

## JAPANESE ENCEPHALITIS (JE)

Japanese Encephalitis is an arboviral disease that primarily affects central nervous system and is caused by Japanese encephalitis virus (JEV) which is a neurotropic, arbovirus of family flaviviridae and is closely related to dengue, yellow fever and West Nile viruses. It is transmitted by the infective bites of female mosquitoes belonging to *Culex tritaeniorhynchus*, *Culex vishnui* and *Culex pseudovishnui* group. JE is primarily a zoonotic disease that may be transmitted from pigs, Ardeid birds etc and man is an accidental host.

### Signs and symptoms of JE

- ❖ Most of the JEV infections are subclinical without any apparent symptoms (1 in 250-1000 cases)  
or
- ❖ It can be mild with fever and headache only.  
or
- ❖ About 1 in 250 infections can result in severe clinical illness characterized by rapid onset of high fever, headache, neck stiffness, disorientation, coma, seizures, spastic paralysis and ultimately death. Prodromal stage may be abrupt (1-6 hours), acute (6-24 hours) or more commonly subacute (2-5 days).
- ❖ In acute encephalitic stage, symptoms noted are convulsions, alteration of sensorium, behavioural changes, motor paralysis and involuntary movement supervene and focal neurological deficit is common. Usually lasts for a week but may be prolonged due to complications. Convalescent phase is prolonged and varies from a few weeks to several months.

Clinically it is difficult to differentiate between JE and other viral encephalitis. JE virus infection presents classical symptoms similar to any other virus causing encephalitis.

**Case fatality rate** can be as high as **30%** among those with disease symptoms.

Amongst patients who survive, some lead to full recovery through steady improvement and **20%–30%** suffer permanent intellectual, behavioural or neurological problems such as paralysis, recurrent seizures or inability to speak.

## **Mode of transmission of Japanese Encephalitis**

Japanese encephalitis is a mosquito borne viral disease. It is transmitted by the infective bites of female mosquitoes belonging to *Culex tritaeniorhynchus*, *Culex vishnui* and *Culex pseudovishnui* group. JE is primarily a zoonotic disease and natural hosts include water birds of Ardeidae family (pond herons and cattle egrets). Pigs play an important role in the natural cycle and serve as an amplifier host since they allow viral multiplication without suffering from disease and help to maintain prolonged viraemia. Due to prolonged viraemia, mosquitoes get opportunity to pick up infection from pigs easily. Man is a dead end host due to low and short-lived viraemia. Mosquitoes do not get infection from JE patient.

## **Characteristics of mosquitoes**

Life cycle consists of egg, four instars of larvae, pupa and adult and the whole cycle takes more than a month. But duration depends on temperature and other ecological conditions.

## **Breeding sources**

*Culex vishnui* is very common, widespread and breeds in paddy fields and the abundance is related to rice cultivation, shallow ditches and pools. These vectors are primarily outdoor resting in vegetation and other shaded places but in summer it may also rest in indoors.

## **Biting habits**

They are mainly cattle feeders but human and pig feeding habits are also recorded in some areas.

## **Diagnosis**

### **Clinical:**

Individuals who live in or have travelled to a JE-endemic area and experience encephalitis are considered a suspected JE case. Clinically JE cases present signs and symptoms similar to encephalitis of viral origin and cannot be distinguished from other encephalitis. To confirm JEV infection and to rule out

other causes of encephalitis requires a laboratory testing of serum or, preferentially, cerebrospinal fluid.

### **Laboratory:**

- **Antibody detection:**

Enzyme Linked Immuno-Sorbant Assay (ELISA) for IgG (paired) and IgM (MAC) antibodies, Hemagglutination Inhibition Test (HI)

- **Antigen Detection:**

RPHA, IFA, Immunoperoxidase etc.

- **Genome Detection :**

RTPCR

- **Virus Isolation** - Tissue culture, Infant mice, etc

**IgM ELISA is the method of choice** and the samples to be collected 3-5 days after the onset of infection.

### **Case definitions for JE Diagnosis and Reporting:**

#### **Suspected case**

Fever of variable severity associated with neurological symptoms ranging from headache to meningitis or encephalitis. Symptoms can include **headache, fever, meningeal signs, stupor, disorientation, coma, tremors, paralysis (generalized), hypertonia, loss of coordination.**

(Patient with fever, altered sensorium lasting more than 6 hours, no skin rash and other known causes of encephalitis to be excluded)

#### **Probable case**

A suspected case with presumptive laboratory results: Detection of an acute phase anti-viral antibody response through IgM in serum/ elevated and stable JE antibody titres in serum through ELISA/HI/Neutralising assay.

## **Confirmed case**

A suspect case with confirmed laboratory result : JE IgM in CSF or 4 fold or greater rise in paired sera (acute & convalescent) through IgM/IgG ELISA, HI, Neutralisation test or detection of virus, antigen or genome in tissue, blood or other body fluid by immuno-chemistry, immunofluorescence or PCR.

## **Treatment of Japanese Encephalitis:**

There is no specific anti-viral medicine available against JE virus. Treatment is supportive to relieve symptoms and stabilize the patient. In acute phase, fluid and electrolyte balance to be maintained properly and control of convulsions if present. Maintenance of airway is crucial.

## **Vaccine for Japanese Encephalitis**

There are 4 main types of JE vaccines currently in use: inactivated mouse brain-derived vaccines, inactivated Vero cell-derived vaccines, live attenuated vaccines, and live recombinant vaccines. Central Research Institute, Kasuali, has developed Japanese encephalitis vaccine indigenously. It is a mouse brain killed vaccine and 3 doses are required to produce primary immunization.. Two doses are administered sub-cutaneously within a gap of 7-14 days followed by third dose any time after one month and before one year of the second dose. A booster is required after 3 years.

The live attenuated **SA14-14-2 vaccine** manufactured in China has become the most widely used vaccine in endemic countries, and it was prequalified by WHO in October 2013. In Thiruvananthapuram and Aplappuzha districts, the vaccine is included under routine immunisation at the age of 1.5 years.

Vaccination is not recommended as an outbreak control measure as it takes at least one month after second dose to develop antibodies at protective levels and the outbreaks are usually short lived.

## **Activities to be done for prevention and control of JE**

- ❖ Reducing the vector density and taking personal protective measures against mosquito bites using insecticide treated mosquito nets.
- ❖ The reduction in mosquito breeding requires eco-management, as the role of insecticides is limited.

- ❖ Piggeries may be kept away (4-5 kms) from human dwellings.

### **Challenges in JE control**

- Outdoor habit of the vector
- Scattered distribution of cases spread over relatively large areas
- Role of different reservoir hosts
- Specific vectors for different geographical and ecological areas
- Immune status of various population groups is not known making it difficult to delineate vulnerable population groups.