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National Immunization Program

Government of Nepal

Ministry of Health and Population

Department of Health Services

Family Welfare Division

Acute Encephalitis Syndrome (AES) / Japanese Encephalitis (JE) Surveillance Manual

2025

Acknowledging World Health Organization- Programme for Immunization Preventable Diseases (IPD) for continuous technical support to National Immunization Program including development of AES/Japanese Encephalitis Surveillance Manual

ACUTE ENCEPHALITIS SYNDROME (AES) / JAPANESE ENCEPHALITIS (JE) SURVEILLANCE MANUAL

Government of Nepal
Ministry of Health and Population
Department of Health Services
Family Welfare Division

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FOREWORD

In line with Nepal's commitment to reduce the morbidity and mortality associated with Japanese encephalitis (JE), the Acute Encephalitis Syndrome (AES) Surveillance Manual for Japanese Encephalitis (JE) has been developed to strengthen AES surveillance systems at all levels. This manual serves as an essential tool for health workers, epidemiologists, and decision makers in detecting and responding to JE cluster or outbreaks in a timely and effective manner.

The manual aims to provide a standardized approach for AES surveillance and case management, outlining the roles and responsibilities of key stakeholders in ensuring early AES case detection and intervention. This manual provides technical guidance to strengthen subnational capacity for responding to outbreaks.

Through this manual, we aim to empower health professionals with the knowledge and tools necessary to enhance AES surveillance, reduce the incidence of JE, and protect vulnerable populations, particularly children, from JE complications and sequelae.

I congratulate the Director of the Family Welfare Division (FWD) for taking lead in development of this important manual. I appreciate continued technical support of World Health Organization-Nepal, guidance and feedback of Technical Working Group, and tireless technical contribution of officials from FWD in development of this manual.

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FOREWORD

Climate change has gradually increased the burden of vector-borne diseases in Nepal. Among them, Japanese Encephalitis (JE) remains a major public health concern in Nepal, particularly in the rural terai region, affecting vulnerable population and children under 15 years of age. Addressing the burden of JE requires multi-disciplinary approach involving coordinated team of surveillance, case management, vaccination, and public awareness on JE prevention. Nepal must strengthen its response to control and eventually eliminate JE as a public health threat.

The Family Welfare Division, in collaboration with health professionals, directors of different division and centers of Department of Health Services (DoHS), Technical Working Group (TWG), and World Health Organization (WHO), have worked diligently to develop this comprehensive JE surveillance manual. Our primary objective is to strengthen the AES surveillance and field response to JE affected areas, improve the quality of care for those affected, and enhance the preventive measures through one health approach.

This manual is intended to serve as a practical tool for healthcare providers, rapid response team and stakeholders both at national and subnational levels. It offers detailed guidance on AES surveillance, laboratory testing, diagnosis, treatment, and prevention of JE emphasizing the critical role of public health education and community engagement in combating this disease. By reinforcing these practices, we aim to reduce the incidence and mortality of JE in Nepal, particularly among children and vulnerable communities.

As we continue to work towards a healthier future, it is essential that we adopt a holistic and integrated approach to address the challenges posed by JE in Nepal. This manual will help to ensure that our health system remains resilient, responsive, and prepared.

Director

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FOREWORD

It is my great pleasure to present National Acute Encephalitis Syndrome (AES) / Japanese Encephalitis (JE) Surveillance manual in Nepal. This manual has been developed through consultative process. It has been critically reviewed by epidemiologists, Technical Working Group, WHO technical team including clinical experts. It aims to provide evidence-based strategies to detect, treat and manage JE cases to prevent JE related deaths. It also emphasized the importance of community awareness and public health interventions to prevent JE cases.

The year-2024 detected 84 lab confirmed JE cases with a case fatality rate of 27%. The focus of this document is not only to strengthen AES surveillance but also to respond suspected JE cases and outbreaks. In addition, it also emphasized efforts to prevent the JE through high JE vaccination coverage, quality AES surveillance and effective preventive measure. As we continue to combat this disease, it is crucial that we make a collaborative approach ensuring all stakeholders play an active role in the fight against JE.

This manual is an essential resource for healthcare professionals, decisionmakers, and community leaders. The manual expects to improve JE outbreak preparedness and response mechanisms involving rapid response team to provide better care for those affected by JE. I encourage all healthcare providers to go through this manual to support AES surveillance and management of JE cases.

As the Chief of the Child Health Immunization Service Section (CHISS), I reaffirm our commitment to improve immunization services and mitigate risk of JE. With collective effort, vigilance, and determination, we can reduce the JE burden and JE related mortality.

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Section Chief

ACKNOWLEDGEMENT

The Director General, Department of Health Service, Ministry of Health and Population expresses sincere gratitude to all the reviewers of this manual, the members of the Technical Working Group and particularly to WHO Country Office-Nepal for supporting development of this comprehensive National AES Surveillance Manual for Japanese Encephalitis.

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Abbreviations:

AES	: Acute Encephalitis Syndrome
AFP	: Acute Flaccid Paralysis
ASAP	: As soon as Possible
BHSC	: Basic Health Service Center
BHSU	: Basic Health Service Unit
BP	: Blood Pressure
BPKIHS	: B.P. Koirala Institute of Health Sciences
CDS	: Communicable Diseases and Surveillance
CFR	: Case Fatality Rate
CIF	: Case Investigation Form
COVID-19	: Coronavirus Disease
CPP	: Cerebral Perfusion Pressure
CSF	: Cerebrospinal fluid
DOHS	: Department of Health Services
EDCD	: Epidemiology and Disease Control Division
ELISA	: Enzyme-linked Immunosorbent Assay
EPID	: Epidemiological Identification
FCHVs	: Female Community Health Volunteers
FWD	: Family Welfare Division
GoN	: Government of Nepal
HF	: Health Facility
HIV	: Human Immunodeficiency Virus
HMIS	: Health Management Information System
HO	: Health Office
HP	: Health Post
ICP	: Intra Cranial Pressure
IEC	: Information, Education and Communication
IgM	: Immunoglobulin M
JE	: Japanese Encephalitis
JEV	: Japanese encephalitis virus
L3 and L4	: Lumbar vertebrae 3 and 4
MoHP	: Ministry of Health and Population
NPHL	: National Public Health Laboratory
NPO	: Nil Per Oral

ORI	: Outbreak Response Immunization
Pao2	: Partial Pressure of Oxygen
PHC	: Primary Health Care center
PHK	: Primary Hamster Kidney
PMR	: Physical Medicine and Rehabilitation
PRNT	: Plaque Reduction Neutralization Test
RCCE	: Risk Communication and Community Engagement
RRT	: Rapid Response Team
RT-PCR	: Reverse Transcription Polymerase Chain Reaction
SIADH	: Syndrome of Inappropriate Anti Diuretic Hormone
VBDRTC	: Vector Borne Disease Research and Training Centre
WHE	: World Health Organization – Health Emergency
WHO IPD	: World Health Organization-Programme for Immunization Preventable Disease
WHO	: World Health Organization

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1 Introduction

1.1 Background

Japanese Encephalitis (JE), often called the “brain fever”, is a serious viral infection of central nervous system. It is transmitted to human through the bite of infected mosquitoes. JE virus is the leading cause of encephalitis and one of the causes of acute encephalitis syndrome (AES) globally. In temperate and tropical regions of Asia, the virus is maintained through a transmission cycle between vertebrate amplifying hosts (e.g., pigs, herons, egrets) and several Culex mosquito species. Humans are the accidental hosts and do not contribute to JE transmission in the community. Surge of JE cases are noticed from communities where human is in closed contact with amplifying hosts. Majority of JE cases, especially in outbreak-prone areas, occur in children under 15 years of age, but in areas experiencing JE for the first time, people of all ages can be affected.[1]

An estimated 3 billion people globally live in JE risk zones, with incidence rates as high as 10 cases per 100,000 or more during outbreaks.[2] This devastating disease not only claims lives, with a case fatality rate of approximately 30%, but also leaves nearly half of its survivors with long-term neurological and psychiatric conditions, impacting cognitive abilities and economic productivity.[3] With no specific cure available, early detection and supportive care are essential to manage symptoms and prevent complications.

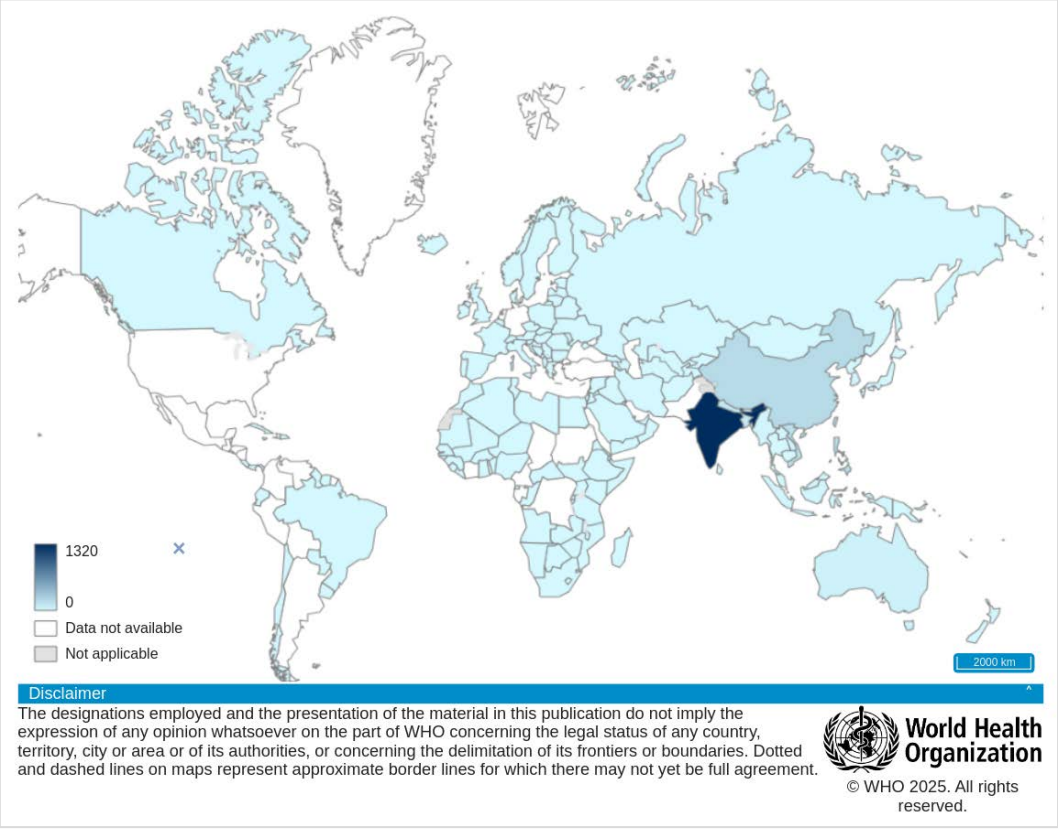


Figure 1. Number of reported cases of Japanese Encephalitis (JE); Data as of July 2024

[1] Heffelfinger JD, Li X, Batmunkh N, et al. Japanese Encephalitis Surveillance and Immunization — Asia and Western Pacific Regions, 2016. MMWR Morb Mortal Wkly Rep 2017;66:579–583. DOI: http://dx.doi.org/10.15585/mmwr.mm6622a3

[2] https://www.who.int/news-room/fact-sheets/detail/japanese-encephalitis

[3] Japanese Encephalitis: A manual for Medical Officers of Health. Epidemiology Unit. Ministry of Health. Srilanka https://www.epid.gov.lk/storage/post/pdfs/JE%20book.pdf

First described in Japan in 1871, Japanese encephalitis virus (JEV) continues to be is the most important cause of viral encephalitis in Asia.[4] The subsequent epidemic in 1924, JE has become a growing concern across Asia, particularly in the South East Asia Region.[5] A systematic review and meta-analysis conducted in 2022 reported that South East Asia had the highest prevalence of JE among vector (mosquitoes) and animals at 39%, followed by East Asia at 35% and South Asia at 15%, with an overall prevalence of 26% across the Asian continent.[6]

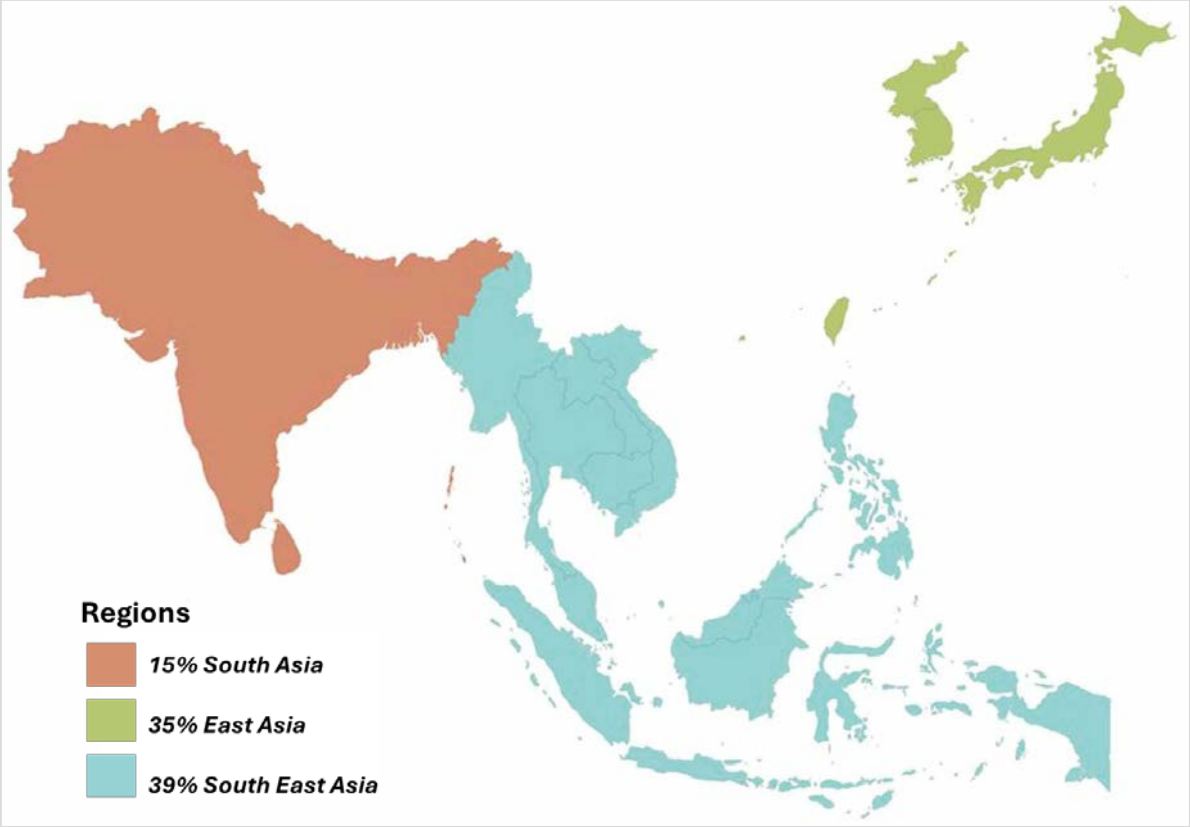


Figure 2: Pooled prevalence of Japanese encephalitis virus in the Asian continent

1.2 Japanese Encephalitis (JE) in Nepal

In Nepal, the first JE outbreak was reported in 1978 from Rupandehi district along Nepal's Southwestern border with India. Subsequent JE outbreaks were noted in the nearby Terai district and eventually in all 24 Terai districts.[7] JE surveillance was integrated with vaccine preventable disease (VPD) surveillance in May 2004.[8] The JE confirmatory diagnostic facilities were only established in WHO accredited laboratories (BPKIHS and NPHL) after 2005. JE is now being

[4] Sakamoto, R., Tanimoto, T., Takahashi, K., Hamaki, T., Kusumi, E., & Crump, A. (2019). Flourishing Japanese encephalitis, associated with global warming and urbanisation in Asia, demands widespread integrated vaccination programmes. Annals of global health, 85(1), 111.

[5] Kumari R, Joshi PL. A review of Japanese encephalitis in Uttar Pradesh, India. WHO South-East Asia J Public Health 2012;1(4):374–395. doi: 10.4103/2224-3151.207040

[6] Suresh, K. P., Nayak, A., Dhanze, H., Bhavya, A. P., Shivamallu, C., Achar, R. R., ... & Patil, S. S. (2022). Prevalence of Japanese encephalitis (JE) virus in mosquitoes and animals of the Asian continent: A systematic review and meta-analysis. Journal of Infection and Public Health, 15(9), 942-949.

[7] Combatting Japanese encephalitis in Nepal: a public health success story. August 2016. https://media.path.org/documents/VAD_je_nepal_case_study_r1.pdf

[8] Field Guide for Surveillance of Vaccine Preventable Disease, GoN MoHP Department of Health Services and WHO IPD.

reported from over 60 districts, including Kathmandu, with surge of JE cases every 2-5 years, especially during the monsoon months (July to September).[9]

Since 2004, the Government of Nepal has been working together with the World Health Organization (WHO) Nepal to conduct AES surveillance for laboratory confirmation of JE. National Immunization Program introduced JE vaccine in 2008[10] and scaled up JE vaccine post-campaign in all 77 districts in a phase wise manner. The introduction of JE vaccines in all districts have dramatically reducing the incidence of JE in Nepal.

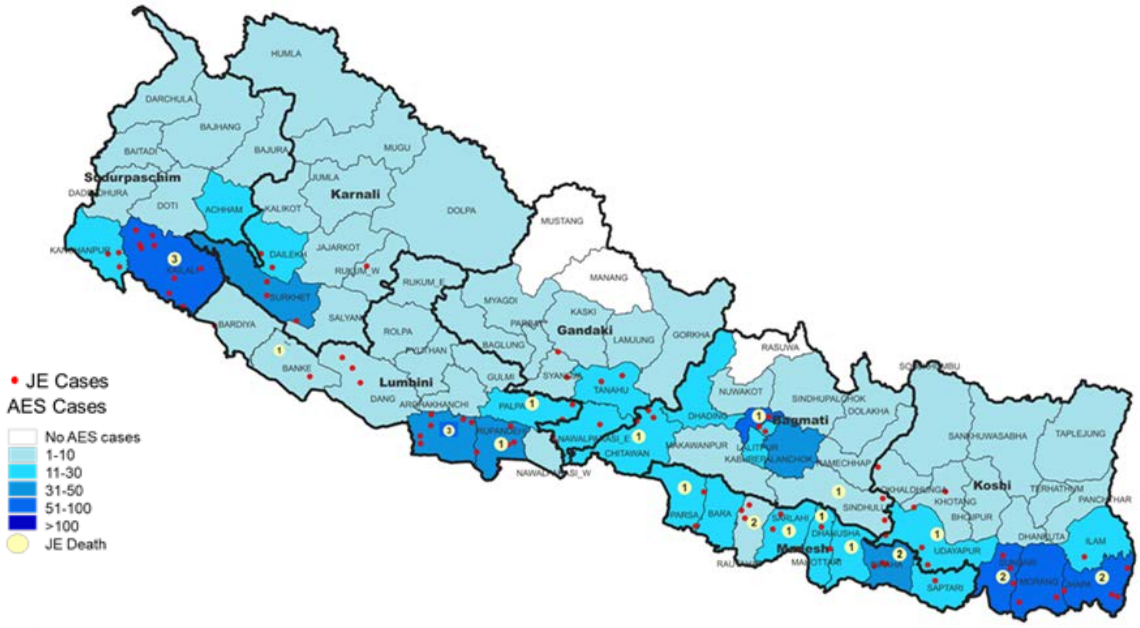


Figure 3: JE cases in Nepal; Data as of Jan-Dec 2024. Source: FWD & WHO VPD surveillance database, Nepal

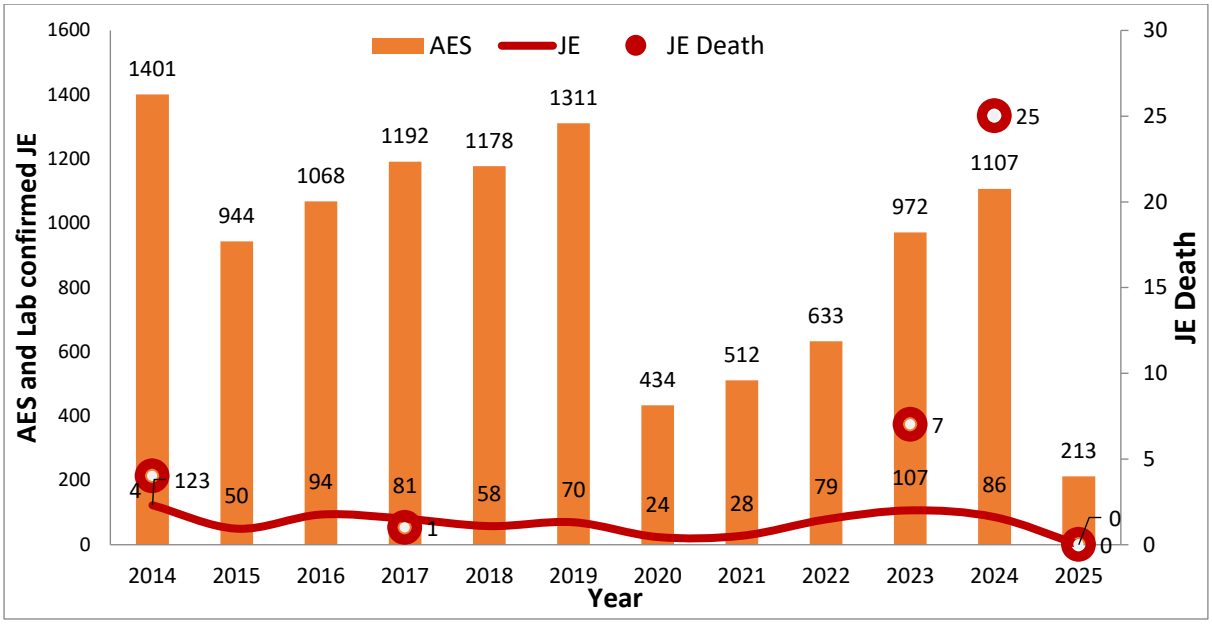


Figure 4: AES, JE, and JE death (2014 – March 2025); Source: FWD/NPHL/WHO-IPD

The AES surveillance data from 2014 till March 2025 Figure 3 shows that reporting of AES case dropped during Covid-19 pandemic year-2020. Post COVID-19, the reporting of AES cases

[9] Joshi, D. (1983). Incidence of Japanese encephalitis in children: 1978, 1979, and 1980 outbreaks. NEPAS J, 2, 18-25.
[10] Progress of polio eradication in Nepal, CHD/DoHS, MoHP Kathmandu Nepal October 2015.

increased gradually reaching pre-pandemic level in 2024. In 2024, there were 86 lab confirmed JE cases with 25 JE related deaths accounting to case fatality rate (CFR) of 29%.

AES Surveillance is a continuous monitoring of all factors influencing JE transmission in the community and systematic collection, analysis and interpretation of AES and JE data needed for the planning, implementation and evaluation of JE control measures. .

Note: All AES cases are Not JE. AES is a spectrum of symptoms whereas JE is a disease that is confirmed only after lab investigation.

1.3 Objectives of AES Surveillance

The objectives of JE surveillance are to:

- understand the epidemiology of JE including the definition of the populations at risk and estimation of the disease burden in the country;
- determine the geographical distribution of JE in the country;
- provide information for the formulation of a vaccination policy; and
- evaluate the impact and effectiveness of the vaccine after its introduction.

1.4 Selection of AES cases for investigation

अतिशीघ्र इन्सेफलाइटिस् सिन्ड्रोम (ए.इ.एस.)

कुनै व्यक्तिलाई अचानक उच्च ज्वरो आउनुका साथै चेत अवस्थामा परिवर्तन (जस्तै: कम्पन, अर्ध चेत, अचेत) भएमा ।

1.4.1 Case definition of an AES case:

A person of any age who, at any time of the year, develops

- Fever of acute onset AND at least one of the following:
- A change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk); or
- New onset of seizures, excluding *simple febrile seizures**.

*A ***simple febrile seizure*** is defined as a seizure among children who are between 6 months and 6 years of age, in whom the only findings are fever and a single generalized convulsion lasting less than 15 minutes, and who recover consciousness within 60 minutes of the seizure.

1.4.2 Case detection and notification:

- AES cases should be reported by community/FCHV/medical doctors/health care workers to respective surveillance focal person & public health authorities within 24 hours after the identification and investigated within 48 hours of reporting.
- If the patient meets the case definition for AES, a standard case investigation form (CIF) should be used to investigate all AES case, submit them to the municipality/district surveillance focal point.
- Specimen (blood serum or CSF) should be collected from all AES cases for laboratory confirmation.

1.4.3 Assigning an EPID number

A unique case identification number should be assigned to each case. The number should begin with one or more three-letter combinations that designate the geographical location, followed by the year and the serial number of the case. All communications and forms related to the case should cite the EPID.

Table. Example of EPID number assignment for AES Case **AES-NEP-PR3-KTM-24-0001**

The EPID number is an 18-character string that consists of the following codes:	
1st to 3rd characters	Disease code for Acute Encephalitis Syndrome
4th to 6th characters	Country code in letters
7th to 9th characters	First administrative level (province) in letters
10th to 12th characters	Second administrative level (district) in letters
13th to 14th characters	Year of onset
15th to 18th characters	4-digit number of the case (using a chronological order as per the respective district)

1.4.4 Sample collection, storage, and transportation,

Two types of specimens can be collected for diagnosis of JE, which are:

1. Cerebrospinal Fluid (CSF), and
2. Blood (Serum)

Cerebrospinal Fluid (CSF)	Blood (Serum)
- The referred specimen for laboratory confirmation of JE. - The IgM to JE virus rises earlier in CSF than in serum and it rises 2-4 times higher than the serum sample. - IgM in CSF can be measured in most patients by 4 days of the onset of symptoms. - Obtained through lumbar puncture - Lumbar puncture is conducted by trained clinicians Amount: 1 ml of CSF per tube. - At least one tube should be sent to JE lab and remaining two tubes (preferably three) should be sent to the hospital laboratory for microbiology (Gram stain and bacterial culture), and the estimation of CSF glucose, protein, and cell count.	- Collected only if facilities for a lumbar puncture are not available. - Antibody can be measured in the serum by 7 days of onset of symptoms. - A JE IgM positive result in the serum is a good indicator for an acute infection. However, there could be cross-reactivity with other flaviviruses such as dengue virus. - Collected by Phlebotomist/health care workers Amount of blood sample to be sent to the laboratory: - 3-5 ml of blood for older children and adults; and - 1-2 ml of blood for infants and younger children

Indications for a second blood sample

If the first CSF or blood sample is positive for JE IgM, it is not necessary to test a second sample. However, if JE-specific IgM antibodies are not present when the first blood sample is taken, a second blood sample must be obtained:

- on day 10 of the illness (usually on the seventh day of hospitalization);

- at the time of discharge; or
- at the time of death.

Rationale for the collection of second blood sample:

- IgM antibody levels rise steadily after onset of encephalitis.
- The percentage of patients with IgM detectable in serum increases with days after onset.

A second blood sample is also required to differentiate JEV and other non JE viruses like West Nile Virus infection. The IgM ELISA test is conducted at national public health laboratory (NPHL) or subnational VPD laboratory at BPKIHS. It is good clinical practice to collect a second sample of blood as well.

Samples should be sent to WHO accredited national laboratory (NPHL) or sub national laboratory (BPKIHS) for JE specific testing within 5 days of sample collection.

1.4.5 Equipment required for sample collection

Cerebrospinal Fluid (CSF)	Blood (Serum)
- Sterile dressing - Sterile gloves - Sterile drape - Antiseptic solution with skin swabs - Lidocaine 1% without epinephrine - Syringe, 3 mL - Needles, 20 and 25 gauge - Spinal needles, 20 and 22 gauge - Three-way stopcock - Manometer - Four plastic test tubes, numbered 1-4, with caps - Cold chain box (vaccine carrier) with ice pack - Syringe, 10 mL (optional) Scan this QR for a detailed video on the procedure of Lumbar Puncture for CSF collection. (https://www.youtube.com/watch?v=DUnZSg6xJ-c)	- 5ml vacutainer tube(non-heparinized) with 23g needle/5ml syringe with needle - 5ml blood collection tube if syringe and needle are used for blood collection - Disposable gloves and face mask - Tourniquet - Sterilized swabs - Sterile serum storage vial - Specimen labels, marker pen - Band aid - Zip lock plastic bags - Lab request form - Cold chain box (vaccine carrier) with ice pack - First- aid kit

1.4.6 Procedure of sample collection

Cerebrospinal Fluid (CSF)	Blood (Serum)
- Position the patient on his/her side with knees curled up to his/her abdomen. In difficult cases, can be performed with the patient sitting or bent forward.	- Tie the torniquet around the patient's arms and collect 3- 5 ml (for adults) and 1-2 ml (for infants and younger children)

- Scrub the skin surface and inject local anaesthetic over lower spine. - Spinal needle is inserted usually between L3 and L4 vertebrae and CSF is drawn. - After the sample is collected, remove the needle, and clean the area. - Advice the patient to lie flat for 6-8 hrs post procedure.	of whole blood in a sterile microcentrifuge tube. - After collection of whole blood, allow the blood to clot by leaving it undisturbed at room temperature. - This usually takes 15-30 minutes. - Remove the clot by centrifuging at rpm 1000-2000 X g for 10 minutes in a refrigerated centrifuge.

1.4.7 Storage of samples

Cerebrospinal Fluid (CSF)	Blood (Serum)
- Perform physical examination of CSF, indicate the findings on the laboratory requisition form and transport to the laboratory as soon as possible. - However, it can be stored at +2^0 to +8^0 C for 1-3 days or at below -20^{0}C for a month and -80^{0}C for longer term storage if delay in processing is anticipated.	- Blood can be stored at +2^0 to +8^{0}Celsius for 24hrs before serum is separated. - Do not freeze whole blood. **In the lab:** - Serum samples received for IgM analysis should be tested as soon as possible after receipt. Short-term storage of serum (1-3 days) should be at +2^0 to 8^{0}C. - Longer term storage of serum should be at below –20^{0}C for a month and -80^{0}C for longer than that.

1.4.8 Transportation of samples

Cerebrospinal Fluid (CSF)	Blood (Serum)
- CSF should be transported within 5 days to the VPD (JE) laboratory maintaining reverse cold chain - If the specimens have been frozen, they should be transported frozen. - Repeated freezing and thawing of CSF should be avoided as this may lead to instability of IgM antibodies. - The CSF sample should always be transported in a sample carrier/yellow box with conditioned ice packs (+2^{0}C to +8^{0}C).	- Specimen should be transported to laboratory as soon as possible, do not wait for collection of additional specimens. - Put specimen in zip pouch/plastic bag with absorbent material(cotton/tissue). - Use vaccine carrier/cold chain box for transport. In vaccine carrier use conditioned ice packs along the sides and place specimen in the centre. Transport as in reverse cold chain. - Repeated freezing and thawing of serum should be avoided as this may lead to instability of antibodies.

Q. Who will send the sample to Lab?

Health care worker and surveillance focal person of respective health facility should send the samples maintaining reverse cold chain to nearby WHO proficient JE laboratory either at NPHL, Kathmandu or BPKIHS, Dharan. Respective higher surveillance focal person (authority) will ensure the sample is shipped on time.

1.4.9 Method of Laboratory Confirmation

For laboratory confirmation, the JE virus IgM antibody test needs to be conducted. An IgM capture ELISA specifically for JE virus may be used to detect the presence of the JE virus-specific IgM in a single sample of CSF or serum. The **sensitivity to the antibodies increases to > 95% in 10 days after the onset of the initial symptoms.**

It is important to differentiate a true JE virus infection from other infections that yield false-positive JE results due to *cross-reactive* epitomes among flaviviruses. For example: In JE prevalent districts of Nepal, **Dengue** is also equally prevalent. To rule out Dengue in JE positive serum samples, Dengue Detect IgM capture ELISA is conducted at NPHL.

Interpretation of IgM positive antibodies test

A. IgM antibodies usually persist for 30–90 days and in a few cases, for longer periods as well. Therefore, a positive result for IgM antibodies occasionally reflects a past infection or vaccination.
B. In areas highly endemic for JE, it is possible for a patient to have AES due to other causes, but to have JE virus-specific IgM antibody present in the serum from a recent, possibly subclinical infection. Therefore, all persons with encephalitis are advised to have a CSF sample tested, if feasible.
C. A positive IgM in CSF may need further confirmatory tests in any of these situations:
    - if there is an ongoing dengue or other flavivirus outbreak;
    - if the coverage of JE vaccination is very high; and
    - if the area does not have epidemiological and entomological data supportive of JE transmission.
D. For persons vaccinated with the JE vaccine within 6 months prior to the onset of illness, testing a single serum sample for JE IgM may not be diagnostic because any IgM detected may be vaccine-related. In such cases, a diagnosis can be confirmed only by:
    - detection of JE IgM in the CSF;
    - isolation of the JE virus;
    - a positive nucleic acid amplification test;
    - immunohistochemistry; or
    - a fourfold or greater rise in antibody titre between acute- and convalescent-phase serum samples.

1.4.10 Classification of cases

Laboratory confirmed JE case	**An AES case that has been laboratory confirmed as JE**
Probable JE case	**An AES or suspected JE case that occurs in close geographical and temporal relationship to a laboratory confirmed case of JE case, in the context of an outbreak**
AES due to other agent	**An AES case in which no diagnostic testing is performed and an etiological agent other than JE virus is identified (such as other flavivirus like dengue virus, yellow fever virus, etc.)**
AES unknown	**An AES case in which no diagnostic testing was performed or in which testing was performed but no etiological agent was identified or in which the test results were indeterminate.**

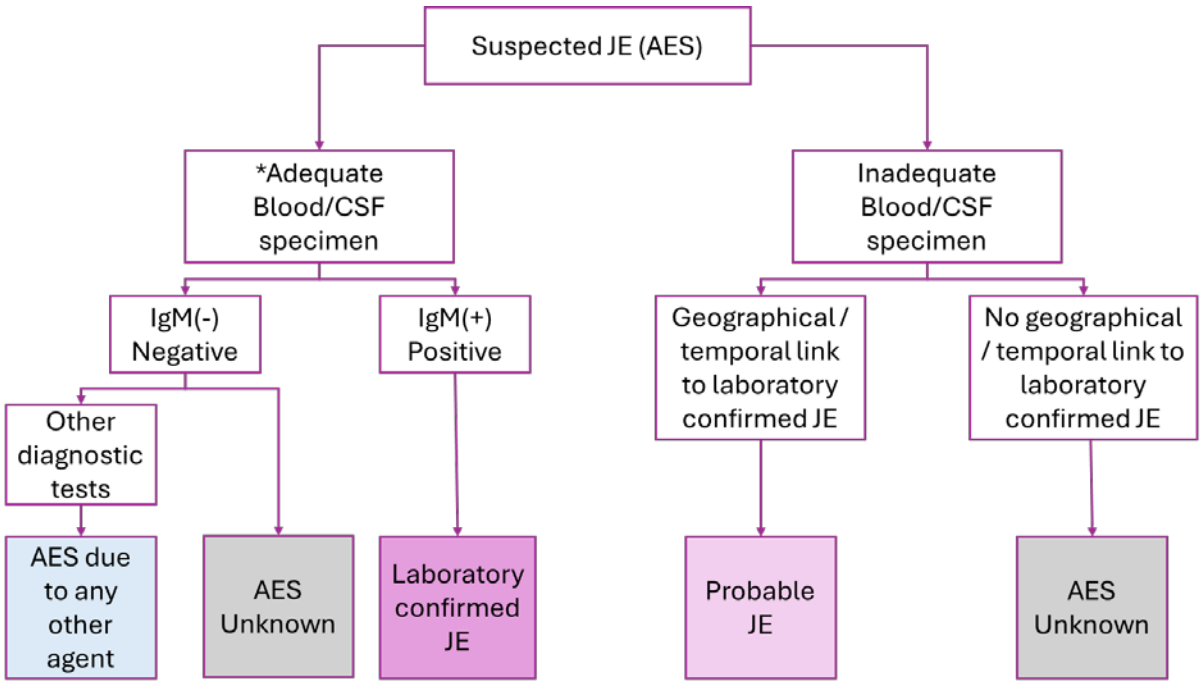


Figure 5. Classification of AES cases

1.4.11 Case Reporting

Reporting units (which report AFP, measles, and neonatal tetanus) also report AES cases on a weekly basis. Persons with AES (encephalitis cases) might be brought in for diagnosis, treatment, or rehabilitation to these reporting units. All the reporting units must report AES cases to designated surveillance focal person. Therefore, each reporting unit should identify a focal person (and one alternates) responsible for identifying and reporting AES cases. The focal person should make sure all necessary weekly VPD reporting form has been filled and the reporting units should report even when no AES cases have been identified in the previous week i.e. "weekly reporting".

Scan QR Code for contact details of district health offices & WHO-IPD network

The health facility should enter the aggregate data of AES cases into the regular HMIS system monthly.

Please note: Any laboratory-confirmed JE (Japanese Encephalitis) case should be reported based on the location where the individual was living during the 4 to 14 days prior to fever onset (the incubation period), rather than their permanent or official address. This ensures that public health response activities are directed to the correct and relevant area for effective intervention.

1.4.11.1 Steps of reporting:

AES case reporting can be done from different platform: surveillance sites, community, FCHV, including reporting through media and national health call center 1115.

1. **Active Case Surveillance:** Active surveillance for AES case detection should be conducted in the emergency department, Intensive Care Unit (ICU), pediatric, medical and neurology wards, as well as through outpatient clinics. The surveillance officer should regularly visit these priority units of tertiary hospitals to ensure that AES cases are detected, reported and samples are collected on time. Apart from this, health workers at all levels must be encouraged to report all AES cases immediately.

Active case search should be conducted even if there is only one "lab" confirmed case since the ratio of symptomatic to asymptomatic JE cases is approximately 1: 250.

This means that there might be 249 undetected cases in the community against 1 detected JE case.

2. **Initial Investigation of Reported AES Cases:** All reported cases should be verified by responsible Surveillance Focal Person within 48 hours after notification. The health worker will investigate the AES case and obtain laboratory (CSF or serum) specimens from the case. A CIF form (See annex 4) should be filled with all core variables (vaccination history, place of residence during the incubation period, travel history) sent to the province surveillance unit and WHO IPD Office.

3. **Case Reporting:** Each reporting facility should assign one individual (and one alternates) who is responsible for identifying and immediately reporting AES cases to the surveillance officer by the quickest means possible (by telephone). If the case is notified or reported directly to the health authority, they must report it to the designated surveillance officer immediately. This case must be reported through the weekly reporting site and in HMIS.

   If the AES case is reported from the hospital, the health worker should support sample collection and coordinate with surveillance officer for sample shipment to VPD lab. The surveillance officer should ensure no AES cases are missed from the hospitals. The case investigation form (CIF) should be filled. All demographic and clinical information should be collected. The CIF must provide history of vaccination including date of vaccination of all AES cases below 5 years of age.

4. **Follow-up:** The Surveillance Focal Person should conduct mandatory visit of all the lab confirmed JE cases as soon as possible. These visits should preferably be at their houses to assess the current health condition of JE case, identify similar cases in the community (probable JE cases), assess the population immunity in the community as well as evaluate environmental and socio-cultural factors to develop tailored strategies for JE control measures.

   The Surveillance Focal Person must re-visit and follow up every laboratory confirmed JE cases at the place of their residence at three months after the onset of disease to confirm for JE sequalae.

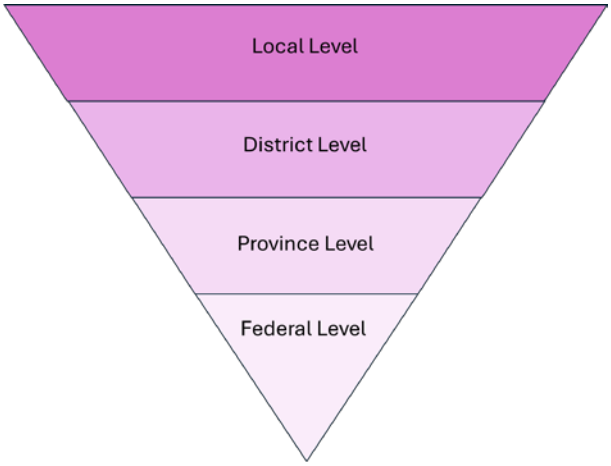
The Surveillance Focal Person should conduct mandatory visit of all the lab confirmed JE cases as soon as possible. These visits should preferably be at their houses to assess patient health status, disease sequalae and their surrounding environment as well as socio-cultural factors.

Surveillance Focal Person should make special efforts to meet personally with local health authorities and stakeholders for one-health approach.

1.4.12 Contact Tracing

Contact tracing is not carried out for JE as it is a vector-borne disease. Surveillance should be enhanced at JE affected areas to document similar cases in the communities. The data should be reviewed by local health authorities to include suspected cases that occurs in close geographical and temporal relationship to laboratory-confirmed JE case as probable JE case.

1.4.13 Surveillance activities for AES Surveillance



Role of each tier of the Government:

Local Level:

- Municipal health section appoint "Surveillance focal point" at municipal and HF.
- Conduct case investigation (CIF) of all the suspected AES cases with adequate specimen and shipped to WHO accredited JE laboratory.
- HF focal person record and report AES cases to Surveillance FP of municipality, district on time. (Platforms: Cased based, DHIS II, Weekly VPD reporting)
- Health Section Chief of municipality should coordinate with health facilities to conduct risk mapping: identify at-risk communities and train the local RRT in each ward levels and FCHV about JE risk factors, case definition and management of JE cases.
- HF conduct JE vaccination regularly as per microplanning.
- FETP trained health professional to support in JE outbreak investigation, response & prevention/control.
- Health Section Chief to cordinates with local health workers and FCHVs to aware communities on JE preventive measures during the peak season (Shrawan-Bhadra)
- The local government should allocate adequate fund for awareness campaigns using local media sources popular in the community, such as TV, radio, miking and street dramas.
- Confirmed JE cases and JE related deaths should be reported to the PHD & HO to support wider preparedness and response efforts.
- Conduct follow-up of lab-confirmed JE cases at or before 90 days to document any JE sequalae.

District Level:

- The Health Office (HO) should appoint "Surveillance focal point" to monitor district AES trend, JE case, JE related death and ensure that all AES cases are reported with adequate specimen with timely shipment to WHO accredited JE laboratory.
- District FETP trained health professional to support in JE outbreak investigation, response & prevention/control.
- HO coordinate with all relevant stakeholders for integrated JE response and risk assessment during the peak season.
- HO should coordinate and advocate with local government to strengthen the AES surveillance and routine immunization in low performing and high-risk communities.
- Broadcast JE preventive messages through local radio, FM stations, social media before start of peak season (Shrawan-Bhadra).
- Train the RRT and health staffs of local level on investigation and management of JE cases.
- The HO must collate AES and JE case from local level and report JE laboratory confirmed cases and deaths to the respective PHD and Family Welfare Division for preparedness and response coordination.

Province Level:

- Provincial health directorate (PHD) should appoint province surveillance FP to monitor trend of AES, lab confirmed JE cases and immediate notification of JE related death to FWD including review of JE immunization and AES surveillance performance.
- The PHD should coordinate with district & local health authorities, hospitals, veterinary services, agriculture, and laboratories, as well as other stakeholders to enhance AES/ JE surveillance. This includes risk mapping of high-risk communities.
- Trained health workers including RRT on case identification and management.
- The directorate should advocate on awareness raising campaigns and preventive measures for JE.
- PPHL: Explore possibility of expansion of new JE laboratory in close coordination with NPHL. Ensure existing Subnational JE lab has adequate JE and dengue ELISA IgM test kits for laboratory confirmation of JE case and share lab result on time.
- Province trained health professional to support in JE outbreak investigation, response & prevention/control measures.

Federal Level:

- National AES/JE Surveillance Program is coordinated by the Family Welfare Division (FWD) under the MoHP.
- FWD: Develop policy and strategic documents related to JE control. Supervise, update guidelines/SOP, provide training, logistic support including budgeting, finance and managerial support. Ensure the JE vaccination coverage is ≥ 95% at all levels.
- NPHL: Support in laboratory confirmation of JE, coordinate with subnational JE labs and collaborate with WHO for accreditation process of existing and new JE subnational lab including testing of AES samples in JE reference lab to classify AES cases due to any other agent.
- EDCD: Support in early case detection, reporting, and analysis of AES and JE cases across the country. Supports in mosquito control programs, particularly targeting Culex species, the main JE vector. Conduct RRT & FETP trainings with close coordination NHTC.
- CSD: Ensures availability of essential medicines, supportive care, and referral pathways during outbreaks.
- NHEICC (Health education & Risk communication): Support in development of JE infographics – FAQ, Flyers, radio jingles in different languages. Conducts awareness campaigns on JE prevention, vaccination, and protective behaviors before the peak of the JE season; Disseminates IEC (Information, Education, Communication) materials in local languages for community awareness.
- Coordination with stakeholders: WHO, UNICEF, GAVI, provincial & local governments, and other sectors (department of Agriculture, department of livestock services, Center for education & human resource development) for One Health-based vector control strategies. Ensures an integrated response plan and resource mobilization during outbreaks.

1.4.13.1 Roles of Surveillance Focal Person at all levels of government:

- Active case search in all prioritized AES surveillance sites/hospitals (review of ER register, admission register and medical record section)
- Ensure AES surveillance performance indicators are achieved and maintained at subnational level as per global and regional standard.

- Sensitization and training of health staffs (RRT) on AES case identification, reporting, tracking of referred cases and management.
- Support relevant health authorities to conduct risk assessment periodically and develop the tailored one-health strategic plan.
- Enhanced AES/JE surveillance in major public and private hospitals of urban cities.
- Home visit of Lab confirmed JE cases for verification and initial follow-up.
- Death verification of JE cases.
- Facilitate to conduct multi-stakeholder/ multi-sectoral coordination on JE situation update and response including field visits.
- Conduct advocacy/interaction meeting with local leaders on JE outbreak preparedness and preventive measures
- Develop infographic/radio messages for public broadcasting from local FM radio, miking etc.

1.4.14 Role of Female Community Health Volunteers (FCHV):

1. Report AES case immediately to nearby health facility.
2. Support local RRT in active case search of AES cases in the community.
3. Support in community awareness on prevention & control of JE.
4. Ensure all eligible children received JE vaccination as per NIP schedule.

1.4.15 Prioritization of Sites and Frequency of visits

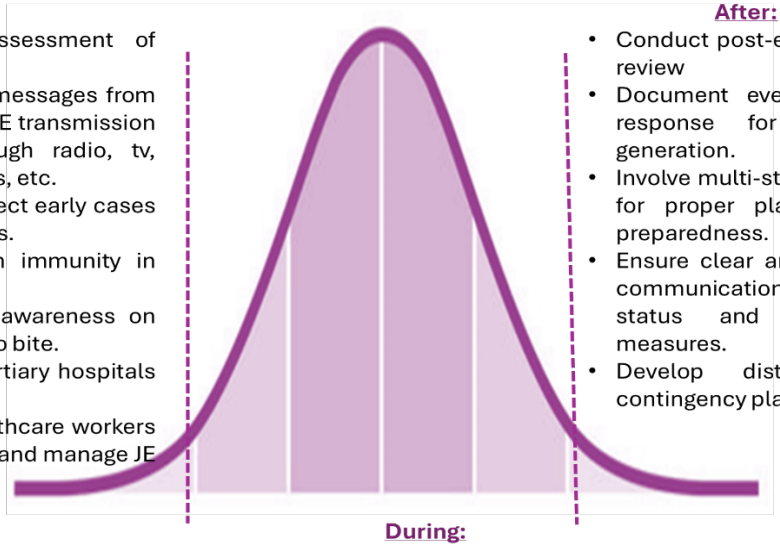
Categorization	Frequency of Visits	
Very high priority (VHP)	Tertiary and/or referral hospitals (public and private)	Once a week
High priority (HP)	All public & private hospitals, and health facilities with Pediatric department	Once in two weeks (not exceeding three weeks)
Low priority (LP)	Health posts, small health facilities, traditional healers, dhami, jhakri pharmacies that have the potential of seeing a suspected VPD case	At least once in 2 months.

1.4.16 Preparedness and Response activities

JE follows a distinct seasonal pattern which peaks during July-October. It is crucial to develop JE preparedness plan and response activities to reduce morbidity and mortality.

Before:

- Conduct national assessment of high-risk districts.
- Circulate awareness messages from high level officials on JE transmission and prevention through radio, tv, social media platforms, etc.
- Set up systems to detect early cases in humans and animals.
- Assess JE population immunity in high-risk areas
- Increase community awareness on prevention of mosquito bite.
- Mapping of referral/tertiary hospitals for case management
- Build capacity of healthcare workers and FCHVs to identify and manage JE cases



After:

- Conduct post-event action review
- Document every step of response for evidence generation.
- Involve multi-stake holders for proper planning and preparedness.
- Ensure clear and frequent communication on the status and preventive measures.
- Develop district level contingency plan.

During:

- Conduct intra-action reviews.
- Conduct joint high-level advocacy meetings and visits at subnational levels.
- Ensure provision of hospitals care and referral mechanism.
- Ensure availability of logistics: IEC material, diagnostic kits, and forms & formats.
- Train multidisciplinary teams for quick deployment.
- Establish systems for timely outbreak information and preventive messages.
- Partner with veterinary and environmental sectors for a one-health approach.

1.5 Data Management

1.5.1 Reporting Requirements

Aggregate case counts (confirmed and probable) to track the disease burden are sufficient to identify clusters and monitor trends.

- In Nepal, case-based data should be reported. Reporting should be weekly or monthly and must include "weekly VPD reporting" (i.e. a zero should be written when no cases have been detected, leaving no blanks in the reporting forms).
- Aggregate case counts should be reported through HMIS at least once a month.
- Although the International Health Regulations do not require the reporting of JE cases, JE is included in the World Health Organization (WHO)/United Nations Children's Fund Joint Reporting Form, which should be submitted annually.

1.5.2 Recommended data elements

- Unique case identifier (EPID number)
- Date of birth (or age if date of birth is not available)
- Sex
- Place of residence (city, district, and province)
- Travel history over the past two weeks
- If ever immunized against JE
- Number of vaccine doses received
- Dates of vaccine doses (if available)
- If vaccinated, type of vaccine received most recently

- Symptoms (fever, change in mental status, seizure)
- Date of onset of first symptoms
- Type of specimen collected (CSF, serum, autopsy)
- Type(s) of testing methodology (IgM, PRNT, PCR, virus isolation, etc.)
- Date(s) of specimen collection (including serum samples 1 and 2)
- Date(s) of receipt of specimen(s) in laboratory
- Date(s) of testing of specimen(s) (for each type of test)
- Date(s) on which laboratory reported results
- Laboratory results for each specimen
- Final classification: laboratory-confirmed JE, probable JE, AES-unknown, AES-other agent
- Status at discharge: alive, dead, unknown
- Date of death or discharge

These data elements have been put together in the sample case investigation form (CIF).

(See Annex.4)

1.5.3 Recommended data analyses

Number and incidence of suspected cases by week, month, year, age group, and Geographic area.

- Number and incidence of confirmed cases by week, month, year, age group, and Geographic area.
- JE vaccine coverage by year and geographical area.
- Percentage of cases vaccinated and unvaccinated; and
- Completeness/timeliness of monthly reporting by geographical area.
- Suspected and confirmed cases – age-specific, gender-specific, geographic area specific, and immunization status-specific incidence.
- Percentage of suspected cases with CSF and/or serum specimens.
- Percentage of cases with serum 10 or more days after onset of illness (when testing methodology is IgM-capture ELISA).
- Case fatality ratio.
- Final classification of all suspect cases; and
- Proportion of AES attributed to JE

1.5.4 Using data for decision making

Surveillance data on JE can be used to:

- Guide policy and strategies on the control of JE;
- Assess the impact of vaccination;
- Identify geographical areas or populations at high risk to provide further guidance on where the coverage of immunization should be improved;
- Monitor the performance of surveillance;
- Monitor the performance of laboratories; and
- Monitor the effectiveness of vaccines.

1.6 Monitoring Surveillance Performance

SURVEILLANCE ATTRIBUTE	INDICATOR	TARGET	CALCULATION (NUMERATOR/ DENOMINATOR)	COMMENTS
COMPLETENESS OF REPORTING	Percentage of surveillance units reporting to the national level, even in the absence of cases	≥ 80%	# of surveillance units in the country reporting/ # of surveillance units in the country X 100	None
TIMELINESS OF REPORTING	Percentage of surveillance units reporting to the national level on time, even in the absence of cases (e.g., Monthly)	≥ 80%	# of surveillance units in the country reporting by the deadline/ # of surveillance units in the country X 100	This should be at least quarterly reporting. At each level, reports should be received on or before the requested date.
SPECIMEN COLLECTION	Percentage of all suspected cases for which at least one specimen was collected.	≥ 90%	# of AES cases with specimen collection/ # of AES cases X 100	None
	Percentage of suspected AES cases that have a lumbar puncture performed	≥ 90%	# of suspected meningitis cases that had a lumbar puncture performed/ # of suspected meningitis cases X 100	None
	Percentage of serum samples taken a minimum of 10 days after onset	≥ 80%	# of serum samples obtained at least 10 days after onset of illness/ # of serum samples obtained in laboratory X 100	This applies to where the testing methodology is IgM capture ELISA.
SPECIMEN ADEQUACY	Percentage of CSF and serum samples reaching laboratory in adequate condition	≥ 80%	# CSF and serum samples reaching laboratory in adequate condition/ all CSF and Serum samples received in the laboratory X 100	Adequate is defined as 1) the specimen is transported using reverse cold chain and 2) the sample volume is greater than 100µl
TIMELINESS OF REPORTING LABORATORY RESULTS	Percentage of laboratory results reported to national public health authorities 7 days after receipt of specimen	≥ 80%	# of laboratory test results reported < 1 month of specimen receipt/ # of specimens received by lab X 100	Indicator only applies to public laboratories.
SENSITIVITY	Maximum AES rate per 100,000 population	>2/100,000	# AES cases captured by the surveillance/ # of target population in the country X 100,000	This applies to enhanced (nationwide) surveillance and not minimal (sentinel) surveillance

1.7 Clinical Management of AES case

Management of AES includes symptomatic and supportive care in many cases. It is important to exclude other causes of CNS infection like bacterial meningitis or cerebral malaria which requires specific treatment. Treatment will depend on the condition in which patient is received in the health facility. Identification of early warning signs and timely referral of AES case is important to reduce severe morbidity and mortality related with JE infection.

Steps for management of Acute Encephalitis Syndrome/Japanese Encephalitis patients[11]

Provide symptomatic treatment as follow:

1. Management of Airway and Breathing
2. Management of Circulation
3. Control of convulsions
4. Control of Temperature
5. Maintenance of fluid, electrolytes, calories & nutrition
6. Specific treatment of any treatable cause
7. Investigations, sample collection and transportation
8. Fill up CIF & report the case
9. Rehabilitation

1.7.1 Empirical treatment:

Emperical treatment must be started even if CSF obtained from patient/laboratory test confirmation is likely to take time and patient is sick with presence of symptoms/signs of an AES.

Encephalitis is a medical emergency

AES Case definition:

A person of any age who, at any time of the year, develops

- Fever of acute onset AND at least one of the following:
- A change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk); or
- New onset of seizures, excluding *simple febrile seizures**.

[11] Operational Guidelines. National Programme for Prevention and Control of Japanese Encephalitis/Acute Encephalitis Syndrome. Government of India, Ministry of Health & Family Welfare.

- If **bacterial meningoencephalitis** is suspected, intravenous **Ceftriaxone** should be started. Pediatric dose - Injection Ceftriaxone 50mg/kg IV stat and adult dose - Inj. Ceftriaxone 2 gm IV stat and every 12 hourly

- For suspected sporadic **viral encephalitis** (e.g., Herpes simplex encephalitis), **Acyclovir** should be started. If diagnosis is established, acyclovir should be continued for 14-21 days. Duration of therapy is 21 days in confirmed & probable cases (ensure CSF PCR negative for HSV near the end of therapy)

Age	Dose
For > 28 days - 3 months	20mg/Kg/dose every 8 hourly
3 months – 12 years	10-15 mg/Kg/dose every 8 hourly
For >12 years	10 mg/kg every 8 hourly

- For suspected **cerebral malaria**, empirical **Artemisinin**-based combination therapy should be initiated. Considering complicated Malaria due to Plasmodium Falciparum, treatment according to National Malaria Treatment Protocol 2019, Nepal
  - Intravenous Inj. Artesunate on 0, 8, 24hr for at least 24 h once started and every 24h until they can tolerate oral medication
  - Children <20kg Inj. artesunate 3.0mg/kg body weight
  - Older children and adults >20kg Inj. artesunate 2.4mg/kg body weight
  - once patient is stable and can tolerate orally switch to 3 days of an artemisinin-based combination therapy (AL) & Primaquine 0.25mg/Kg single dose
  - (PQ Contra Indicated in pregnant/women breastfeeding <6 months and infant < 6 months)
- Pulse therapy with **methylprednisolone** (20–30 mg/kg/day) with a maximum dose of 1 g per day for 3–5 days is recommended in Acute disseminated encephalomyelitis (ADEM) and other immune encephalitis syndromes.

**Definitive treatment depends on identification of etiological agent and course of the disease.*

Flow Chart of Management of Acute Encephalitis Syndrome/Japanese Encephalitis patients

AES Case definition:

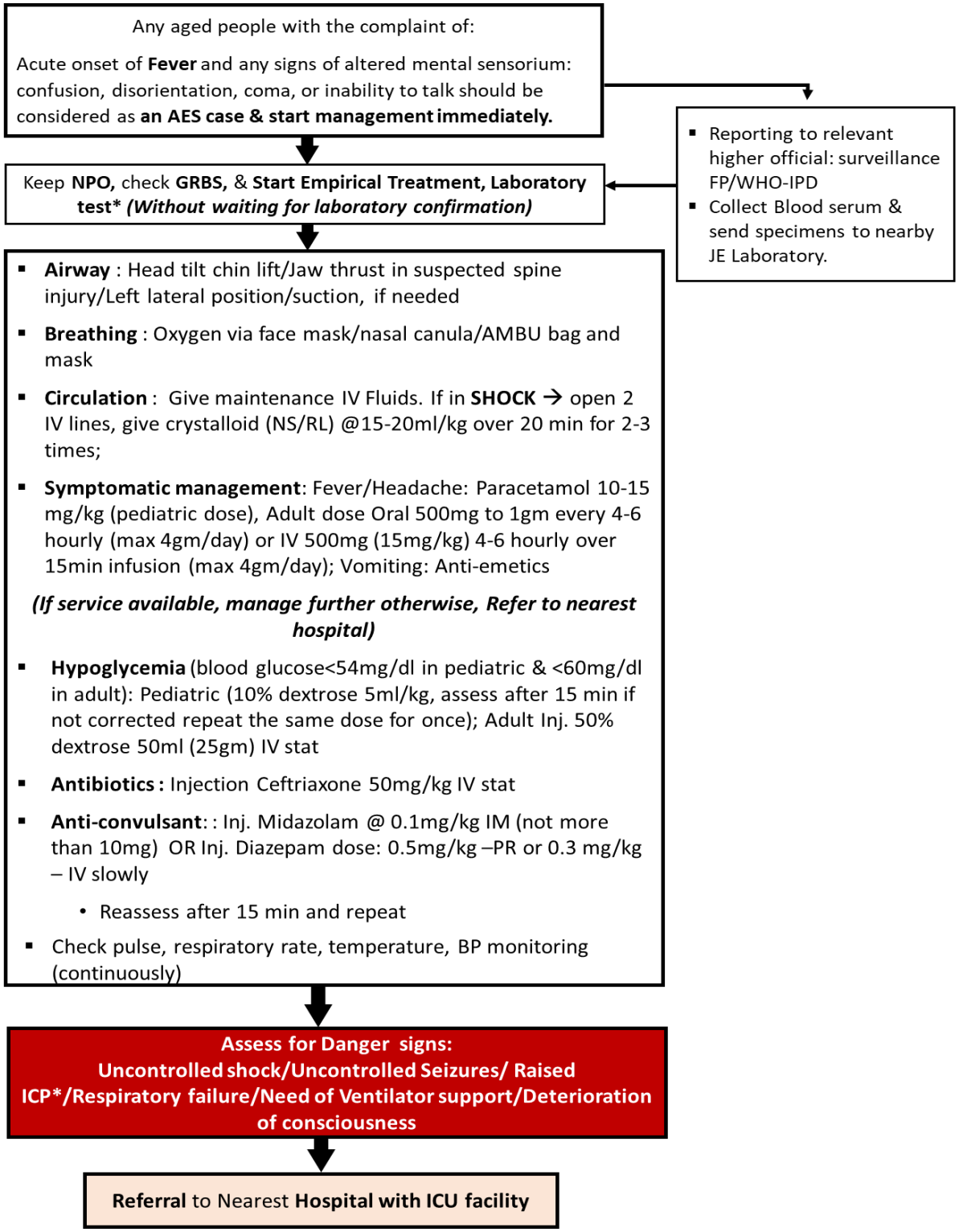
A person of any age who, at any time of the year, develops

- Fever of acute onset AND at least one of the following:
- A change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk); or
- New onset of seizures, excluding *simple febrile seizures**.

1.7.2 Management of AES case at Household level

- **Fever**
  - **Paracetamol**
  - **Cold sponging** (Tap water)
- If patient shows change in behavior, restlessness, irritability, or convulsion, place the patient in **left lateral position.**
- **Do not feed orally**
- Inform the **FCHV** of your area and immediately call **1115** (Hello Swasthya)
- Call **Ambulance** for transportation to the nearest health facilities (Hospital)

1.7.3 Management of AES case at Basic Health Service Center



***If Lab available, Blood test :** CBC, blood glucose, serum calcium (in seizure), RFT, Electrolytes, LFT, Malaria parasite (MP), Dengue, GRBS (General random blood sugar)

Category of health facilities and Hospitals as per Minimum standard service tool, Curative service division, DoHS, Nepal

***Signs and symptoms of raised intracranial pressure (ICP):**

- **Headache**
- **Decreased conscious level**
- **Vomiting**
- **Seizure**
- **Posturing**
- **Papilledema**
- **Cushing triad (bradycardia, respiratory depression, and hypertension)**

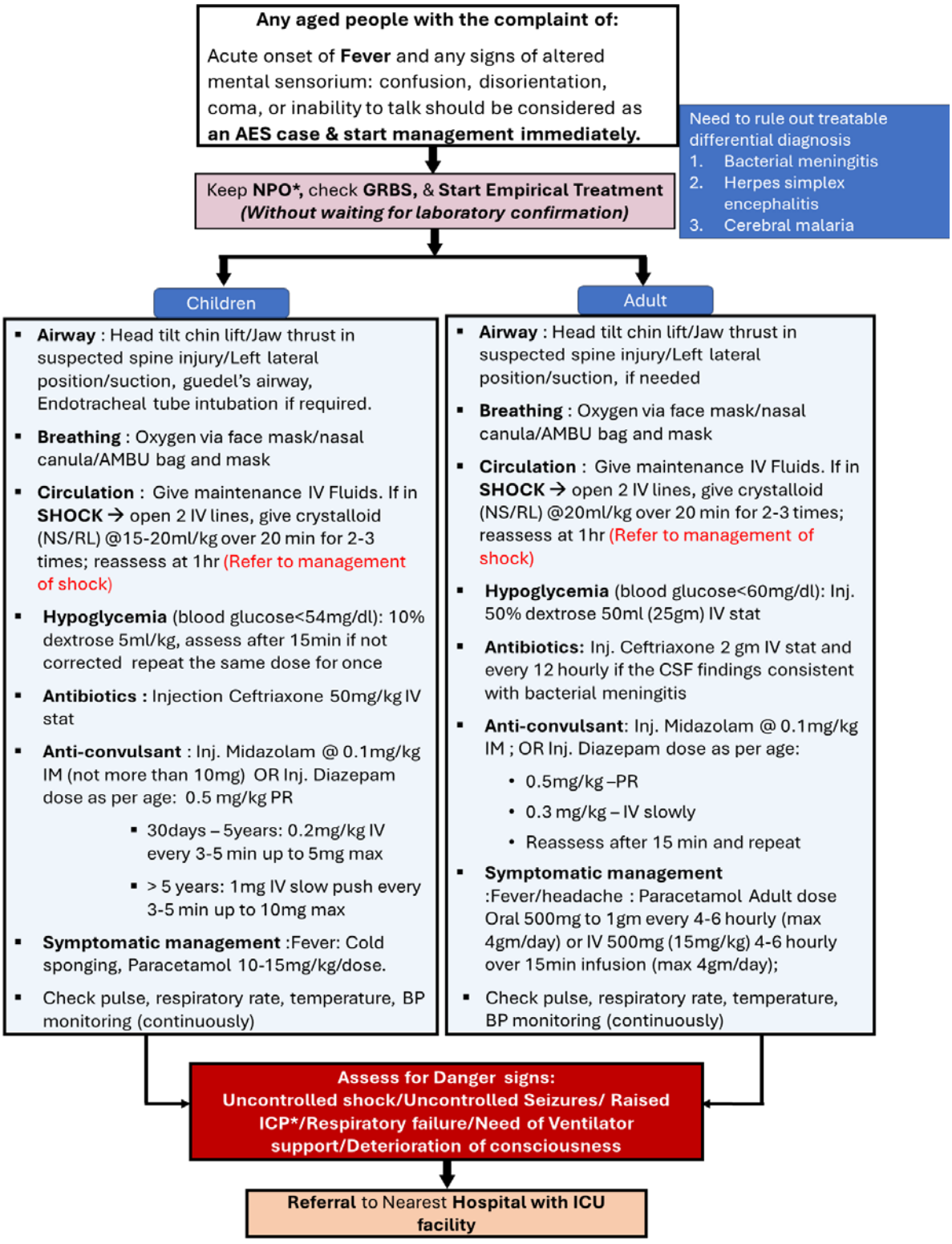
Care of patient during transportation

- Give Oxygen
- Proper Positioning: Right/Left lateral Position
- Nil per oral
- IV fluids

List of Anti-convulsant drugs (commonly available in Nepal):

S.N	Name of Drugs	Doses	Available as	Route of Administration	Max dose (Pediatric)	Max dose Adult
1	Midazolam	0.1-0.2mg/ Kg	5mg/5ml vial	IV: 0.1mg/kg max 5mg IM: 0.2 mg/kg max 10 mg, Buccal: 0.5mg/kg max 10mg Intranasal spray: 0.2 mg/kg max 10mg (5mg per nostril)	6m – 6yr: Max 6mg >6 yr: Max 10mg	10mg
2	Lorazepam	0.05-0.1mg/ Kg	I/V (2mg/1ml) vial	IV Slowly	4 mg/dose	4mg/ dose
3	Phenytoin (Eptoin/ Dilantin)	15-20mg/Kg	100mg/2ml or 50mg/1ml vial	I/V Slowly after dilution in normal saline	300 mg/day	1500mg
4	Sodium Valporate	20-40mg/Kg	500mg/5ml I/V or Oral Syrup 200mg/5ml	Syrup can be given as per rectal	60 mg/kg/day Not >14 days	3000mg
5	Diazepam	0.1 - 0.5mg/ 0.2 Kg	50mg/10ml IV OR 5mg for P/R	IV Slowly or P/R	10 mg	10mg
6	Phenobarbitone (Gardinal/ Luminal)	20mg/Kg As loading dose	200mg per ml. ampoule	I/V Slowly after dilution in normal saline	1000mg/ dose	1000mg/ dose
7	Levetiracetam	30-60mg/kg	100mg/1ml vial	IV	4500 mg/dose	4500 mg/ dose

1.7.4 Management at Hospital without ICU service



***Blood test :** CBC, blood glucose, serum calcium (in seizure), RFT, Electrolytes, LFT, Blood culture, Lumbar puncture, MP, Dengue, GRBS (General random blood sugar)
NPO- Nil Per Oral

Category of health facilities and Hospitals as per Minimum standard service tool, Curative service division, DoHS, Nepal

1.7.5 Management at Hospital with ICU service

First Visit or Referred AES case of Fever with any one of the following :
Altered mental status (including disorientation/confusion/inability to talk/coma) and/or new onset of seizure (excluding febrile seizure)

Keep NPO, Secure Airway, Breathing & Circulation, GRBS, Laboratory Evaluation* and Start Empirical Treatment – Inj. Ceftriaxone @50mg/kg/dose 12hrly

*Blood test : CBC, blood glucose, serum calcium (in seizure), RFT, Electrolytes, LFT, Blood culture, PBS-MP), Dengue
Neuroimaging (MRI with contrast >CT head), Lumbar Puncture, EEG

Need to rule out treatable differential diagnosis
1. Bacterial meningitis
2. Herpes simplex encephalitis
3. Cerebral malaria

- Management of **Airway and Breathing**
  - ✓ Positioning: Head tilt chin lift /Jaw thrust in suspected spine injury/ Left lateral position/ guedel airway/ LMA (Laryngeal mask airway)
  - ✓ Oxygen via nasal cannula, face mask/venturi mask/ high flow nasal cannula/ BiPAP/CPAP
  - ✓ Endotracheal tube intubation
  - ✓ Suction if needed

- Management of **Circulation**
  - ✓ Open IV line and infuse IV Fluids (Ringer Lactate/Normal Saline)
  - ✓ Catheterization, Input-Output charting

→ **Shock Present** *(Please see management of shock)*

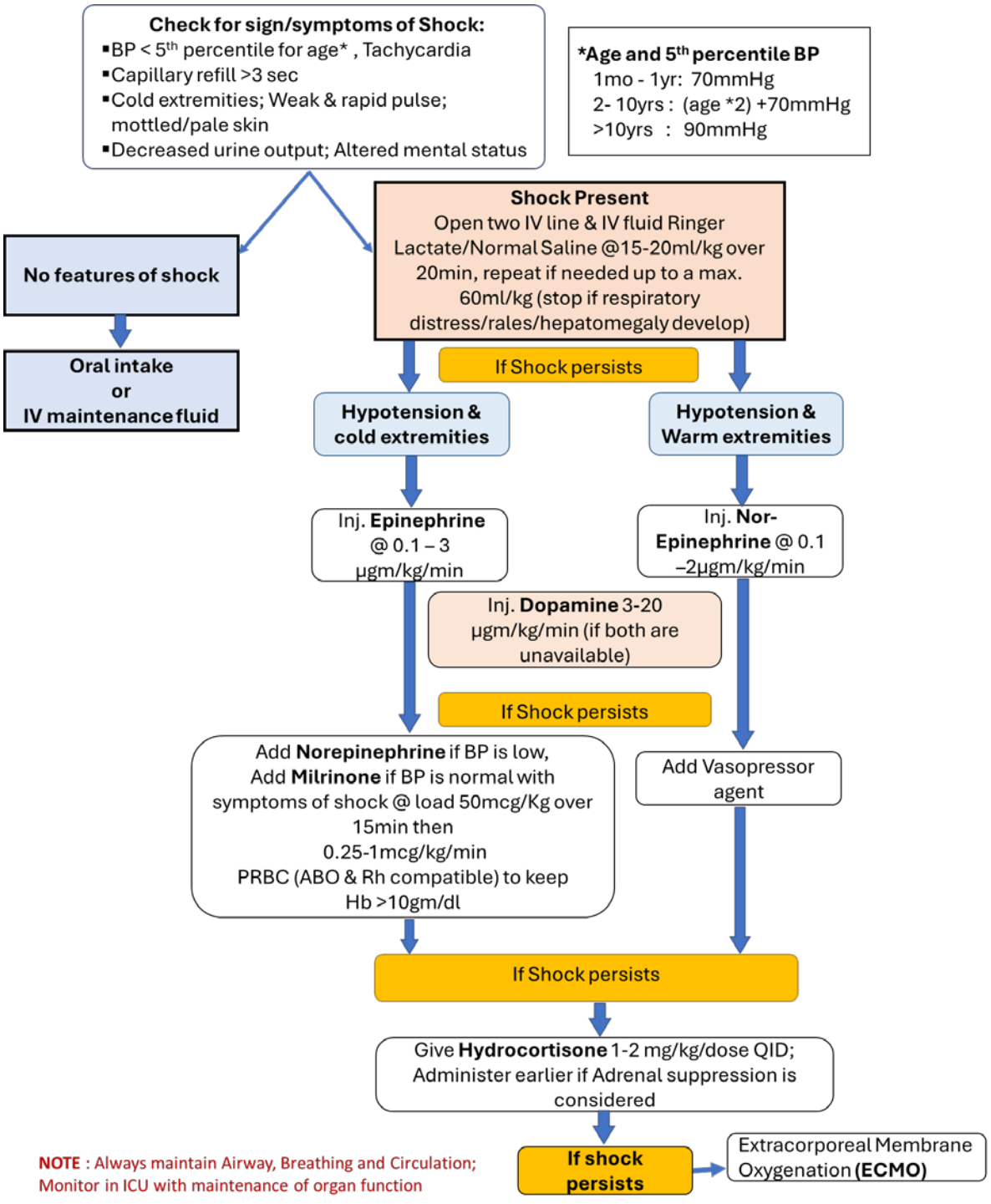
- Management of **Increased Intracranial Pressure (ICP): (Only after correction of dehydration)**
  - ✓ Intubate if GCS < 8 or signs of herniation,
  - ✓ signs of impending herniation: hyperventilation to target a $PaCO_2$ of 30–35 mmHg
  - ✓ Initial bolus of 20% mannitol (0.25 g/kg) followed by 0.25 g/kg every 6 h as required, up to 48 hours
  - ✓ In cases of hypotension, hypovolemia, and renal failure: hypertonic (3%) saline (preferred over mannitol) and infused at a rate of 0.1–1 mL/kg/h. Serum sodium levels should be targeted at 145–155 meq/L.
  - ✓ In ventilated patients, proper sedation and analgesia should be provided to prevent noxious stimuli.

- **Management of Seizure & Metabolic disorder**
  - ✓ Anticonvulsant therapy empirically may be used for children exhibiting a GCS score of < 8 and signs of increased ICP. *(Please see management of seizure)*
  - ✓ Hypoglycemia : 5ml/kg of 10% dextrose then maintain GIR @3-5mg/kg/min
  - ✓ Hypocalcemia : 2ml/kg 10% Calcium gluconate over 10 min with cardiac monitoring
  - ✓ Hyponatremia (<120 mmol/L- 3 to 5 mL/kg of 3 % saline administered over 15 minutes.

Note: Heart rhythm, breathing, and oxygen saturation should be monitored continuously along with periodic measurement of blood pressure and temperature in all patients with generalized convulsions to detect arrythmias, apnea, hypoxia, shock, and fever.

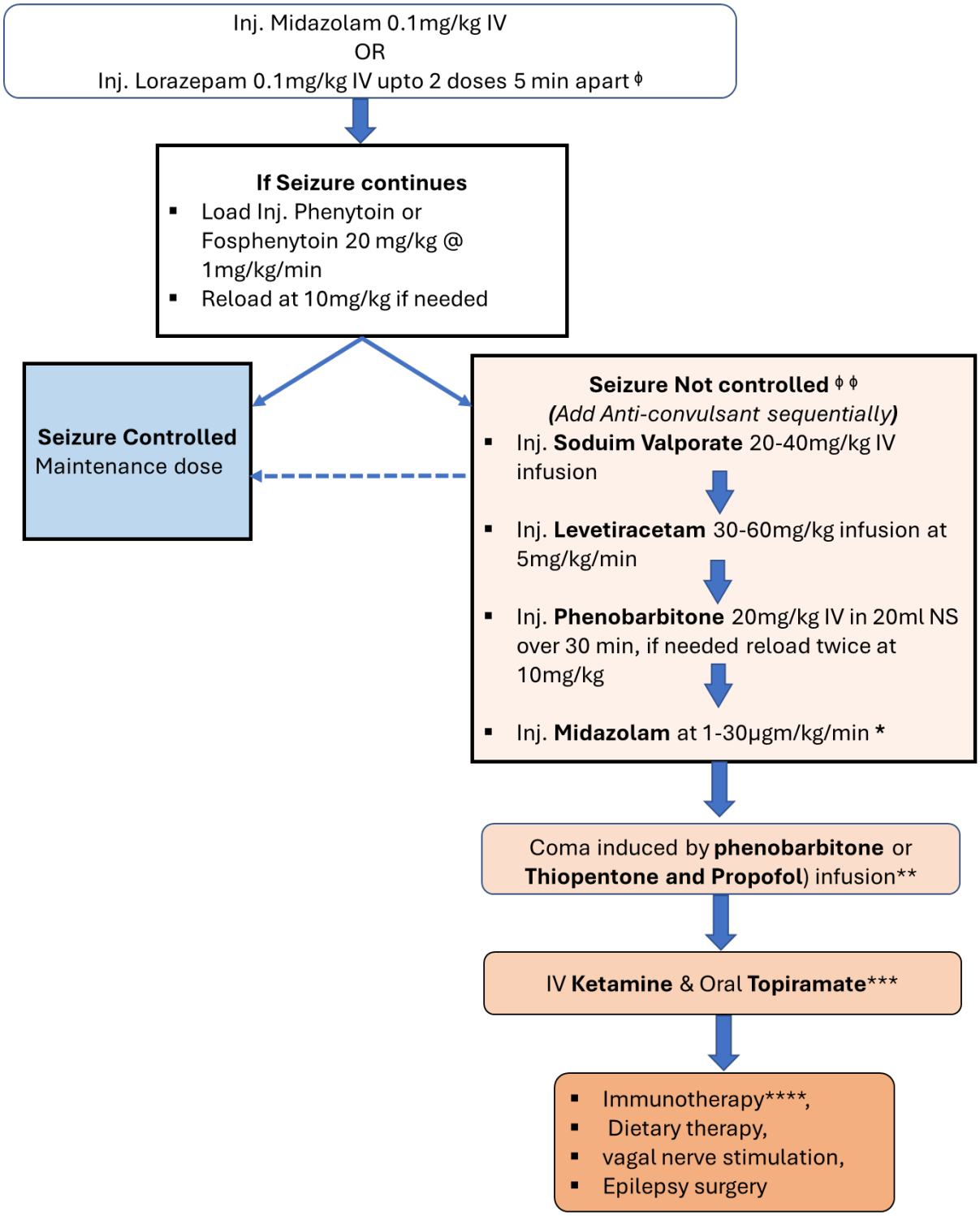
Category of health facilities and Hospitals as per Minimum standard service tool, Curative service division, DoHS, Nepal

1.7.6 Flow chart of Management of Shock[12]



[12] American academy of pediatrics (AAP)

1.7.7 Flow chart of Management of Seizure[13]



[13] Treatment of prolonged seizure, pediatric clinical standard; Nepal Pediatric Society: https://nepas.org.np/wp-content/uploads/2023/06/NEPAS-standards-pdf.pdf; OP Ghai Essential Pediatrics book; https://pubmed.ncbi.nlm.nih.gov/25560156/

NOTE:

ϕ When seizure continues after 2 doses of benzodiazepines, antiseizure medicines- phenytoin, levetiracetam or sodium valproate can be used but levetiracetam is more commonly used.

ϕϕ Phenytoin infusion should not exceed 1mg/kg/minute; maximum rate 50 mg/minute

- Drug that is last introduced is to be the first to be withdrawn
- If seizure is controlled with an anticonvulsant drug that should be continued at its Maintenance doses: should be initiated after 8-12hour of loading dose that stopped the seizure
    - Inj Phenytoin 5-8mg/kg/day in 2 divided doses
    - Inj Phenobarbitone 3-5mg/kg/day in 2 divided doses
    - Inj Levetiracetam dose is decreased by 10mg/kg/day

*Inj. Midazolam 0.2mg/kg iv stat and increase by 1 µg/kg/min every 5min till seizure stops up to a maximum of 30µg/kg/min, tapering initiated after 24hrs of seizure control @1 µg/kg/min every 3 hour

**High dose phenobarbitone 5-10mg/kg boluses every 30min up to 120mg/kg over 24 hrs, maintenance upto 40mg/kg/day. OR propofol 1-2mg/kg followed by continuous infusion of 1-2mg/kg/hr and Thiopentone loading dose 5mg/kg bolus followed by 3-5mg/kg/hr

***Topiramate through OG/NG tube (2-5mg/kg, increase by 5-10mg/kg/day up to maximum of 25mg/kg/d

****Case to case basis; immunotherapy (IVIG/Methylprednisolone) for suspected autoimmune

1.7.8 Rehabilitation of AES Case

- Physiotherapy/ Physical Medicine and Rehabilitation (PMR)
- Advice of Pediatric Neurologist
- Correction to fix deformity by Orthopedic Surgeon
- Child Psychologist advice
- Prosthesis and Artificial appliances as and when required

1.8 JE Outbreak

1.8.1 Definition of JE Outbreak

An occurrence of two or more lab confirmed JE cases in a ward or adjoining wards of a municipality within a 14-day period of time.

1.8.2 Declaration of JE outbreak

Nepal Gazette, published by the Government of Nepal, Section 70 Kathmandu, 21 September 2020 (Number 23), Chapter- 8, Protection and Promotion of Public Health and Emergency Health Service and Prevention of Infection, 27, (4)* indicates legal provision for declaration of an outbreak.

*If a crisis situation is created as a result of insects, microbial bioterrorism, emergency and unforeseen causes or a pandemic of infectious diseases, the Government of Nepal, Provincial Government and Local Level can declare a public health emergency by issuing a necessary order pursuant to Sub-Section (4) of Section 48 of the Act.

1.8.3 Role of Rapid Response Team (RRT) in JE outbreak investigation and response

The municipal (local) level RRT will lead the initial investigation and response for all suspected JE outbreak. Depending upon the number of JE cases, local level RRT will coordinate with province RRT for JE outbreak response. Similarly, in case of large JE outbreak affecting multiple districts within a province or affecting adjoining provinces, the province RRT will coordinate with federal

RRT for necessary support in outbreak investigation and response. The composition and functions of different level RRT will be guided by National RRT Guideline, 2079 B.S[14].

Whenever a surveillance focal person at HF level gets information of a suspected outbreak at local level, s/he should collect basic data, verify rumor, and notify to the relevant surveillance focal person at district, province and WHO-IPD.

Once the rumor is verified, all the suspected cases should be line listed, specimen (CSF/blood specimens) from the first 5-10 cases should be collected during investigation in order to confirm that the outbreak is caused by JE Virus. In the initial period of surveillance, it is advised to collect specimens from each symptomatic suspected case. The sample should be sent to WHO proficient lab (NPHL or BPKIHS) maintaining reverse cold chain.

1.8.3.1 Local outbreak response team

The local RRT team will carry out investigation and response actions under administrative leadership of the chief of Health Section of municipality and technical guidance of the chief of District Health Office.

KEY TASKS

At Health facility Level:

- Case detection (including active case search in the community) and identification as well as filling the CIF forms.
- Preparation of line listing of AES cases.
- Specimen collection and shipment to the lab.
- Case Management and Referral.
- Regular coordination with Municipality level RRT
- Implement awareness activities by mobilizing FCHVs, Mother's group, sensitizing local leaders & religious leaders.

At Municipality Level:

- Conduct rapid risk assessment and risk mapping.
- Work with health facilities to identify at-risk communities and educate them about JE risk factors, such as standing water near homes or pig and duck farming and provide information on past JE cases.
- Collaborate with health workers of public and private health facilities for case detection, notification and management.
- Support for mobilization of Female Community Health Volunteers (FCHVs) to raise awareness about JE and prevention measures.
- Allocate adequate fund for awareness campaigns using media sources popular in the community, such as TV, radio, miking and street dramas.
- Report confirmed cases and deaths to the Provincial Health Directorate to support wider preparedness and response efforts.
- Collaborate and coordinate with local stakeholders (Veterinary, agriculture, etc.) for integrated response.

[14] Rapid response team guideline Nepal, EDCD; https://drive.google.com/file/d/16q-m3NCCtxc-eLajIndh08lFYjmvsdBM/view?usp=sharing

1.8.3.2 District outbreak response team

The district team will be led by the Chief of the Health Office.

KEY TASKS:

- Support local Rapid Response Teams (RRTs) to conduct risk assessment in high-risk areas, active case search, case investigation, and management.
- Support case management and referrals.
- Coordinate with relevant sectors, like veterinary, agriculture, for integrated response at district level.
- Inform and alert all healthcare workers about the JE situation.
- Sensitize and build capacity of local level RRT.
- Broadcast JE preventive messages through local radio, FM stations, social media etc.
- Supervise investigation and management of JE cases.
- Report confirmed JE cases and deaths to the provincial RRT/PHD and Family Welfare Division for preparedness and response coordination.
- Conduct continuous monitoring of JE-related activities at the local level.

1.8.3.3 Provincial outbreak response team

The provincial team will be led by the provincial RRT focal person from Provincial Health Directorate.

KEY TASKS:

- Provide necessary guidance and support to district and local RRT
- Collaborate with sectors such as veterinary services, agriculture, and laboratories, as well as other stakeholders, to mobilize health personnel across districts for timely and effective JE surveillance. This includes mapping of high-risk communities.
- Support case management and referrals.
- Build capacity of district and local RRT
- Supervise and monitor JE outbreak investigation and response activities.
- Fund allocation for identification and management of cases at provincial level.
- Advocate for province-wide awareness campaigns and preventive measures for JE.
- Report confirmed JE cases, deaths to the federal RRT.
- Disseminate daily situation update of JE.
- PPHL: Explore possibility of expansion of new JE laboratory in close coordination with NPHL. Ensure existing Subnational JE lab has adequate JE and dengue ELISA IgM test kits for laboratory confirmation of JE cases and share lab results on time.

1.8.3.4 Federal outbreak response team

The Federal Rapid Response Team (RRT) will be led by the Director General of the Department of Health Services, with the Director of the Epidemiology and Disease Control Division (EDCD) serving as the secretariat. The team will include directors, senior representatives from key divisions and centers such as the Family Welfare Division (FWD), National Public Health Laboratory (NPHL), National Health Education, Information, and Communication Center (NHEICC), Sukraraj Tropical and Infectious Disease Hospital, Curative Service Division (CSD), Nursing and Social Security Division, and the Health Emergency Operation Center (HEOC) of the Ministry of Health and Population (MoHP). Representatives from WHO, UNICEF, and other immunization partners will also be part of the team. Additionally, a taskforce dedicated to Japanese Encephalitis (JE) outbreak preparedness and response will operate under the guidance of this federal Rapid Response Committee (RRC).

KEY TASKS:

- Provide necessary guidance and support to subnational RRTs.
- Collaborate & coordinate with subnational RRT, stakeholders and health partners (WHO, UNICEF) during JE outbreak preparedness, response, and control activities.
- Analyze the surveillance data available for decision making.
- Ensure and allocate necessary human resource, funding, and logistics/materials required for JE outbreak response.
- Conduct supportive supervision and provide feedback for corrective action.
- Advocate for risk communication and preventive measures for JE.
- Ensure hospital care and case management of JE cases to reduce the mortality.

1.8.4 One-Health Approach to JE Outbreak Response

Outbreak response and mitigation requires a multi-sectoral coordination. A One Health approach, which brings together data and collaboration from human health, animal health, mosquito bite control, and environmental sectors, is essential. This is because JE spreads through a complex transmission cycle involving mosquitoes and animal hosts, making cross-sectoral coordination critical for effective prevention and response.

One-health approach brings together public health experts, clinicians, veterinarians, and entomologists for effective response to JE and other types of encephalitis.

Key recommended activities for responding to JE outbreaks:

1.8.4.1 Early case detection and case management

To reduce the morbidity and mortality, early case detection and case management is crucial. *(Please see chapter 2.5)*

1.8.4.2 Risk Communication and Community Engagement (RCCE):

Raising community awareness plays a key role in reducing the time between the onset of symptoms and the time of seeking medical care. The sooner people get help, the better their chances of recovery, and helps to prevent deaths. That's why it is important to conduct awareness campaigns and provide health education in communities at risk. These efforts help us prepare for potential outbreaks.

The Female Community Health Volunteers (FCHVs) and local volunteers need to be mobilized to spread awareness in the communities at risk. Using simple and accessible tools like FAQs, JE preventive messages in local languages on the social media platform, radio, loudspeaker announcements (miking), and other IEC materials can go a long way in helping communities stay informed and protected.

1.8.4.3 Interruption of transmission:

There is limited evidence that vaccinating pigs, managing the environment to control vectors, or using chemicals to kill mosquitoes can effectively stop disease transmission. However, it is important to take personal protective measures against mosquito bite such as using bed nets, applying mosquito repellent, and taking other personal precautions.

1.8.4.4 Vaccination:

Vaccination of humans is the only proven method for reducing JE disease.

According to vaccination schedule of National Immunization Program (NIP), children should receive the Japanese Encephalitis (JE) vaccine at 12 months of age. If a child misses this

scheduled dose, they can still get vaccinated up to the age of 5, following the NIP's delayed schedule.

To ensure no child is left behind, the Government of Nepal runs an annual "Search and Vaccinate" campaign in across all levels focusing on high-risk areas. Additionally, the month of Baishakh (April-May) is celebrated nationwide as "Immunization Month," a time dedicated to reaching zero-dose, under-immunized and missed children.

1.8.5 Surveillance modifications during an outbreak

According to the definition "An occurrence of two or more lab confirmed JE cases in a ward or adjoining wards of a municipality within a 14-day period of time" is considered as an outbreak.

- During an outbreak, there might be many AES cases in the community; however, lab confirmation of initial 2 or more case will be enough to declare outbreak. The seasonal pattern of the JE spread is important to consider for community case search. All the AES cases found during active case search or reported from Health Facilities in the outbreak area need to be line-listed and will be considered as probable JE cases.
- If the outbreak lasts for more than 2 months, it's a good idea to collect another 5 to 10 samples every 2 months. This helps ensure that Japanese Encephalitis (JE) is still the cause.
- If the outbreak doesn't follow the usual seasonal pattern or shows unusual features, like affecting unexpected age groups or occurring in places without the typical mosquitoes or animal hosts, it's important to test cerebrospinal fluid (CSF) samples to rule-out other cause of AES.

1.8.6 Purpose of collecting data during AES Outbreaks

The primary purpose of data collection during AES outbreak is to collect detailed epidemiological information on JE cases in Nepal along with laboratory confirmation of AES cases. Investigations can help identify why an outbreak has occurred, which can thereby inform vaccine policy in the future.

Outbreaks of JE are often associated with higher morbidity and mortality than found in sporadic cases. Identifying outbreaks early and ensuring that appropriate case management procedures are followed can significantly reduce associated complications and mortality.

1.9 Special Considerations for JE Surveillance

Consider Integrated surveillance with AFP	Rule out other causes/ infections	Identify people vaccinated within 6 months
• Some cases of JE - particularly among children- might only present with signs of meningismus or AFP, which are not captured by AES. •Because of the overlap in clinical syndromes, there is reason to consider integrating AES surveillance for JE with surveillance for AFP and stool sample need to be collected, if age of case is appropriate (eg. >15 years), to maximize sensitivity and efficiency of surveillance.	•As a general rule, persons with acute encephalitis should undergo a lumbar puncture to obtain CSF to identify other treatable agents that may result in an illness that manifests as acute encephalitis syndrome. • In Nepal currently, Dengue is also being tested in JE positive serum sample to check for cross-reactivity. •Health care providers should also rule out herpes encephalitis, if possible, as it is a treatable cause of AES.	•For persons vaccinated with JE vaccine within six months of illness onset, testing a single serum sample for JE IgM may not be diagnostic because it may give a false positive result. •In such cases, the diagnosis can only be confirmed by demonstrating JE IgM in the CSF, JE virus isolation, a positive nucleic acid amplification test, immunohistochemistry, or a four-fold or greater rise in antibody titre in acute and convalescent phase serum samples.

Assess the Vaccination status of ALL patients presenting with Japanese Encephalitis.

2 Disease Epidemiology

2.1 Epidemiology of the Disease

Japanese encephalitis (JE) is caused by Japanese encephalitis virus (JEV) – an arbovirus that belongs to the flavivirus genus, family *flaviviridae*. It is a single-stranded RNA virus transmitted by the main vector - mosquitoes of the *Culex genus*, especially *Culex tritaeniorhynchus*. The pig is found to be the primary amplifying host of the virus. Birds, such as herons or ducks have also been implicated in the transmission of JE.

2.1.1 JE Transmission

JEV is transmitted to humans through "accidental" bites from infected mosquitoes of the Culex species (mainly *Culex tritaeniorhynchus*). The mosquito picks up the virus from animals (most commonly pigs and water birds), then transmits it to humans. Humans, once infected, do not develop sufficient viraemia to infect feeding mosquitoes. The virus exists in a transmission cycle between mosquitoes, pigs and/or water birds (enzootic cycle).

The disease is predominantly found in rural and peri- urban settings, where rice is grown and the humans live in closer proximity to these vertebrate hosts, in particular domestic pigs. Being outdoors after sunset is a risk factor since the mosquitoes commonly bite during dawn and dusk hours.

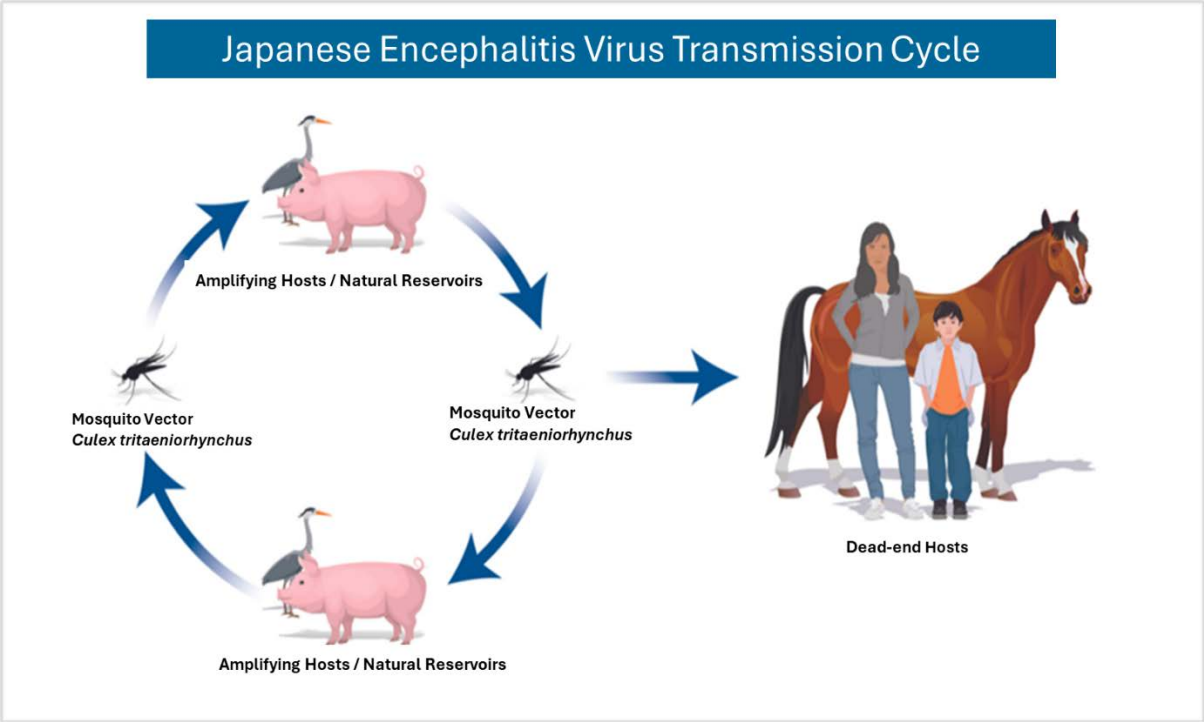


Figure 6. JE transmission cycle

2.1.1.1 Seasonality of Transmission

JE case follows seasonal pattern in Nepal. The below graph shows reported AES cases in different colors with JE cases in number.

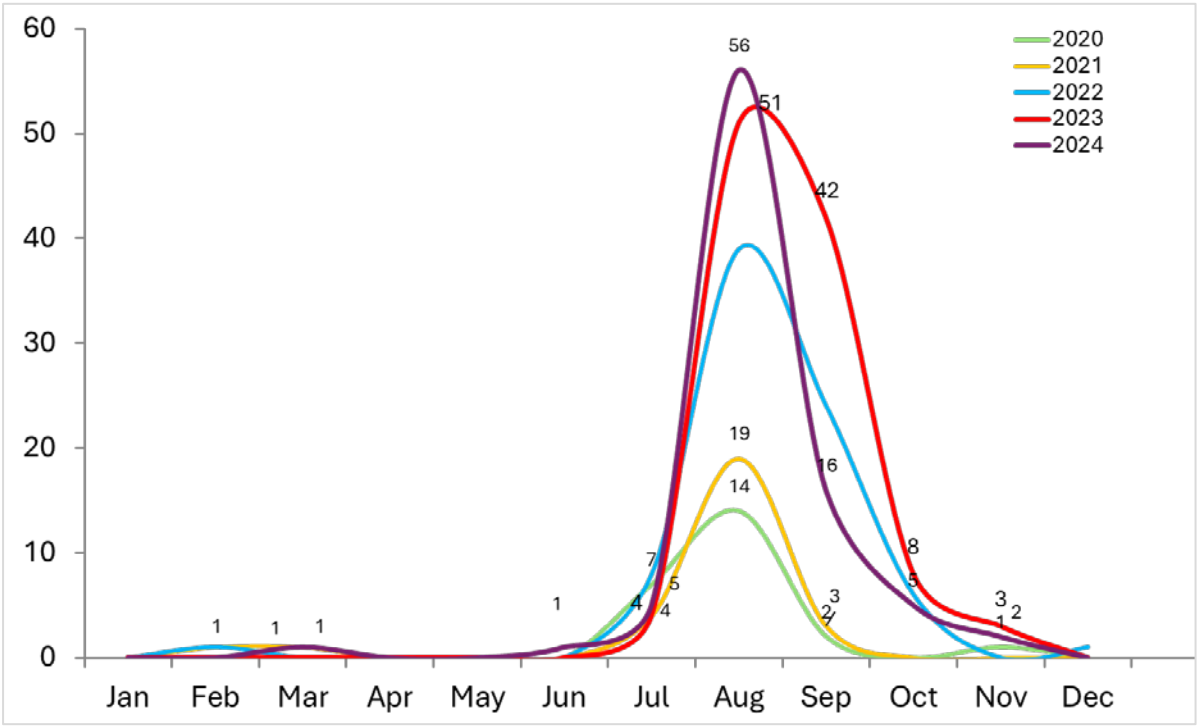


Figure 7. Seasonal trend of JE disease (Source: FWD & WHO_IPD, Nepal, as of 31 Dec 2024)

In endemic areas, children 1-15 years old are most frequently infected with JE. In general, JE cases are infrequent among children younger than 1 year old, they have less exposure to mosquitoes. Adult infection most often occurs in areas where the disease is newly introduced because there is no established immunity among the population.

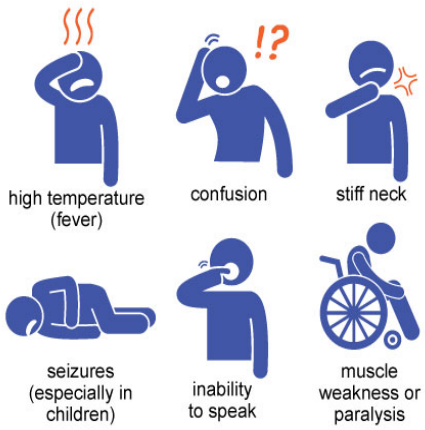
In Nepal, all age groups are equally affected. However, the analysis of age-specific data from 2004-2024 shows that almost 60% of cases have been detected in children less than 15 years of age.

JE infection is not transmitted directly from person to person.

Children between ages 1 and 15 years are at higher risk than adult.

2.1.1.2 Clinical Picture of JE

The incubation period of JE is 4–14 days. Most JEV infections are asymptomatic or mild (fever and headache) and approximately 1 in 250 infections results in severe clinical illness. Severe disease is characterized by the rapid onset of a high fever, headache, stiffness of the neck, change in mental status/disorientation, coma, fits/convulsions (common among children), weakness in the limbs, spastic paralysis and ultimately, death. The case fatality rate can be as high as 30%. Convulsions occur in >75% of pediatric patients, though less frequently in adults.



In children, gastrointestinal pain and vomiting may be the dominant initial symptoms. Disease may rapidly progress to severe encephalitis with mental disturbances, general or focal neurological abnormalities and progressive decline in consciousness to coma. Patients may require ventilator support.

2.1.1.3 Course of JE infection:

Stages	Duration	Symptoms
Prodromal	2-3 days	High fever with severe headache *Non-specific symptoms*: malaise, anorexia, nausea and vomiting
Acute	3-4 days	Change in the state of consciousness (ranging from mild clouding to stupor and coma); Patient remains febrile and Seizures are common; Generalized body weakness and stiff neck are usually seen. *Less frequent symptoms*: tremor, abnormal movements, and cranial nerve involvement.
Sub-acute	7-10 days	*In uncomplicated/mild cases*: fever decreases over a period of 1-2 weeks and neurological sequelae may improve *In severe cases:* secondary infections are common including bladder infections, pneumonia, and bedsores
Convalescence	Next few weeks	*In uncomplicated/mild cases:* Complete recovery over the next few weeks *In severe cases:* some improvement but patients are frequently left with neurological sequelae

2.1.2 Disability and sequelae

Although symptomatic JE is rare, the case fatality rate (CFR) among those with Encephalitis can be as high as 30%. Disability and sequelae have been found in 40% to 75% of surviving JE patients. Disability determinations vary depending on the type of sequelae included in the study and the timing of the follow up. Permanent neurologic, cognitive and behavioral sequelae occur in 30–50% of those with encephalitis. [15]

Sequelae (a condition which is the consequence of a previous disease or injury) fit into 4 major categories: motor, behavioral, intellectual, and other neurological sequelae which can present as seizures, hearing or vision loss, speech, language, memory and communication problems or weakness of limbs. Motor deficits are common in approximately 30% of survivors with significant cognitive and language impairments in 20%. An inverse relationship exists

Disability and sequelae occur in 40%-75% of the population.

Sequelae may be motor, behavioral, intellectual or other neurological deficits.

[15] World Health Organization (WHO). (2024). Japanese encephalitis. https://www.who.int/news-room/fact-sheets/detail/japanese-encephalitis

between the percentages of survivors and the amount and severity of sequelae so that the more people survive the acute illness, the more people who are left with disabilities. There is also evidence to show that sequelae can develop as well as resolve over time.

Naturally acquired immunity: Infection with JEV is believed to confer lifelong immunity. The different flaviviruses share antigens and induce cross-reacting antibodies. Previous infections with related flaviviruses may provide some cross-protection and may reduce incidence and severity of sequelae from subsequent infections with JEV, though the available data are limited.

2.1.3 Prevention

There is little evidence to support a vaccination of pigs, environmental management for vector control and use of chemical for vector control. Vaccination of humans is the only proven methods for reducing JE disease. Personal protection measures against mosquito bites decrease risk of getting JE infection.

Vaccination of human beings is the most effective measure to control JE.
In addition, personal protection against mosquito bites is important to further reduce the risk of infection.

2.1.4 Differential diagnosis

Acute Encephalitis Syndrome (AES) may have various other causes as shown in the figure:

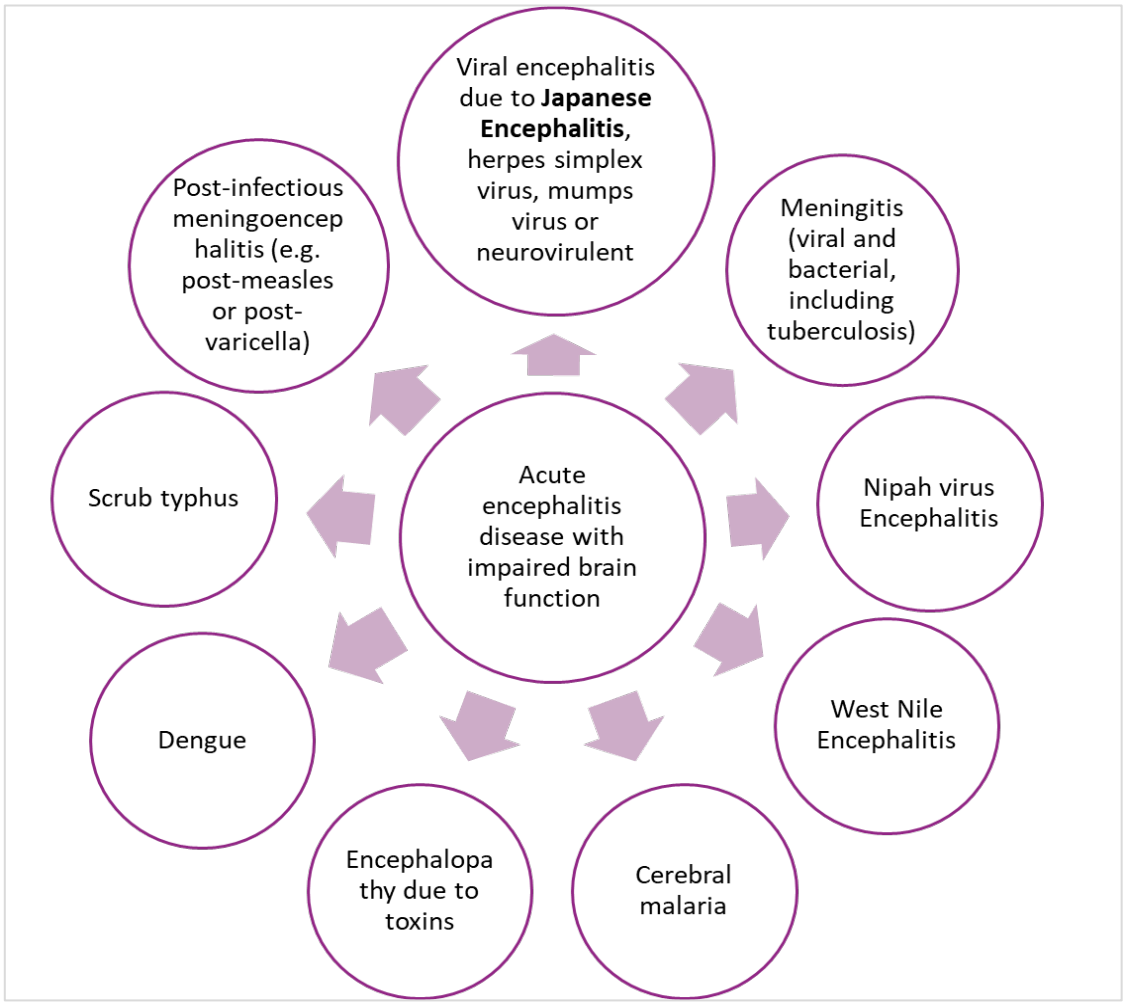


Figure 8. Differential diagnosis of Acute Encephalitis Syndrome (AES)

2.2 Japanese encephalitis vaccines

Globally, approximately 15 JE vaccines in use are based on genotype 3 virus strains. JE vaccines fall into 4 classes:

1. Inactivated mouse brain-derived vaccines,
2. Inactivated Vero cell-derived vaccines,
3. **Live attenuated vaccines**, - Currently used in the National Immunization Program of Nepal
4. Live recombinant (chimeric) vaccines

2.2.1 Live attenuated vaccines (SA-14-14-2 strain)[16]

A primary hamster kidney (PHK) cell-derived, live attenuated vaccine based on the SA 14-14-2 strain of the JEV is licensed and has been used widely in China since 1988 (CD.JEVAX®). The vaccine is licensed and used in an increasing number of countries in Asia. Two other live

[16]Japanese Encephalitis Vaccines: WHO position paper – February 2015. Weekly Epidemiol Rec. 2015; https://iris.who.int/bitstream/handle/10665/242325/WER9009_69-88.PDF?sequence=1

attenuated vaccines based on the same attenuated strain are manufactured in China but not exported.

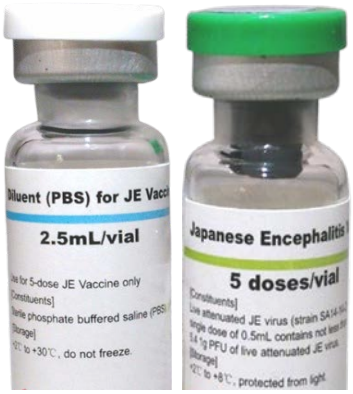
Primary immunization consists of 1 dose (0.5ml) given subcutaneously from 8 months of age or older. The live attenuated vaccine (SA 14-14-2 strain) contains gelatin, saccharose, human serum albumin, and sodium glutamate as excipients.

In infants given a single dose of vaccine at 8–12 months of age, seroprotection rates at 28 days post-vaccination ranged from 90.6% to 92.1% among children in different age groups in one trial and from 80.2% to 86.3% among children who received different vaccine lots in another trial. The seroprotection rate was 97.3% (95% CI: 93.1–99.2) for the live attenuated vaccine when used as a control in a randomized controlled trial of live recombinant JE vaccine in children aged 9–18 months and 99.1% in children aged 12– 24 months.

In case-control studies conducted in Nepal, good vaccine effectiveness was demonstrated in children vaccinated at 1–15 years of age in endemic settings, with 99.3% at 1 week –1 month[17] and 98.5% at 1-year post-immunization.[18]

A convenience sample of 69 individuals vaccinated with a single dose at ages 1–15 years found seroprotection rates of 89.9% and 63.8% at 4 and 5 years after vaccination, respectively. Following a mass vaccination campaign in children aged 1–15 years in Nepal, vaccine effectiveness was 96.2% 5 years post-vaccination.[19]

2.2.2 JE vaccination in the National Immunization Program



The National Immunization Program of Nepal is using live attenuated (SA 14-14-2) JE vaccine. Following the start of JE surveillance in 2004, JE vaccination campaigns using live-attenuated SA 14-14-2 JE vaccine were conducted starting from 2006 in phases. By 2011, campaigns were completed in all 31 high risk districts. Following vaccination campaign completion in these districts, JE vaccine was introduced in routine immunization. By 2012, introduction of JE vaccine (live-attenuated, SA 14-14-2) in routine immunization was completed in all 31 high-risk districts. Further, JE vaccination campaign was conducted in 47 districts in 2016 (44 remaining districts not targeted previously in campaigns and three districts with outbreaks). Following the campaign, JE vaccine was introduced in routine immunization of these remaining districts as well in 2016, covering all districts of Nepal.

JE vaccine is given at 12 months of age in routine immunization as per National Immunization Program (NIP) schedule. If any child misses JE vaccine, the child can get the missed dose up to under 5 years of age as per NIP's missed vaccination schedule.

[17] Bista MB et al. Efficacy of single-dose SA 14-14-2 vaccine against Japanese encephalitis: a case control study Lancet, 2001;358(9284):791–795.

[18] Ohrr H et al. Effect of single dose of SA 14-14-2 vaccine 1 year after immunization in Nepalese children with Japanese encephalitis: a case-control study. Lancet, 2005;366(9494):1375–1378.

[19] Tandan JB et al. Single dose of SA 14-14-2 vaccine provides long-term protection against Japanese encephalitis: a case-control study in Nepalese children 5 years after immunization. Vaccine,2007;25(27):5041–5045.

2.2.3 National Immunization Program (NIP) for JE vaccine

Dose	0.5ml
Site of injection	Antero-lateral aspect of Right thigh
Route of injection	Subcutaneous
Vaccine vial should be discarded after six hours of reconstitution or at the end of the session whichever comes first.	

Annexes

Annex 1: Entomological Surveillance:

Entomological surveillance can be carried out round the year to know the JE vector density, their resting behavior, feeding behavior and detection/isolation of JE virus from vector mosquitoes.

Objectives of entomological surveillance

- To identify the JE vector mosquitoes in an area
- To monitor JE vector abundance in JE endemic areas
- To detect JE virus in vector mosquitoes
- To suggest appropriated vector control measures

Procedure

Adult surveys: Adult mosquito survey should be carried out in the index villages. Indoor resting collection of the adult mosquitoes should be carried out in indoor sites such as human dwellings/cattle sheds, and outdoor resting collection can be done in bushes, plantations, standing crops etc. Collection of the adult mosquitoes can be done by hand catch method using mouth aspirators and CDC light traps.

Larval surveys: Larval survey should be carried out periodically, and all potential breeding sites of JE vectors should to be identified and mapped.

In Nepal, Epidemiology and Disease Control Division (EDCD) and Vector Borne Disease Research and Training Centre (VBDRTC) under Ministry of Health and Population, GoN lead the entomological surveillance activities and provide trainings related to Vector Borne Diseases (including JE). In 2023, entomology labs were established in all 7 provinces and Integrated Vector Surveillance (IVS) are being conducted in the sentinel sites as per the National SOP on IVS 2023 (though not regular). The SOP recommends the IVS should be done (including for JE vectors) during the four seasons such as summer (April-June), rainy (July-September), Autumn (October-December) and winter (January-March). The SOP contains the details about the adult mosquito collection and larval collection procedures, and daily work schedule.

Control measures during inter epidemic period of JE include;

- **Personal protective measures**: Segregate pigs from humans, wear long sleeved clothes and trousers, use mosquito coil, spray, repellent and bed net to avoid exposure to mosquitoes. All windows of the house should be fixed with wire net.

In Nepal, Integrated Vector Surveillance (IVS) standard operating procedures (SOP)[20] was developed in 2023, along with selection of sentinel sites in each province, the vector surveillance activities are being conducted (though infrequent) since many years.

[20] https://edcd.gov.np/resource-detail/national-guideline-on-integrated-vector-management-2020-new

Annex 2: Veterinary Surveillance:

Veterinary surveillance aims to monitor JE activity in animal hosts by assessing pig and bird populations, detecting viral activity, and conducting serological tests. This includes regular blood sample collection from pigs to track antibody levels and identify recent infections.

Monitoring should be carried out in collaboration with veterinary departments and research institutes to establish and maintain free zones and respond to potential outbreaks.

Annex 3: AES Sample Flow and Feedback Mechanism

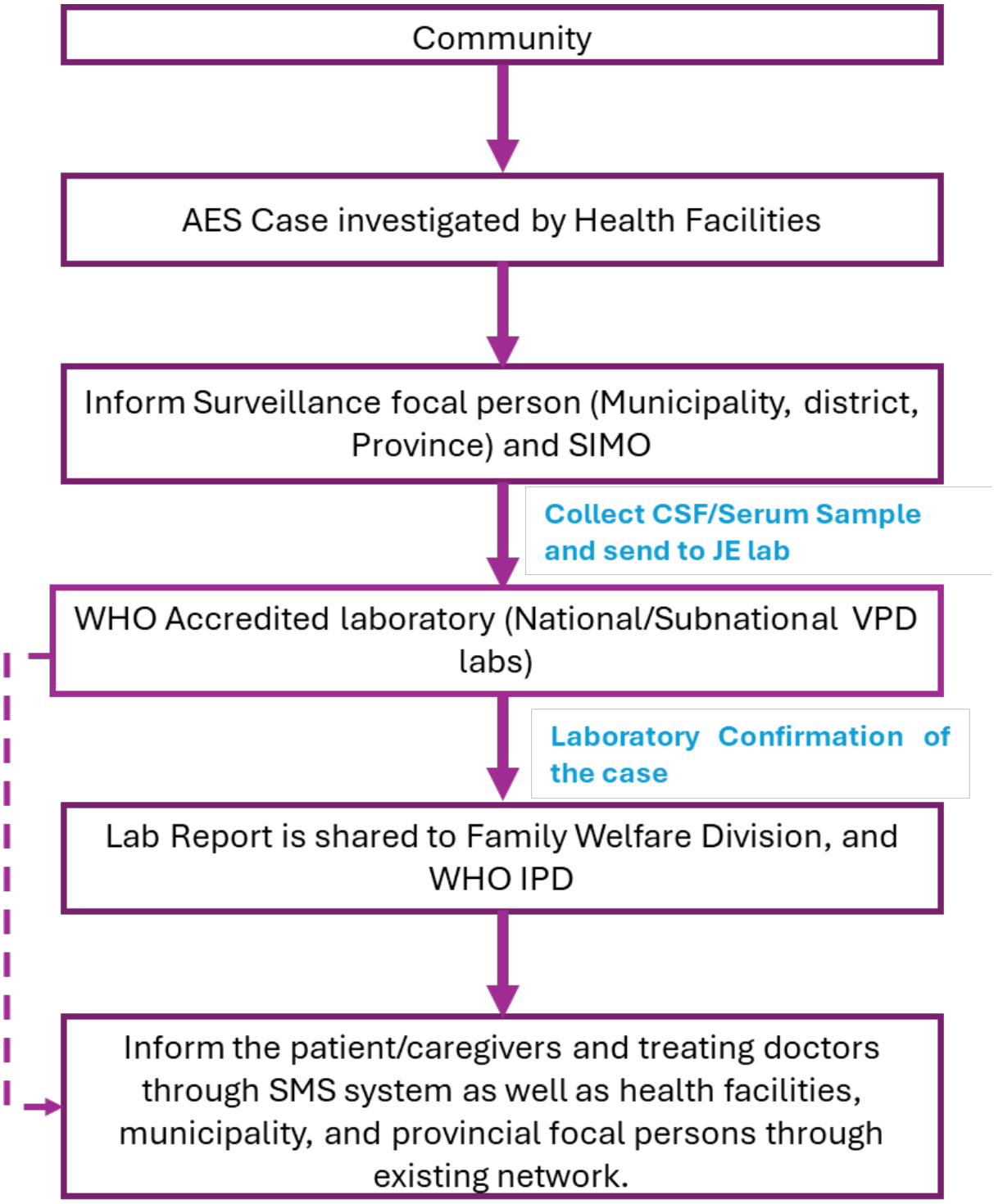


Figure 9. AES sample flow and feedback mechanism

Annex 4: AES Case Investigation Form

Acute Encephalitis Syndrome (AES) Investigation Form

EPID No.: Surveillance FP/SIMO:

Notification / Investigation information

Date case notification: Case notified by: Title: Name of HF:

Source of notification: HP | PHC | Hospital | Teaching Hos. | RRT | NGO | Private | Community | Category of Source: RU | IU | Others

Date of investigation: Name of investigator: Government/Private/SIMO Investigator's Phone No.

Part of Outbreak: Yes | No If yes, Outbreak ID:

Verified by Surveillance FP/SIMO: Yes/No if Yes, Physical/Virtual

Patient Identification

Name of patient: Religion:

Date of birth: Age: Year Month: Sex: M | F

Cast/ethnicity: Migrant*: Yes | No

Father's name: Occupation: Mother's name:

Address: Province: District: Rural/Urban Municipality:

Street/Tole/House No.: Tel./Mobile:

Landmark/GPS Coordinate:

Admitted in Health Facility Yes | No | Unknown

Name of health facility: Date of OPD Attendance: Date of admission:

Inpatient/Outpatient: OPD | IPD Number:

Current status: Cured/discharged | Died | Referred | UT$^{\phi}$ | Unknown $^{\phi}$*Under treatment*

If died, date of death:

JE Vaccination History

Ever had JE vaccine: Yes | No | Unknown

Date of vaccination:

Clinical Signs and Symptoms Date of Onset of Symptoms (Fever):

Fever:	Yes / No / Unknown	Altered sensorium:	Yes / No / Unknown	Neck rigidity:	Yes / No / known
Unconscious:	Yes / No / Unknown	Disorientation:	Yes / No / Unknown		
Loss of coordination:	Yes / No / Unknown	Convulsions:	Yes / No / Unknown		
Headache:	Yes / No / Unknown				

Provisional Diagnosis:

Travel history before 2 weeks of onset Yes | No | Unknown

If yes, specify place:

History of HF visit after onset:

Name and address of Health facility/ Private practitioners/ local healers etc.	1	2	3	4	5
Date visited:					

Follow-up after Lab result:

Current status: Cured/discharged | Died | Referred | UT$^{\phi}$ | Lost to f/up $^{\phi}$*Under treatment* If died, date of death:

Motor deficit:	Yes	No	Unknown	Behaviour deficit:	Yes	No	Unknown
Intellectual deficit:	Yes	No	Unknown	Other Neurological Sequelae:	Yes	No	Unknown
No Disability/Sequelae:	Yes	No	Unknown	Unknown:	Yes	No	Unknown

Follow-up date: Activities carried (Mulitple choice): ACS/QIA/Orientation/Awareness

Malaria parasite test: Positive | Negative | Not done | Pending | Unknown

Final Classification

JE Confirmed | Probable JE | AES Unknown

AES due to other agent

Follow-up after 3 months:

Current status: Cured/discharged | Died | Referred | UT$^{\phi}$ | Lost to f/up $^{\phi}$*Under treatment* If died, date of death:

Motor deficit:	Yes	No	Unknown	Behaviour deficit:	Yes	No	Unknown
Intellectual deficit:	Yes	No	Unknown	Other Neurological Sequelae:	Yes	No	Unknown
No Disability/Sequelae:	Yes	No	Unknown	Unknown:	Yes	No	Unknown

Comments:

*A migrant is defined as any person who is moving or has moved across an international border or within a country from his/her habitual place of residence, regardless of (1) the person's legal status; (2) whether the movement is voluntary or involuntary; (3) what the causes for the movement are; or (4) what the length of the stay is.: Adapted form -International organisation for migration(IOM) : *https://www.iom.int/who-is-a-migrant*

Acute Encephalitis Syndrome (AES) Lab Investigation Form

EPID No.:

Patient Identification Date of Onset of Symptoms (Fever):

Name of patient:

Date of birth: Age: Yr: Mon: Sex: M F Other

Father's name:

Address: Province: District: Rural/Urban Municipality:

Ward No.: Street/Tole/House No.: Tel./Mobile:

Landmark/Other:

JE Vaccination History

Ever had JE vaccine: Yes No Unknown

Date of vaccination: dd/mm/yyyy

Laboratory Investigation

Any Specimen Collected: Yes No Unknown

Specimen no.:	1				2				3				4			
Nature of specimen:	CSF				Serum1				Serum2				Other			
Date sample collected:																
Date sent to lab:																
Name of Lab:																
Date received at lab:																
Specimens condition at lab:	Good	QNS	Hea		Good	QNS	Hea		Good	QNS	Hea		Good	QNS	Hea	
Date tested:																
Lab ID No.:																
Titer units:																
Interpretation*:	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D
Dengue test:	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D
Date sample sent to RRL:																
Date tested:																
Result*:	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D	Pos	Neg	Ind	N/D

**Pos - Positive, Neg - Negative, Ind - Indeterminate, Hea - Heamolised, N/D Test not done, QNS - Quantity not sufficient*

Remarks:

Annex 5: Weekly VPD Reporting Form

VACCINE PREVENTABLE DISEASE SURVEILLANCE SYSTEM

WEEKLY REPORTING FORM (Only for CRS included sites)

After review of all wards and registry books,
please complete and send this report to the following office every Monday.

Office Location of Surveillance Focal Person/Surveillance and Immuniation Medical Officer (SIMO): _____

Telephone: _____ Fax: _____ Email: _____

Name of health institution: _____

Province: _____ District: _____

Week No. ☐ Period included in this report: From ___/___/_____ to ___/___/____

Number of cases identified during the week. If no cases were identified, write 0 (zero):

AFP ☐ NT ☐ Suspected Measles ☐ AES ☐ CRS ☐

Please list each AFP, NT, Acute Encephalitis Syndrome (AES) and CRS case identified during this time period:

Diagnosis (circle one)	Name	Address
AFP NT AES CRS		
AFP NT AES CRS		
AFP NT AES CRS		
AFP NT AES CRS		
AFP NT AES CRS		

Please fill out the information below for any suspected measles patient seen in the facility or admitted during the last week:

Date of visit or admission	Patient Name	Sex	Age	Full Address (Dist/VDC/Ward)	Ever had MSL vacc? (Y/N/U)	Hospi-talized? Y/N/U	Died? Y/N/U

Please fill the information below:

No. of Pneumonia (any age)		No. of Pneumonia cases with avain influenza (bird flu) exposure history		Sudden Death of Domestic Birds	Sudden Death of Wild Birds
Cases	Deaths	Cases	Deaths	Y/N/U (if yes, how many)	Y/N/U (if yes, how many)

Name of person filling this report: _____

Date of report sent to Suveillance Focal Person/SIMO: _____

Signature of Head of the Institution: _____

ACUTE ENCEPHALITIS SYNDROME (AES) / JAPANESE ENCEPHALITIS (JE) SURVEILLANCE MANUAL 2025