JAPANESE ENCEPHALITIS (J.E.)

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Introduction

Japanese Encephalitis (J.E.) is an infection of the central nervous system caused by a virus transmitted to man through mosquitoes. The Japanese encephalitis virus was first isolated in Japan in 1935 from the brain of a patient dying from encephalitis. The virus is transmitted in an enzootic cycle among mosquitoes and vertebrate amplifying hosts, chiefly domestic pigs and wading birds. Culex mosquitoes, primarily *Culex tritaeniorhynchus* and *Culex gelidus* are the principal vectors.

History of the disease

Japanese Encephalitis has been reported in the South-East Asia and Western pacific regions for a long time with epidemics mainly in Japan, Korea and some Provinces of Taiwan. During the last decade, outbreaks of the disease have extended to some parts of Thailand, Burma, India, Nepal and Sri Lanka. For the first time, J.E. cases were reported from Australia in 1995.

It is a disease of public health importance in many Asian countries. Approximately 50,000 cases of J.E. with 15,000 deaths are estimated to occur annually. This disease primarily occurs in children. Approximately 25 percent of cases die and 50 percent develop permanent neurologic and psychiatric sequelae. The magnitude of the problem is even greater when it is considered that the disease often occurs in epidemics that are somewhat predictable and that J.E. is a vaccine preventable disease.

Clinical Features

The incubation period in man, following an infective mosquito bite, may range from 5 to 16 days. The course of the disease can be conveniently divided into three stages:

1. **A prodromal stage** occurs before the involvement of the Central Nervous System (CNS). Early symptoms of the prodromal state are; fever, rigors, headache, nausea and vomiting.

2. **An acute encephalitic stage** usually occurs by the third to fifth day. The symptoms are; altered sensorium (clouding of consciousness, excitement, confusion, disorientation, stupor and coma), convulsions, stiff neck, muscular rigidity, mask-like face, abnormal movements (coarse tremors, choreo-athetotic movements etc), dehydration and weight loss.

3. **A late stage** marked by recovery or the persistence of signs of CNS injury. Other signs and symptoms which also can be present at early or late stages are: increased deep tendon reflexes, thick and slow speech, aphasia and paresis.

Japanese Encephalitis (J.E.) in Sri Lanka

Japanese Encephalitis virus was first isolated in Sri Lanka in 1968. The isolation was done at the Medical Research Institute, Colombo. Since then J.E. cases have been identified from various parts of the country. The disease was considered as endemic in certain parts of the country. In the dry zone, the disease was reported mainly from areas where paddy cultivation is being done, while in the wet zone it was reported from the areas where pig breeding and coir products are made as cottage industries. The vector mosquitoes were also frequently identified in these areas.

In 1988, 409,888 doses of J.E. vaccine were administered to children 1-10 years of age in Anuradhapura, Polonnaruwa, Kurunegala and Puttalam RDHS divisions.

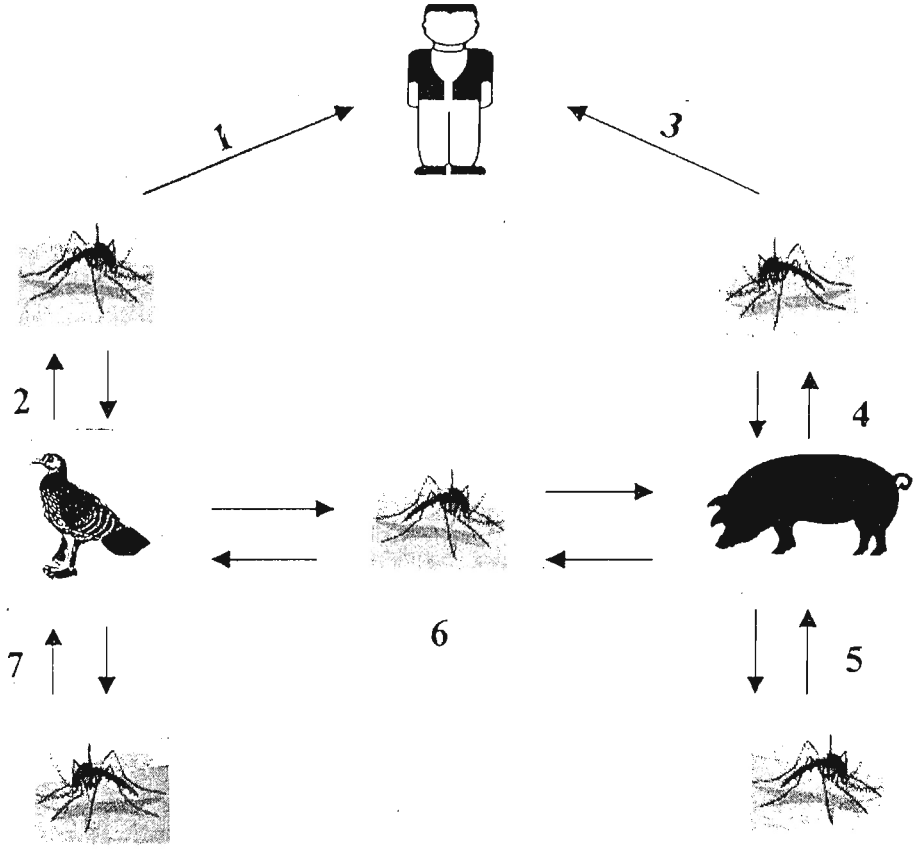

Figure 1: Life cycle of Japanese Encephalitis virus

1. **Man mosquito contact is high when adult mosquito densities build up to a maximum.**
2. **The cycle within birds.**
3. **No disease transmission from one human to another.**
4. **The virus develops in pigs.**
5. **Life cycle of the virus within pigs.**
6. **Mosquito breeds in water logged paddy fields and ground pools.**
7. **Mosquito prefers blood of poultry and animals**

The disease occurs throughout the year, and shows a marked increase with the North East monsoonal rains (November to February) as a result of increased mosquito breeding places, due to water logging of rice-fields and ground pools. Man mosquito contact is observed to be high, when adult insect densities build up to maximum, during this period.

Geographic distribution and incidence

Countries with proven epidemics of Japanese Encephalitis are India, Nepal, Sri Lanka, Burma, Laos, Thailand, Kampuchea, Vietnam, Malaysia, Singapore, Philippines, Indonesia, Saipan, China, maritime Siberia, Korea and Japan. Regular seasonal epidemics occur in northern South East Asia, China and Korea.

Epidemiological Patterns – Two patterns

(a) Sporadic cases - occasional cases widely distributed in time and space – seen in Japan, Taiwan, Korea and Sri Lanka.

(b) Regional Seasonal Outbreaks - Large number of cases occurring simultaneously at one time and place – seen in Thailand, Parts of India, Sri Lanka and Nepal.

Epidemic cycle

Japanese Encephalitis virus is transmitted by zoophilic mosquito vectors; consequently, wild and domesticated animals are the principal hosts. Man is considered to be a dead-end host for this virus due to the short duration and low titre of viremia in man and the relative preference of vector mosquitoes for animals over man.

Animal reservoirs

Pigs and some birds are the most important hosts for maintenance, amplification, and spread of the virus. Rodents appear to be unimportant hosts.

Bird-mosquito cycles are thought to be important in maintaining and amplifying Japanese Encephalitis virus in the environment. Viremia frequently follows infection of both wild and domestic birds with the virus.

Animals and mosquitoes infected with Japanese Encephalitis virus generally remain asymptomatic, though fatal Encephalitis occurs in horses and fetal wastage may occur in infected sows.

Vectors

The *Culex tritaeniorhynchus* mosquito is the main vector in the transmission of J.E. to humans in Asia.

This mosquito breeds in rice fields some distance from human dwellings but flies to peridomestic areas for blood meals. *Culex tritaeniorhynchus* mosquitoes can fly for a distance of up to 1.5 kilometers and have been found in treetops 43-50 feet above the ground, where virus could be spread among birds.

The *Culex gelidus* mosquito is also an important vector in the transmission of J.E.

Seasonality

Transmission of Japanese Encephalitis virus in the tropics may occur year round. Where seasonal epidemics occur, they generally begin during the rainy seasons when mosquito populations are maximal.

Japanese Encephalitis Prevention and Control Measures

Japanese Encephalitis could theoretically be prevented by a combination of the following:

1. Surveillance
2 Treatment and management of patient
3. Vector control
4. Vector avoidance/prevention of mosquito bites
5. Immunization of susceptible persons
6. Protection of animal reservoirs
7. Immunization of amplifying host

Surveillance

Surveillance aims at building up an early warning system in known infected zones as well as in those where the virus is not known to occur but where ecological conditions are favourable to the introduction of the virus.

Surveillance is mainly based on early recognition of first suspected case(s) and their prompt reporting to the health authorities.

Vector Control

The use of pesticides to control Japanese Encephalitis virus vectors has generally been effective only in some areas for a certain period of time and at great cost.

Prevention of mosquito bites

1. Keeping people away from mosquitoes by distancing houses from rice fields and pig sites. Use of netting also can help but is impractical.

2. Laws requiring that pigs be grown only in localized pig pens, may be away from human habitation will help in disease control.

Immunization against Japanese Encephalitis (J.E.)

Sri Lanka adopted immunization against J.E. as a major strategy for the prevention and control of the disease in high risk areas in 1988. The target population is children between the ages of 1 and 10 years. This age group was selected considering the age distribution of patients, immunity levels and the cost of vaccine, to achieve maximum long term results making the programme cost-effective.

The vaccination programme was first conducted in Anuradhapura, Polonnaruwa and Puttalam districts and later it was extended to other districts based on the epidemiological situation of the disease in these areas.

Over 10 million doses of J.E. vaccine were administered to children in Sri Lanka from 1988-1999. According to the data available there is a general reduction in incidence of J.E. in areas where immunization against J.E. has been carried out and it has not been reported in children who were immunized against J.E.

Adverse reactions following immunization with J.E. vaccine were monitored from the beginning of the programme. No major side effects were reported.

In 1997, immunization programme was extended to Colombo, Kalutara, Matara, Hambantota, Ampara and Galle districts based on the epidemiological situation of J.E. in these areas.

Japanese Encephalitis Vaccine J.P. (Beijing strain)

Japanese Encephalitis Vaccine "SEIKEN" is a colourless to slightly turbid liquid preparation containing inactivated Japanese Encephalitis virus.

Administration and Dosage

Primary Immunization: In general usage, two subcutaneous injections of 0.5 ml (under 3 years of age, 0.25 ml) are given at 1-4 week interval.

Booster Immunization: A single subcutaneous injection of 0.5 ml (under 3 years of age, 0.25 ml) is typically administered about 1 year after the completion of the primary immunization. Further booster immunizations are given at the first sign of a local epidemic or every 4-5 years in order to maintain effective immune levels.

Contraindications

Fever, a serious disease, experience of anaphylactic shock to any of the vaccine components in the past and considered unsuitable for vaccination for any reason other than those given below.

- Fever or allergic reaction, such as rash etc., within two days of previous vaccination.
- A convulsion in the past (one year)
- Diagnosed with a form of immunodeficiency in the past.
- May be likely to experience an allergic reaction of any of the vaccine components.

Clinical side effects

Local oedema, swelling, pain and such general reactions as fever, chills, headache and fatigue may be experienced but those usually diminish within a few days.

Comparison of effects of disease and vaccine

a) Disease

Japanese Encephalitis

Caused by an arthropode-borne flavivirus (J E virus). J.E. spread by the bite of infective mosquitoes. After incubating for 1-2 weeks, the infection causes an acute brain syndrome characterized by reduced consciousness, generalized spasticity, focal neurological signs and fits.

b) Effects of disease

There is no specific treatment, and the prognosis is poor, especially in cases in which consciousness is impaired. The case fatality rate of encephalitis is 25%, and 30% have neuropsychiatric sequelae.

c) Side effects of vaccination

Local indurations, redness and tenderness are common. Systemic adverse sections such as fever, headache, malaise, rash, dizziness, myalgia, nausea and vomiting have been reported in 10% of recipients. Serious reactions reported in 62.4 per 10,000.

Notes for Parents

1. If your child has a fever (temperature) after the vaccination.

If your child has a fever, give paracetamol (dose based on weight). Give no more than 6 doses in 24 hours. If fever persists, consult your doctor.

2. Advice to parents on reactions to vaccination

Many vaccine infections may result in soreness, redness, itching, swelling or burning at the infection site for 1 to 2 days. A cold, wet cloth will help to relieve this. Sometimes a small lump may persist for some weeks or longer. If adverse events like urticaria, fits occur consult your doctor immediately.