned pet rabbits and ducks. The broad timing of this outbreak coincided with the breeding season for bats, a known zoonotic reservoir of this disease. The index case may have come into contact with a NiV-infected baby bat.

Transmission Dynamics: The outbreak had 3 clusters of cases, identified at hospitals hospital 1, hospital 2, and hospital 3. Figure 4 depicts the transmission dynamics of this outbreak within the various hospital settings.

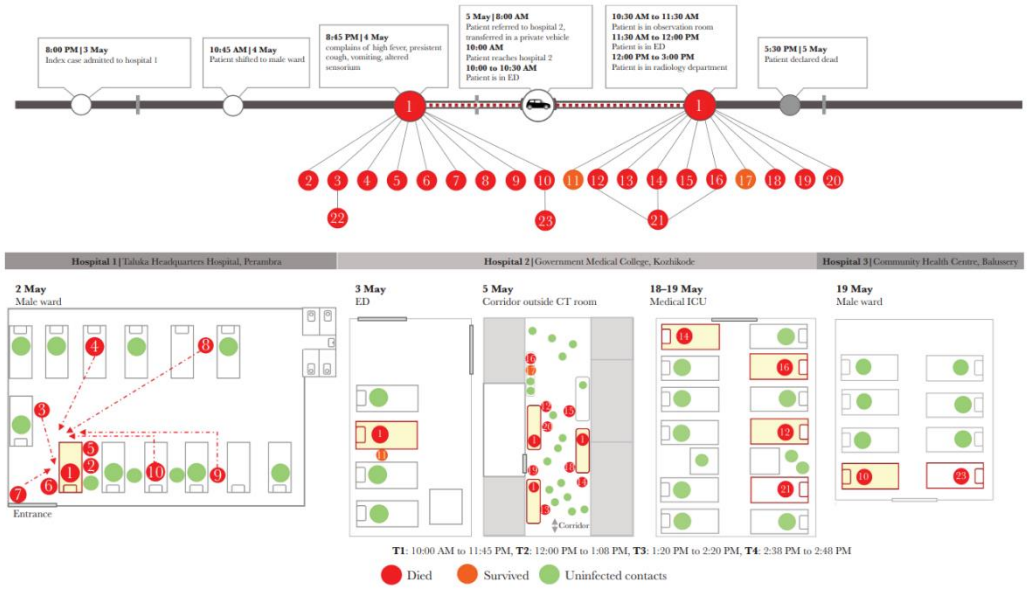


Figure 3- Transmission dynamics

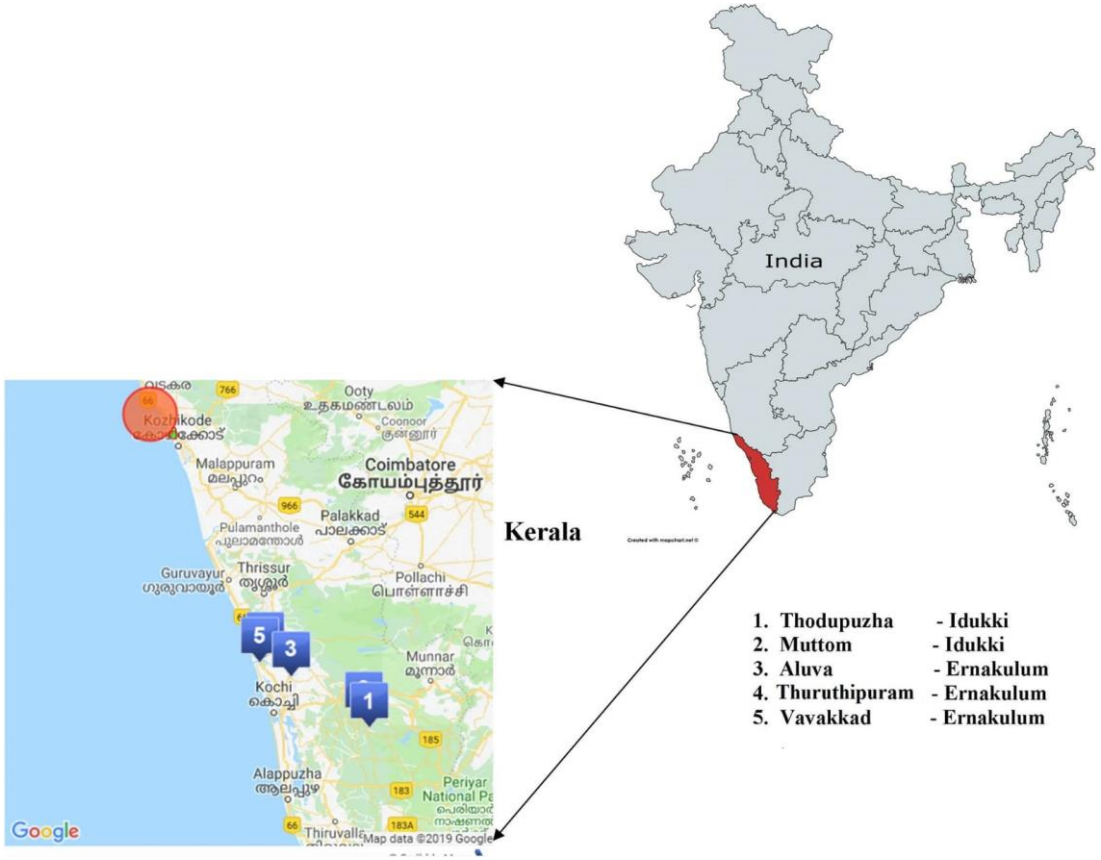


Figure 4- Epicentre of the infection

Demographic Data and Clinical Features: The case-fatality rate was 91%, with 21 individuals dying and 2 surviving. The median age of cases was 45 years; the sex of 15 (65%) was male. The median incubation period (defined as the time between contact with the index case and symptom onset) was 9.5 days (range, 6–14 days). Clinical features of the cases included fever (in 100%), acute respiratory distress syndrome/ shortness of breath (in 83%), altered sensorium (in 74%), myalgia (57%), headache (48%), vomiting (48%), cough (44%), and seizures (17%). Twenty cases (87%) had any respiratory symptoms.

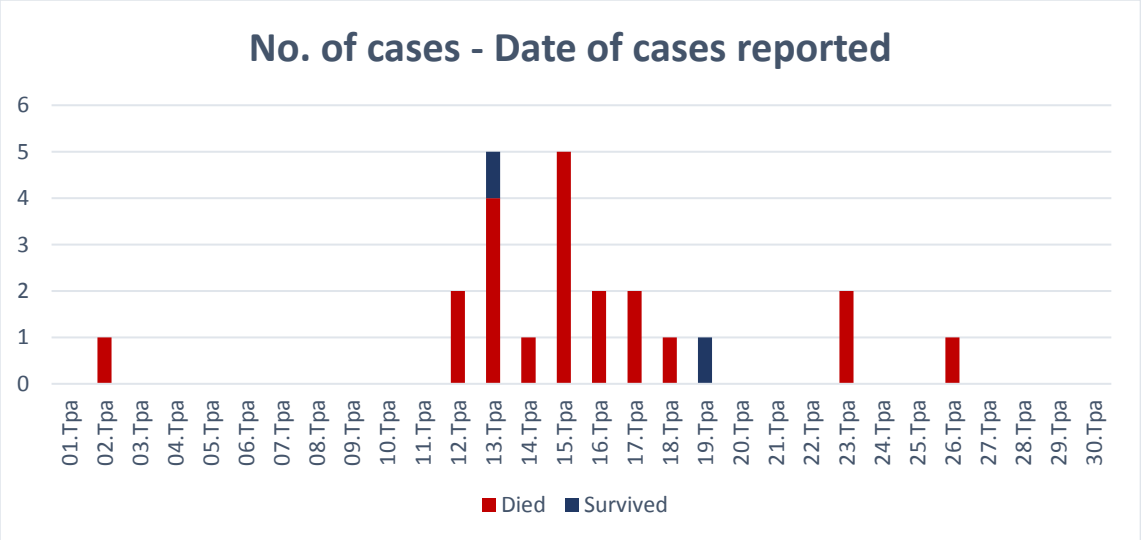


Table 2 – Epidemiologic curve of NVD

1. 2nd May- Onset of illness in index case
2. 17th May- Cases 2,5 and 6 admitted to hospital
3. 18th May- MCVR, Manipal confirms Nipah virus disease in cases 2,5,6
4. 18th May- State government and public health persuaded Rapid Response Team (RRT)
5. 19TH May- Every confirmed case where isolated in specific Nipah wards
6. 20th May- The government declares the Nipah virus outbreak as official

Table 3 Total analytical data of the cases in Kerala

CASE	AGE	SEX	DATE OF EXPOSURE	DATE OF ONSET	DATE OF SAMPLE COLLECTION	DATE OF DEATH	INCUBATION PERIOD (D)	TOTAL DURATION OF ILLNESS (D)	NATURE OF EXPOSSURE	PATIENT OUTCOME	NiV REAL TIME RT-PCR	NiV IgM ELISA
1	27	M	NA	2 MAY	NOT DONE	5 MAY	NA	3	Not applicable	Died	Not done	Not done
2	28	M	4 MAY	13 MAY	17 MAY	18 MAY	9	5	Proximity<1m, touching feeding, duration>10h	Died	+	+
3	45	M	4 MAY	13 MAY	NOT DONE	15 MAY	9	2	Proximity<1m, next- bed patient companion, duration>5h	Died	Not done	Not done
4	100	M	4 MAY	15 MAY	NOT DONE	17 MAY	11	2	Proximity<1m, admitted in opposite bed, duration>10h	Died	Not done	Not done
5	59	M	4 MAY	15 MAY	17 MAY	24 MAY	11	9	Proximity<1m, touching feeding, duration>10h	Died	+	_
6	53	F	4 MAY	13 MAY	17 MAY	19 MAY	9	6	Proximity<1m,touching,duration>10h	Died	+	_
7	31	F	4 MAY	15 MAY	19 MAY	20 MAY	11	5	Proximity<1m, nursing care, no PPE, duration>5h	Died	+	_
8	48	F	4 MAY	18 MAY	19 MAY	20 MAY	14	2	Proximity<1m, cleaned vomitus, no PPE, duration>5h	Died	+	+
9	45	M	4 MAY	15 MAY	19 MAY	22 MAY	11	7	Proximal <1m, present in same ward, duration >5h	Died	+	+
10	47	M	4 MAY	17 MAY	19 MAY	20 MAY	13	3	Proximity <1m, touching, feeding, duration>5h	Died	+	_
11	19	F	5 MAY	13 MAY	21 MAY	_	8	17	Proximity<1m, gave injection, measured BP, no PPE, duration<1h	Survived	+	+
12	48	M	5 MAY	16 MAY	20 MAY	20 MAY	11	4	Proximity NA, present in corridor, duration<1h	Died	+	+
13	27	M	5 MAY	14 MAY	19 MAY	27 MAY	9	13	Proximity NA, present in corridor, duration<1h	Died	+	+
14	32	F	5 MAY	16 MAY	20 MAY	20 MAY	12	4	Proximity NA, present in corridor, duration<1h	Died	+	+
15	52	M	5 MAY	15 MAY	20 MAY	22 MAY	10	7	Proximity NA, present in corridor, duration<2h	Died	+	+

16	23	F	5 MAY	13 MAY	19 MAY	20 MAY	8	7	Proximity<1m, waiting in corridor, duration 3h	Died	+	+
17	27	M	5 MAY	19 MAY	21 MAY	_	14	13	Proximity<1m, waiting in corridor, duration 3h	Survived	+	+
18	55	M	5 MAY	17 MAY	22 MAY	30 MAY	12	13	Proximity NA, present in corridor, duration<2h	Died	+	+
19	48	F	5 MAY	12 MAY	Not done	19 MAY	7	7	Proximity NA present in CT area and corridor, duration 2h	Died	Not done	Not done
20	17	M	5 MAY	12 MAY	Not done	17 MAY	7	5	Proximity NA present in radiology section, duration NA	Died	Not done	Not done
21	75	F	17 MAY	23 MAY	24 MAY	26 MAY	6	3	Proximity<1m, present in same room, duration>10h	Died	+	_
22	28	M	14 MAY	23 MAY	29 MAY	30 MAY	9	7	Proximity NA, present in same room, duration NA	Died	+	+
23	25	M	19 MAY	26 MAY	30 MAY	31 MAY	7	5	Proximity<1m, present in same room, duration>5h	Died	+	+

RESULTS

During 2–29 May 2018, 23 cases were identified, including the index case; 18 were laboratory confirmed. The lineage of the NiV responsible for this outbreak was closer to the Bangladesh lineage. The median age of cases was 45 years; the sex of 15 (65%) was male. The median incubation period was 9.5 days (range, 6–14 days). Of the 23 cases, 20 (87%) had respiratory symptoms. The case-fatality rate was 91%; 2 cases survived. Risk factors for infection included close proximity (i.e., touching, feeding, or nursing a NiV-infected person), enabling exposure to droplet infection. The public health response included isolation of cases, contact tracing, and enforcement of hospital infection control practice.

MANAGEMENT

In community level the general public reports the unusual cases or clustering of similar cases as that of NIPAH to the Asha workers or the field staffs. The information verified by the medical officer and he firmed it and send to IDSP (integrated disease surveillance program).

In Hospital level the conformed and suspected cases were reported by the respective Doctors to DMO (District Medical Officer) DSO (District Surveillance Officer) and the action were taken by the DHS (District Health Service) and state IDSP (Integrated Disease Surveillance Program) and pursued with the effective contact training by the RRT.

In laboratory the sample collection, packing and transportation was done with proper precautionary measures and it's given to DSO(District Surveillance Officer) and transported directly to the NIV (National Institute of Virology) Pu.

GOVERNMENT VS NIPAH

Government strengthened the diagnostic and transport facilities by establishing standard diagnostics. Enhancing preparations by improving infrastructure like ventilators, ICU's and personal prevention equipment. The proper disposal of biomedical waste is a challenge in such type of infections. Must be done adhering to strict infection control practices to ensure safety of all personnel involved. This has to be supervised and properly co-ordinated by the hospital infection control committee.

Nursing staffs and co-workers were given special training from NCDC (National Centre for Disease Control) to enhance public health measures such as proper sanitary management, personal hygiene and various nursing approaches. Doctors were updated with various drug regiments, new treatment guidelines including technical aspects by IDSP (Integrated Disease Surveillance Program) and NCDC (National Centre for Disease Control). Pyramidal approaches by state government for the disease surveillance and appropriate contact tracing from lower community sectors to higher sectors.

CONCLUSION

This is the first recorded NiV outbreak in South India. Early laboratory confirmation and an immediate public health response contained the outbreak. Kerala successively experienced back-to-back two outbreaks of NIPAH. The second outbreak on 3 June 2019 has made to think of having a systematic approach to deal with any virus outbreaks in future. The first outbreak has taught some lessons and the second accentuated the need of developing the system and processes. The intellectual approach of the Kerala government in the robust contact tracing and isolation within immediate time frame help to subside the further outbreaks.

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