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Standard Operating Procedures (SOPs) for Joint Outbreak Investigation One Health Program

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Standard Operating Procedures
(SOPs) for Joint Outbreak Investigation
One Health Program

Health and Family Welfare Department
Government of Kerala

KERALA.HEALTH

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Preface

One Health is an integrated, unifying approach that recognizes the interconnection between human, animal, and environmental health. It emphasizes the need for collaboration across various sectors to prevent and mitigate health issues that arise at this intersection. The concept of One Health fosters a comprehensive strategy for disease control and public health preparedness.

Kerala health experienced Nipah outbreak in 2019 in Ernakulam. At that time the structured approach of having thematic committees, their roles and responsibilities and templates for reporting and presentation were prepared. The same was further refined and a comprehensive systems/ protocols were established. During the COVID period realizing the need of all line departments involvement in case of epidemic / pandemic, Kerala launched the program in May 2022 under Rebuild Kerala Initiative. The program is being piloted in four Pamba river basin districts Kottayam, Pathanamthitta, Idukki, and Alappuzha with plans to expand in all the districts. The inclusion of Panchayat Raj Institutions in implementing the program ensures that local governance bodies are actively engaged, allowing for tailored, community-driven solutions. This decentralized approach ensures that the One Health initiative is responsive to local health challenges, creating a stronger, more resilient public health system in the state. It also ensured peoples involvement in public health.

Developing a Standard Operating Procedure (SOP) for Joint Outbreak Investigations was completed through a series of consultations at multiple level, involving various department officials and technical experts to finalise the design of SOP. The SOP also outlines the roles and responsibilities of various departments and provides a structured approach for implementing joint outbreak investigations both at district and state levels. By offering a standardized framework, the SOP aims to ensure consistency in responses, improve communication between sectors, and streamline interventions to prevent and control disease outbreaks effectively. The SOP will guide early detection, rapid response, and intervention strategies during outbreak situations, significantly enhancing epidemic control in the state.

Centre for One Health Kerala has ably coordinated the activities for developing the SOP for joint outbreak investigations. Dr Aravind, Dr. Ajan M J, Dr. Antony Paul P, Dr. Milu Anna Ittycheria, Dr. Priya Babu, Dr. Revu J and Sri. Satheesh Chandran have guided the team by giving technical inputs. The document has been developed with the aim of fostering a stronger One Health approach, promoting collaboration, and ensuring that outbreak investigations are well-coordinated across the state. The line departments' representatives Dr. Sanjay D, Disease Investigation Officer, SIAD, Animal Husbandry and Dr Jess Vergis, Assistant Professor, Veterinary and Animal Sciences University, Pookode actively participated during discussions and preparation of the SOP.

I am confident that the SOP for Joint Outbreak Investigation will be a resource document to all the field functionaries and the key stakeholders of the respective domain subjects.

Dr Rajan Khobragade IAS

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Abbreviations

1.	AHD	Animal Husbandry Department
2.	AMR	Antimicrobial Resistance
3.	AI	Avian Influenza
4.	BPHU	Block Public Health Unit
5.	CFR	Case Fatality Rate
6.	CHC	Community Health Center
7.	CBS	Community Based Surveillance
8.	CWRDM	Centre for Water Resources Development and Management
9.	DHS	Directorate of Health Service
10.	DFO	District Forest Officer
11.	DMO	District Medical Officer
12.	DSP	District Surveillance Officer
13.	DST	Department of Science & Technology
14.	ELISA	Enzyme-linked immunoassay
15.	HPAI	Highly Pathogenic Avian Influenza
16.	ICDS	Integrated Child Development Services
17.	IEC	Information Education Communication
18.	JAS	Janakiya Arogya Samidhi
19.	JOIN	Joint Outbreak Investigation
20.	KFD	Kyasanur Forest Disease
21.	KUHS	Kerala University of Health Sciences
22.	KVASU	Kerala Veterinary and Animal Sciences University
23.	LSG	Local Self Government
24.	LSGB	Local Self Government Body
25.	LSGD	Local Self Government Department
26.	NIHSAD	National Institute of High Security Animal Disease
27.	NIV	National Institute of Virology
28.	OH	One Health

29.	OHC	One Health Committee
30.	PEID	Prevention of Epidemics and Infectious Diseases
31.	PCB	Pollution Control Board
32.	PHC	Public Health Centre
33.	PHE	Public Health Emergency
34.	PHL	Public Health Laboratory
35.	PPE	Personal protective equipment
36.	SARS	Severe Acute Respiratory Syndrome
37.	SOPs	Standard Operating Procedures
38.	RT-PCR	Real- time reverse transcriptase Polymerase Chain Reaction
39.	RRT	Rapid Response Team
40.	TDD	Tribal Development Department
41.	TWD	Tribal Welfare Department

Glossary

Community Based Surveillance	Community-based Disease Surveillance is an active process of community participation in reporting outbreak prone communicable diseases.
Foodborne/ Waterborne illnesses	Diseases caused by ingesting food or water contaminated with pathogenic microorganisms or toxins
Joint Outbreak Investigation	A Joint Outbreak Investigation is a coordinated and multidisciplinary approach to investigating disease outbreaks and public health events involving multiple sectors, such as human health, animal health, and environmental health. It aims to determine the source, mode of transmission, and contributing factors through a collaborative effort among experts from various fields, facilitating rapid and effective implementation of control measures to prevent further spread and protect public health.
Intersectoral collaboration	Intersectoral collaboration is the coming together of different people, organizations and sectors to work together to understand and solve complex issues.
One Health	One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent.
Outbreak	An outbreak or an epidemic is defined as the occurrence in a community of cases of an illness clearly in excess of expected numbers
Outbreak Investigation	An outbreak investigation is a systematic and coordinated approach to identify the source, mode of transmission, and contributing factors of a disease outbreak or public health event. The primary objective is to implement appropriate control measures to prevent further spread and mitigate the impact on public health.
Vector-borne diseases	Diseases transmitted by arthropod vectors like mosquitoes, ticks, or flies, which serve as intermediate hosts for disease-causing pathogens.
Zoonotic diseases	Diseases caused by infectious agents that can be transmitted between animals and humans, often involving animal reservoirs or vectors
Lead department	The department that is the responsible for taking the lead during an outbreak investigation

Purpose of the SOP

The purpose of this Standard Operating Procedure (SOP) is to establish a standardized framework for coordinating joint outbreak investigations under the One Health Programme in Kerala. It serves as a comprehensive guide to ensure timely and effective multisectoral and multidisciplinary collaboration, aimed at preventing, preparing for, and responding to zoonotic disease outbreaks at all levels. The document outlines procedures for developing or updating an integrated approach to zoonotic pathogen preparedness, ensuring an equitable and robust response.

This SOP focuses on the operationalization of the One Health approach, facilitating coordination across various sectors and agencies. It provides clear guidelines for early detection, rapid response, and the implementation of control measures to mitigate the spread of zoonotic diseases, emerging infectious diseases, and other public health threats, thereby safeguarding human, animal, and environmental health.

Furthermore, the SOP offers practical steps to establish linkages and coordinated multisectoral mechanisms to address both existing and emerging zoonotic diseases at the state and district levels. It has been developed based on ongoing learning and remains subject to periodic revisions as necessary.

Chapter 1 **: Introduction**

The chapter gives a brief introduction to the SOP for Joint Outbreak Investigation. It contains the following subheadings:

A. Objectives
B. Scope of SOP
C. Steps in Outbreak Investigation
D. Chain of Infection
E. Disease prioritisation

This Standard Operating Procedure (SOP) outlines the framework and procedures for conducting joint outbreak investigations within the One Health Program in Kerala. Recognizing the interconnectedness of human, animal, and environmental health, this SOP emphasizes collaboration among various stakeholders to effectively respond to outbreaks and prevent the spread of diseases. All information provided in the SOP is a combination of details drawn from the World Health Organization (WHO) fact sheets and compiled original material from experts.

A. Objectives

- To establish a standardized approach for coordinating joint outbreak investigations among different sectoral departments of One Health Programme in Kerala.
- To enhance the capacity for early detection, rapid response, and mitigation of disease outbreaks.

B. Scope of SOP

This SOP applies to all outbreak investigations involving zoonotic diseases, emerging infectious diseases, and other public health threats with potential impacts on human, animal, and environmental health in Kerala.

At present, the Disease Surveillance Officer (DSO) at the District Level, a functionary of the Health Department is the sole person authorised to declare an outbreak of a disease in humans. In this document Health and Family Welfare is considered as lead department to co-ordinate the outbreak investigations in the concerned Geographical Area. The document is framed in such a way that, outbreak investigations focus more on human health or diseases which affect human existence are given more priority. However, in the event of a Kyasanur Forest disease outbreak, the Forest & Wildlife department is the Nodal department. Additionally, the Animal Husbandry Department will be the Nodal department during an Avian Influenza outbreak.

C. Steps in Outbreak Investigation

Outbreak Investigation involves 3 phases namely,

- Descriptive phase: This phase of outbreak investigation involves collecting and analysing data to describe the outbreak in terms of time, place, and person.
- Explanatory phase: This phase of outbreak investigation aims to identify the source of the outbreak and the mode of transmission by developing and testing hypotheses.

- Response phase: This phase of outbreak investigation focuses on implementing control measures to prevent further spread of the disease and to minimize its impact on the community.

Figure 1 outlines the phases of outbreak investigation. A diagrammatic representation of the steps involved in outbreak investigation is given in Figure 2.

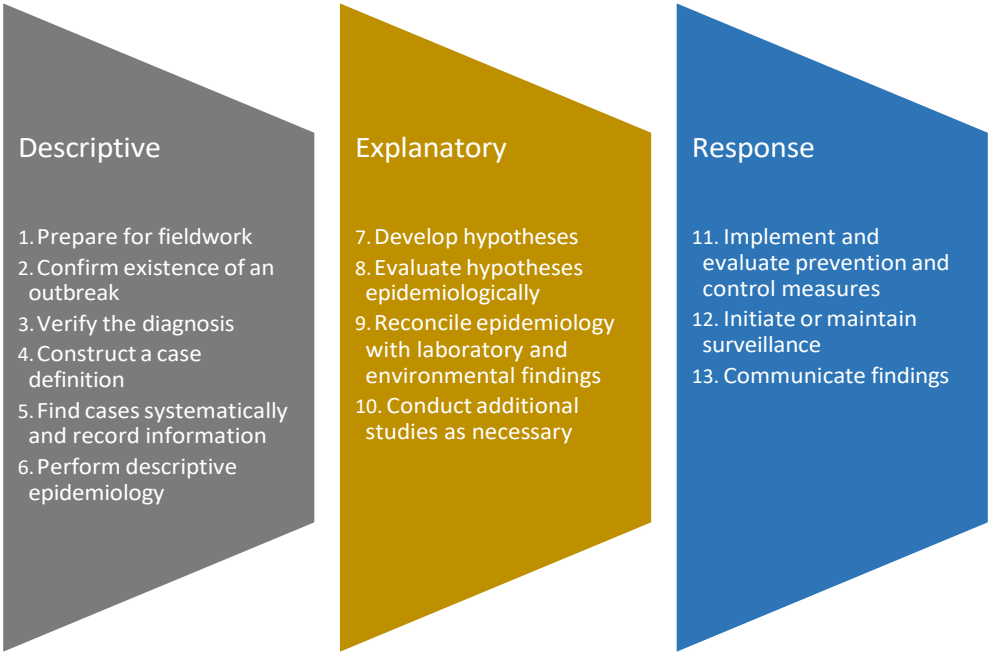


Figure 1: Phases in outbreak investigation

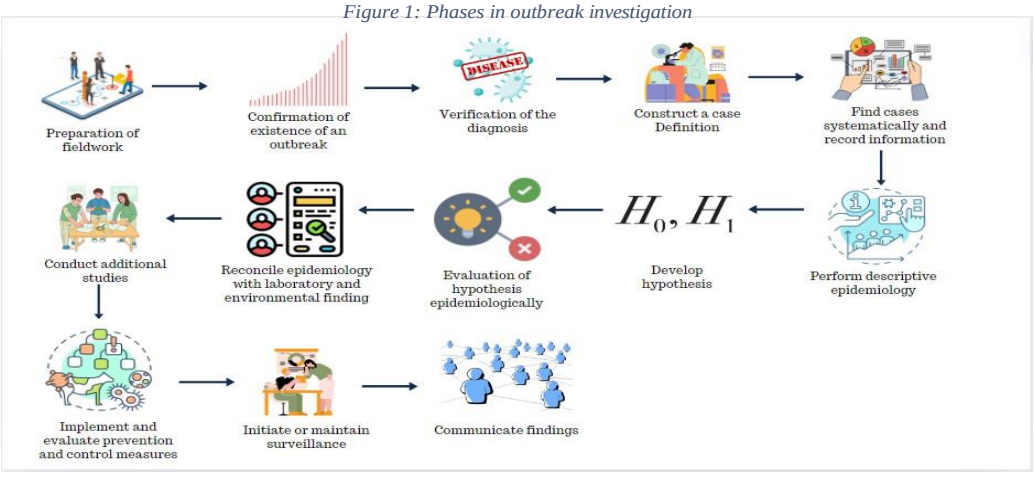


Figure 2: General steps in outbreak investigation

General steps in outbreak investigation

1 Preparation of Fieldwork

- This initial step involves planning and organizing resources, such as personnel, equipment, and logistics, required for the investigation. Teams prepare to gather data, visit affected areas, and ensure they are equipped to address the outbreak. This step is crucial for ensuring an efficient and coordinated response.

E.g. In the event of a suspected leptospirosis outbreak, this step can include formation of multidisciplinary team for field work comprising of staff from Health, Animal Husbandry, Irrigation, Agriculture, LSG and other relevant departments along with community volunteers

2 Confirmation of existence of an outbreak

- This step involves confirming whether an outbreak is occurring. It requires identifying whether the number of cases is higher than expected in a particular population or region. This includes verifying the validity of the cases to ensure that there is a genuine outbreak, not just a false alarm.

E.g. In the event of a suspected leptospirosis outbreak Health department can compares incidence with that of previous years, to determine the existence of an actual outbreak. Animal husbandry department can communicate whether there has been an uptick in leptospirosis cases among animals and compare with previous year incidence.

3 Verification of the diagnosis

- In this step, the reported cases are checked whether they are accurate and consistent with the suspected disease. It involves reviewing clinical findings, laboratory results, and epidemiological data to confirm the diagnosis, ruling out misreporting or unrelated conditions that could skew the investigation.

E.g. In the event of a suspected avian influenza outbreak, team members from Animal Husbandry collect samples from suspected birds for laboratory testing. Team members from Health collect samples from humans exposed to the birds for testing. Team members discuss the findings from tests and departments at higher levels are informed by the respective team members

4 Construct a Case Definition

- A standardized case definition is created to categorize individuals as being affected by the outbreak based on specific clinical, epidemiological, and laboratory criteria.

E.g. A case definition is established based on clinical symptoms (fever, rash, muscle pain) for humans and animals residing in the affected area during the outbreak.

5 Find Cases Systematically and Record Information

- Field work team actively search for and identify individuals affected by the outbreak. They systematically collect and record detailed information about each case. Accurate record-keeping is vital for data analysis.

E.g. A questionnaire is developed to collect details of the cases such as symptoms, travel history, and potential exposure sites.

6 Perform Descriptive Epidemiology

- The data gathered is analysed using descriptive epidemiological methods. This step involves reviewing the "person, place, and time" characteristics of the outbreak: who is affected, where cases are occurring, and when they developed symptoms. This analysis helps in identifying patterns and trends. Spot maps may be prepared for geographical visualisation of the cases.

E.g. An epidemic curve shows a sharp rise in cases over the past few weeks. Spot maps reveal a cluster of cases in a specific neighbourhood.

7 Develop Hypothesis

- Based on the descriptive analysis, plausible explanations regarding the cause of the outbreak i.e. hypotheses are generated to explain the cause, source, and transmission of the outbreak.

E.g. A hypothesis that the stagnant water which is a breeding ground for mosquitoes is the source of the dengue outbreak in the neighbourhood.

8 Evaluation of Hypothesis Epidemiologically

- This step involves systematically testing the initial hypothesis to identify the actual cause of the outbreak. This process typically requires an in-depth analysis of data gathered from affected individuals and evidence from field investigation that point to the potential sources and modes of transmission which helps narrow down the true source.

E.g. during an outbreak of foodborne illness at a community event, an initial hypothesis may suggest that a contaminated dish was responsible. Epidemiologists would compare disease rates among individuals who consumed different foods, perhaps finding that those who ate a particular salad had significantly higher illness rates. Through this method, the team would either confirm the initial hypothesis or adjust it if another food item showed a stronger association, allowing them to identify the true cause with greater certainty. This rigorous, evidence-based approach is essential to target control measures effectively and prevent further spread.

9 Reconcile Epidemiology with Laboratory and Environmental Findings

- The epidemiological data is reconciled with laboratory and environmental testing results. This alignment helps to confirm the source of the outbreak.

E.g. Laboratory tests confirm dengue virus from some samples, aligning with the increase in cases and identified breeding sites.

10 Conduct Additional Studies

- If necessary, further studies are conducted to gather additional evidence to refine the understanding of the outbreak.

E.g. Geospatial mapping pinpoints high-risk areas with potential breeding sites

11 Implement and Evaluate Prevention and Control Measures

- Control measures are put in place to prevent further spread of the disease. The effectiveness of these measures is monitored and evaluated.

E.g. Fogging with an insecticide is carried out in the affected area. Community education campaigns raise awareness about mosquito breeding sites and preventive measures like using mosquito nets.

12 Initiate or Maintain Surveillance

- Surveillance is either initiated or the existing surveillance system is strengthened and maintained to monitor the situation.

E.g.: Community volunteers are asked to report fever cases in their vicinity.

13 Communicate Findings

- Once the investigation is complete, the findings are communicated to stakeholders, including public health authorities, the public, and other relevant agencies. Effective communication ensures that lessons learned are shared, and preventive measures can be implemented to reduce the risk of future outbreaks.

E.g. A report outlining the investigation, findings, and implemented control measures is sent to relevant authorities

D. The Chain of Infection

The chain of infection refers to process by which an infection spreads from an individual or place to another. It consists of six links, each of which must be connected for an infection to occur. Figure 2 illustrates the six-key links to the chain of infection.

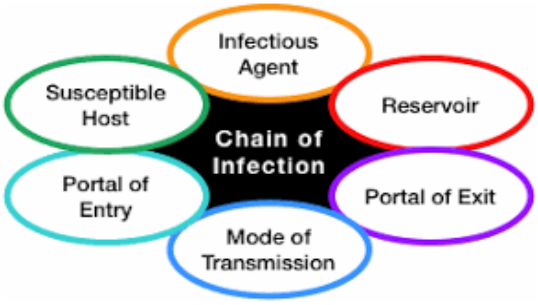


Figure 3: Links in the chain of infection

1. **The Infectious agent:** The pathogen that causes the disease.
2. **Reservoir:** The places in the environment where the pathogen lives including people. Animals and insects, medical equipment and soil and water.
3. **Portal of exit:** The way the infectious agent leaves the reservoir such as open wounds, aerosols and splatter of body fluids including coughing, sneezing and saliva.
4. **Mode of transmission:** The way the infectious agent can be passed on such as through direct or indirect contact, ingestion, or inhalation.

5. **Portal of entry:** The way through which the infectious agent can enter a new host such as broken skin, the respiratory tract, mucous membrane, catheters and tubes.
6. **Susceptible host:** Any vulnerable person/ animal.

E. Disease prioritisation

A detailed assessment of the communicable disease scenario in Kerala over the past decade was done using data sourced from the Integrated Disease Surveillance Programme (IDSP) by the Directorate of Health Services, Kerala. The disease prioritisation involved the shortlisting of diseases which have public health significance in terms of severity, morbidity and mortality. The One Health approach, by promoting collaboration across human, animal, and environmental health sectors, proves essential in mitigating the impact of these diseases and safeguarding public health.

The diseases selected were:

1. **Dengue:** The State saw a surge in Dengue cases in the year 2017 and cases have come down since then. However, suspected dengue cases have surfaced in recent years.
2. **Leptospirosis**: Cases of leptospirosis surged from 1,029 in 2020 to 2,482 in 2022, with 121 deaths reported in 2022. There have been 49 mortality events associated with probable Leptospirosis in 2023 as well.
3. **ADD, Hepatitis A, Hepatitis E and other Foodborne / waterborne illnesses**: Foodborne and waterborne illnesses such as Acute Diarrhoeal Disease (ADD), food poisoning, Cholera, Typhoid, Hepatitis A, Hepatitis E, and Shigellosis also pose significant challenges in Kerala. Although ADD cases peaked in 2018 and 2019 with 541,532 cases and minimal mortality, food poisoning remains a persistent issue. The fluctuating numbers of Cholera, Typhoid, and Hepatitis (Hepatitis A, Hepatitis E) cases further emphasize the need for a One Health approach to enhance sanitation, food safety, and disease surveillance.
4. **Nipah:** The State has witnessed sporadic outbreaks of Nipah since 2018. Twenty cases were reported between 2018 and 2021.
5. **Avian Influenza:** Although no human cases of avian influenza have been reported, the State witnesses yearly outbreaks among poultry which underscores the need to remain vigilant in the event of a spill over.
6. **Japanese Encephalitis (JE):** With more than 30 cases of JE being reported in 2011, cases have come down in recent years. However, cases of Acute Encephalitic Syndrome (AES) have been reported in recent years.
7. **Kyasanur Forest Disease (KFD):** Kerala has seen notable KFD cases in recent years, including three fatalities. However, there is a decrease in KFD cases in Kerala from 2020 to 2022.
8. **Chikungunya:** Although there have been no mortality events linked to Chikungunya in the State, cases have been reported consistently since 2011.
9. **Scrub Typhus**

Chapter 2 : **Departments to be engaged in Outbreak Investigation for various diseases**

In this chapter a matrix that can guide in the engagement of various departments in the outbreak investigation of specific diseases are provided

The table below shows the involvement of various departments in the outbreak investigations for different diseases and departments involved in Joint Outbreak investigations (JOI). Each department's participation is indicated with checkmarks or stars. Other departments shall be involved as per need. The lead department is expected to initiate and lead the outbreak investigation proceedings for the particular disease. The lead department has been selected as such as the activities involved under that disease come under their respective jurisdiction. For eg. Avian Influenza outbreaks are initially reported among poultry and therefore comes under the purview of the Animal Husbandry department.

Diseases	Health	Animal Husbandry	Agriculture	Forest & Wildlife	Fisheries	Water Authority/ Irrigation / Groundwater	Food Safety	LSG	Tribal department
Kyasanur Forest Disease(KFD)	✓	✓		★				✓	✓
Avian Influenza	✓	★	✓	✓		✓	✓	✓	
Leptospirosis	★	✓	✓			✓		✓	✓
ADD, Hep A, Hep E and other Foodborne / waterborne illnesses.	★	✓	✓		✓	✓	✓	✓	✓
Dengue	★		✓		✓	✓		✓	✓
Japanese Encephalitis	★	✓	✓			✓		✓	✓
Chikungunya	★		✓		✓			✓	✓
Nipah	★	✓	✓	✓			✓	✓	✓
Scrub Typhus	★	✓	✓	✓			✓	✓	✓

✓ - Departments to be engaged | ★ - Lead department

Chapter 3 : **General Reporting Mechanism during an outbreak**

This chapter outlines a basic flowchart indicating the reporting mechanism during an outbreak

The diagram below outlines the general reporting mechanism during an outbreak, where a trigger event leads to reporting by community volunteers or other grassroot sources to the nodal department at different levels (local, district, state), which then coordinate with other relevant departments.

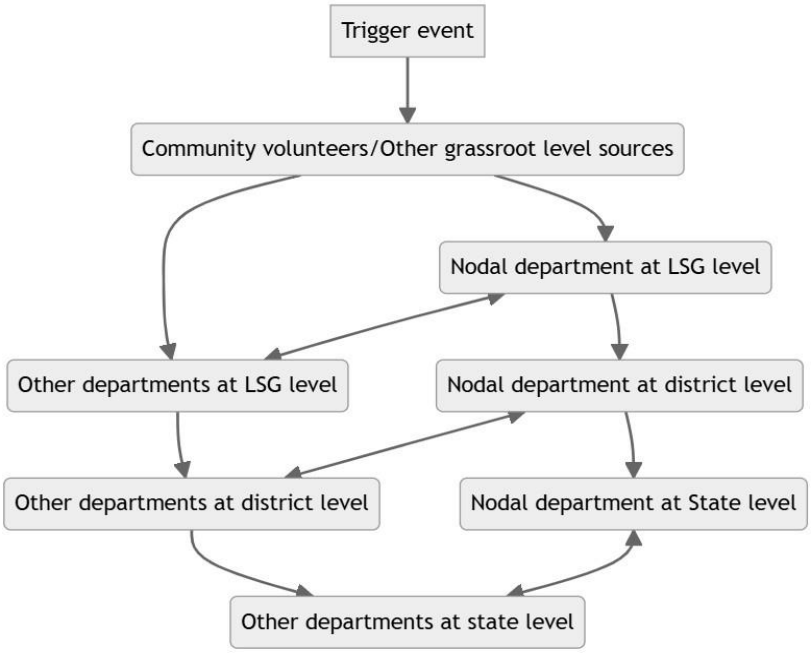


Figure 4: General reporting mechanism during an outbreak

The general reporting format for the prioritised diseases attached as Annexure I and short format for reporting attached as Annexure II. The contact details of Nodal Officers of One Health Programme attached as Annexure III.

Chapter 4 : **Pre-requisites for Outbreak Investigation**

This chapter on prerequisites for an outbreak investigation covers the essential aspects that can ensure a well-organized and efficient outbreak investigation process. It contains the following subheadings:

A. Confirmation of an outbreak
B. Details to be collected
C. Resources and Capacity building
D. Community based Surveillance
E. Resource pooling and management
F. Intersectoral Collaboration
G. Planning and Implementation of routine Joint Outbreak Investigations

A. Confirmation of an outbreak

An outbreak is defined as the occurrence in a community of cases of an illness clearly in excess of expected numbers. Confirmation of an outbreak is a crucial step that sets the outbreak investigation in motion. This confirmation can be done by assessing disease incidence at the same time in previous years through data available from Integrated Disease Surveillance Programme (IDSP) / Integrated Health Information Platform (IHIP). However, for some diseases like Kyasanur Forest Disease (KFD) and Nipah, even a single case is considered as an outbreak.

B. Details to be collected

During an outbreak investigation, after the construction of a case definition the information given in the table below, regarding each case needs to be collected such that the details regarding time, place and person are captured effectively. Analysis of data from previous outbreak can also help in the development of this tool for data collection.

• Name • Age • Sex • Contact information • Ward/village of residence • Location (Longitude, Latitude)	• Date of onset of symptoms • Date of confirmation • Symptoms based on case definition • Co-morbidities • Risk factors (activities, behaviour, travel history etc)

C. Resources and Capacity building

A Public Health Event (PHE) reporting system and a platform for data sharing between sectors within the Local Self-government (LSG) needs to be established. This can be co-ordinated by the Block Public Health Unit (BPHU), Animal Husbandry department (AHD) and other departments with regular reporting to One Health Committee (OHC).

Staff from concerned sectors need to be given routine training (either once in a month or prior to a potential outbreak by a public health specialist) on management of One Health PHEs, including simulation exercises like mock drills and tabletop exercises.

D. Community based surveillance

Instances pointing to potential outbreaks are generally reported via grassroots level workers / community volunteers to the LSG through which other stakeholder at LSG level such as Medical Officer, Jurisdictional Veterinary Officer etc. are notified. Following this a field investigation is done by the concerned staff and the information is passed to the authorities at the District Level. Data entry into the Integrated Disease Surveillance Programme (IDSP) / Integrated Health Information Platform (IHIP) is done consequently.

The IHIP by the Ministry of Health and Family Welfare (MoHFW) has a provision for Community reporting of outbreak events. However, at present timely access to this data is limited for Local, District and State level authorities. Moreover, the platform is not suitable for local users as it does not support all native languages.

The One Health Programme has identified and trained Community volunteers for Community Based Surveillance (CBS). CBS can detect Early Warning Signs of disease outbreaks and thereby fast track the outbreak investigation and response through community engagement.

E. Resource pooling and management

The financial resources needed for outbreak investigation have to be pooled in by concerned departments based on the responsibilities and activities planned. Additional resources shall be raised by LSGBs from their emergency management fund. With regard to finance management, further guidelines shall be obtained from concerned departments.

F. Intersectoral Collaboration

State, District and LSG level one health committees are to be constituted as per G.O.(Rt)No. 399/2022/H&FWD dated 19.02.2022 available at https://dhs.kerala.gov.in/wp-content/uploads/2022/06/One-Health-Guidelines-GO-Rt-399-2022-Health.pdf . A framework for collaboration and communication during disease outbreaks is provided at the end of the SOP for each disease. Establishment of coordination and communication mechanisms between human and animal health authorities, local governments, and other relevant sectors is the key to ensure One Health approach for comprehensive disease surveillance and response.

The responsibilities of each department are summarised as below:

Responsibilities of each department/stakeholders	
Health department	● Coordinate outbreak response efforts and lead the overall investigation process. ● Conduct epidemiological investigations, including case identification, contact tracing, and data analysis. ● Implement control measures to limit the spread of disease among human populations.

	• Sharing of data as per need • Coordination of activities at district level by Disease Surveillance Officer (DSO)
Animal Husbandry department	• Provide expertise in animal health and zoonotic diseases. • Conduct surveillance in animal populations to detect disease outbreaks and assess potential risks to human health. • Participate in the investigation of animal cases and facilitate sample collection for laboratory testing. • Sharing of data as per need
Department of Forestry and Wildlife	• Monitor and report unusual morbidity and mortality events in wildlife populations. • Participate in field investigations involving wildlife or forest ecosystems. • Provide expertise in wildlife ecology and management. • Sharing of data as per need
Department of Fisheries	• Monitor and report unusual morbidity and mortality events in aquatic animals and fish populations. • Participate in field investigations involving aquatic ecosystems and fish health. • Provide expertise in fisheries and aquatic ecosystems. • Sharing of data as per need
Department of Irrigation	• Monitor and manage water resources, including irrigation systems, to prevent contamination. • Provide expertise in water management and infrastructure. • Sharing of data as per need • Coordinate with Water authority and Ground water department as and when necessary
Food Safety department	• Monitor and regulate food production, distribution, and sales to ensure food safety and prevent foodborne illnesses. • Participate in investigations of foodborne outbreaks. • Provide expertise in food safety and hygiene practices.

	• Sharing of data as per need
LSGD	• Coordinate the detection, response and management of the outbreak at the local self-governing body (LSGB) level. • Mobilize local resources and community engagement. • Facilitate communication and collaboration between local stakeholders and other government departments. • Sharing of data as per need
Agriculture department	• Monitor and report unusual morbidity and mortality events in livestock populations. • Participate in field investigations involving animal health and agricultural ecosystems. • Provide expertise in livestock management and agricultural practices. • Sharing of data as per need
Community Volunteers/Mentors	• Observe the surroundings and identify unusual health hazardous events and incidents and share information to local health authorities or and the PRI officials. • Support responses on a need-based manner.

G. Planning and Implementation of routine Joint Outbreak Investigation

Joint outbreak investigation will be a routine activity during outbreaks and there are 3 major facets to it which must be considered during its routine planning and implementation which are:

- **Case reporting:** Initial reports of unusual cases or deaths come from various sources
- **Planning:** This involves intimating stakeholders, conducting inter departmental meetings, resource planning, drawing up of maps
- **Response:** Activities such as field visits to find and collect information on cases, sample collection and testing, implementation of prevention and control strategies and

communication to the government and the public regarding the findings of the investigations and interventions done.

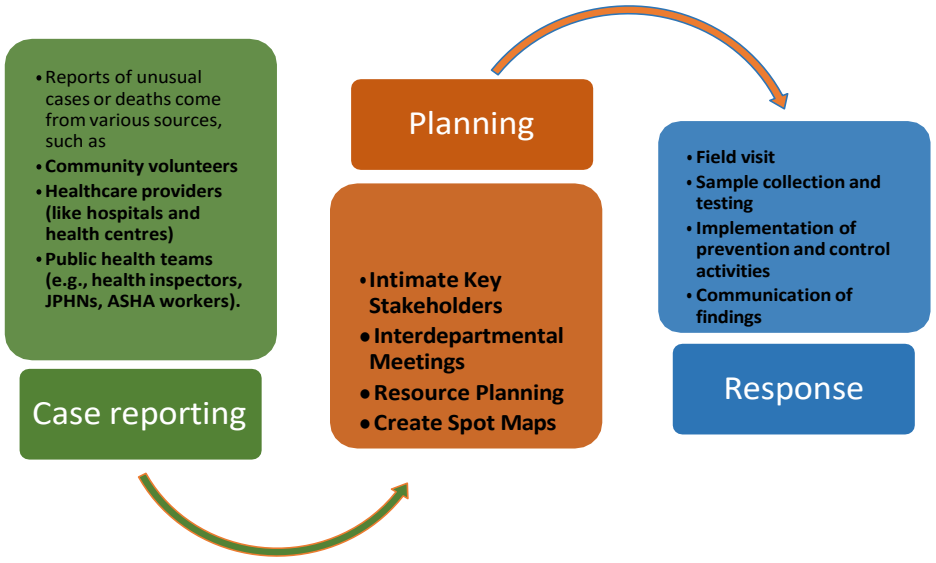


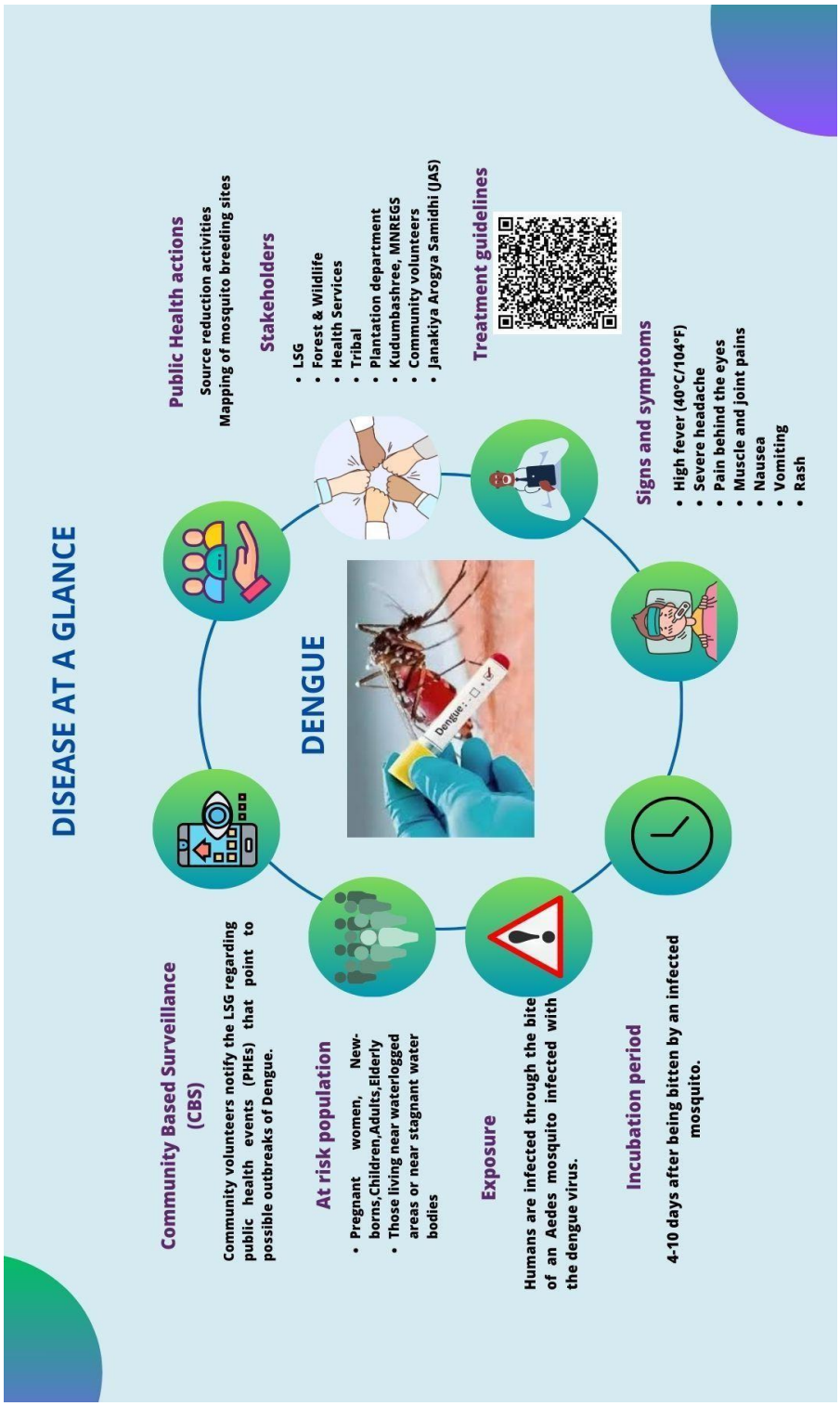
Figure 5: Facets to routine joint outbreak investigations

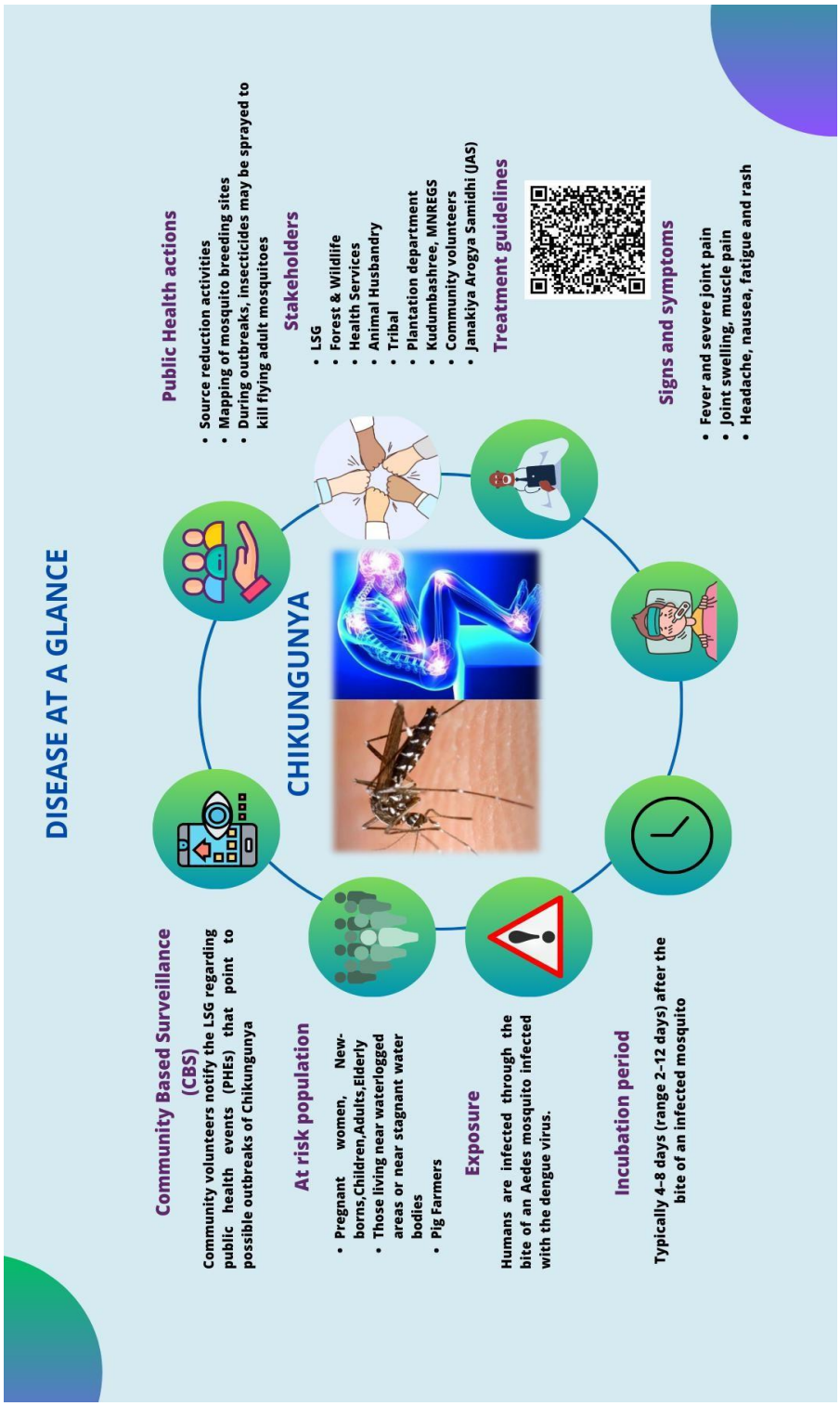
- **Share Findings and Recommendations**: Ensuring that the community receives a summary of findings and actionable recommendations builds trust and shows respect for their involvement in the process. This transparency can encourage cooperation in future initiatives.

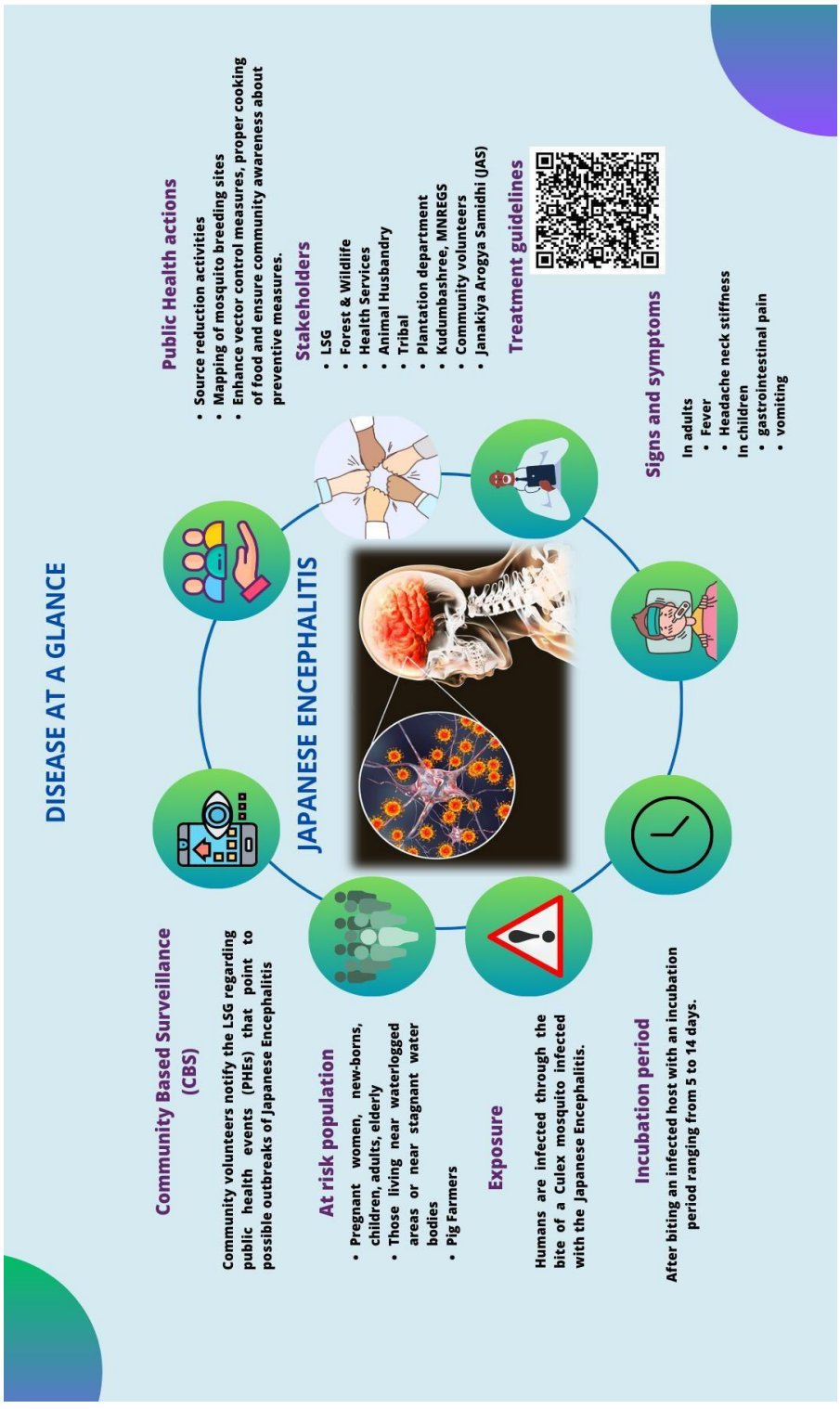
Chapter 5 : SOP for Joint Outbreak Investigation of Vector Borne Illnesses (Dengue, Chikungunya, Japanese Encephalitis)

The following pages contain the SOP for Joint Outbreak Investigation of Vector Borne Illnesses. The three prioritised vector borne illnesses are Dengue, Chikungunya and Japanese Encephalitis. The SOP consists of the following components:

1. Disease at a glance for Dengue, Chikungunya, Japanese Encephalitis (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during a vector borne disease outbreak


DISEASE AT A GLANCE
DENGUE
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of Dengue.
At risk population
• Pregnant women, New-borns,Children,Adults,Elderly
• Those living near waterlogged areas or near stagnant water bodies
Exposure
Humans are infected through the bite of an Aedes mosquito infected with the dengue virus.
Incubation period
4-10 days after being bitten by an infected mosquito.
Public Health actions
Source reduction activities
Mapping of mosquito breeding sites
Stakeholders
• LSG
• Forest & Wildlife
• Health Services
• Tribal
• Plantation department
• Kudumbashree, MNREGS
• Community volunteers
• Janakiya Arogya Samidhi (JAS)
Treatment guidelines
Signs and symptoms
• High fever (40°C/104°F)
• Severe headache
• Pain behind the eyes
• Muscle and joint pains
• Nausea
• Vomiting
• Rash


DISEASE AT A GLANCE
CHIKUNGUNYA
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of Chikungunya
At risk population
• Pregnant women, New-borns,Children,Adults,Elderly
• Those living near waterlogged areas or near stagnant water bodies
• Pig Farmers
Exposure
Humans are infected through the bite of an Aedes mosquito infected with the dengue virus.
Incubation period
Typically 4–8 days (range 2–12 days) after the bite of an infected mosquito
Public Health actions
• Source reduction activities
• Mapping of mosquito breeding sites
• During outbreaks, insecticides may be sprayed to kill flying adult mosquitoes
Stakeholders
• LSG
• Forest & Wildlife
• Health Services
• Animal Husbandry
• Tribal
• Plantation department
• Kudumbashree, MNREGS
• Community volunteers
• Janakiya Arogya Samidhi (JAS)
Treatment guidelines
Signs and symptoms
• Fever and severe joint pain
• Joint swelling, muscle pain
• Headache, nausea, fatigue and rash


DISEASE AT A GLANCE
JAPANESE ENCEPHALITIS
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of Japanese Encephalitis
At risk population
• Pregnant women, new-borns, children, adults, elderly
• Those living near waterlogged areas or near stagnant water bodies
• Pig Farmers
Exposure
Humans are infected through the bite of a Culex mosquito infected with the Japanese Encephalitis.
Incubation period
After biting an infected host with an incubation period ranging from 5 to 14 days.
Public Health actions
• Source reduction activities
• Mapping of mosquito breeding sites
• Enhance vector control measures, proper cooking of food and ensure community awareness about preventive measures.
Stakeholders
• LSG
• Forest & Wildlife
• Health Services
• Animal Husbandry
• Tribal
• Plantation department
• Kudumbashree, MNREGS
• Community volunteers
• Janakiya Arogya Samidhi (JAS)
Treatment guidelines
Signs and symptoms
In adults
• Fever
• Headache neck stiffness
In children
• gastrointestinal pain
• vomiting

A. Early Warning Signs

- Cases of high fever, vomiting, altered sensorium, disorientation, and dehydration.
- Animals: stillbirth, mummified foetus in piglets.
- Presence of mosquito breeding grounds – stagnant water in drains etc.
- High density of Culex mosquitoes
- Presence of amplifying hosts such as pigs, water birds (active surveillance/community surveillance), etc.
- Reporting of a suspect case or increase in suspect cases with clustering in time and space, which do not fit into the expected known endemicity or seasonality of JE in a given area.
- Fluctuations in ecological conditions conducive for vector breeding and enhanced adult density of JE vectors Presence of amplifying host in good number Detection of viral activity in vector
- Detection of viral activity in zoonotic reservoirs(s)
- The meteorological department predicted high rainfall and an unusual increase in the adult vector density.
- Relative increase in pig population and water-frequenting birds
- Unusual deaths in piglets (JE) - stillbirth, abortions, mummified in pigs (JE), death of migratory birds-Scope of community surveillance
- Virus detected in the suspected animal hosts and in mosquitoes can also act as an indicator for warning of a forthcoming outbreak.
- Rumours - Phone calls, Media, social media, LSGD, Informal reporting from bird watchers
- Death of crows & Ducks-West Nile fever

B. Reporting mechanism

Early warning signs of outbreak can be obtained from community volunteers and other grassroot level functionaries or from surveillance mechanisms such as IHIP-IDSP reporting, through S, P, L forms. reports from private hospitals (through IHIP or email), rumour register maintained in institutions.

Early warning signs regarding JE may be obtained from farmers / veterinarians who observe stillbirth in pigs.

Educational institutions /offices must report to govt authority – concerned MO.

Public health – based on this follow up action shall be initiated at LSG level by all relevant units

C. Responsibilities during an outbreak

Department/ Stakeholder	**Roles and responsibilities**
Health services	Logistics, transport, diagnostics, human resources, IEC/BCC. Formulate questionnaires, training of HR, IT support
LSG	Finance, community participation, law enforcement, IEC/BCC, Human Resource
Kudumbashree	Human Resource, IEC/BCC activities
MNREGS	HR, minor engineering works
Forest & wildlife	Support in field work in difficult to reach areas
Labour department	Identification of migrant sites, IEC/BCC, law enforcement
Tribal department	Linkage to the community, IEC/BCC, Case finding
Plantation department	Source reduction, Human Resource
Community volunteers	Identify potential breeding places, clustering of fever cases, suspicious cluster of cases (more than 2 houses in neighbourhood where disease is reported)
Janakiya Arogya Samidhi (JAS)	Involved in detection of source and reporting of illnesses to LSG and other line departments at that level.

D. Treatment

Dengue

At the time of publication, treatment guidelines for Dengue are as per G.O. (Rt)No.1654/2023/H&FWD dated 10-07-2023 available https://dhs.kerala.gov.in/wp-content/uploads/2023/07/Dengue-Fever_Treatment-and-Referral-Guidelines_July-2023.pdf.

Chikungunya

At the time of publication, treatment guidelines for Chikungunya are as per National Guidelines for clinical management of Chikungunya available at https://ncvbdc.mohfw.gov.in/Doc/National%20Guidelines%20for%20Clinical%20Management%20of%20Chikungunya%20Fever%202023.pdf.

Japanese Encephalitis

At the time of publication, treatment guidelines for JE are as per "Clinical Management of Japanese Encephalitis" available at https://ncvbdc.mohfw.gov.in/WriteReadData/l892s/Clinical_Management-JE.pdf.

However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. Steps in outbreak investigation.

1. Preparation of field work

Community volunteers involved in CBS can inform the LSG regarding Early Warnings Signs of the outbreak and inform the LSG. The Rapid Response Team (RRT or Jagratha Samithi) comprising of Medical Officer, other health workers, LSGI members, Community volunteers and representatives from other line departments (like AYUSH, LSGD, Water authority, Plantations, Tribal department, Labour department etc.) can form the team for field work. Upon receiving information about the outbreak, a meeting of this RRT shall be convened at the LSG level and duties can be assigned to each.

2. Confirmation of existence of an outbreak

In case of dengue the data should be compared with previous 3 years data of dengue cases in the area and thus the existence of outbreak needs to confirm.

Every suspected JE case needs to be investigated in areas of low JE endemicity. However, in places where JE is endemic, the term outbreak can be applied to an unusual increase in suspected JE cases compared to the standard transmission or increase beyond the normal range

due to Seasonal variations. The health services department confirms the outbreak by comparing surveillance data from previous years.

Based on the previous 2 years of surveillance data, the health service department confirmed the existence of chikungunya outbreak. The outbreak criteria mentioned in the national guidelines for clinical management of Chikungunya mentions one or more cases in an area where no case was reported before.

3. Verification of the diagnosis

For the Public Health action, it is not mandatory to confirm the diagnosis of each and every suspected Dengue/Chikungunya case. However, Laboratory confirmation of the suspected cases would be required to validate the clinical diagnosis of the suspected cases. Confirmation of a few cases would be enough to identify the cause of the fever outbreak. Out of the reported suspected Dengue fever cases, 5-10% blood samples should be randomly collected for Laboratory test. In case, any blood sample is found positive serologically for Dengue IgM antibody the respective area (sub-centre/ ward) should be declared as having confirmed outbreak of Dengue. There is no need for taking additional blood samples for laboratory diagnosis of Dengue from that sub-centre area/Ward and clinically suspected cases should be treated as Dengue.

4. Construct a case definition

Dengue

Probable/ suspected case:

- A case compatible with clinical description* of dengue fever during outbreak

AND/OR

- Non-ELISA based NS1 antigen/ IgM positive (RDT).
- (RDT reports are considered as probable due to poor sensitivity and specificity of currently available RDTs)

*Clinical description: Acute febrile illness of 2-7 days with any one of the following: Nausea, vomiting, rash, headache, retro orbital pain, myalgia or arthralgia.

Confirmed case:

A probable case with at least one of the following tests done in the acute phase of illness showing direct evidence i.e., Virus isolation / Presence of viral RNA by RT-PCR or Indirect evidence by showing the presence of virus specific IgM antibodies in single serum sample collected in acute or convalescent stage or four-fold increase in IgG values in samples collected at least three weeks apart.

Japanese Encephalitis

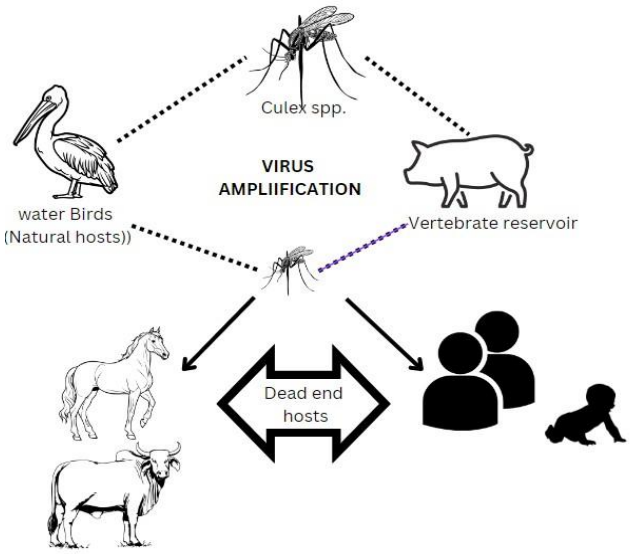


Figure 4: Transmission of Japanese Encephalitis

Suspected case:

- Acute onset of fever, not more than 5-7 days.
- Change in mental status with/ without
  - New onset of seizures (excluding febrile seizures)
  - Other early clinical findings may include irritability, drowsiness or abnormal behaviour greater than that seen with usual febrile illness

Probable Cases

Suspected case in close geographic and temporal relationship to a laboratory-confirmed case of AES/JE in an outbreak

Laboratory-Confirmed case:

A suspected / probable case with any one of the following markers:

- Presence of IgM antibody in serum and/ or CSF to a specific virus including JE/EnteroVirus or others
- Fourfold difference in lgG antibody titer in paired sera
- Virus isolation from brain tissue
- Antigen detection by immunofluorescence
- Nucleic acid detection by PCR In the sentinel surveillance network,

AES/JE will be diagnosed by lgM Capture ELISA, and virus isolation will be done in National Reference Laboratory.

Acute Encephalitis Syndrome due to other agent
A suspected case in which diagnostic testing is performed and an etiological agent other than AES/JE is identified.

Acute Encephalitis Syndrome due to an unknown agent
A suspected case in which no diagnostic testing is performed / no etiological agent is identified / test results are indeterminate

Chikungunya
Probable/ suspected case: Any individual with acute onset of fever and severe arthralgia / arthritis with or without skin rash and residing or having left an epidemic area 15 days prior to onset of symptoms not explained by other medical conditions.

Confirmed case: A probable case with at least one of the following tests done in the acute phase of illness showing direct evidence i.e., Virus isolation / Presence of viral RNA by RT-PCR or Indirect evidence by showing the presence of virus specific IgM antibodies in single serum sample collected in acute or convalescent stage or four-fold increase in IgG values in samples collected at least three weeks apart.

5. Finding cases systematically and record information

The questionnaire for active case search to be developed by the health service department. The questionnaire should contain questions to collect socio-demographic details, clinical features including date of onset of illness, travel history, vector indices, possible breeding sources of the vector etc.

Sample case sheet for Chikungunya used by WHO is available at https://cdn.who.int/media/docs/default-source/outbreak-toolkit/outbreaktoolkit_caseinvestigationform_chikungunya.pdf?sfvrsn=79af451f_1 .

6. Perform descriptive epidemiology

Based on the data collected a descriptive epidemiological analysis can be done with respect to time, place, and person. An Epi Curve can be made to describe the time distribution of cases. Spot maps/ plethograph can be created for geographical distribution of cases. Age and sex distribution, occupation, comorbidity status etc. and other relevant risk factors can also be described descriptive epidemiology.

7. Develop hypothesis

Based on the findings of the descriptive epidemiology a hypothesis can be developed.

8. Evaluation of hypothesis epidemiologically

Epidemiological possibilities of correlated hypotheses will be evaluated.

9. Reconcile epidemiology with laboratory and environmental findings

The findings from descriptive epidemiology and analytical epidemiology shall be reconciled and can conduct additional surveys if necessary.

10. Conduct additional studies

- Geospatial mapping of epidemiologically identified hotspots
- Dengue serotyping and vector studies

11. Implement and evaluate prevention and control measures

After Receiving the warning signals and investigating a suspected outbreak, the containment measures should automatically be rolled out. The rapid response team should be mobilized and start immediate containment action. To minimize the mortality and reduce CFR prompt and appropriate clinical management of suspected JE cases is essential. Cases Occurring in the periphery needing specialized care should be referred to the referral centre immediately. Some of the measures detailed below will be useful for managing the JE outbreak. Daily monitoring of the outbreak, cases, and deaths. Besides early referral of cases to higher treatment centres. Daily Report to state/ National Health authorities. The local health authorities, particularly the PHC Medical officer and district health officials, must be aware of the disease profile in their area. As the overt incidence of JE in a village in a given season does not exceed more than 2 cases, the local health personnel and the community at large must be alerted about reporting the occurrence of any fever case with altered sensorium. Sensitize the community and staff regarding JE and its prevention and control. Immediate and ongoing activities to be undertaken as part of prevention and control measures are given in the table below:

Stakeholder	Immediate Activities	Ongoing/Long-Term Activities
Health Department	• Surveillance and monitoring • Case management and treatment • Laboratory testing and diagnosis	• Public health education and awareness campaigns • Vector control programs • Strengthening surveillance systems
Animal Husbandry Department	• Surveillance of livestock for vector-borne diseases • Vaccination of livestock against relevant diseases • Treatment of infected animals • Biosecurity measures in livestock farms	• Regular monitoring of vector populations in livestock areas • Collaboration with LSG and health department for integrated vector management
Local Self-Governance (LSG) Bodies	• Source reduction activities (e.g., removal of stagnant water, cleaning drains • Fogging and spraying operations in affected areas	• Regular inspection and maintenance of public spaces • Solid waste management and disposal

	• Community mobilisation and participation in control efforts • Enforcement of sanitation bylaws	• Capacity building of LSG staff for vector control
Agriculture Department	• Surveillance of agricultural fields for vector breeding sites • Promotion of integrated pest management practices • Awareness campaigns among farmers	• Collaboration with other departments for integrated vector management
Irrigation Department	• Maintenance of irrigation canals and reservoirs to prevent water stagnation	• Regular cleaning of water bodies to remove debris and vegetation • Promotion of water conservation practices • Collaboration with other departments for integrated vector management

As JE is a vector-borne disease, the control measures include vector control measures. NVBDCP has issued guidelines on integrated vector management; the link is shared below.

https://ncvbdc.mohfw.gov.in/Doc/Guidelines/Manual-Integrated-Vector-Management-2022.pdf .

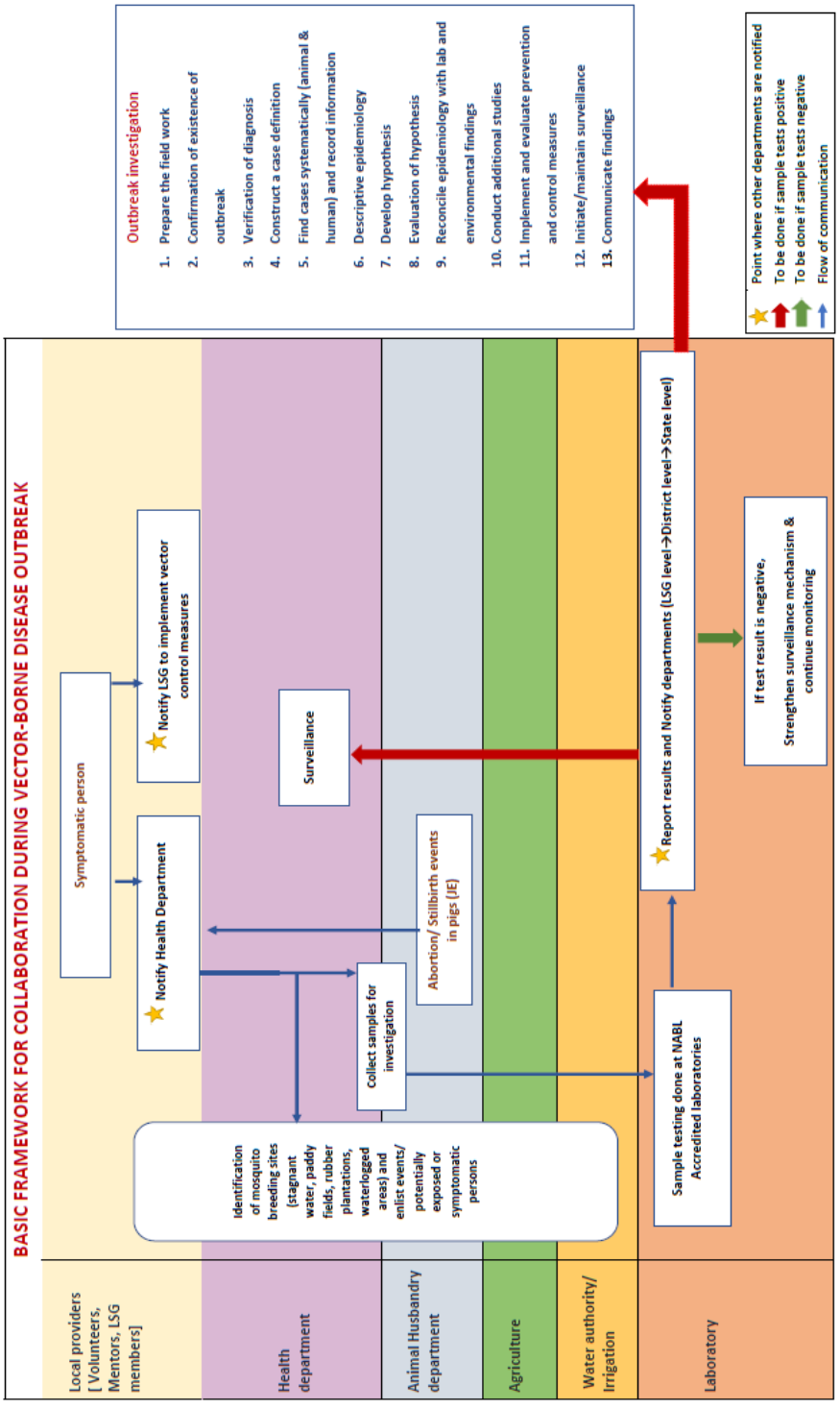
Along with these, personal protective measures shall also be adopted at the individual level for the prevention of disease.

12. Initiate and maintain surveillance

Community-based surveillance can be strengthened with the help community volunteers and grassroots level health workers. Seasonal surveillance would need to be enhanced, focusing on high-risk areas. Public awareness campaigns, Continuous vector control measures are essential to prevent disease transmission and ensure effective response.

13. Communicate findings

The report of the outbreak investigation shall be communicated to the respective department heads, LSGD secretary, District Administration, State IDSP cell and all the other concerned departments.



Basic Framework for Collaboration during vector- borne disease outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Service

Chapter 6 : SOP for Joint Outbreak Investigation of Leptospirosis

The following pages contain the SOP for Joint Outbreak Investigation of Leptospirosis. The SOP consists of the following components:

1. Disease at a glance for Leptospirosis (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during a leptospirosis outbreak

DISEASE AT A GLANCE
LEPTOSPIROSIS
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of leptospirosis
At risk population
• People who work outdoors or with animals, such as farmers, sewer workers, dairy farmers, veterinarians, rice and sugarcane field workers.
• Recreational hazard for participants of sports involving water or muds
Exposure
Broken skin or mucous exposure to urine or tissues from infected animals or contact with water or soil contaminated with urine of infected animals. Often occurs as an aftermath of rains or flooding Direct person-to person transmission is rare.
Incubation period
5-14 days (range 2-30 days)
Public Health actions
• Organize community clean-up events
• Promote proper waste management
• Educate pet owners about leptospirosis
• Raise awareness about safety precautions through social media
Stakeholders
• Local self government
• Health
• Animal Husbandry
• Forest & Wildlife
• Agriculture
• Irrigation
• Tribal
• MGNREGS workers
• Community volunteers
Treatment guidelines
Signs and symptoms
• Fever
• Chills
• Headache
• Muscle aches
• Coughing
• Vomiting
• Diarrhoea

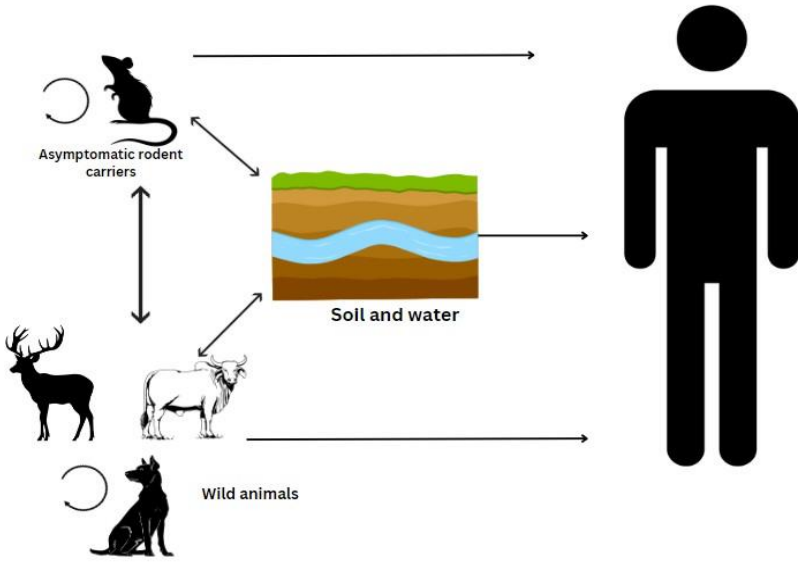


Figure 5:Transmission of Leptospirosis

A. Early Warning Signs

- Presence of standing water, especially in urban areas, that could be contaminated with animal urine.
- Reports of people with fever, chills, muscle aches, and vomiting especially among those who would have come in contact with stagnant water like MGNREGS, agricultural and daily wage labourers.
- Fever with myalgia / headache/ calf muscle pain among high-risk groups.
- Reports of symptoms suggestive of leptospirosis in dogs such as fever, anorexia, jaundice, decreased urine output etc and symptoms of leptospirosis in farm animals like abortion, mastitis, reduced milk yield etc.

B. Reporting mechanism

Sources of Information of disease can be community volunteers involved in CBS and other grassroot level functionaries or from review of surveillance data of health and AHD, Clinician or laboratory reports of unusual diagnoses, reports from the public etc. All confirmed and probable cases are to be reported to the District Surveillance Officer and the DHS. Directorate

of Animal Husbandry shall be notified by the jurisdictional veterinary officer via the Chief Veterinary Officer in case of animal cases.

C. Responsibilities during an outbreak

Department/ Stakeholders	**Responsibilities**
LSG	• Interdepartmental communication • Procurement and maintenance of Logistics • Evaluation of the actions taken in the One Health Committee (OHC) constituted at LSG level and give necessary suggestions • Control room Establishment • IEC activities
Forest & Wildlife	Notifying other line departments, case finding
Animal Husbandry	• Case finding and sero-surveillance • Routine Surveillance among domestic animals and mapping of hot spots
Health services	Establishment of Public Health Event reporting system and platform for data sharing between sectors within the local body coordinated by the Block Public Health Unit (BPHU) and AHD, with regular reporting to OHC.
Agriculture	• The Agriculture department will be actively involved in the environmental evaluation and control activities. • IEC Activities
Water Authority/Irrigation	• Environmental evaluation, • IEC Activities
Education	Awareness creation among public and specifically live-stock farmers and pet owners and those at occupational risk.
MGNREGS	IEC Activities, Case finding
Community Volunteers	Alert to people in waterlogged areas, IEC Activities
Tribal Department	IEC Activities, Case finding

Rapid Response Teams (RRT) / Jagratha Samithis, OH community mentors and Volunteers can be trained for PHEs and be included in the joint outbreak investigation teams.

Staff and Volunteers from concerned sectors will be given routine training on management of One Health PHEs, including simulation exercises like mock drills and tabletop exercises.

D. Treatment

At the time of publication, treatment guidelines are as per G.O. (Rt)No.2108/2022/H&FWD dated 25-8-2022 available at https://dhs.kerala.gov.in/wp-content/uploads/2022/08/G.O.Rt-No.-2108-2022-HFWD-dated-25-08-2022-Treatment-Guidelines-For-Leptospirosis-disease-Orders-issued.pdf . However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. Steps in outbreak investigations

1. Preparation for fieldwork

- Team formation based on type of event
- Learn about the disease
- Make necessary administrative, personnel, and logistical arrangements
- Coordinate with partner agencies and local contacts

Team:

- Clinicians from Health and AHD
- Epidemiologist
- Lab Technician
- Staff from Irrigation / Agriculture/ Disaster Management
- Community volunteers

2. Confirmation of existence of an outbreak

The occurrence of more cases of a disease than expected for a particular place and time

- Review the reports or data
- Confirm that cases are the same disease
- Confirm that the number of cases exceeds the usual or expected number

3. Verification of diagnosis

- Evaluate the Clues to Verify the Diagnosis
- Whether laboratory confirmation obtained
- Whether clinical presentation consistent with diagnosis
- Signs and symptoms

- Clinical laboratory findings
- Clinical course
- Whether exposure compatible, e.g., to a known case?

4. Construct a case definition

Suspected case:

- Epidemiological link/ Risk exposure*
- clinical signs and symptoms consistent with leptospirosis: abrupt onset of fever, chills, conjunctival suffusion, headache, myalgia, jaundice, cardiac or renal failure, and pulmonary haemorrhage.

Probable case:

- suspected case and the presence of Leptospira immunoglobulins type M (IgM) in one serum sample detected by serology (e.g., Immunoglobulin M (IgM) enzyme-linked immunosorbent assay (ELISA)).
- Presumptive laboratory findings, but without confirmatory laboratory evidence of *Leptospira* infection.

Confirmed case:

• a suspected case confirmed by laboratory test as follows:

  – seroconversion or a four-fold or higher rise in titre detected by serological techniques (e.g.,microscope agglutination technique (MAT)2 or IgM ELISA) in consecutive serum samples.

or

  – detection of Leptospira DNA from a clinical specimen by polymerase chain reaction (PCR).

or

  – demonstration of Leptospira spp. in tissue.

* Exposure Criteria for Epidemiologic Linkage

Cyclone and/or flooding, exposure events such as adventure sports, Occupational exposure

5. Find cases systematically and record information

- Contact health facilities
- Contact laboratories
- Contact community health workers
- Contact other districts
- Talk to patients
- Record Information Systematically — Line List

A sample case report form for Leptospirosis used by WHO is available at https://cdn.who.int/media/docs/default-source/outbreak-toolkit/outbreaktoolkit_caseinvestigationform_leptospirosis_eng.pdf?sfvrsn=cc529a8_1 .

Identify Contacts / Other Potentially Exposed Persons

Identify persons who may have been exposed to the same source as the patient. If any are ill, inform them (or their physician) of possible exposure, in order to facilitate proper diagnosis and therapy. Anyone meeting the probable case definition (i.e., clinically compatible illness sharing a common exposure with the case) should be reported and investigated in the same manner as the case.

6. Perform descriptive epidemiology

Clinical Features

- Symptoms – what patient feels
- Signs – what the clinical exam reveals
- Laboratory results
- Definitive diagnosis
- Clinical results

Time Place Person

- Time (epidemic curve)
    - Ideally: when were they infected
- When did they become ill
- Ideally: where were they infected
    - More commonly: where do they live, work
    - Place (spot map, shaded map)
- Person (tables)
    - Who was infected
    - Numerators and denominators
    - What do the cases have in common

Identify Potential Sources of Infection

Ask the case about contact with animals, particularly if known to be infected, and exposure to water, mud, or soil e.g., recreational water exposures, drinking untreated water, occupational hazards, etc.

7. Develop hypotheses

- Hypothesis (in context of outbreak) = educated guess about an association between an exposure and outcome, and/or about mode of spread
- Hypothesis should be in a form that allows it to be tested
- Subject matter knowledge – known sources, vehicles, transmission modes
- Review descriptive epidemiology – what would account for most?
- Outliers (unique exposure opportunities)
- Talk to case-patients – what do they think

- What do local health officials think

8. Evaluate hypotheses epidemiologically

- Compare hypothesis with collected evidence
- Laboratory evidence
- Clinical evidence
- Environmental evidence
- Epidemiologic evidence

9. Reconcile epidemiology with laboratory and environmental findings

In case of an outbreak situation, risk factor analysis, hot spot mapping, serovar identification, and high-risk behaviour mapping may be done.

10. Conduct additional studies

Periodic sero surveillance in pets and livestock

11. Implement and evaluate prevention and control measures

Stakeholder	Immediate Activities	Ongoing/Long-Term Activities
Health Department	• Surveillance and monitoring • Case management and treatment • Laboratory testing and diagnosis	• Public health education and awareness campaigns • Strengthening surveillance systems
Animal Husbandry Department	• Surveillance of livestock for leptospirosis • Vaccination of livestock and pets • Treatment of infected animals • Biosecurity measures in livestock farms	• Maintaining communication with LSG and health department regarding cases in animals
Local Self-Governance (LSG) Bodies	• Source reduction activities (e.g., removal of stagnant water, cleaning drains • Community mobilisation and participation in control efforts • Enforcement of sanitation guidelines	• Regular inspection and maintenance of public spaces • Evaluation of Waste Management practices • Provision of appropriate Personal Protective Equipment (PPE) for MGNREGA and sanitation workers

	• Evaluation of sanitation and hygiene practices among farmers, NREGs workers and others at risk • Report recreational water associated cases to the local environmental health division	
Agriculture Department	• Surveillance of agricultural workers • Awareness campaigns among farmers • Rodent control • Evaluation of sanitation and hygiene practices among farmers	• Collaboration with other departments
Irrigation Department	• Maintenance of irrigation canals and reservoirs to prevent water stagnation • Drain potentially contaminated waters and soil when possible	• Regular cleaning of water bodies to remove debris and vegetation • Collaboration with other departments

Prevention Recommendations:

Prevention involves avoiding contact with potentially infected animals and contaminated water and soil.

1. If drinking water is being collected from a source potentially contaminated by flood water or exposed to urine from infected animals, treat by boiling or appropriate chemical methods before drinking.
2. Do not swim, wade, bathe, submerge your head in, or swallow flood or fresh water that might be contaminated with animal urine.
3. Persons with occupational or recreational exposure to potentially infected animals, water or soil should wear protective clothing, boots, and gloves.
4. Do not feed wildlife or attract wildlife to homes or yards.
5. Prevent rodent infestation by keeping food, water, and trash in closed containers and trapping any rodents that you see. Rodent-proof homes and outbuildings. Avoid eating food to which rodents may have had access.
6. Persons exposed to the same source as the case should be educated about symptoms of leptospirosis to facilitate prompt diagnosis and treatment if they become ill.

Doxycycline may be effective in preventing leptospirosis in adults exposed in high-risk areas[1].

Management of Contacts / Others Exposed

The infection is not routinely spread person-to-person

Leptospirosis in Animals

Animal infections are reportable to the health department from the State Animal husbandry Department and vice versa. The primary mode of transmission of leptospirosis from pets to humans is through direct or indirect contact with contaminated animal tissues, organs, or urine. People in contact with the infected animal (owners, clinicians, kennel workers, etc.) should be provided the following information:

- Avoid contact with urine, blood or tissues from the infected animal until it has received treatment.
- Veterinarians or others who have contact with infected material from the animal should wear protective clothing.
- Wash your hands after handling your pet or anything that might have your pet's excrement on it. If you are cleaning surfaces that may be contaminated, use an antibacterial cleaning solution or 1-part bleach to 10 parts water.
- Make sure your infected pet takes all its medicine and follow up with your veterinarian.
- Maintain symptom watch for 30 days after last exposure and tell your healthcare provider about exposure if symptoms consistent with leptospirosis occur.

12. Initiate /maintain surveillance

Environmental Evaluation/Management

Based on potential sources identified, further evaluation for contaminated water, poor sanitation, animal rearing practices, hygiene of farmers, rodent problem etc will be done.

Case finding and Sero-surveillance among domestic animals maybe done by AHD department

13. Communicate findings

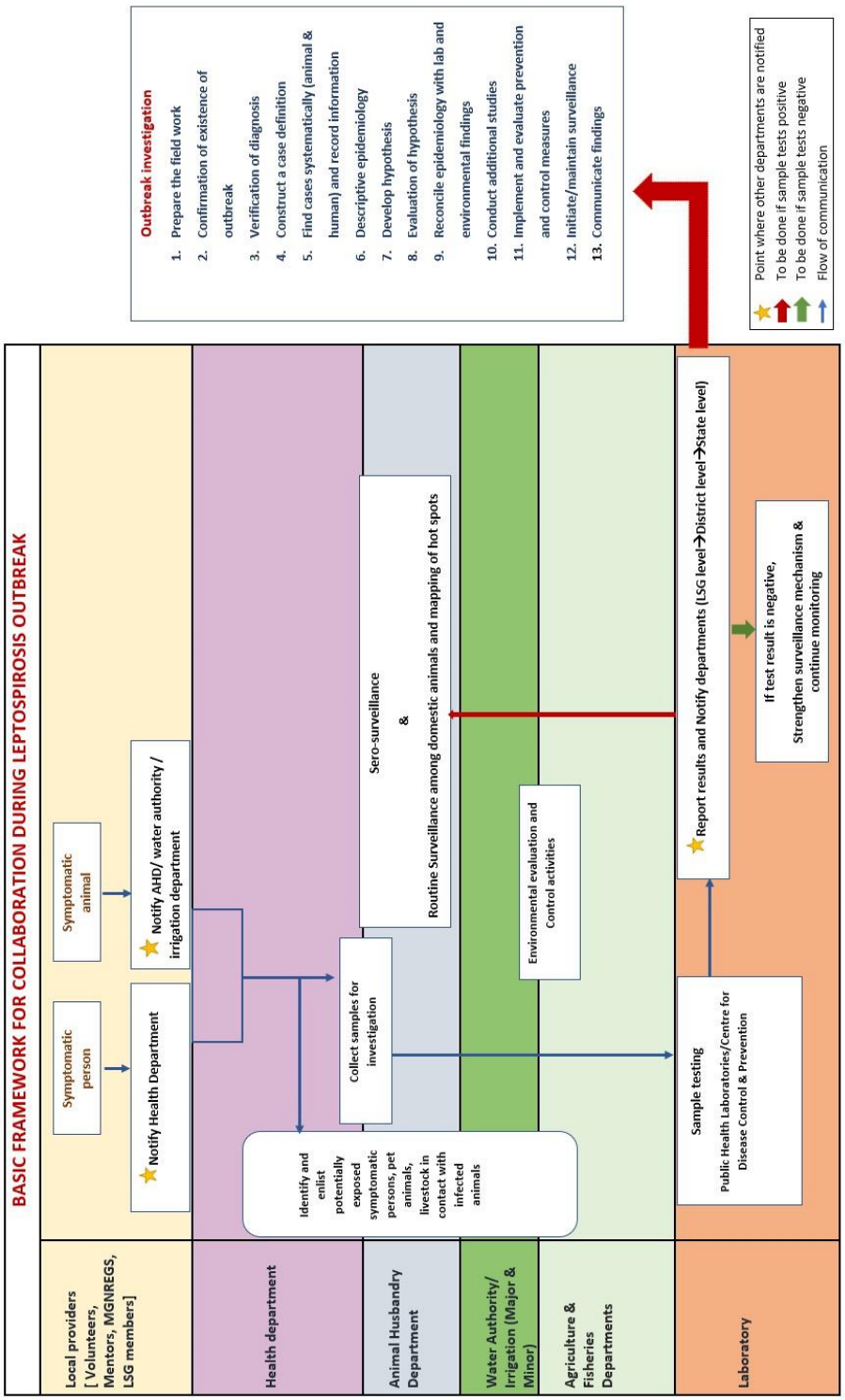
Internal Communication

- Data integration (DHS/ AHD/ LSGs/ and allied stakeholders)
- Periodic review of activities & control measures (DC/ DHS/ AHD/ District OH committee/ State OH committee/ State Zoonoses Committee)

External Communication

I.E.C. activities to create awareness about the disease and its control. (Action: LSGDs/ DHS/ AHD)

[1] Sehgal et al., "Randomized Controlled Trial of Doxycycline Prophylaxis against Leptospirosis in an Endemic Area."



Basic framework for collaboration during leptospirosis outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Service

Chapter 7 : SOP for Joint Outbreak Investigations of ADD, Hepatitis A, Hepatitis E and other Foodborne / Waterborne illnesses

The following pages contain the SOP for Joint Outbreak Investigation of ADD, Hepatitis A, Hepatitis E and other foodborne / waterborne illnesses. The SOP consists of the following components:

1. Disease at a glance for foodborne / waterborne illnesses (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during a foodborne / waterborne illnesses outbreak

DISEASE AT A GLANCE
FOOD BORNE/WATER BORNE ILLNESSES
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of food/water borne diseases.
Vulnerable population
Infants, children
pregnant women, Elders
Exposure
• Through ingestion of contaminated food or water, or through person-to-person contact, especially in settings with poor hygiene and sanitation.
• Outbreaks are common in areas with inadequate water treatment and food safety practices.
Incubation period
Varies widely depending on the pathogen but generally ranges from a few hours to a few days.
Public Health actions
• Raise awareness on causes, symptoms & prevention of food and water-borne illnesses.
• Promote safe water practices, such as boiling drinking water or using water purification tablets.
• Educate the community on proper food handling, preparation, and storage practices to prevent foodborne illnesses.
Stakeholders
• LSG
• Food safety
• Animal Husbandry
• Health Services
• Water authority/ Irrigation
• Police department
• Community volunteers
Treatment guidelines
Signs and symptoms
• Acute diarrhoea
• Abdominal pain
• Fever
• Fatigue
• Vomiting

A. Early Warning Signs

- Reports of gastrointestinal illness in people who have consumed at the same restaurant/event/schools/canteens/hostels or consumed the same food product.
- Reports of illness in food handlers
- Reporting sale of stale food and stale fish/meat
- Report cases of usage of non-potable water for cooking
- Report of use of non-edible ice for juice / shakes / welcome drink
- Food safety violations in food establishments, such as improper food handling, processing or storage
- Reports of gastrointestinal illness in people who have consumed contaminated water
- Presence of algae blooms or other signs of contamination in local water sources
- Waste dumping near or at water bodies
- Mass fish deaths in water bodies

B. Reporting Mechanism

An institutional mechanism needs to be established at each level and in the concerned department to address the outbreak adequately.

a) Intersectoral Rapid Response Team at all levels

Level	Stakeholder	Responsibilities
State level	Directorate of Health Services	• Oversee the actions • Decision making • Protocol making • Reporting other departments
	Food Safety Department Water/Irrigation Authority	
District level	Food safety Officers District Surveillance Units Water/Irrigation department	• Oversee action at LSG level • HR to inform the state.
Block level	Block public health units having an Epidemiologist, Block MO, HS and other staff	• To oversee the process • To give technical expertise • To be discussed in detail
Panchayat level	MO in charge	Overall coordination. Team leader

	Food safety department & Fisheries department	Environmental investigation, sample collection & testing
	Water authority	Environmental investigation, water sample collection & testing Control measures implementation
	Healthcare providers of Peripheral Health Institutions	Active case finding (epidemiological survey) Case management Risk communication
	NABL Accredited Laboratory under each level of various departments ● Fisheries ● PCB ● CWRDM ● DST facilities ● Labs in Stakeholders departments	Confirmation of the pathogen
	Veterinary Officer	Monitoring of illnesses in livestock and pet animals

C. Responsibilities during an outbreak

Stakeholders / departments	**Responsibilities**
LSG	● Interdepartmental communication ● Procurement and maintenance of Logistics (PPE) ● Control room Establishment
Forest & Wildlife	● Notifying other line departments ● Finding cases
Animal Husbandry	● Disease notification ● Finding cases
Health Services	● Facilitate the transport of specimens to Regional or State Public Health Laboratories for confirmatory testing ● Disease notification ● Finding cases ● Notifying Block Public Health Unit

	• In every outbreak the local health authority shall initiate outbreak investigation response at their level. They shall report the same to Block Public Health Unit and District Surveillance Units (DSU). The DSU shall decide on conducting Outbreak Investigations at its level and shall seek support from PEID (Prevention of Emerging and Infectious Diseases) cells.
Education	IEC activities
RRT	Rapid Risk Assessment. • Situation analysis • Confirm the Outbreak • Probable diagnosis • Prepare the plan of action • Review activity weekly until the situation is over or until double the disease's incubation period
Food Safety	• Sample collection and testing • Identification of and action against eateries serving contaminated food • Monitoring of reports regarding unsafe food in eateries
Water Authority/ Irrigation / Groundwater Department	• Sample collection and testing • Identification of contaminated water source and appropriate disinfection procedures • Water quality monitoring
Police department	Support the implementation of laws & orders related to food & waterborne outbreaks.
Community volunteers	clustering of cases of ADD, open air defecation, reporting functions (juice stall), sewage flowing into water bodies, improper disposal of solid and liquid waste

D. Treatment

At the time of publication, treatment guidelines for dehydration in diarrhoeal diseases are as per the guidelines released by the Health Service Department, Govt. of Kerala available at https://dhs.kerala.gov.in/wp-content/uploads/2020/06/ort080513.pdf . However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. General steps for Outbreak Investigation

1. Preparation of fieldwork

Fieldwork team can include medical officer and grassroot level workers such as JHI, LSG level officers, jurisdictional veterinary officer, community volunteers etc. The stakeholders are mentioned in section C above.

2. Confirm the existence of an outbreak

This is done by comparing the disease frequencies during the same period of previous years in that particular population in the community. An arbitrary limit of two standard deviations is used to define the epidemic thresholds. Declaration is to be done by DSO.

If the cases are more than expected, or there is a large number of unusual presentations (severe or unusual presentation), or a large number of cases with unknown sources, or there is death, the situation can be declared an outbreak.

3. Verification of Diagnosis

A quick verification has to be done to confirm the diagnosis, and it will help prevent the misinterpretation of signs & symptoms by the lay public or a wrong diagnosis by any spurious laboratory reports. Laboratory investigations should be used to confirm the diagnosis wherever possible. Expert opinion is also needed for final confirmation of the diagnosis.

4. Case definition & classification

Case definition must include components such as time, place and person. A person (who?) living in town / city (where?) with diarrhoea (≥ 3 loose stools in 24 hours) and any one of the following symptoms – abdominal pain, nausea and vomiting (what?) – and date of onset of symptoms from the date (when?) and not travel history (who? where?).

Case classification for some common food and water borne illnesses are given below

Hepatitis A.

Case Classification

1. Suspected case: Discrete onset of an acute illness with signs/symptoms of acute infectious illness (e.g. fever, malaise, fatigue) associated with:
    i. Clinical signs of liver damage: anorexia, nausea, jaundice, dark urine, right upper quadrant tenderness, or
    ii. Raised alanine aminotransferase (ALT) levels more than ten times the upper limit of normal laboratory levels).
2. Probable case: Not applicable
3. Confirmed case: A suspected case with:
    a. Laboratory confirmation: Immunoglobulin M (IgM) anti-HAV (hepatitis A virus) positive or
    b. An epidemiological link with a confirmed case.

Hepatitis E

1. Suspected case: Discrete onset of an acute illness with signs/symptoms of acute infectious illness (e.g. fever, malaise, fatigue) associated with:
    a. clinical signs of liver damage: anorexia, nausea, jaundice, dark urine, right upper quadrant tenderness, or
    b. raised alanine aminotransferase (ALT) levels more than ten times the upper limit of normal laboratory levels).
2. Probable case: Not applicable
3. Confirmed case:
    a) laboratory confirmation: Immunoglobulin M (IgM) anti-HEV (Hepatitis E) positive;2 or
    b) an epidemiological link with a confirmed case.

Cholera

Clinical case description: In an area where Cholera is **not endemic**:

Severe dehydration or death from acute watery diarrhoea in a patient aged ≥ 5 years

OR

In an area where Cholera is **endemic**:

Acute watery diarrhoea, with or without vomiting, in a patient aged ≥ 5 years

Case classification

1. Suspect: A case that meets the clinical case description.
2. Probable: Not applicable
3. Confirmed: A suspected case that is laboratory-confirmed

Laboratory criteria for diagnosis: Isolation of Vibrio cholerae 01 or 0139 from the stool samples of a patient with diarrhoea.

5. Find cases systematically and record information

Purpose:

- Define the area (High-risk area)
- Make the line list of the affected and suspected population
- Identify the development of new cases

Where to do **an Active case search**

· Community – House-to-house visit

· Public and private hospitals or primary healthcare centres

· People at risk: school children, nursing homes, mass gatherings

Search in all places where affected or susceptible cases are probable within the incubation period of the index case. The search for new cases (secondary cases) should be carried out every day till the area is declared free of the epidemic, which will be twice the incubation period of the diseases since the occurrence of the last case.

How to do an Active case search

Prepare an Epidemiological case sheet or use a standardised questionnaire to interview the people.

The line list should have ID, age, Name, sex, phone number, residence with geographical coordinates, clinical information (chronologically- time and date of onset), food consumed with date and time

Standard questionnaire for foodborne disease outbreak use by WHO is available at https://iris.who.int/bitstream/handle/10665/43771/9789241547222_eng.pdf .

6. Perform descriptive epidemiology

Descriptive data analysis in terms of time, place, person

Time:

- Identify the type of the epidemic curve
- Describe the incubation period. Minimum maximum and median IP. Foreknowledge of IP shall help in agent identification
- Seasonality variation
- Climate

Place

- Geospatial mapping – spot maps may be prepared
- Clustering of the cases
- Extend of the cases
- Source -Locate the source and its relation with the cases
- Health facilities- Government & private

Person

- Demographic characteristics
- Behaviour
- History of visit to place of outbreak

7. Develop hypothesis

- Based on the descriptive data analysis generates a hypothesis. It should include
- Total number of confirmed cases, suspected cases, susceptible population (High-risk group).
- Index case,

- Incubation period,
- clinical features,
- laboratory details and environmental investigation findings.
- Most probable source
- Mode of Transmission
- Common vehicle

8. Evaluate the hypotheses

Analytical epidemiological methods such as case-control & retrospective cohort can be used.

9. Reconcile epidemiology with environmental and laboratory findings

Food sample and environmental samples such as water should be tested periodically.

10. Conduct additional studies

A case control or retrospective study may be conducted

11. Implement and evaluate prevention and control measures

Immediate and ongoing prevention and control measures to be implemented by various stakeholders are given in the table below.

Stakeholder	**Immediate Activities**	**Ongoing/Long-Term Activities**
Health Department	• Case management and treatment • Laboratory testing and diagnosis	• Public health education and awareness campaigns • Strengthening surveillance systems • Promotion of water, sanitation, and hygiene (WASH) practices
Local Self-Governance (LSG) Bodies	• Source reduction activities (e.g., removal of solid waste, cleaning drains • Ensure the premises are cleaned and equipment and food contact surfaces are sanitized. To enforce environmental sanitation • Community mobilisation and participation in control efforts • Enforcement of sanitation guidelines	• Regular inspection and maintenance of water supply systems • Solid waste management and disposal • Evaluation of Waste Management practices • Capacity building of LSG staff for water quality monitoring and control

Food safety Department	• Removing implicated foods from the market (food recalls, Food seizure
	• Closing food premises or prohibiting the sale of food
	• Inspection of the affected site using an inspection checklist based on schedule 4 of FSS (Licensing & Registration of Food Business Regulation 2011)
	  ○ Sampling
	  ○ Transportation
	  ○ Testing of the samples
	• Awareness campaigns on food safety and hygiene
		• Enforcement of food safety standards and guidelines
		• Capacity building of food safety inspectors
		• Periodic inspection of eateries
		• Hygiene inspection in markets
		• Organoleptic testing (appearance, odour & texture eye, fins, gills,)
		• Chemical testing – formalin & ammonia

Irrigation Department	• Maintenance of irrigation canals and reservoirs to prevent water stagnation
	• Regular cleaning of water bodies to remove debris and vegetation
		• Collaboration with other departments for integrated water resource management
		• Monitoring and surveillance of water supply system keeping in mind the following factors:
		  ○ Water source
		  ○ Abstraction points and distribution network
		  ○ Treatment processes (Including frequency and method of disinfection)
		  ○ Storage tanks
		  ○ Location of potential contamination sources

12. Initiate or maintain surveillance

Continuing surveillance, environmental survey, both active and passive surveillance

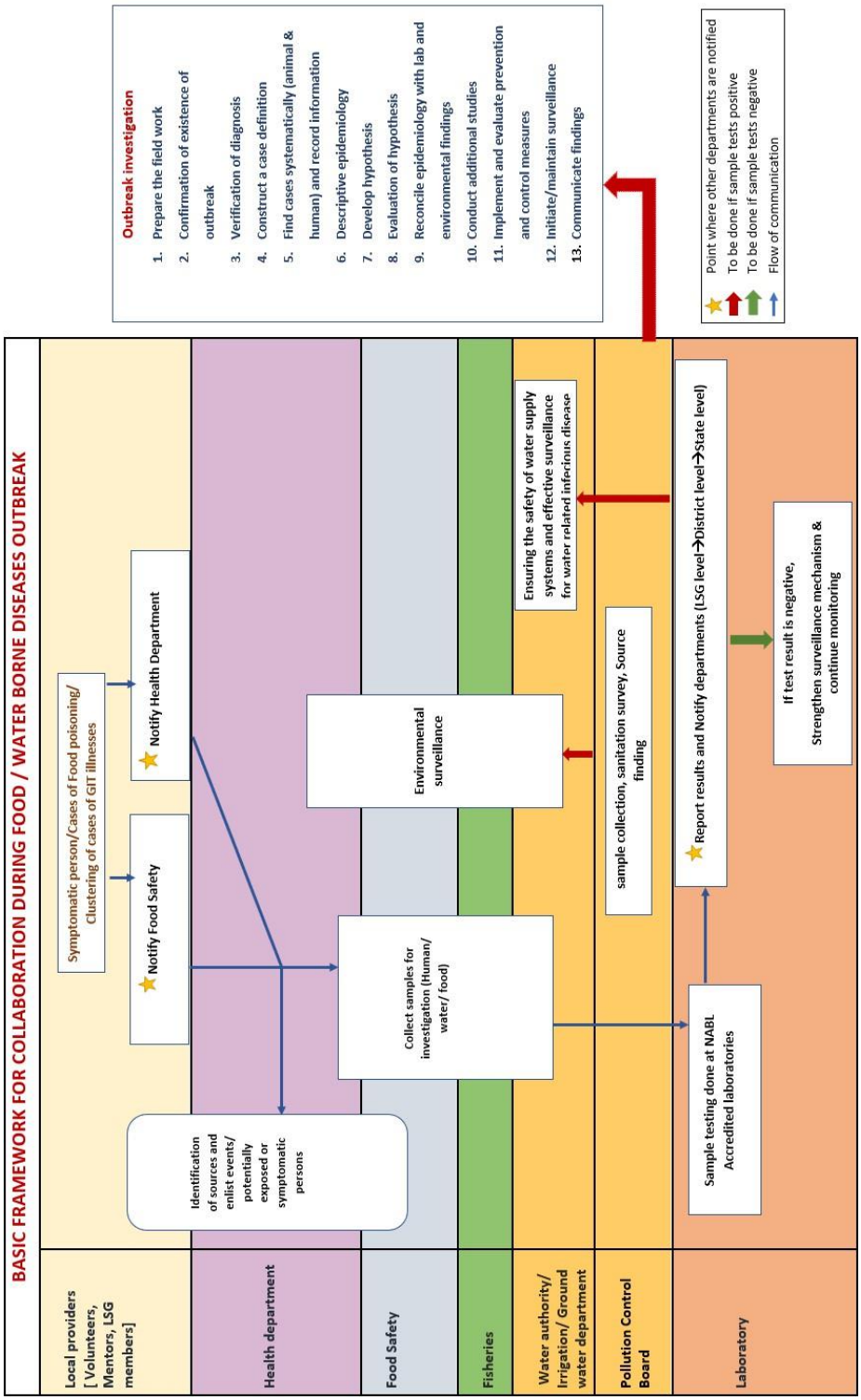
13. Communicate Finding

Internal Communication

- All stakeholders must maintain communication (LSG, water, education, WCD, Food safety, PWD etc.)

External Communication

- I.E.C. activities to create awareness about the disease and its control. (Action: Nodal person for PRD including media)
- Address the false propaganda, FSSAI toll number may be provided.



Basic framework for collaboration during food/waterborne disease outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Service

Chapter 8 : SOP for Joint Outbreak Investigation of Nipah

The following pages contain the SOP for Joint Outbreak Investigation of Nipah. The SOP consists of the following components:

1. Disease at a glance for Nipah (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during a Nipah outbreak

DISEASE AT A GLANCE
NIPAH
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of Nipah.
At risk population
Children, pregnant women, adults,elderly
Fruit Farm workers & Pig Farm Workers.
Any contact with body fluids (blood, urine, saliva, etc.) or touching clothes, linens, or items used by a confirmed or suspected Nipah case.
Exposure
Direct contact with infected animals such as fruit bats or consumption of contaminated food and through contact with respiratory secretions, urine, or other bodily fluids of infected individuals/animals.
Incubation period
From 4 to 14 days
Public Health actions
Educate the community about the causes, symptoms, and prevention of Nipah
Raise awareness about the role of fruit bats in transmitting the virus and discourage the destruction of their habitats.
Encourage safe food practices, such as avoiding bitten fruits from trees and consuming only cooked meat from pigs.
Stakeholders
LSG
Health Services
Forest & Wildlife
Animal Husbandry
Agriculture
Tribal
Community volunteers
Treatment guidelines
Signs and symptoms
Fever
Headache
Muscle pain
Vomiting
Sore throat
Respiratory issues

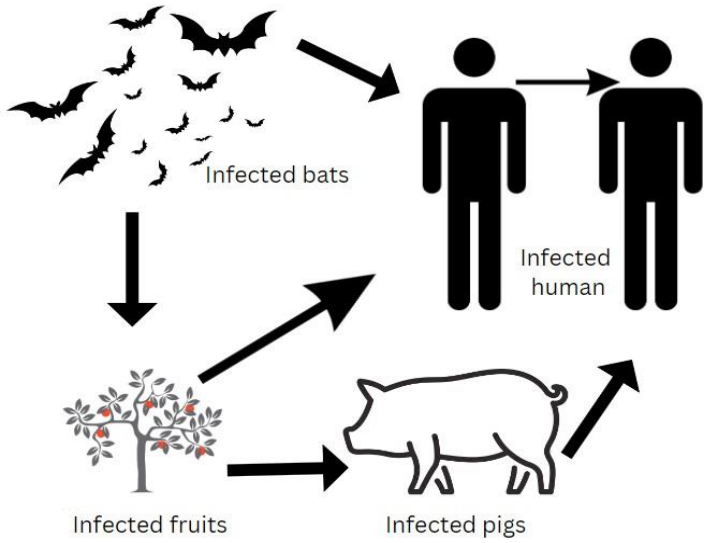


Figure 6: Transmission of Nipah Virus

A. Early Warning Signs

- Respiratory symptoms among pigs
- A person from an area/ locality affected by a Nipah virus disease outbreak who has:
  - Acute Fever with new onset of altered mental status or seizure and/or
  - Acute Fever with severe headache and/or
  - Acute Fever with Cough or shortness of breath

B. Reporting mechanism

- Potential Outbreak Indicator/ Events - Clustering of deaths in mammal
- Any Encephalitis/ARDS case without an alternate diagnosis
- Any family/ contact clustering of Encephalitis/ARDS
- Any family/ contact cluster of deaths without a known definite reason
- Unusual clustering of deaths in domestic animals associated with neurological and/or respiratory symptoms

C. Responsibilities during an outbreak

Departments/Stakeholders	Responsibilities
LSG	• Interdepartmentalcommunication • Procurement and maintenance of logistics • Funding • Control room Establishment
Forest & Wildlife	Notifying other line departments, Case finding
Animal Husbandry	Sample collection and sero surveillance Joint Investigation Protocol – Animal Husbandry attached as Annexure IV.
Health Services	Establishment of Public Health Event reporting system and platform for data sharing between sectors within the local body coordinated by the Block Public Health Unit (BPHU) and AHD, with regular reporting to OHC.
Agriculture	The Agriculture department will be actively involved in the environmental evaluation and control activities.
Community volunteers	Report known locations of the bat roosts / foraging sites in a locality. Focus IEC as per Nipah Calendar.
Kudumbashree (CDS)	To provide support for the investigation team

D. Treatment

At the time of publication, treatment guidelines are as per G.O. (Rt)No.2363/2023/H&FWD dated 16-09-2023 available at https://dhs.kerala.gov.in/wp-content/uploads/2023/09/GO-Rt-No-2363-2023-HFWD-dated-16-09-2023-with-Annexure-Nipah-Tratment-Guidelines-2023-September-.pdf . However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. Steps in outbreak investigation

1. Prepare for the field investigation

Preparing for the field investigation in case of any of the following situations.

- Any Encephalitis/ARDS case without an alternate diagnosis
- Any family/ contact clustering of Encephalitis/ARDS
- Any family/ contact cluster of deaths without a known definite reason
- Unusual clustering of deaths in domestic animals associated with neurological and/or respiratory symptoms

Notification

- Notification should be done with prime importance
- The offices/officers to whom the event should be notified include the Medical Officer (MO), Chief Veterinary Officer and the Secretary of the local body where the event, District One health committee, and District Medical Officer (DMO.
- The event and plan of action and any significant findings should be notified as and when they are gathered.

Constructing the team for investigation

- The team ideally should include the District Surveillance Officer (DSO), District Epidemiologist of the Animal Husbandry Department (AHD), Medical Officer (MO) in charge of the local public health officer, Veterinary Officer (VO), Secretary of the local body, Village Officer, Police SHO and the Regional Prevention of Epidemic and Infectious Diseases cell coordinator of the Government Medical College of the District
- Other officers like the District Education Officer (DEO), Child Development Project Officer (CDPO), etc. could be included in the team according to the need.
- Leaders of social institutions like Kudumbashree (CDS) could be included if the team need such supports
- The MO of the private hospital may be included if the event under investigation warrants
- Any experts from forestry, virology, epidemiology, or any person from other domains of academia or governance systems could be utilized if needed.
- Community volunteers involved in CBS.
- Any officials listed above can depute able representatives to the team

Preparation of work format/plan of investigation, if confirmed

- The DSO will be the team leader unless specified otherwise
- The team should prepare a detailed plan for investigating the outbreak if the infection is confirmed by any of the molecular or serological tests.
- As Nipah is a State/National priority, the team has to accommodate experts from the State/National agencies
- The team should have a plan to address the potential social/economic impact of the outbreak investigation
- Logistics and funding should be worked out
- Funding should be from LSGD till a dedicated funding mechanism such as that of disaster management is put in place
- The participating departments should provide sufficient HR and all available material resources

2. Confirmation of the existence of an outbreak

Based on evidence, the team should confirm the outbreak's existence (For Nipah, even a single case is an outbreak). The source of information could be

- Community volunteers / Public
- Hospitals
- ASHA workers, ICDS, Kudumbashree, local leaders

3. Verification of diagnosis

Verification of diagnosis of Nipah should be made only using molecular techniques (RT-PCR) unless otherwise specified. Point of care PCR tests (TruNat) and serological techniques could also use once approved facilities are made available. Samples (throat swab, blood, urine and CSF) should be sent for screening to the laboratories listed below and should be confirmed at BSL-4 facilities. A screened positive result should be considered for the epidemiological investigation and the team should not wait for the result get confirmed.

4. Construct a case definition

The investigating team should collect relevant data from human subjects, animals and environmental samples. Standard case definitions should be used for the data collection.

Human

Follow the last updated SOP of the State delivered for management of Nipah given at **https://dhs.kerala.gov.in/wp-content/uploads/2023/09/GO-Rt-No-2363-2023-HFWD-dated-16-09-2023-with-Annexure-Nipah-Tratment-Guidelines-2023-September-.pdf**

Suspect Nipah Case

A person from an area/ locality affected by a Nipah virus disease outbreak who has:

· Acute Fever with new onset of altered mental status or seizure and/or
· Acute Fever with severe headache and/or
· Acute Fever with Cough or shortness of breath

Probable Nipah case

· Suspect case-patient/s who resided in the same village where suspect/confirmed cases of NIPAH were living during the outbreak period and who died before complete diagnostic specimens could be collected.

OR

· Suspect case patients who came in direct contact with confirmed case patients in a hospital setting during the outbreak period and who died before complete diagnostic specimens could be collected.

Confirmed Nipah Case

Suspected case who has laboratory confirmation of Nipah virus infection either by:

· Nipah virus RNA identified by PCR from throat swab, urine, serum or cerebrospinal fluid (optional).
· Isolation of Nipah virus from throat swab, urine, serum or cerebrospinal fluid.

Animal

Suspected Case

Pigs: Manifested as severe respiratory and neurologic syndrome (Porcine respiratory and neurological syndrome, Porcine respiratory and encephalitic syndrome (PRES), Barking Dog Syndrome).

- Starts as febrile respiratory disease with severe cough and difficulty in breathing. Nervous signs like twitching, trembling, spasms and convulsions may accompany respiratory signs. Some animals, however, remain asymptomatic in the affected herd. Signs may vary depending on age and individual response. Mortality is low except in piglets. However, it is highly contagious, and morbidity is very high.

· Cats & Dogs: Flu-like, distemper-like syndrome with respiratory and neurological signs

- Confirmed: Laboratory confirmed

5. Find cases (both animal and human) recording information

Case identification and Contact tracing: These contacts need to be followed up for appearance of symptoms of NiV for the longest incubation period (21 days). They must be transported to appropriate care facilities if they develop symptoms with proper infection control practices.

Risk Stratification of Contacts:

RISK CATEGORY	DESCRIPTION
High risk	1. Any contact with body fluids (blood, urine, saliva etc) of a confirmed case of Nipah 2. Any contact with body fluids of a probable case who died without a lab confirmation of Nipah 3. Spend time in proximity or in closed space for more than or equal to 12 hrs
Low risk	Any other contact such as touching, contact with clothes or linen or any other item used

Follow-up Action:

RISK CATEGORY	FOLLOW-UP ACTION
High risk	Asymptomatic- Home quarantine with active follow up for fever, by health workers using telephone, twice a day for 21 days Symptomatic (fever)- Immediate admission in designated isolation ward with ICU facility

	Low risk	Asymptomatic- Home quarantine and follow up for fever by telephone. Symptomatic (fever)- Immediate admission in designated isolation facility

High-Risk Contact (Human)

According to the SOP, a High-risk/ Close contact is defined as a person who,

- Was in contact with a Nipah case (confirmed or probable cases) by sharing a ward or a room during the infectious period,
- Dwelling in the same household,
- Has had direct close physical contact (within 2 meters) during the illness including during transportation,
- Has had direct close contact with the (deceased) suspect/ confirmed case of Nipah at a funeral or during burial preparation rituals,
- Has touched the blood or other body fluids (saliva, urine, vomitus, and semen) during their illness or
- Has touched the clothes or linen during the illness.

- The high-risk contacts should be quarantined for 28 days (double the maximum IP reported in the State)
- Tested if presented with symptoms
- Outbreak investigation procedures should be repeated for any new positivity reported

High-Risk Animals

- Bats those roost or forage at or near the suspected site of spillovers
- Wild boars
- Pigs: farm located in an outbreak area, acute respiratory illness with nervous signs, high morbidity in adults, mortality in piglets, area with high reservoir density.
- Horses (if any)
- Any domestic animal with unusual illnesses
- Unusual animal death cases

Case record form template for Nipah used by ICMR-NIV is available at https://niv.icmr.org.in/images/pdf/services/Case_Record_Form_Nipah_Viral_Disease.pdf .

6. Descriptive epidemiology

Descriptive data that should be collected and analysed should include, but not be limited to.

Spatial

- Mapping of places with high risk for transmission: Used to prepare the route maps
- Geospatial mapping of the residences: used for micro-containment
- Mapping of bat roosts and foraging sites

Temporal

- Temporal evolution of new cases
- Determination of the timeline (starting and ending of outbreak, potential date of spillover)
- Seasonality and IP of infection

Personal (demographic, behavioural, etc)

Activities, behaviours, contact history,etc.

7. Develop hypotheses

Develop hypothesis on

- Site of spillover
- Mechanism of spill over
- Virological/serological positivity in bats
- Environmental contaminations like fruits, nectars, water bodies, vegetation, and materials like date palm sap/ toddy (if any)
- Intermediate/ Maintenance hosts (if any)
- Variations in the virulence/genetic nature of the virus

8. Evaluation of hypothesis

The investigation could be started with a set of hypotheses based on the epidemiological understanding of Nipah. The investigators can be in contact with the Kerala One Health Centre for Nipah Research and Resilience (KOHCNRR) or any other experts in the epidemiology of Nipah (Human) and One Health Centre at the Veterinary University or experts of animal diseases for animal studies. The consultations should be ideally made before the data collection as the tools for data collection could be made in such a way that it addresses the important hypotheses that should be tested.

- As the number of spillover events till now is limited in Kerala, epidemiological methods to test the hypothesis like case-control studies have limited scope.
- So, we must rely upon the serological and virological analysis of human/animal samples, and the virological analysis of environmental samples.

9. Reconcile epidemiology with lab and environmental findings

At the end of every epidemiological investigation, the investigators should sit together and discuss the major findings, and how they could be incorporated into the existing body of information about the epidemiology of the disease in the State and the globe. The study should also have a component which informs relevant action points to the health system of Kerala and the Government of Kerala to take necessary action to contain the outbreak. The investigators are encouraged to discuss the same with the State and Kerala One Health Centre for Nipah Research and Resilience (KOHCNRR) experts in Kozhikode. Considering the socio-political implication of the infection, the investigators should take utmost care to safeguard the data, and it should not be shared with any unauthorized persons. As Nipah is a disease with significant individual and community level stigma, privacy and safety personnel information is a top priority.

10. Construct additional studies as necessary

Any epidemiological investigation on Nipah is an iterative loop. Further investigations should be planned from the cues of prior ones to address the knowledge gap further. These investigations could be related to the following activities other than specific insights from the leads of the initial investigation.

- IEC activities in areas with potential spillover
- Strengthening the syndromic surveillance for early warning of the infection
- Monitoring of bat roosts (including guano)
- Establishment of TruNat facility in hospitals

- Continuous serological and virological surveillance in animals and bats
- Genomic surveillance of the virus

11. Implement and evaluate prevention and control measures

Every critical learning by the investigating team should be converted to action. The team should be keen on watching any situations, contexts and human behaviours which can facilitate the chance of spillovers or transmission of Nipah infection. The team should focus on the following things,

- Ensure strict farm biosecurity measures
- Biosafety measures shall be practiced during sampling
- Updating of SOPs and treatment guidelines based on existing outbreaks
- Sero surveillance of contacts and animals (in the vicinity)
- Information Education and Communication for the public

12. Initiate/maintain surveillance

Any place with reported spillover of NiV, seropositivity among bats or any other significant finding resulting from the investigation should be kept under constant surveillance because of the geospatial clustering of Nipah spillovers reported in Kerala. The surveillance includes,

- Monitoring of seroprevalence and the presence of virus in fruit bats
- Seasonal surveillance of humans, animals, and environment (fruits [Areca, Cycas], bat droppings, etc.
- Disturbing the bat roosts may be discouraged

Stakeholder	Immediate Activities	Ongoing/Long-Term Activities
Health Department	• Case management and treatment • Laboratory testing and diagnosis	• Public health education and awareness campaigns • Strengthening surveillance systems •
Local Self-Governance (LSG) Bodies	• Community mobilisation and participation in control efforts • Enforcement of sanitation guidelines • Mapping of bat roosts	• Capacity building of LSG staff for disease prevention and control • Development of strategies for reducing human-bat contact
Forest & Wildlife Department	• Collaboration with health departments for integrated disease management	• Development of strategies for reducing human-bat contact
Animal Husbandry	• Surveillance of livestock for Nipah virus infection • Biosecurity measures in livestock farms	• Monitoring of seroprevalence and the presence of virus in fruit bats

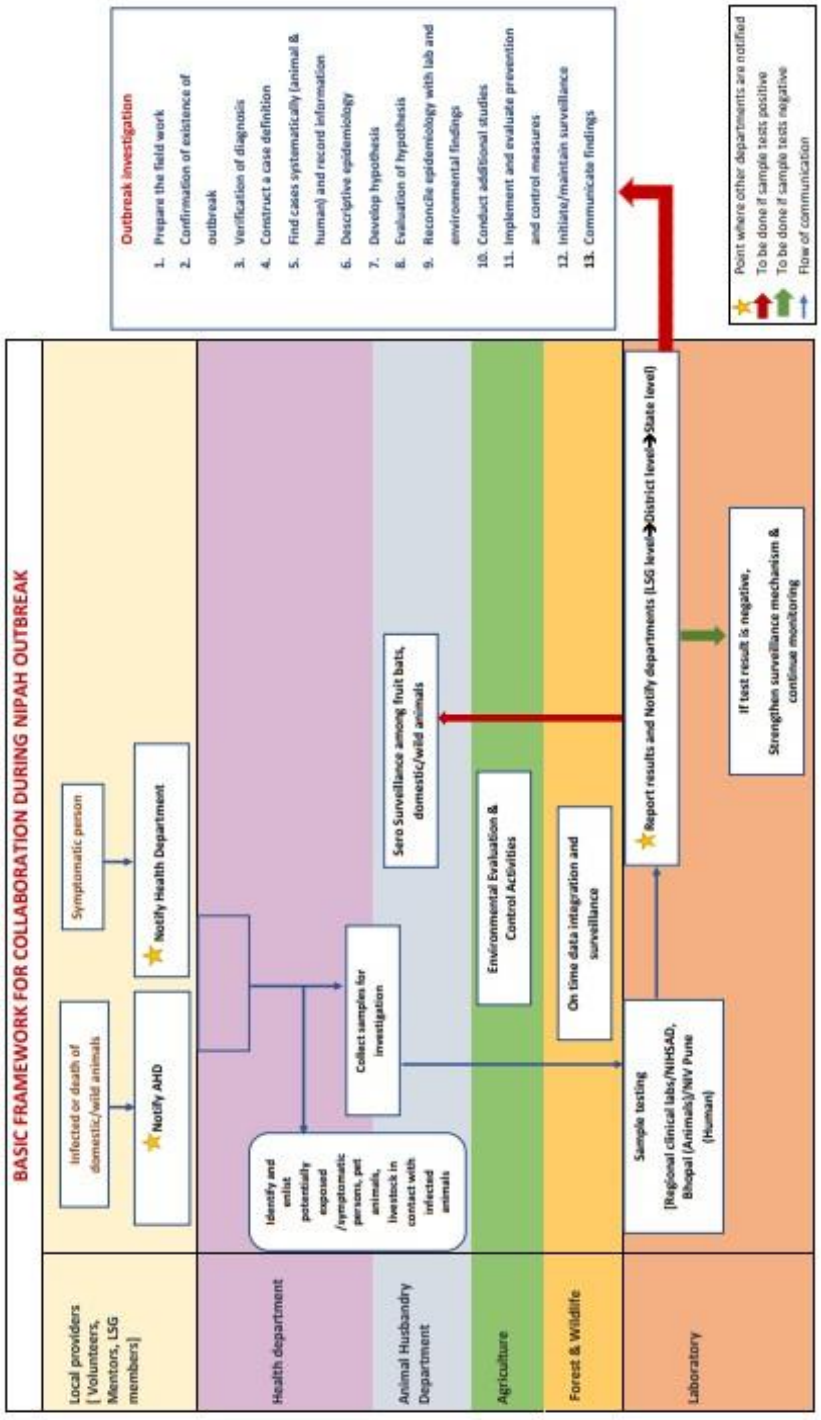
13. Communicate findings

Internal Communication

- On-time data integration (DHS/ AHD/ Forest & wildlife/ LSGs/ and allied stakeholders)
- Periodic review of activities & control measures (DC/ DHS/ AHD/ District OH committee/ State OH committee/ State Zoonoses Committee)

External Communication

- I.E.C. activities to create awareness about the disease and its control. (Action: Nodal person for PRD including media)
- Address the false propaganda



Basic Framework For Collaboration during Nipah Outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Services

Chapter 9 : SOP for Joint Outbreak Investigation of Avian Influenza (AI) / Bird Flu

The following pages contain the SOP for Joint Outbreak Investigation of Avian Influenza. The SOP consists of the following components:

1. Disease at a glance for Avian Influenza (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during an Avian Influenza

DISEASE AT A GLANCE

AVIAN INFLUENZA

Community Based Surveillance (CBS)

Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of Avian influenza.

At risk population

- Poultry farmers/ breeders
- Pet Shop Owners
- Veterinary personnel

Exposure

Unprotected exposures to sick or dead infected poultry and other birds

Incubation period

- 1-7 days (range 1-14 days) in birds
- 2-7 days (range up to 17 days) in human

Public Health actions

- Avoid contact with sick or dead birds. Use protective gear if handling birds.
- Inform local authority & animal husbandry about sick or dead birds.
- Seek medical attention: If experiencing symptoms after exposure to birds

Stakeholders

- LSG
- Health
- Animal Husbandry
- Food Safety
- Forest & Wildlife
- Agriculture
- Irrigation
- Police Department
- Community volunteers

Treatment guidelines

Signs and symptoms

In Human

- Fever,Headache,Muscle pain ,Diarrhoea

In birds,

- Bluish discolouration of eyes comb,wattle, Respiratory diseases, drop in egg production among poultry, bleeding from nostrils

Figure 7: Image showing symptomatic bird and disposal of carcasses (Image sourced from Animal Husbandry department)

A. Early Warning Signs

- Reports of sick or dead birds, especially poultry including ducks in the area, especially those in proximity to water bodies, where migratory bird are frequently seen
- Presence of sick or dead wild birds in the area.
- Presence of sick or dead birds in or near water bodies.
- Increased mortality, respiratory diseases, drop in egg production among poultry, bleeding from nostrils, bluish discoloration of eyes, comb and wattle, torticollis among poultry.

B. Reporting mechanism

Sources of Information regarding potential outbreaks / trigger events are community volunteers, farmers, review of surveillance data of health and AHD clinicians or laboratory reports of unusual diagnoses reports from the public. When an unprecedented mortality is observed in a poultry farm, the farmer shall report it to the jurisdictional veterinary officer, who shall visit the flock and if found necessary, send the samples to nearest regional laboratory, after intimating the Chief Veterinary Officer. The human samples shall be submitted to the regional level laboratory immediately for sending it to NIV Pune for confirmation at the earliest. Bird Flu in animals / birds is reportable to the directorate of AHD. Veterinarians who observe avian cases with abnormal clinical signs and increased mortality shall notify to the regional laboratory through the local Veterinary Dispensary and facilitate submission of samples for onward transmission to NIHSAD, Bhopal.

C. Responsibilities during an outbreak

Department/ Stakeholders	Responsibilities
LSG	● Interdepartmental communication ● Procurement and maintenance of Logistics ● Control room Establishment ● Facilitation and awareness of procedures to be followed during culling if needed, supplies for burning/ incineration of culled birds ● Disposal of carcasses ● Layering of the culled premises with disinfectants, followed by gravelling ● Evaluation of the actions taken in the One Health Committee (OHC) constituted at LSG level and give necessary suggestions ● Board and lodging for RRT ● Logistics management
Forest & Wildlife	● Notifying other line departments ● Finding cases
Animal Husbandry	● Disease notification ● Finding cases & Sero surveillance among domestic animals ● Facilitate the transport of specimens to Regional laboratories for onward transmission under cold chain as prescribed in the GoI action plan for the control of Bird Flu to NIV, Pune for confirmation ● Routine Surveillance among domestic animals / birds and mapping of hot spots Provide: – PPE kits – Inhalant anaesthetics – Gunny bags – Cotton – Vehicles
Health services	● Disease notification ● Finding cases ● Providing PPE for medical dept staff ● Facilitate the transport of specimens to Regional laboratories for onward transmission under cold chain as prescribed in the GoI action plan for the control of Bird Flu to NIV, Pune for confirmation Provide: – PPE for medical dept staff – Drugs for prophylaxis and treatment (Oseltamivir tablets and syrup), Personal Protective Equipment, Viral Transport Media for transporting human samples – Disinfects and antiseptics for cleaning up operations – Vehicles

RRT	• Rapid Response Teams (RRT) will be trained for PHEs. OH, community mentors and Volunteers will be included in the teams. • The RRTs for clean-up and disinfection shall function under the overall supervision of veterinarians/ para-veterinarians and comprise of supporting staff / labour, etc. Generally, there are 4 to 5 members in each RRT • The total number of RRTs required to be set up is based on area, type and concentration of poultry • Allot the work and the area to each RRT in a precise manner and keep a record of it. This should be started well in advance • Arrange boarding and lodging for RRTs. Arrangements for food and refreshments must be a part of this exercise. • Community mentors and volunteers will be included in the RRT. One member of each RRT shall cull 200-300 birds per day
Food Safety	• Environmental investigation, sample collection & testing
Police	• Prevent transportation of poultry during an outbreak • Support in culling and containment activities (Law enforcement)
Agriculture	IEC activities among farmers
Education	IEC activities
Volunteers	IEC activities
Fisheries	IEC activities

Bird Flu in animals / birds is reportable to the Directorate of AHD. A case report form may be prepared.

District collector can head the entire process and coordinates various departments like Health, AHD, Police, Revenue, LSGD, Agriculture, Forest, Water authority, Pollution control Board, Fire and Rescue etc.

If the need arises, Director A.H./Commissioner should mobilize manpower from other districts. Faster mobilisation of RRTs to outbreak areas is an important element of planning. Necessary medical check-up of the RRTs should be planned accordingly.

D. Treatment

No treatment regime recommended in birds except culling for control and containment of AI as per the Action plan of GoI (2021). Similarly, no treatment recommendations have been given in case of animals as per the Action Plan for Prevention, Control & Containment of Avian Influenza available at https://dahd.nic.in/sites/default/filess/Revised%20AI%20Action%20Plan%202021_1.pdf.
At the time of publication, treatment guidelines for humans are as per G.O.(Rt)No.1451/2024/H&FWD dated 15.06.2024. However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. Steps in outbreak investigation

1. *Preparation for fieldwork*

Team formation with Clinicians from Health and AHD, Epidemiologist, Lab Technician, Environmental Health Specialist, community volunteers and other RRT member etc. Based on the type of event make necessary administrative, personnel, and logistical arrangements and coordinate with partner agencies and local contacts.

2. *Confirmation of existence of an outbreak*

The confirmed results should either come from NIHSAD, Bhopal or NIV, Pune. Results from no other labs in the country will be accepted by the state Govt.

3. Verification of diagnosis

Infection prevention and specimen collection protocol as per "Contingency plan for human cases of AI" released by the Directorate General of Health Services (2005), it is available at https://dhs.kerala.gov.in/wp-content/uploads/2020/06/gudlines_birdflu.pdf can be followed.

4. Construct a case definition

Case Definition

Avian influenza (AI), as per World Organization for Animal Health (OIE), is defined as an infection of poultry caused by any influenza A virus of the H5 or H7 subtypes or by any influenza A virus with an intravenous pathogenicity index (IVPI) greater than 1.2 (or as an alternative at least 75% mortality) as described below. These viruses are divided into high pathogenicity avian influenza viruses and low pathogenicity avian influenza viruses

Suspected case:

1. Fever (body temperature of 380 Celsius or higher); in addition to

2. One of the following symptoms – muscle ache, cough, abnormal breathing (unusual breathing difficulty), or suspected of pneumonia by physician, or influenza, in addition to

3. History of direct contact with infected/dead birds in the past 7 days or occurrence of unusual death of birds in the community within the past 14 days; or contact with a pneumonia patient or another patient suspected of avian influenza.

Probable case:

The above-mentioned symptoms of suspected case and:

Preliminary test shows infection of influenza group A, but cannot yet be confirmed whether it is influenza from humans or birds / Respiratory failure/ Death

Confirmed case:

Suspected/ probable case with final PCR test or virus isolation showing H5 strain of influenza group A, which is a bird strain.

Note: Diagnosis of suspected and probable cases can be changed if confirmation tests show that the patient's infection was caused by other factors.

5. *Find cases systematically and record information*

A sample case investigation form for human cases are available at https://dhs.kerala.gov.in/wp-content/uploads/2020/06/gudlines_birdflu.pdf . Sample case sheet for animal cases are available at https://dahd.nic.in/sites/default/filess/Revised%20AI%20Action%20Plan%202021_1.pdf .

Action plan for finding cases may incorporate

- Contact nearby Veterinary facilities
- Contact laboratories
- Contact livestock inspectors
- Contact other districts
- Talk to farm owners
- Record Information Systematically — Line List

Population at high risk for Avian Influenza

The affected zone means 1 km radius from the epicenter. Surveillance zone means 1-10 kms from the epicenter (as per national action plan)

- Commercial birds with high density- chicken and ducks
- Backyard Birds – chickens, ducks, pigeons and other species- Biosecurity is usually poor and there is no specific population estimate or density distribution estimate for backyard birds
- Wild/migratory birds
- Live bird markets including wet markets particularly at the border areas

Population at risk in human

- Farm owners / keepers
- Bird vendors
- Buyers of the poultry products from the affected area
- Members of Rapid Response Team involved in culling process

Risk factors for Avian Influenza

- Disease situation in neighbouring area across the border
- States/districts previously affected by AI and adjoining states/districts
- Domestic duck population
- Backyard bird population

- Number and activity of live bird markets
- Poultry value chain / wholesale live bird markets
- National sanctuaries, wetlands / lakes used by migratory/ wild birds and their proximity to domestic poultry population/establishments
- Captive birds
- Flyways of migratory birds

Identify Potential Sources of Infection
Ask the case about contact with animals / birds which was confirmed with bird flu.

Identify Contacts / Other Potentially Exposed Persons
Identify persons who may have been exposed to the same source as the patient. If any are ill, inform them (or their physician) of possible exposure, in order to facilitate proper diagnosis and therapy.

Case finding and Sero-surveillance among domestic animals
To be done by AHD.

6. Perform descriptive epidemiology

In humans
Clinical Features

- Symptoms – what patient feels
- Signs – what the clinical exam reveals
- Laboratory results
- Definitive diagnosis
- Clinical results

Time Place Person

- Time (epidemic curve) -Ideally: when were they infected?
- More practically: when did they become ill? -Place (spot map, shaded map)
- Ideally: where were they infected? -More commonly: where do they live, work?
- Person (tables) Who was infected?

-Numerators and denominators

-What do the cases have in common?

In animals
Clinical Features

- Symptoms
- Signs
- Preliminary laboratory results from Regional / State laboratory
- Confirmative diagnosis from NIHSAD, Bhopal.

Time Place Person

- Time (epidemic curve)
- Ideally: when were they infected?
- More practically: when did they become ill?
- Place (spot map, shaded map)
- Ideally: where were they infected?
- More commonly: where do they live, work?
- Co-ordinates: Latitude: ---------- Longitude: ----------
- Person (tables)
- Which farm was infected?
- Numerators and denominators
- What do the cases have in common?

Spot maps may be prepared to visualize the human and animal cases and their proximity to outbreak epicentres.

7. *Develop hypotheses*
   - Hypothesis (in context of outbreak) = educated guess about an association between an exposure and outcome, and/or about mode of spread
   - Hypothesis should be in a form that allows it to be tested
   - Subject matter knowledge – known sources, vehicles, transmission modes
   - Review descriptive epidemiology – what would account for most?
   - Outliers (unique exposure opportunities)
   - Talk to case-patients – what do they think?
   - What do local health / Veterinary officials think?

8. *Evaluate hypotheses epidemiologically*

- Compare hypothesis with collected evidence
  - Laboratory evidence
  - Confirmatory evidence
  - Environmental evidence
  - Epidemiologic evidence

9. *Reconcile epidemiology with laboratory and environmental findings*

- Establishing the link between, the arrival of migratory birds / exhibition of symptoms in domestic poultry including duck and mortality pattern with the laboratory findings
- Ecology and natural history of AI
- Climactic correlation / Seasonality/ Migratory seasons (October - March)

10. Conduct Additional studies

- Active/ Passive/ Targeted surveillance studies year around in domestic birds
- Genomic studies to be taken up to identify the circulating clades

11. Implement and evaluate prevention and control methods

- Culling of birds
- Establishment of a Control Room: Set-up a 24-hour Control Room within the infected area, equipped with telephones, computers with internet access, secretarial-assistance, etc. The personnel deployed in the Control Room should be able to receive and clearly disseminate all comprehensive information. The Control Room may be contacted by several news agencies/media.
- Establishment of Rapid Response Teams (RRT): The DM will be the incident commander who shall personally lead and supervise the entire procedures. One medical officer, one veterinarian and one member of the block public health unit should be there round the clock in the control room. Sufficient number of Rapid Response Teams (RRTs) fully equipped with PPE and sanitization materials for disinfection need to be established. The RRTs shall be responsible for operations like culling, disposal of birds, supervising and undertaking clean-up and disinfection of infected premises, etc. All veterinary, para-veterinary, and other related personnel of the State Animal Husbandry Departments are trained in the procedure to be adopted for control and containment of Avian Influenza by the states. Daily wagers, untrained/ unskilled labourers/ or personnel, if engaged on contractual basis, should be trained for their personal safety and quarantine measures, in addition to the control and containment operations.

Management of Contacts / Others Exposed

The spread of infection from person-to-person is rare.

Persons exposed to the same source as the case should be educated about symptoms of bird flu and the seriousness of the situation to facilitate prompt diagnosis and early treatment. Any site where the birds are affected / culled following bird flu will be demarcated and necessary warning sign boards placed. People under high risk may be given a course of neuraminidase inhibitor antiviral drugs under medical supervision.

Environmental Evaluation/Management

- Based on potential sources identified, further evaluation for other predisposing causes will be done.
- Awareness creation among the public and specifically poultry farmers and pet owners and those at occupational risk.
- Evaluation of sanitation and hygiene practices among farmers, NREGs workers and others at risk

- Evaluation of Waste Management practices by LSG team and implementation of corrective actions.
- If a site of exposure is determined, consider posting signs in the area to warn others of the risk and prevent further illness.

People in contact with the infected animal (owners, clinicians, kennel workers, etc.) should be provided the following information:

- Avoid contact with a positive flock of birds, once confirmed as Bird flu.
- Veterinarians or others who have contact with infected material from the animal / birds should wear protective clothing.
- Keep your pet animal under quarantine, if confirmed as bird flu and proceed as per the action plan for treatment.
- Wash your hands after handling your pet or anything that might have your pet's excrement on it. If you are cleaning surfaces that may be contaminated, use an antibacterial cleaning solution or 1-part bleach to 10 parts water.
- Make sure your infected pet takes all of its medicine and follow up with your veterinarian.

Personal Hygiene and cleanliness

Proper hand hygiene through regular and proper washing is necessary for the cullers and transporters after each operation. Quarantine of all the personnel engaged in culling/ cleaning operations must be enforced under medical supervision. Arrangements for boarding/ lodging of such personnel during this period and payment of wage for the labour should be ensured. Self-surveillance is strongly advised with quick reference to a health institution, governmental or private, in case of any flu-like symptoms or respiratory complaints etc.

Personal Protective Equipment (PPE)

Prior to the commencement of operations, briefing must be given to all involved on the importance of the kit, its use and disposal etc. PPE must be used by RRTs and all persons having direct and active exposure to infected poultry. Workers/ labour force, if engaged for clean-up and disinfection etc. must also be provided with PPE kits. Operations should not be started without the use of PPE.

The composition of the kit is given in detail in the Action Plan for Prevention, Control & Containment of Avian Influenza available at : https://dahd.nic.in/sites/default/filess/Revised%20AI%20Action%20Plan%202021_1.pdf).. Kits used by the direct handlers i.e. cullers and others having direct exposure to infected poultry must have a face mask with a filter (N-95).

Safety of Personnel Engaged in Control Operations

Persons engaged in control operations have high chances of exposure to infection. It is therefore, of utmost importance to ensure the safety measures as explained in succeeding paras

Health checkup of personnel before start of operations

The members of the RRTs must be physically and mentally healthy.

Stakeholder	Immediate Activities	Ongoing/Long-Term Activities
Health Department	• Case management and treatment • Laboratory testing and diagnosis	• Public health education and awareness campaigns • Strengthening surveillance systems
Local Self-Governance (LSG) Bodies	• Community mobilisation and participation in control efforts • Establishment of control room • Mobilise funds and resources for culling activities • Assistance in culling activities	• Capacity building of LSG staff for disease prevention and control • Map areas for disposal of culled birds in case of future outbreaks
Animal Husbandry	• Surveillance of poultry • Assistance in culling activities • Biosecurity measures in livestock farms	• Seasonal surveillance of birds in poultry farms
RRT	• Culling of birds • Disinfection of farms	
Police	• Prevent transport of poultry	

It is to be noted that personnel involved in culling activities must be quarantined for a period of 10 days post culling as per the guidelines. Daily wage workers and other staff involved in culling activities would stand to lose their wages for the time spent in quarantine. LSGBs should consider this loss of wages of the culling staff when setting aside funds for culling activities.

12. Initiate and maintain surveillance

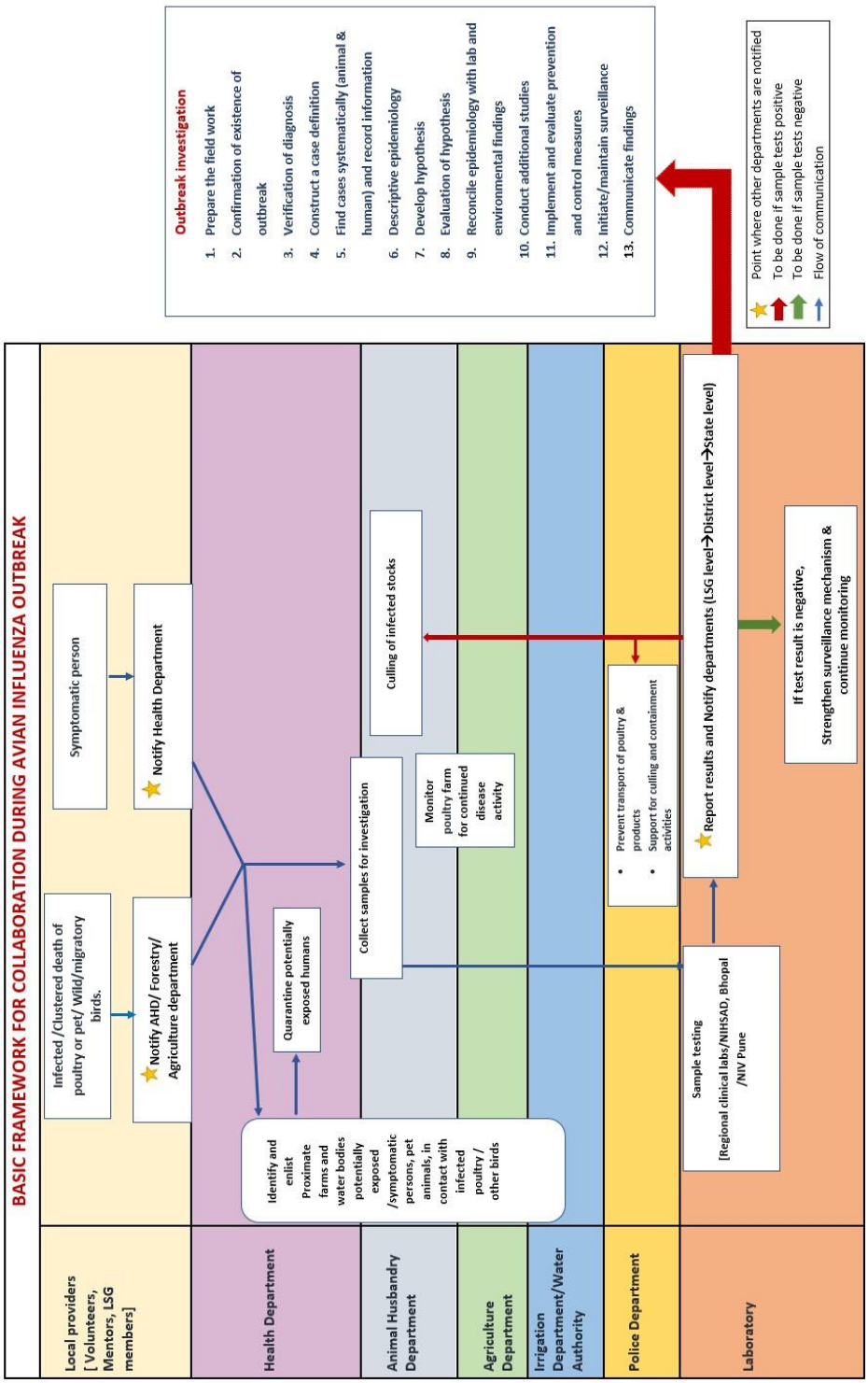
As per the GoI action plan, the positive flock of birds needs to be culled along with all other poultry populations in the 1 km infected area. The birds from the 1 – 10km zone come under the Surveillance zone. The Postoperative Surveillance Plan (POSP) is from a 1 – 10 km zone. For this 6 samples each of throat, cloacal swabs as well as serum samples from 25% of the diameter of the surveillance zone shall be sent to NIHSAD, Bhopal every fortnight for four consecutive fortnights so as to cover the entire surveillance zone. Once the four fortnightly results are negative, GoI will declare the zone disease free and fresh restocking is possible.

13. Communicate the findings
Internal Communication

- Data integration (DHS/ AHD/ Forest & wildlife/ LSGs/ Food safety and allied stakeholders).
- Periodic review of activities & control measures (DC/ DHS/ AHD/ District OH committee/ State OH committee/ State Zoonoses Committee/ Food safety).

External Communication

- I.E.C. activities to create awareness about the disease and its control. (Action: LSGDs/ DHS/ AHD/ TWD/ Forest & Wildlife/ PRD including media/ Tourism).



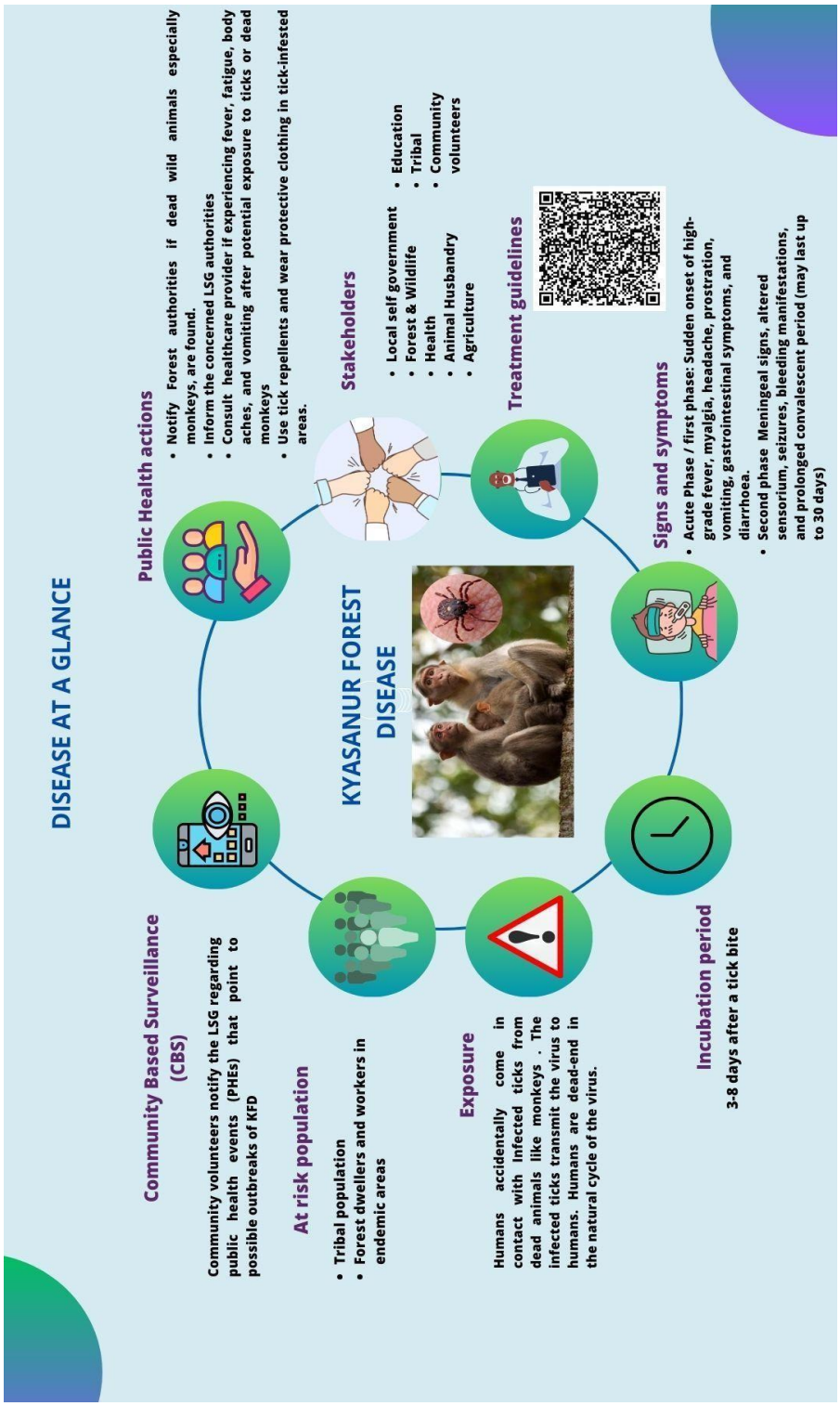
Basic Framework for Collaboration during Avian Influenza Outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Service

Chapter 10: SOP for Joint Outbreak Investigation of Kyasanur Forest Disease (KFD)

The following pages contain the SOP for Joint Outbreak Investigation of Kyasanur Forest Disease. The SOP consists of the following components:

1. Disease at a glance for Kyasanur Forest Disease (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during a Kyasanur Forest Disease outbreak


DISEASE AT A GLANCE
KYASANUR FOREST DISEASE
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding public health events (PHEs) that point to possible outbreaks of KFD
At risk population
• Tribal population
• Forest dwellers and workers in endemic areas
Exposure
Humans accidentally come in contact with infected ticks from dead animals like monkeys . The infected ticks transmit the virus to humans. Humans are dead-end in the natural cycle of the virus.
Incubation period
3-8 days after a tick bite
Signs and symptoms
• Acute Phase / first phase: Sudden onset of high-grade fever, myalgia, headache, prostration, vomiting, gastrointestinal symptoms, and diarrhoea.
• Second phase Meningeal signs, altered sensorium, seizures, bleeding manifestations, and prolonged convalescent period (may last up to 30 days)
Treatment guidelines
Stakeholders
• Local self government
• Forest & Wildlife
• Health
• Animal Husbandry
• Agriculture
• Education
• Tribal
• Community volunteers
Public Health actions
• Notify Forest authorities if dead wild animals especially monkeys, are found.
• Inform the concerned LSG authorities
• Consult healthcare provider if experiencing fever, fatigue, body aches, and vomiting after potential exposure to ticks or dead monkeys
• Use tick repellents and wear protective clothing in tick-infested areas.

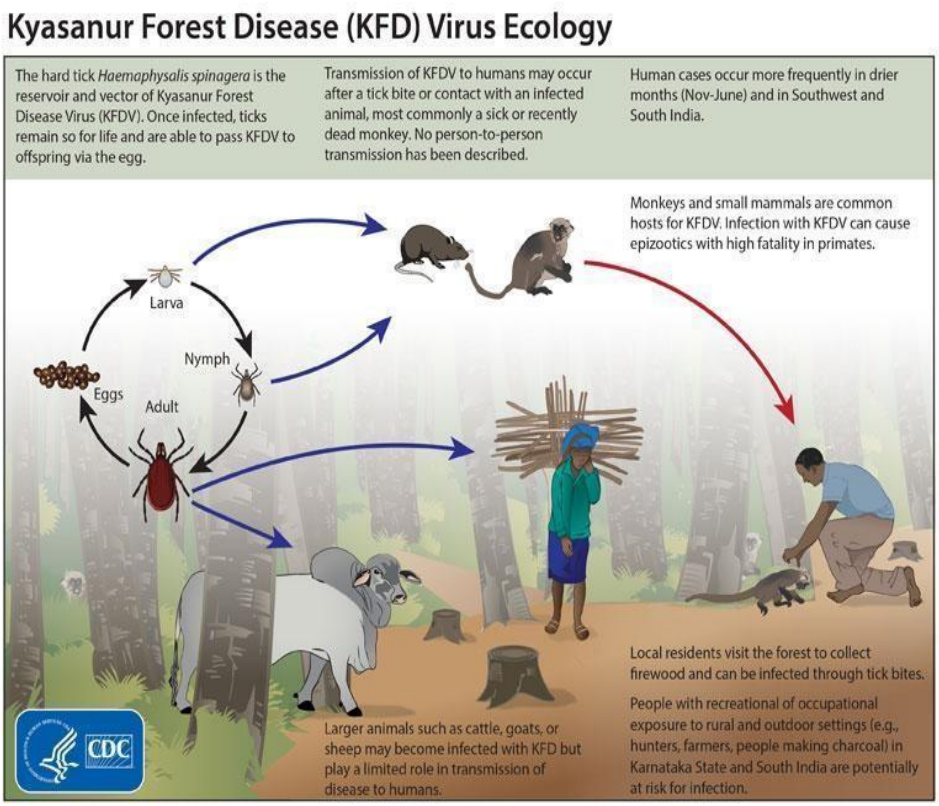


Figure 8: Transmission of KFD (Image sourced from Centre for Disease Control, openly available at https://www.cdc.gov/kyasanur/about/index.html)

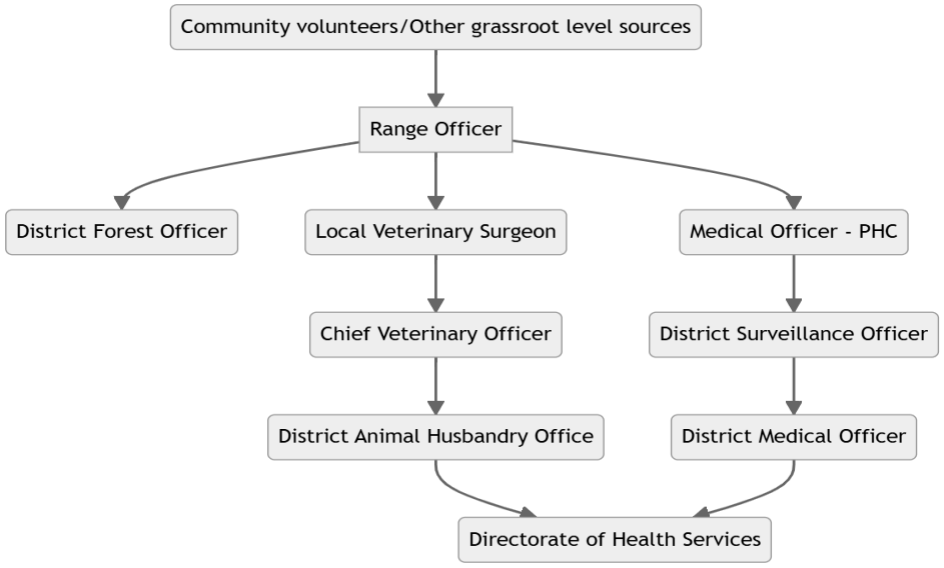
A. Early Warning Signs

- Presence of sick or dead small mammals such as rats, squirrels, or bandicoots and most importantly monkeys in the area.
- Cases of fever, fatigue, body aches, and vomiting among residents, especially if they have had contact with dead monkeys.
- Unexplained animal deaths.
- Presence of ticks on domestic animals venturing into forests

B. Reporting mechanism

Sentinel event for KFD is monkey death and it may be reported by grassroot level sources such as Community volunteers/ Forest guards, watchers/ General public including tribal population, trekkers, farmers, teachers/Tribal promoters, ASHA workers, ICDS, Kudumbashree, local

leaders etc. Any government official if intimated regarding the sentinel event shall inform the forest department, the nodal department for the disease, who shall inform other departments as per the following reporting mechanism. In every outbreak LSG level one health committee shall be alerted which as well shall be leveraged to transfer information across departments. Official outbreak declaration in case of human cases is to be done by the District Surveillance Officer (DSO).



C. Responsibilities during an outbreak

Stakeholders / Departments	**Responsibilities**
LSG	Interdepartmental communication Procurement and maintenance of Logistics (PPE) Control room establishment Monkey proofing of houses and crops
Forest & Wildlife	Notifying other line departments Finding cases Malathion dusting Cremation of dead monkeys
Animal Husbandry	Disease notification Finding cases Ectoparasiticides / Tick repellent distribution Tick collection Malathion dusting Actions to be taken up by AHD given in detail in Annexure V

Health Services	Facilitate the transport of specimens to Regional or State Public Health Laboratories for confirmatory testing Disease notification Finding cases Malathion dusting
Agriculture	Long term crop policy to avoid monkey menace
Education	IEC activities
Community volunteers	IEC activities
Tribal Department	Finding cases, IEC activities

All *confirmed* and *probable* cases (see below) can be reported to DHS. A format for KFD case investigation cum lab referral form is given in the Operational Manual for Kyasanur Forest Disease, Directorate of Health and Family Welfare Services, Govt. of Karnataka (2020) available at https://monkeyfeverrisk.ceh.ac.uk/sites/default/files/2022-05/Operational-Manual-Kyasanur-Forest-Disease-DHFWS-2020-compressed.pdf for data entry in the IHIP.

Kyasanur forest disease in monkeys is reportable to the Departments of Forests and Wildlife and AHD. An animal case report form may be prepared.

D. Treatment

At the time of publication, treatment guidelines for humans are as per the protocol given in the Operational Manual Kyasanur Forest Disease, Directorate of Health and Family Welfare Services, Govt. of Karnataka (2020) available at https://monkeyfeverrisk.ceh.ac.uk/sites/default/files/2022-05/Operational-Manual-Kyasanur-Forest-Disease-DHFWS-2020-compressed.pdf . However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. Steps in outbreak investigation

1. Prepare the field work

a) Preparing for the field work in the event of reporting
   - Any monkey illness/monkey death in endemic areas and suspected illness or deaths in other areas
   - Post-mortem findings of monkey deaths suggestive of KFD
   - Clinical suspect (Human)

b) Notification (One health committee/KFD control cell/ Chief veterinary officer/Block Public Health (BPH) (Unit/DMO/DFO/LSGD)

c) Construct the team: Team may include DSO, District Epidemiologist of AHD, PHC Medical Officer (MO), MO Block PH unit, Veterinary Officer, AFVO, Panchayat Secretary, Police SHO, DEO, Range Officer, CDS, DVC unit, CDPO, Tribal welfare officer (The officers may depute staff under their control), community volunteers

d) Preparation of action plan for investigation, if confirmed
e) *Logistics and funding* should be worked out (vehicles owned by forest, HR by different departments).

2. Confirmation of existence of outbreak

Team based on evidence should confirm the existence of the outbreak (*For KFD even a single case is an outbreak*).

3. Verification of diagnosis

Infection prevention should be followed (Operations manual KFD, Govt of Karnataka, 2020 available at https://monkeyfeverrisk.ceh.ac.uk/sites/default/files/2022-05/Operational-Manual-Kyasanur-Forest-Disease-DHFWS-2020-compressed.pdf)

4. Construct a case definition

Case definition: human

A patient of any age presenting with acute fever, headache and myalgia, and a history of exposure to ticks and/or a visit to a forest area and/or living in, a KFD-endemic area[2].

- *Suspected case:* A patient, within a radius of 5 km surrounding the villages reporting recent monkey deaths or laboratory confirmed KFD cases, with sudden onset of high-grade fever and one of headache or myalgia[3].
- *Probable case:* A clinically compatible illness that does not meet the confirmed case definition, but with one of the following:
    - epidemiological link to a documented exposure to a KFD-affected area (one or more of the following exposures within the 3 weeks before onset of symptoms),
    - positive result on testing of clinical serum specimens using the immunoglobulin M (IgM) enzyme-linked immunosorbent assay (ELISA).
- *Confirmed case:* A confirmed case of KFD is defined as a case that fulfils the criteria for a probable KFD case and, in addition, it should cover any of the following:
    - exposure to secretions from a confirmed acute or convalescent case of viral haemorrhagic fever (VHF) within 10 days of that person's onset of symptoms.
    - isolation of KFDV in cell culture or in a mouse model, from blood or tissues.
    - detection of KFDV-specific genetic sequence by reverse transcription-polymerase chain reaction (RT-PCR) or real-time RT-PCR from blood or tissues.

[2] Mourya, Yadav, and Patil, "Highly Infectious Tick-Borne Viral Diseases."
[3] Mourya, Yadav, and Patil.

Case definition: animals

Similar to humans with a high grade of mortality. KFD has been reported only among monkeys till date.

5. Find cases systematically (animal & human) and record information

Fieldwork team should make a priority plan or action plan for planning case search. Depending on extend of outbreak the operating authority may write up protocol for case search. Concerned departments shall share information regarding, high risk group priorities as per plan. Possible high-risk groups include

- People living in the forests of endemic areas.
- People with recreational or occupational exposure wherein they directly come in contact with tick (e.g. people visiting the forest for their livelihood, coffee/ tea and other plantation workers, cashew nut/ areca nut farm workers, farmers who work in the agricultural fields, which are situated in outskirts of village and in the vicinity of forest, Forest department officials, tourists visiting forest area, wild-life photographers, etc.).
- People handling cattle and who visit forest in endemic areas.
- Persons handling dead monkeys.

6. Descriptive epidemiology

- **Spatial**
  - Geospatial mapping (Spot maps) of areas with
    - Monkey deaths/ illness
    - Human deaths/ illness
  - Vector dynamics
- **Temporal**
  - Temporal evolution of new cases
- **Personal** (demographic, behavioural, etc)
  - Activities, behaviours, etc

7. Develop hypothesis

Develop hypothesis based on descriptive epidemiology on

- Vector dynamics – possible habitats and their distribution
- Mechanism of transmission (anthropogenic factors)
- Immunopositivity in tick vectors (seasonality)
- Other potential vector species (if any)
- Other potential livestock carriers or maintenance hosts (including rodents)
- Variations in the virulence/genetic nature of the virus

8. Evaluation of hypothesis

As the pattern of disease events has been limited in Kerala (spatio-temporal), epidemiological methods to test the hypothesis like case-control studies have limited scope.

So, we must rely upon the serological and virological analysis of human/animal samples, and the virological analysis of tick vector samples.

9. Reconcile epidemiology with lab and environmental findings

- Ecology & natural history of KFD (DHS/ AHD/ TDD/Forest & wildlife/ LSGDs)
- Climatic correlation/ seasonality with the occurrence of KFD (DHS/ AHD/ TDD/Forest & wildlife/ LSGDs)

10. Conduct additional studies

Conduct periodic sero-surveillance and vector dynamics (PHLs; AHD; Entomologists)

11. Implement and evaluate prevention and control measures

Stakeholder	Immediate Activities	Ongoing/Long-Term Activities
Health Department	• Case management and treatment • Laboratory testing and diagnosis • IEC activities • Members of the expert team shall be vaccinated against KFD prior to the commencement of action	• Public health education and awareness campaigns • Strengthening surveillance systems
Local Self-Governance (LSG) Bodies	• Community mobilisation and participation in control efforts • IEC activities • Ensure application of tick repellents and use of appropriate PPE before reaching site of death	• Food waste management throughout the year • Avoid purposeful feeding of monkeys by people • Long term crop policy to avoid monkey menace/ alternate crops which don't attract monkeys • Trained team for chasing monkeys • Monkey proofing of houses and crops
Animal Husbandry	• Distributing ectoparasiticides in and around the endemic areas • Vaccination and determination of titre in high-risk groups/ population in endemic areas • Tick collection in 70% alcohol from domestic animals (Action: AHD)	• Provide guidance to livestock owners on tick control and preventive measures.

	and handed over for its identification • Disinfestation using malathion dusting from a distance of 50 ft concentrically around the monkey carcass • Members of the expert team shall be vaccinated against KFD prior to the commencement of action • Ensure application of tick repellents and use of appropriate PPE before reaching site of death • Dead monkey should be burnt after the post-mortem	
Forest & Wildlife	• Disinfestation using malathion dusting from a distance of 50 ft concentrically around the monkey carcass • Members of the expert team shall be vaccinated against KFD prior to the commencement of action • Ensure application of tick repellents and use of appropriate PPE before reaching site of death • IEC activities • Dead monkey should be burnt after the post-mortem	• Avoid purposeful feeding of monkeys by people • Trained team for chasing monkeys
Tribal Welfare Department	• Ensure application of tick repellents and use of appropriate PPE before reaching site of death • PPE shall be discarded and burnt immediately before entering the vehicle for return journey	

Vector surveillance:

- Collection of ticks, larvae, nymphs are carried out by flag dragging method from the endemic areas reported earlier (Action: DHS/ Forest & Wildlife)
- Ticks need to be collected from domestic animals of endemic areas of KFD (Action: AHD).
- Ticks will be collected from the body of the infested persons (Action: DHS).
- Ticks will be collected from places where unnatural monkey deaths are reported (Action: PM Team) and will be labelled. For species identification, the samples will be sent to KVASU/ biologists at DVC, DHS.
- For virus detection, samples will be sent in cold chain to NIHSAD, Bhopal or NIV, Pune (Action: DHS).

Human surveillance:

- Surveillance activities for detection of human fever cases will be conducted in the nearby areas of monkey death. (Action: DHS)
- From suspected cases, blood/sera samples (3-5ml) will be collected, labelled and sent in cold chain to VDL, Shimoga/ NIV, Pune. (Action: DHS)
- Strengthened I.E.C. activities to create awareness about the disease and its control. (Action: DHS)

Animal surveillance:

- Sero-surveillance of domestic animals
- Sero-surveillance of rodents in endemic areas

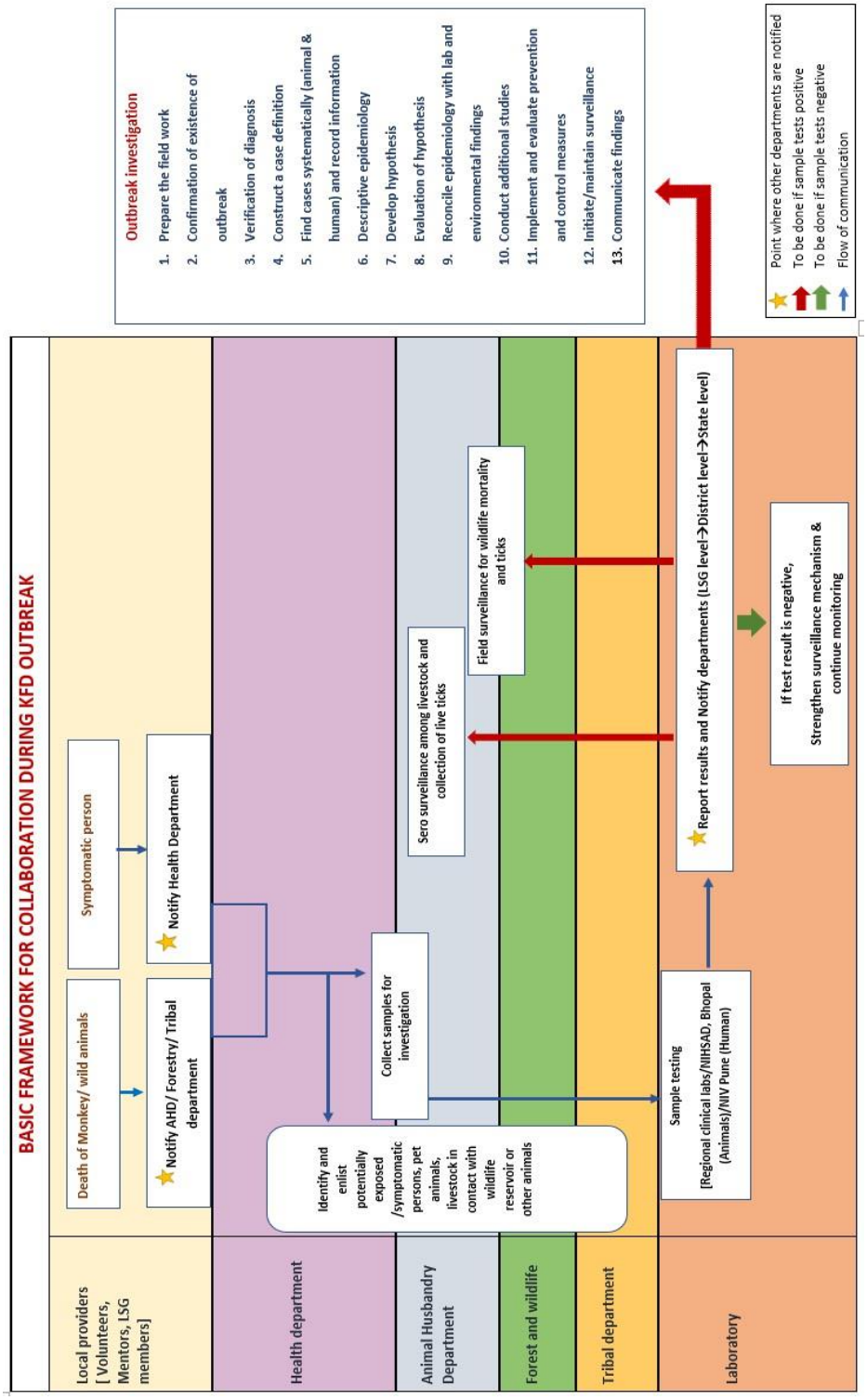
13. Communicate findings

Internal Communication

- Data integration (DHS/ AHD/ Forest & wildlife/ LSGs/ and allied stakeholders)
- Periodic review of activities & control measures (DC/ DHS/ AHD/ District OH committee/ State OH committee/ State Zoonoses Committee)

External Communication

- I.E.C. activities to create awareness about the disease and its control. (Action: LSGDs/ DHS/ AHD/ TWD/ Forest & Wildlife/ PRD including media/ Tourism)



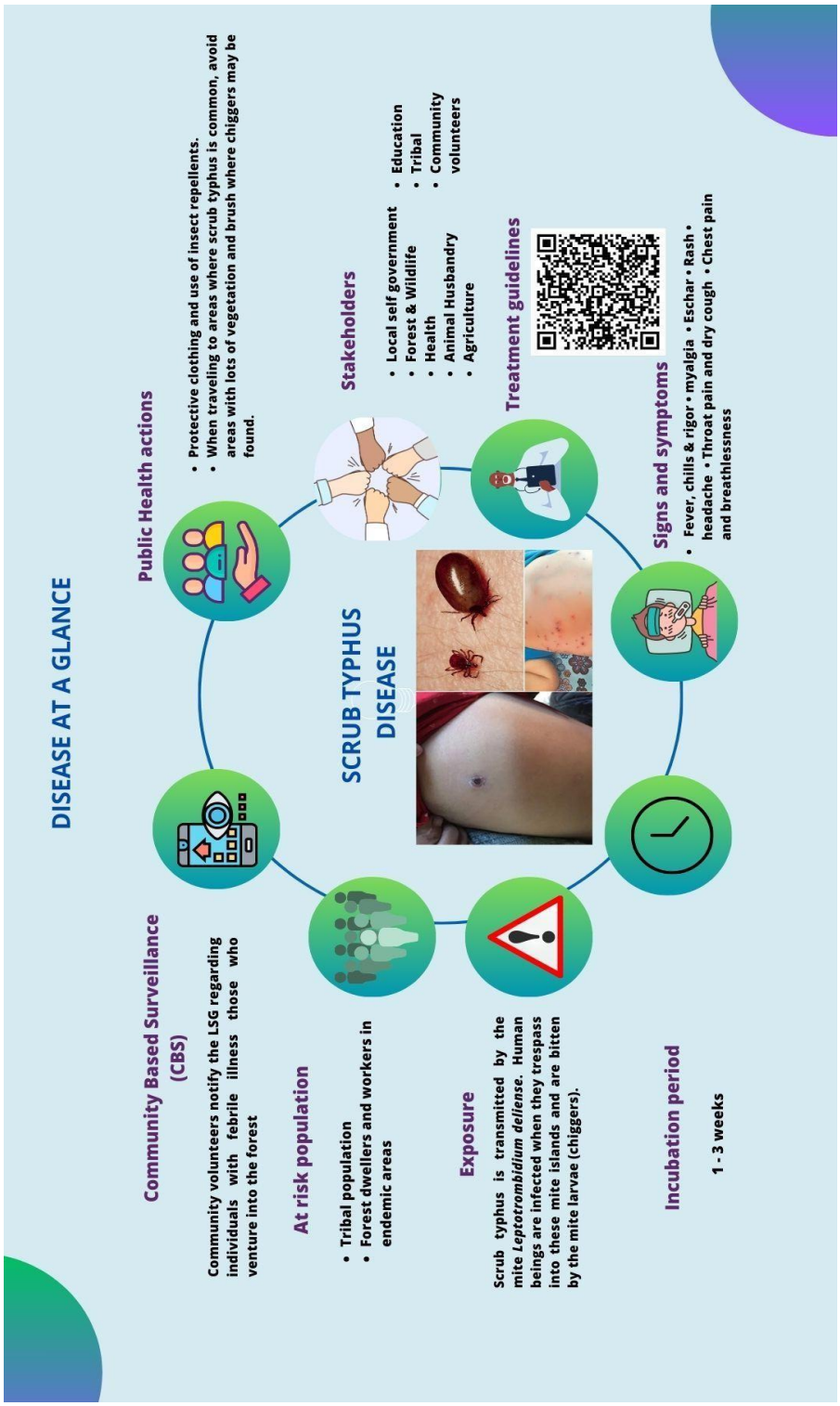
Basic framework for collaboration during KFD outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Services

Chapter 11 : SOP for Joint Outbreak Investigation of Scrub Typhus

The following pages contain the SOP for Joint Outbreak Investigation of Scrub Typhus. The SOP consists of the following components:

1. Disease at a glance for Scrub typhus (Treatment guidelines can be obtained by scanning the QR Code),
2. Early warning signs
3. Reporting mechanism
4. Responsibilities of departments/ stakeholder
5. Treatment
6. Steps involved in outbreak investigation
7. Basic framework for collaboration during a Scrub Typhus outbreak


DISEASE AT A GLANCE
SCRUB TYPHUS DISEASE
Community Based Surveillance (CBS)
Community volunteers notify the LSG regarding individuals with febrile illness those who venture into the forest
At risk population
• Tribal population
• Forest dwellers and workers in endemic areas
Exposure
Scrub typhus is transmitted by the mite Leptotrombidium deliense. Human beings are infected when they trespass into these mite islands and are bitten by the mite larvae (chiggers).
Incubation period
1 - 3 weeks
Signs and symptoms
• Fever, chills & rigor • myalgia • Eschar • Rash • headache • Throat pain and dry cough • Chest pain and breathlessness
Treatment guidelines
Stakeholders
• Local self government
• Forest & Wildlife
• Health
• Animal Husbandry
• Agriculture
• Education
• Tribal
• Community volunteers
Public Health actions
• Protective clothing and use of insect repellents.
• When traveling to areas where scrub typhus is common, avoid areas with lots of vegetation and brush where chiggers may be found.

A. Early Warning Signs

- Cases of fever, muscle pain, body aches among residents, especially if they have ventured into forest areas.
- Presence of mites/ chiggers on domestic animals venturing into forests.

B. Reporting mechanism

Sources of Information of disease can be community volunteers involved in CBS, Tribal promoters and other grassroot level functionaries or from review of surveillance data of health, Clinician or laboratory reports of unusual diagnoses, reports from the public etc. All confirmed and probable cases are to be reported to the District Surveillance Officer and the DHS. Directorate of Animal Husbandry shall be notified by the jurisdictional veterinary officer. The Range officer at the nearest forest office may be notified by the LSG.

C. Responsibilities during an outbreak

Stakeholders / Departments	**Responsibilities**
LSG	Interdepartmental communication Procurement and maintenance of Logistics (PPE) Control room Establishment Management of overgrown grass Notifying other line departments
Forest & Wildlife	Finding cases Insecticide spraying near affected forest areas
Animal Husbandry	Finding cases Ectoparasiticides / mite repellent distribution
Health Services	Facilitate the transport of specimens to Regional or State Public Health Laboratories for confirmatory testing Disease notification Finding cases IEC
Agriculture	Assist in clearing overgrown vegetation, reducing potential breeding grounds for mites
Education	IEC activities
Community volunteers	Finding cases , IEC activities
Tribal Department	Finding cases, IEC activities

D. Treatment

At the time of publication, treatment guidelines for scrub typhus are as per the protocol given by the Directorate of Services, Govt. of Kerala available at https://dhs.kerala.gov.in/wp-content/uploads/2020/06/scrub2.pdf . However, stakeholders are advised to look at latest treatment guidelines or refer to the directions given by the State Government.

E. Steps in Outbreak Investigation

1. *Preparation for fieldwork*

This initial step involves planning and organising resources such as personnel, equipment and logistics required for the investigation. Teams prepare to gather data, identify, map and visit affected areas and ensure they are equipped to address the outbreak. This step is crucial for ensuring an efficient and coordinated response. An outbreak investigation team has to be constituted at this stage.

2. Confirmation of existence of an outbreak

In this step, it is checked whether the number of cases is higher than expected in the particular region. This includes verifying the validity of the cases to ensure that there is a genuine outbreak, not just a false alarm. The outbreak is confirmed with analysis of symptoms, number of patients affected and validation of data.

3. Verification of the diagnosis

The reported cases are checked whether they are accurate and consistent with the suspected diseases. It involves reviewing clinical findings, laboratory results, and epidemiological data to confirm the diagnosis, ruling out misreporting or unrelated conditions that could skew the investigation.

- A list of suspects and patients with contact with high risk environment is made.
- Samples are collected from list of suspects.
- Cases are confirmed with serology sent to State Public Health Lab / MCH Kottayam.

4. Construct a case definition

A standardised case definition is created to categorise individuals as being affected by the outbreak based on specific clinical, epidemiological and laboratory criteria.

- **Suspected Case:** A patient with febrile illness who presents with symptoms consistent with scrub typhus but lacks definitive epidemiological exposure or laboratory confirmation.
- **Probable Case:** A patient with acute febrile illness and supportive epidemiological exposure (e.g. recent travel to endemic areas) but without laboratory confirmation.
- **Confirmed Case:** A patient with acute febrile illness and on or more of the following:
    - **Eschar (localised necrotic lesion)**
    - **Lymphadenopathy**
    - **Headache, myalgia, or other non-specific symptoms,**

    With Laboratory confirmation (Positive serology for *Orientia tsutsugamushi* (e.g. IgM, IgG or PCR confirmation of *Orientia tsutsugamushi from clinical specimen)*

5. *Find cases systematically and record information:*

Investigation team actively search for and identify individual affected by the outbreak. They systematically collect and record detailed information about each case using a case finding form.

6. *Perform descriptive epidemiology*

The data gathered is analysed and reviewed to identify characteristics of the outbreak in terms of time – when they developed symptoms, place- where cases are occurring and person- who is affected. This helps to identify patterns and trends. Creating spot maps can help pinpoint hotspot areas, if any.

7. *Develop hypothesis*

Based on the descriptive analysis, hypotheses are generated to explain cause, source and transmission of the outbreak.

8. *Evaluation of hypothesis epidemiologically*

The proposed hypotheses are tested through additional analyses or studies to determine their validity.

9. *Reconcile epidemiology with laboratory and environmental findings*

The epidemiological data is reconciled with laboratory findings and insights from environmental investigations. This alignment helps to confirm the source of the outbreak.

10. Conduct additional studies

If necessary, further studies are conducted to gather additional evidence to refine the understanding of the outbreak.

11. Implement and evaluate prevention and control measures

Stakeholder	Immediate Activities	Ongoing/Long-Term Activities
Health	• Conduct awareness and health education sessions on symptoms and preventive measures. • Train healthcare workers on identifying, diagnosing, and treating Scrub Typhus cases.	• Establish regular surveillance and early detection systems in high-risk areas. • Conduct periodic refresher training for healthcare providers.
LSG	• Mobilize community volunteers for early detection and notification of febrile illnesses. • Facilitate immediate reporting and response coordination with health authorities.	• Implement policies for regular environmental maintenance to control mite populations.
Agriculture	• Educate farmers on risk factors associated with forested and vegetative areas. • Implement immediate measures to reduce mite habitats in fields close to residential areas.	• Promote safe agricultural practices that minimize exposure to mites. • Integrate pest control measures for mites into standard agricultural practices.
Animal Husbandry	• Mite repellent Distribution.	• Develop and maintain mite control programs for livestock and animal shelters • Conduct periodic evaluations of animal

		habitats to monitor for mite presence.
Tribal Welfare	• Initiate awareness programs specifically for tribal communities about Scrub Typhus prevention.	• Continuously support and engage tribal communities in public health awareness efforts.

Control measures are put in place to prevent further spread of the disease. The effectiveness of these measures in monitored and evaluated. These measures include:

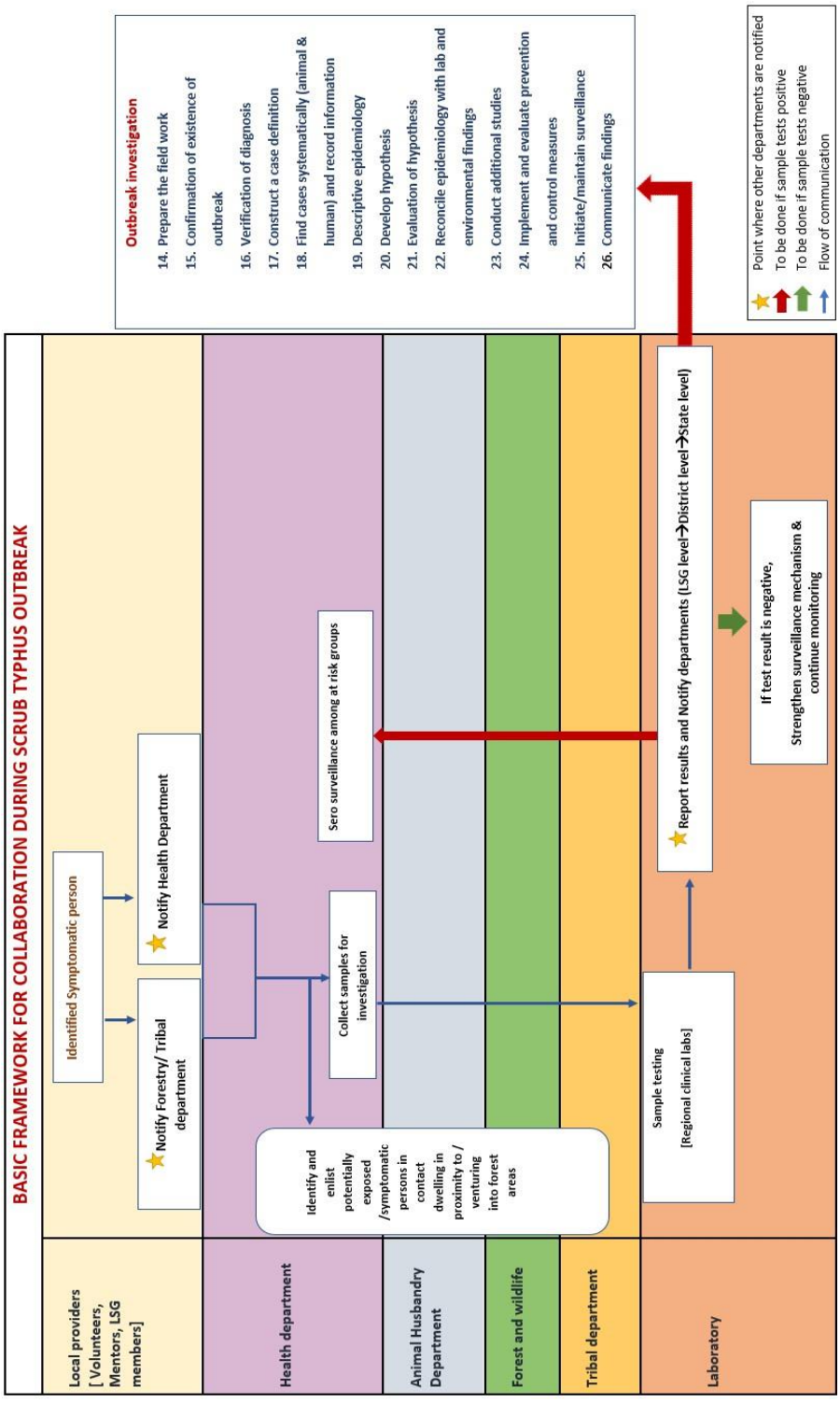
- Vector control
- Waste management in cooperation with the LSG to reduce rodent population
- Make people aware of protective footwear, dressing with help of awareness programmes, media
- Timely management of overgrown grass around homes with help of LSG.

12. Initiate or maintain surveillance

Surveillance is either initiated or existing surveillance mechanisms are strengthened and maintained to monitor the situation.

13. Communicate findings

Once the investigation is complete, the findings are communicated to stakeholders, including authorities from health, LSG and other line departments, the public and other relevant agencies.



Framework for collaboration during a Scrub Typhus outbreak

Model adopted from One Health toolkit developed by Arizona Department of Health Services

Chapter 12 : **Considerations during Field Investigation**

This chapter briefly talks about certain matters that need to be taken into consideration during field visits. It consists of the following subheadings:

A. Field Investigation Checklist
B. Recommended practices during Field Investigation
C. Addressing Stigma during Outbreak Investigations

A. Field Investigation Checklist

An outbreak investigation benefits from a systematic approach, as it can help reduce the likelihood of oversight and maintain efficiency and thoroughness throughout the entire process. The table given below provides a checklist that outlines specific indicators and their means of verification that can help guide investigators to comprehensively document a joint outbreak investigation. This documentation offers valuable insights for external stakeholders as it allows others to understand the methods, decisions, and critical actions undertaken during the outbreak investigation.

Step No.	Step Description	Possible Indicator	Means of Verification
1	Prepare for the field work	Team formation, resources allocated, logistics arranged	Field work plan, meeting minutes, resource distribution records
2	Confirmation of existence of outbreak	Reports of increased cases in a defined area	Health department reports, epidemiological surveillance data
3	Verification of diagnosis	Clinical records, laboratory test results	Laboratory results, medical records, confirmation from clinicians
4	Construct a case definition	Defined criteria for a case (symptoms, laboratory findings, etc.)	Case definition document, comparison of suspected cases with criteria
5	Find cases systematically (animal & human) and record information	Identification of animal and human cases, data collection	Case logs, surveillance reports, field surveys
6	Descriptive epidemiology	Data on cases (time, place, person)	Descriptive tables, epidemiological maps, statistical analysis
7	Develop hypothesis	Initial hypothesis based on available data	Hypothesis formulation, discussions with team, initial analysis
8	Evaluation of hypothesis	Testing the hypothesis against new data	Comparison with new case data, statistical testing
9	Reconcile epidemiology with lab and environmental findings	Consistency between epidemiological data, lab results, environmental observations	Cross-checking with laboratory and environmental reports

10	Conduct additional studies	Additional surveys, focused studies (e.g., environmental, risk factors)	Study reports, additional data collection sheets
11	Implement and evaluate prevention and control measures	Initiation of control measures (vaccination, quarantine, etc.)	Implementation reports, monitoring and evaluation of interventions
12	Initiate/maintain surveillance	Surveillance system in place, continued case reporting	Surveillance records, weekly or monthly updates from health authorities
13	Communicate findings	Reports, meetings, public health alerts	Final investigation report, meetings with stakeholders, media statements

B. Recommended practices during Field investigations

An outbreak can be a cause for concern and fear within the community. Field investigation teams must be mindful of this and approach community members with empathy and understanding. By adhering to recommended practices, investigators can build trust, alleviate concerns, and facilitate a smooth investigation process, ultimately contributing to effective outbreak control.

Recommended practices during an outbreak investigation	
Preparation and Coordination	• Planned field visits with local authorities, community leaders and other personnel the community is familiar with can facilitate smoother access and acceptance during field investigations. • Field work team members must be familiar with cultural norms, local languages and dialects, and remain cognizant about the community's concerns. • Communities must be informed in advance regarding field visits as impromptu visits may be met with distrust and resistance. • Limiting the team size is important as a smaller, well-coordinated team allows for smoother interactions and minimizes community disruption.
Building Rapport and Trust	• During house and field visits, fieldwork team members must introduce themselves and explicitly state the purpose of the investigation to the community members. • Fieldwork teams should address community members courteously, using culturally appropriate greetings and gestures. • Fieldwork teams are advised to use layman's language so that explanations of the investigation are clear and understandable for the community

	• Team members should provide clear understandable responses to any query from the community members. • Value community input by actively seeking and responding to their questions.
Confidentiality and Privacy	• Inform individuals that their information will be kept confidential and will only be used for the purpose of outbreak control. • Obtain consent before conducting interviews or examinations, emphasizing voluntary participation. • Details regarding individual cases that may reveal personal information must be discussed discretely. • Fieldwork team members must respect personal boundaries of the community members
Empathy and Compassion	• Community members must be given the opportunity to share their concerns and experiences related to the outbreak. • Fieldwork team must acknowledge the community's apprehensions and provide accurate information to allay their concerns.
Precautionary measures	• Team member must use appropriate personal protective equipment (PPE) and sanitize hands regularly to prevent spreading infections. • Encourage the community to follow preventive measures to reduce transmission. • Social distancing guidelines must be followed regardless of social conventions.
Communication Strategies	• Disseminate timely and accurate information about the outbreak, its causes, and the steps being taken to address it. • Develop clear and concise messages to debunk false information. Speculative statements must be avoided. • Multiple channels (e.g., social media, traditional media, community meetings) may be used to communicate findings with the community

C. Addressing stigma during outbreak investigations

Fear, uncertainty, and restrictions during outbreaks often lead to stigma, which hinders control efforts[4]. The outbreak investigation team should understand the socio-cultural context while navigating the community in search of cases. Here are a few strategies to address stigma among diverse population during outbreak investigations:

- **Collaborate with Community Leaders and engaging the communities**: Partnering with respected local leaders can enhance trust and acceptance. Community leaders can act as intermediaries to bridge communication and cultural gaps, making it easier to engage with the community. The communities can be engaged using Participatory Rural Appraisal (PRA) methods.

[4] Paterson, Olliaro, and Rojek, "Addressing Stigma in Infectious Disease Outbreaks."

- **Diversify the Investigation Team**: Including team members who share the community's cultural, linguistic, or ethnic background can help in better understanding and reducing stigma.
- **Respect Local Customs and Beliefs**: Demonstrating awareness and respect for the community's customs and practices can build rapport.
- **Clear Communication in Local Language**: Explaining the investigation's goals, methods, and expected outcomes in the community's primary language reduces misunderstandings and builds transparency.
- **Provide Support and Resources**: Offering tangible resources—such as healthcare services, informational materials, and emotional support—reinforces the message that the investigation aims to help rather than scrutinize the community.

Chapter 12 : **Summary**

This SOP provides a framework for conducting joint outbreak investigations within the One Health Program in Kerala. It serves as a comprehensive action plan to guide coordinated responses to disease outbreaks across various sectors. It establishes clear responsibilities for public health, veterinary, environmental, and other relevant departments, ensuring that each plays a vital role in investigating, controlling, and managing outbreaks. Implementation of this SOP will contribute to a more coordinated and effective approach to outbreak management and strengthen the resilience of our communities against emerging health threats.

The SOP's flexibility, coupled with its emphasis on continuous learning and adaptation, ensures that it will remain a relevant and proactive resource for years to come. By operationalizing the One Health approach and encouraging intersectoral collaboration, this SOP will play a crucial role in safeguarding human, animal, and environmental health, thus protecting Kerala's communities from both current and future public health threats.

With its structured framework, the SOP is not only a blueprint for immediate outbreak investigations but also a proactive resource for strengthening community resilience against future public health challenges.

Please note: If any other Country/ State adopts this SOP, they may consider their public health situation at their respective geographical area for disease prioritisation. If anyone requires further clarifications regarding the preparation of the SOP, they may contact the Centre for One Health – Kerala at keralaonehealth@gmail.com .

Annexures

ANNEXURE I

Outbreak reporting format

A. General format for reporting is as follows:

General Information

Date of Report: [Date when the report is prepared]

Reporting Agency: [Name of the agency, e.g., District Medical Office]

Contact Person: [Name, Designation, Contact details]

Location of Outbreak: [District, Panchayat/Municipality, Area/Ward]

Human Cases

Number of Human Cases: [Total, Confirmed, Suspected, Probable]

Age Range: [Minimum age] - [Maximum age]

Date of Illness Onset on index case: [Start date]

Deaths: [Number of deaths]

Animal Cases

Species Affected: [List of affected species, e.g., Monkey, Dog]

Number of Animal Cases: [Dead], [Sick]

Location of Cases: [Forest area, Village/Town/Ward]

Date of Onset (if known): [Start date]

Clinical Signs: [Describe observed symptoms]

Laboratory Results: [Positive/Negative for KFD]

Environmental Factors

Type of vector detected: [Tick species, other vectors]

Weather Conditions: [Temperature range, Rainfall]

Land Use: [Forest, Agriculture, Urban, etc.]

Water Sources in the vicinity: [Rivers, Ponds, Wells, etc.]

Public Health Actions

Case Finding and Investigation: [Methods used, number of cases identified]

Contact Tracing: [Number of contacts identified, followed up]

Isolation/Quarantine: [Implemented/Not Implemented]

Vaccination: [Target population, number vaccinated]

Health Education: [Activities conducted, target audience]

Vector Control: [Methods used; areas covered]

Risk Communication: [Messages disseminated; channels used]

RRT Member involved [Name, designation, department]

Inter-Sectoral Collaboration:

Departments Involved: [List involved departments, e.g., Health, Forest, Animal Husbandry]

Roles and Responsibilities: [Describe roles of each department]

Coordination Mechanisms: [Describe how coordination is handled]

Challenges: [Identify challenges faced]

Laboratory Findings

Laboratory Involved: [Name of the laboratory]

Specimens Tested: [Human, animal, vector]

Test Results: [Positive/Negative for KFD]

Turnaround Time: [Time taken for test results]

Recommendations

Immediate Actions: [Urgent steps to be taken]

Short-Term Actions: [Actions to be taken within a specific timeframe]

Long-Term Actions: [Sustainable actions for prevention and control]

Surveillance: [Recommended frequency and methods]

Department	Name of Official	Designation	Signature	Date
Health Department				
Forest Department				

Animal Husbandry				
Agriculture Department				
Others (Specify)				

ANNEXURE II

B. Short format for reporting is as follows:

Sl. No.	Area involved (District/Block / PHC/Village)	Disease	Number of cases in humans	Number of cases in animals	Number of deaths in humans	Number of deaths in animals	Date of start of outbreak	Date of reporting of outbreak	Current status	Comments (suspected cause of outbreak, RRT investigation, Line list available, Lab samples tested (Name of Lab), results of lab samples tested, control measures taken)

ANNEXURE III

C. State Nodal Officers of One Health Programme

Nodal Officers of One Health Programme

Sl. No	Department	Name of Nodal Officer	Designation	Official Address	Contact number	Email id
	Centre for One Health – Kerala	**Ms. Madhavikutty MS IAS**	**Director**	**Centre for One Health, KSIHFW Campus, Thycaud, Thiruvananthapuram,**		**dshealthhandfw@gmail.com**
1.	Health Services	Dr. Ajan M J	Assistant Director (Medical)	Directorate of Health Services, State Nodal Officer- One Health Programme	9496337143	ajanmj@gmail.com
2.	LSGD (Urban)	Dr. Ummusalma	Joint Director - SPHEO	LSGD Principal Directorate, Swaraj Bhavan, Nanthancode, Thiruvananthapuram	9496747351	pdlsgdphsection@gmail.com
3.	Fisheries	Mr. K Suhair	Deputy Director (Inland)	Directorate of Fisheries, Thiruvananthapuram	9387221531	ddinlandhq@gmail.com
4.	Environment & Climate Change	Dr. Jissy Jyothi S	Environmental Officer	Directorate of Environment & Climate Change, KSRTC Bus Terminal (4th Floor), Thiruvananthapuram	8086061587	jissyjyothi@gmail.com
5.	Food Safety	Dr.Ansha John	Food Safety Officer	O/o Food Safety Commissioner, Thiruvananthapuram	9539996216	cfs.foodsafety@kerala.gov.in, foodsafetykerala@gmail.com

6.	Drug Control	Mr. Saju John	Deputy Drugs controller -II	Office of the Drugs Controller,Red Cross Road,Thiruvananthapuram – 695 035	9446082697	sajujohndi@gmail.com
7.	Animal Husbandry	Dr. D Sanjay	Disease Investigation Officer	State Institute for Animal Disease, Vamanapuram , Palode, Kerala 695563	9946558727	devarajansanjay@gmail.com
8.	Irrigation	Ms. Suja Gracen	Superintending Engineer	Office of the Superintending Engineer, Minor Irrigation South circle, Ambalamukku, Thiruvananthapuram	9400690094	semictvpm@gmail.com
9.	Forest	Mr. Muhammed Anvar	Deputy Forest Conservator (Administration)	Forest Headquarters , Vazhuthacaud, Thiruvananthapuram	9446795213	deputycf2020@gmail.com
10.	Agriculture	Mr. Thomas Samuel	Addl. Director (Farms)	Directorate of Agriculture Department, Vikas Bhavan, Thiruvananthapuram	9446395098	addldirfarms.agri@kerala.gov.in , agrifarmsth@gmail.com
11.	KWA	Mr. Joy H Jones	Asst. Executive Engineer	Jalabhavan, Vellayambalam, TVM	9562640712	joyhjones@gmail.com
12.	Dairy Development	Ms. Nisha B S	Deputy Director	Dairy Development Directorate, Pattom	9995240861	dd.ext.kerala.gov.in
13.	Pollution Control Board	Ms. Pravitha P K	Asst. Executive Engineer	KSPCB HO, TVM	9497719054	pcbhorules2024@gmail.com

ANNEXURE IV

D. Nipah – Joint Investigation Protocol - Animal Husbandry

In the event of confirmation of Human NIPAH case or unusual death of Pigs in a farm (domestic and wild) or a single Pig (in wild) with either respiratory or nervous signs in an epicentre, reporting has to be done and the case shall be investigated. Death of Dogs and Cats with respiratory or nervous signs in an epicentre with a confirmed Human case needs to be investigated.

- **Reporting Protocol** –Farm owners/ Community Volunteers/Public/ Escalated to Section Forest Officer/Medico of PHC & Jurisdictional Veterinary Officer of VD/VH – Escalated to Range Officer of Forest dept/ DSO/ Chief Veterinary Officer(CVO) of AHD - Escalated to CWW of Forest dept/ DFO/ DMO of Health/DAHO of Animal Husbandry/RDDL/ SIAD-Escalated to DHD/DAH/CWW.

- District Collector to be coordinate inter sectoral meeting of line departments such as Health,AHD, Forest and Wild Life, LSGD, Revenue and Police on receiving the report

- Team Constituted by Chief Veterinary Officer including District Epidemiologist and Jurisdictional Government Veterinary Officer will visit the epicentre along with Livestock

Inspector and Attendant. If needed, District laboratory officer and Laboratory technician will jointhe team. Health Inspector/Medico of PHC, SFO of Forest will join the team. (JOINT

INVESTIGATION)

- District Epidemiologist under the control of Chief Veterinary Officer will visit the site ofdeaths in pigs/ other animals, examine index case and surroundings for exposure to possible risk factors, presence of Bat roost and report back to Chief Veterinary Officer for

confirmation of existence of outbreak. (JOINT INVESTIGATION).

- Samples will be collected from ailing suspected animals. Nasal/Throat/Oral swab, serum, blood, urine. From Post- mortem samples brain, Lungs, Spleen & Kidney, whole carcass of dead Bats or their droppings, and blood. All samples except serum samples are used for antigen detection while serum is for detection of Antibodies.
- Bat samples will be collected with the permission and help of Forest and wildlife department.
- Samples will be collected using PPE kits by observing bio security measures
- The samples will be transported in VTM for further testing.
- The samples will be dispatched to National Institute for High Security Animal Diseases, Bhopal, or designated laboratory as per directions from State Institute for Animal Diseases, Palode.
- Thiruvananthapuram, state referral laboratory under Department of Animal Husbandry

- Data will be collected on presence of Bat roost, Pig and other domestic animal population around 5 km from Epicentre of Human case or in place where unusual death of Pigs reported with respiratory or nervous signs
- Alert and Advisories issued to all Veterinary Institutions involved in health care delivery through email, SMS.
- Once a clinical case is confirmed in the designated laboratory, case definition needs to be Constructed.

Case Definition - Nipah viral infection is a highly contagious disease in pigs that affects the respiratory and nervous systems. Pigs with fever, severe cough, and dyspnoea and with or without nervous signs such as twitching, trembling, muscle fasciculation, spasms, muscle weakness, convulsions, and death should be suspected for NIPAH

- Animals with signs as per case definitions are investigated in laboratory in consultation with District Epidemiologist.

If Clinical case confirmed in Humans

- Issue Alert to Veterinary Health care delivery institutions and advice to report case as per case definition
- To establish source of infection and mode of transmission for establishing/verification of Hypothesis
- District Collector or his representative will be the nodal officer of the district
- Nodal Officer from each Line department to be identified.
- District Collector to convene meetings (intersectoral –Line departments) on a daily basis to review the situation
- Sero Surveillance/Active surveillance for Antigen detection to be conducted among all Pigs within 5 Kms of Epicentre
- Active Surveillance among dead/infected Pigs (domestic and Wild)/Bats/Dogs/Cats immediately after confirmation of NIPAH among humans
- Sero Surveillance among 10% of all domestic animals within 5 km of epicentre to be conducted
- Death of domestic animals with respiratory/nervous signs to be investigated.
- Appropriate environmental samples to be collected and dispatched to National Institute for High Security Animal Diseases, Bhopal for surveillance
- IEC programs in and around the epicentre
- Observe strict Bio-security among susceptible animals.
- Call centre to be established at Collectorate with technical officers who can answer to calls from public/farmers/Media
- Communicate results/new cases among line departments

If Clinical case of NIPAH confirmed in Pigs or any animals

- To be reported to Department of Animal Husbandry and Dairying, Government of India through Director of Animal Husbandry, Kerala for appropriate action
- Frame the actions based on the advisories issued from Government of India(no cases reported in domestic animals in India)
- Culling of infected animal and in- contact animals
- Movement restriction of Pigs or species confirmed to be infected with immediate effect to be ensured within the district
- To take actions as per instructions from Department of Animal Husbandry and Dairying, Government of India in the event of confirmation of a clinical case in animals (Wild/Domestic)
- To issue advisory and guidelines through state referral laboratory to Veterinarians in health care delivery service, laboratories and administration for control of the disease by observation of signs in animals, ensuring biosecurity, pigs in particular as per case definition
- To issue advisory to Government by Department of Animal Husbandry
- To establish source of infection and mode of transmission for establishing/verification of Hypothesis
- Appropriate environmental samples to be collected and dispatched to National Institute for High Security Animal Diseases, Bhopal for surveillance
- Communicate results/new cases among line departments

Routine Surveillance (Passive Surveillance)

- Surveillance of Bats/ Pigs/other susceptible species with respiratory/nervous signs across the state periodically for presence or absence of the disease (Antigen or Antibody).
- Sero Surveillance of Bats to be done across the state to study the presence or absence of disease.
- Sero Surveillance to be done in designated laboratories of Department of Animal Husbandry and Dairying, Government of India
- In the event of confirmation of NIPAH clinical case in Humans/animals, IEC programs to be conducted by Department of Animal Husbandry in and around the epicentre in consultation with Local Self Government and Food Safety Authority
- Sero Surveillance of Bats/ Pigs/other susceptible species with respiratory/nervous signs across the state periodically for presence or absence of the disease as part of conducting additional studies
- Communicate results/new cases among line departments

ANNEXURE V

E. Actions to be taken up by AHD during KFD Outbreak Investigation

- In the event of death of more than 2 monkeys (suspected/ unnatural death) or a single monkey in hot spots, reporting has to be done
- Reporting Protocol –Tribal/Tourist/Public Range Officer/Medico of PHC & Jurisdictional Veterinary Officer of VD/VH - Escalated to DFO of Forest dept/ DSO/DMO of Health/ Chief Veterinary Officer (CVO) of AHD - Escalated to CWW of Forest dept/ DSO/DMO of Health/ Chief Veterinary Officer (CVO) of AHD
- District Epidemiologist under the control of Chief Veterinary Officer will visit the site of Monkey death being reported, examine surroundings, presence of domestic animals around 1 km and report back to Chief Veterinary Officer.
- Forest team shall dust ectoparasiticide within 100 m of monkey death.
- Team Constituted by Chief Veterinary Officer including District Epidemiologist and Jurisdictional Govt Veterinary Officer will visit the suspected epicentre along with the team for conduct of post-mortem.
- If dead monkey is there, the post-mortem has to be done on site (PPE kits needs to be used).
- The visceral samples of dead monkey, blood, serum samples, swabs of discharges (if any) will be send to NIHSAD, Bhopal for laboratory confirmation (PPE kits needs to be used)
- Live ticks also will be collected from the epicentre (if any) observing strict Biosecurity measures and will be send to NIHSAD, Bhopal for Laboratory confirmation.
- If the monkey samples are found to be positive for KFD, alert will be given to all PHCs……. Veterinary Hospitals and Forest department.
- Sero Surveillance in hot spots to be done among Livestock in the event of a case being reported in Humans for finding out possible source of infection.
- Health of Monkeys to be strictly monitored and reported by Forest Veterinary Officers
- All sick and dead Monkeys to be investigated and post-mortem of all unnatural deaths shall be conducted.
- Alert to be given by AHD, if a single clinical case or sero prevalence is reported in any Domestic Animals to Department of Health.

- In the event of confirmation of KFD in Humans, Forest and AHD officials will be alerted, District Epidemiologist of AHD will conduct Sero Surveillance of domestic animals such as Livestock (10% of the total population in that area) and rodents at random, within 1 km from the infected zone.
- In the event of confirmation of KFD in Monkeys at designated Laboratories, but no human cases, District Epidemiologist of AHD will conduct Sero Surveillance of domestic animals such as Livestock (10% of the total population in that area) and rodents 1 km from the infected zone.
- In the event of confirmation of KFD in any domestic animals, Department of Animal Husbandry and Dairying, Govt of India will be alerted through Department of Animal Husbandry, Kerala to come out with an action plan (as of now, there is no evidence of Domestic animals being infected with KFD).
- Tick Control Program in Forest and fringe areas to be taken up on a war footing (dusting, controlled burning by forest department)
- Tick Control Program among livestock in particular on a war footing (AHD)
- Rodent Control program
- Sero Surveillance in Livestock, Poultry, Rodents for KFD concentrating in hotspots in phase I and in other parts of the state as Phase II.
- Sampling plan to be finalised by ICMR-National Institute for Epidemiology for Humans and ICAR- NIVEDI for animals.
- Surveillance among Ticks to be taken up done by AHD through ICAR-NIHSAD.
- Source of Infection to be analysed by intersectoral collaboration that includes, Forest/Health/LSGD/AHD officials. Need to discuss epidemiological factors in detail and come out with an action plan.
- Sero Surveillance in hot spots to be done regularly among Livestock, Poultry and Rodents.
- IEC programs to be done at Hotspots among Health officials

ANNEXURE VI

F. Contributors List

Sl No.	Name	Designation & Office	Department/Agency
1.	Dr Reetha K P	Additional Director, Public Health	Health Services
2.	Dr NandaKumar K V	Additional Director (Medical), Health	
3.	Dr. S Sunija	Director, State Public Health Lab, Trivandrum	
4.	Dr . V Jithesh	Executive Director, State Health System Resource Centre - Kerala	
5.	Dr Sachin K C	District Surveillance Officer, DMCCHS, Kannur	
6.	Dr Geethu Maria Joseph	District Surveillance Officer, Palakkad	
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8.	Dr. Ajan M J	Assistant Director (Medical), Directorate of Health Services, State Nodal Officer- One Health Programme	
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28.	Dr Subin M S	Veterinary Surgeon,Erumeli	
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31.	Dr Rekha Sagar	Veterinary Surgeon,Cheppad, Alappuzha	
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44.	Dr Syam Chandran	Forest Veterinary Officer, Pathanamthitta	
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