INTERNATIONAL SCHOOL OF MEDICINE

Department of Infectious Diseases

Japanese Encephalitis

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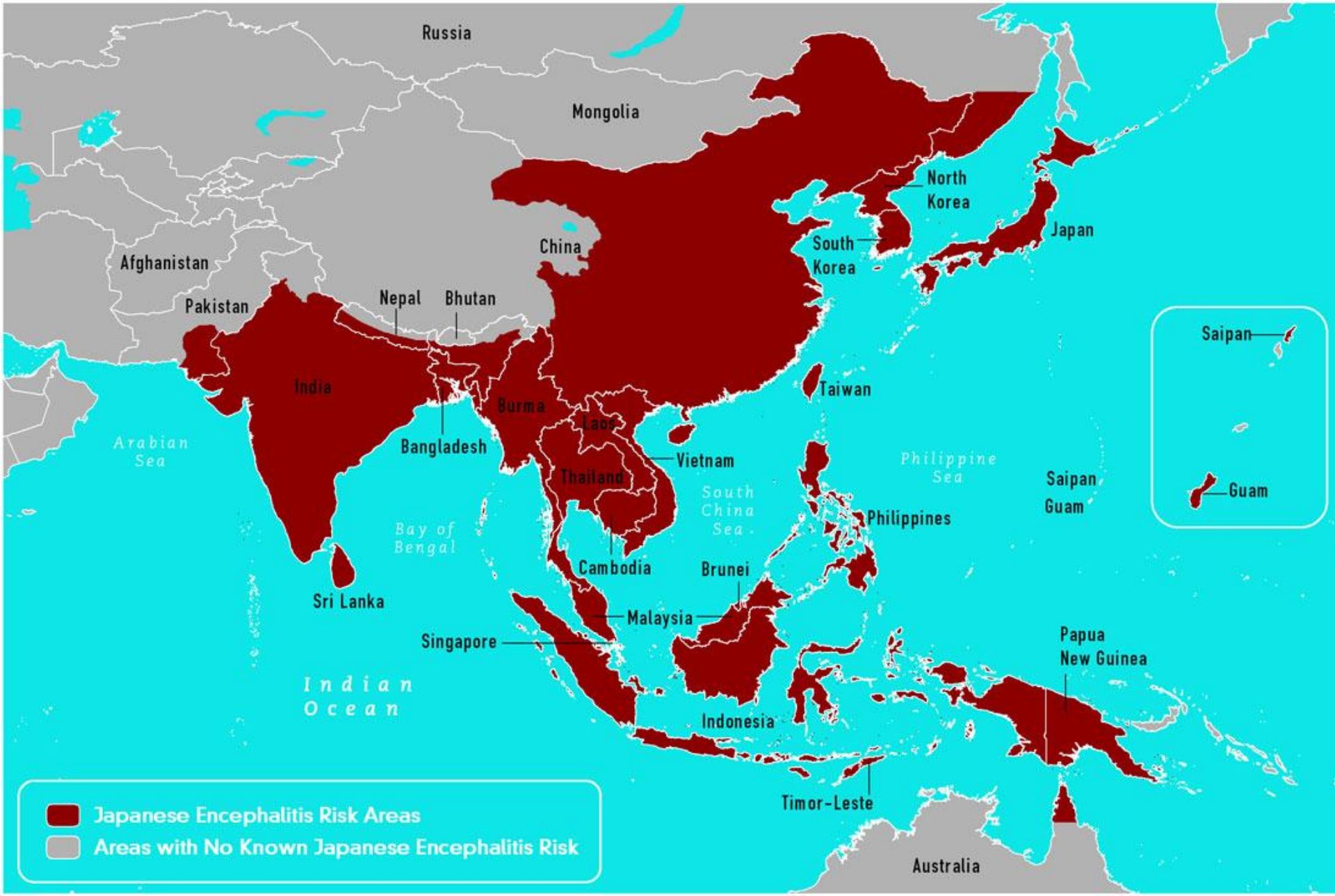
- Japanese encephalitis is a mosquito-borne viral infection of horses, pigs and humans.

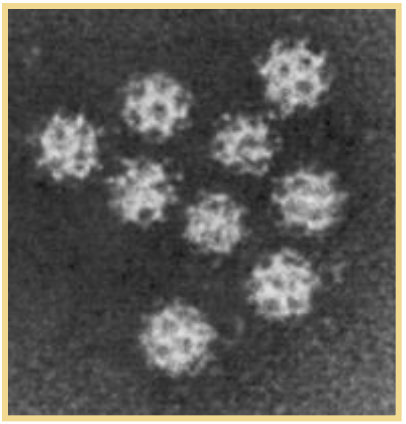
- It is also referred to as Japanese B encephalitis, arbovirus B, and mosquito-borne encephalitis virus.

Geographic Distribution of Japanese Encephalitis Virus



The Organism

- Japanese Encephalitis (JE) virus belongs to the genus *Flavivirus* in the family Flaviviridae
- Name derived from the Latin *flavus* meaning "yellow", which refers to the yellow fever virus
- Single stranded, enveloped RNA virus
- Morphology not well defined



History

- 1870s: Japan
  - "Summer encephalitis" epidemics
- 1924: Great epidemic in Japan
  - 6,125 human cases; 3,797 deaths
- 1935: Virus first isolated
  - Fatal human encephalitis case
- 1938: Virus isolated from mosquito *Culex tritaeniorhynchus*

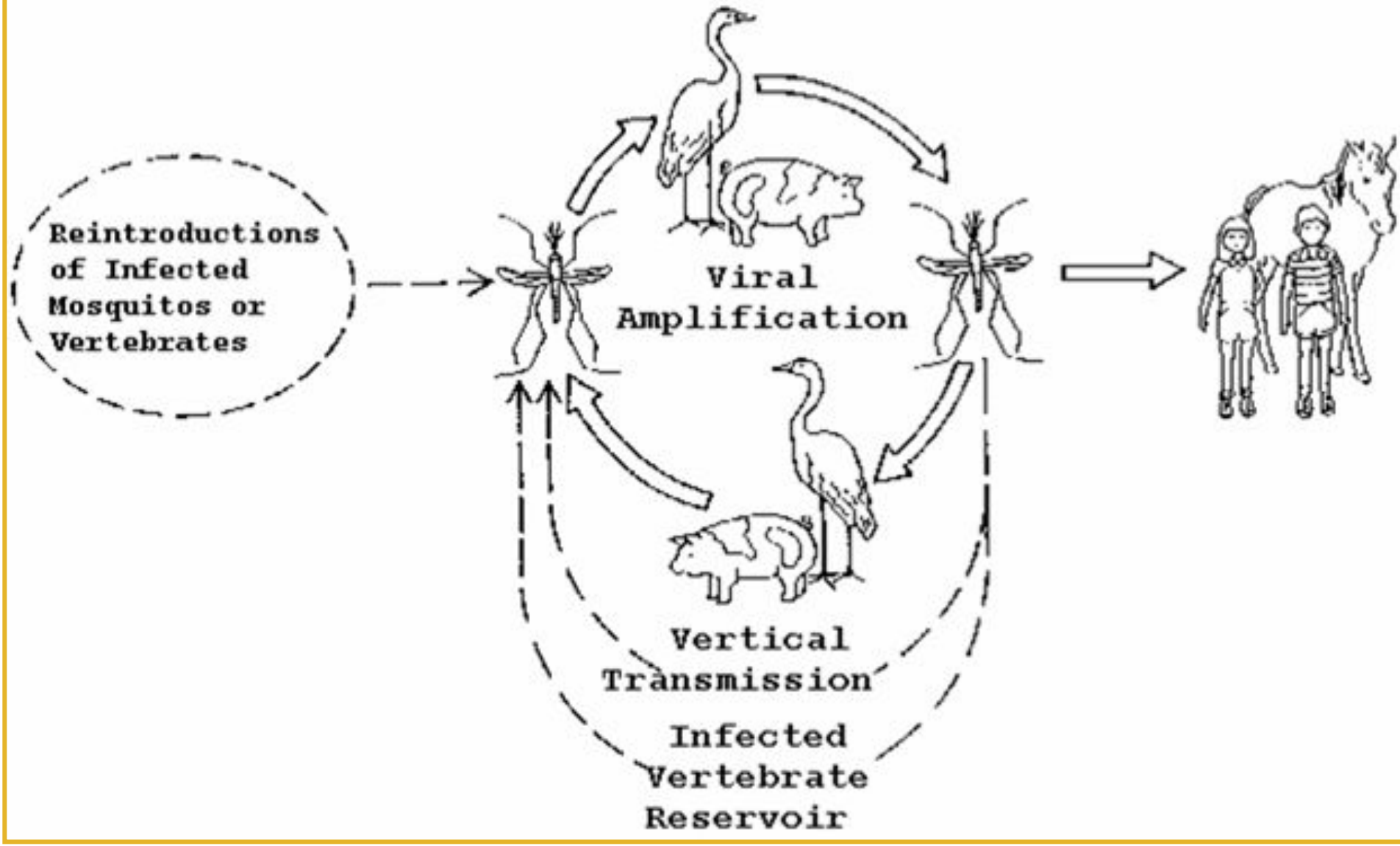
History

- 1940 to 1978
  - Disease spread with epidemics in China, Korea, and India
- 1983: Immunization in South Korea
  - Started as early as age 3
  - Endemic areas started earlier
- 1983 to 1987: Vaccine available in U.S. on investigational basis

Transmission

- Vector-borne
- Enzootic cycle
  - Mosquitoes: *Culex* species
    - *Culex tritaeniorhynchus*
  - Reservoir/amplifying hosts
    - Pigs, bats, Ardeid (wading) birds
    - Possibly reptiles and amphibians
  - Incidental hosts
    - Horses, humans, others

Figure 2. Transmission Cycle of Japanese Encephalitis Virus



Transmission

- Transmission is usually seasonal
- In temperate zones of China, Japan, Korea and northern areas of Southeast Asia, Japanese encephalitis is transmitted during summer and early autumn -- May to September.
- In north India and Nepal transmission occurs from June to November
- In south India and Sri Lanka epidemics are found from September to January.

Clinical Signs

- Every year approximately 35,000 to 50,000 symptomatic cases occur worldwide
- Incubation period: 6 to 8 days
- Disease varies from a febrile headache to an acute and possibly fatal encephalitis
- Most asymptomatic or mild signs
- Children and elderly
  - Highest risk for severe disease
  - case-fatality rate (30%)

Clinical Signs: Severe

- Acute encephalitis
  - Headache, high fever, stiff neck, stupor
  - May progress to paralysis, seizures, convulsions, coma, and death
- Neuropsychiatric complication
  - 45 to 70% of survivors
- *In utero* infection possible
  - Abortion of fetus

JE disease manifestations can be divided into three stages.

- **A Prodromal Stage**
- **An Acute encephalitic Stage**
- **and a late stage**

Prodromal Stage : is characterised by

- **Fever**
- **Rigors**
- **Headache**
- **Nausea**
- **and Vomiting**

The Prodromal stage usually lasts for 1 to 6 days. It can be as short as less than 24 hours or as long as 14 days

An Acute Encephalitic Stage:

Begins by the third to fifth day. The symptoms include:

- **Convulsions**
- **Altered sensorium, unconsciousness, coma**
- **Mask like face**
- **Stiff Neck**
- **Muscular Rigidity**
- **Tremors in fingers, tongue, eyelids and eyes.**
- **Abnormal movements of limbs**
- **Speech impairment**

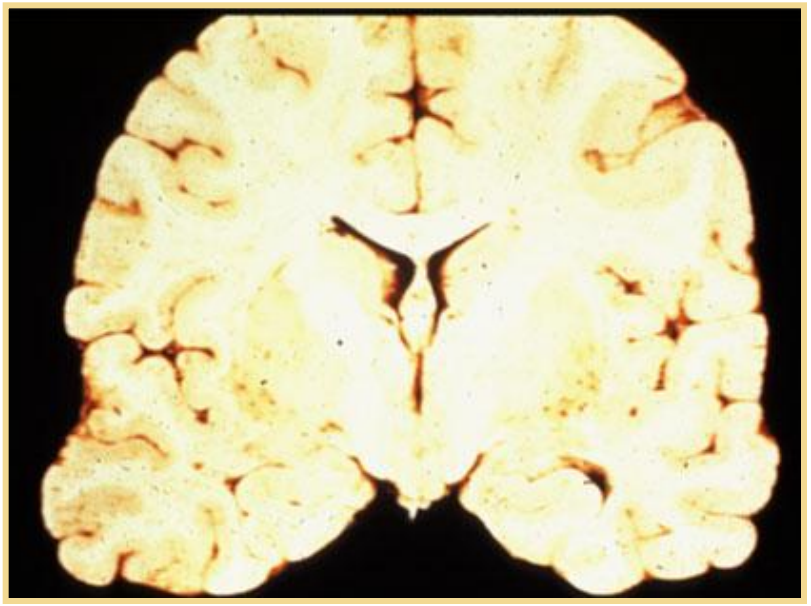
A Late Stage:

Characterised by

- **the persistance of signs of CNS injury such as,**
- **Mental impairment.**
- **Increased deep Tendon reflexes**
- **Paresis either of the upper or lower motor neuron type.**
- **speech impairment**
- **Epilepsy, Abnormal movements, Behaviour abnormalities.**

Post Mortem Lesions

- Pan-encephalitis
- Infected neurons throughout CNS
- Occasional microscopic necrotic foci
- Thalamus generally severely affected

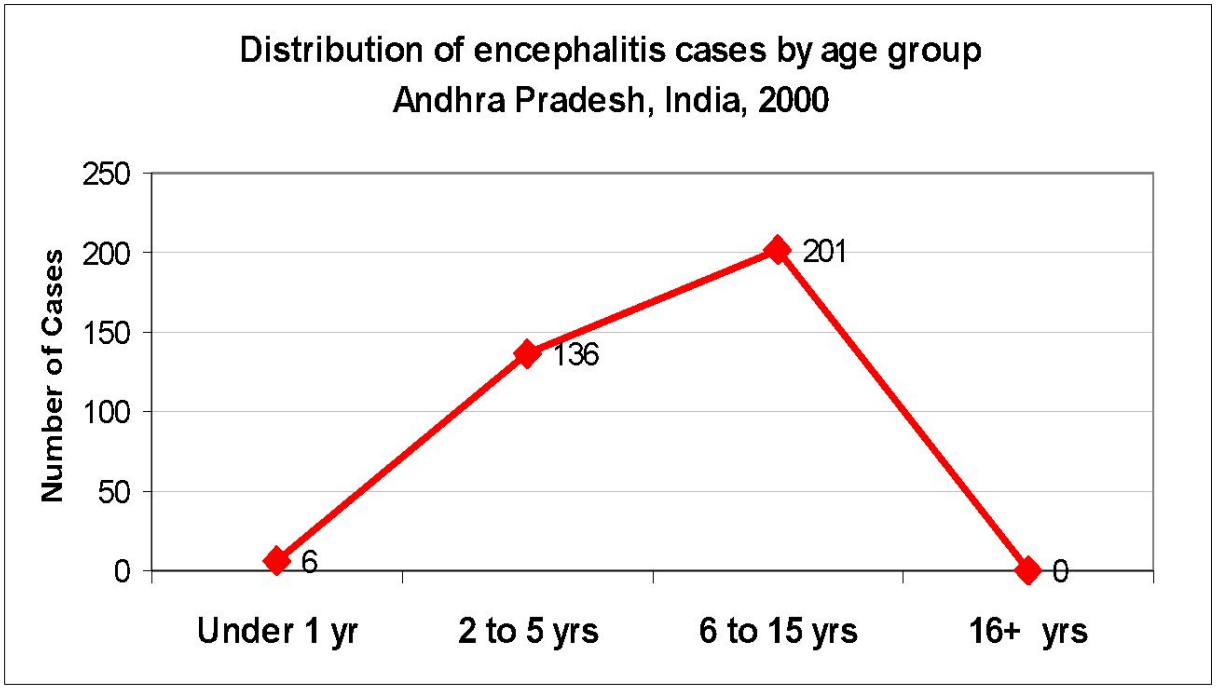


The perivascular congestion and hemorrhage may be diffuse or focal, and is seen predominantly in cortical gray and deep gray matter.

Age groups affected by JE

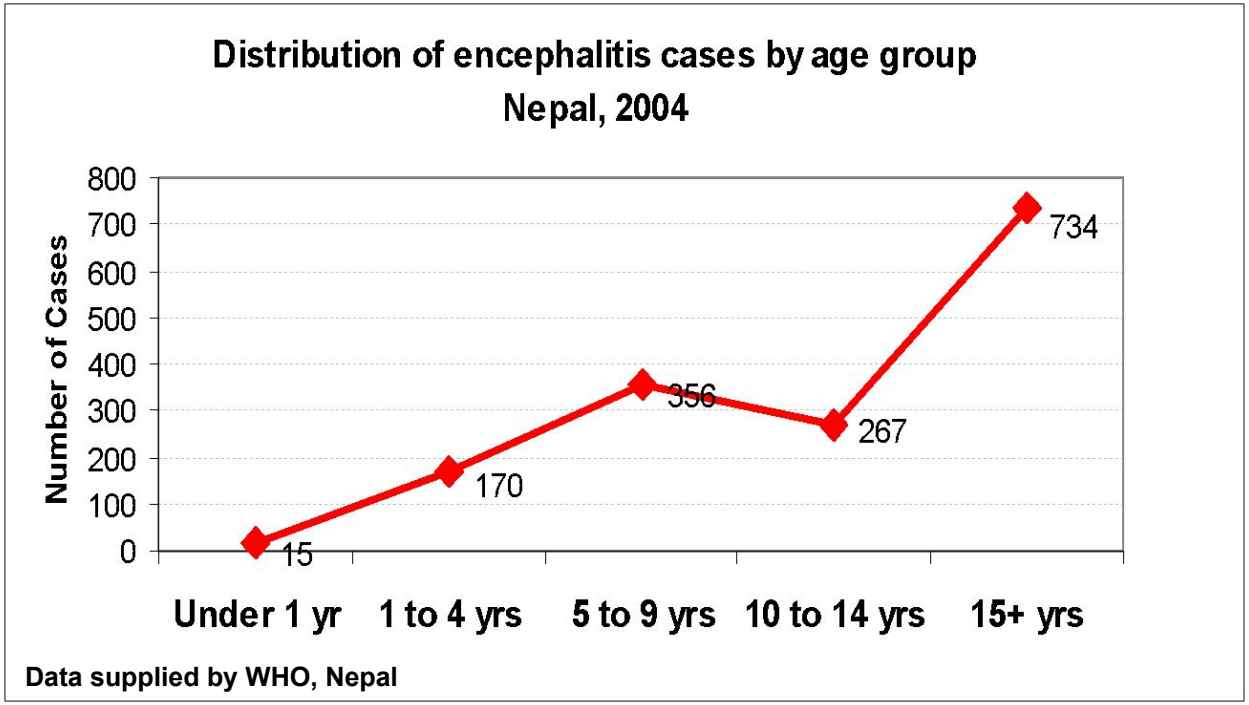
- Children 1 to 15 years of age are mainly affected in endemic areas.
- But people of any age can be infected. Adult infection most often occurs in areas where the disease is newly introduced.

Photo credit: Carib Nelson, PATH



Data supplied by Government of Andhra Pradesh

Different patterns of age distribution of cases

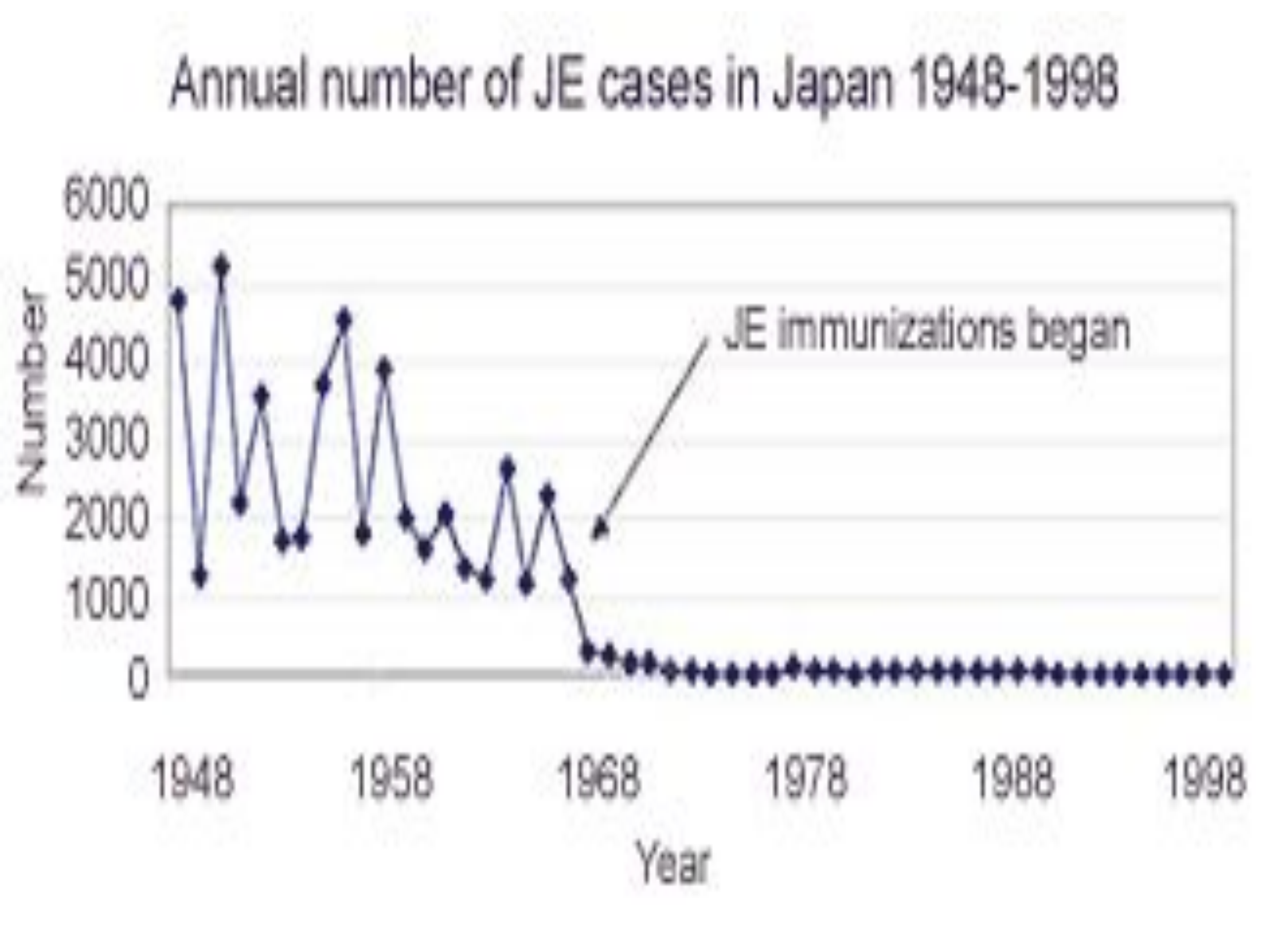


Diagnosis and Treatment

- Laboratory diagnosis required
- Tentative diagnosis
  - Antibody titer: HI, IFA, ELISA
  - JE-specific IgM in serum or CSF
- Definitive diagnosis
  - Virus isolation: CSF, brain
- No specific treatment
  - Supportive care

Vaccination

- Live attenuated vaccine
  - horses and swine
  - Successful for reducing incidence
- Inactivated vaccine (JE-VAX)
  - Humans
  - Japan, Korea, Taiwan, India, Thailand
  - Used for endemic or epidemic areas
  - Travelers, military, laboratory workers


Annual number of JE cases in Japan 1948-1998
Number
6000
5000
4000
3000
2000
1000
0
JE immunizations began
1948
1958
1968
1978
1988
1998
Year