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# Review on Japanese Encephalitis Outbreak Cases in Nepal During the Year 2011

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Additional information is available at the end of the chapter

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## 1. Introduction

Nepal is one of the richest countries in the world in terms of bio-diversity due to its unique geographical position and altitudinal variation. The elevation of the country ranges from 60 m above sea level to the highest point on earth, Mr. Everest at 8,848 m, all within a distance of 150 km resulting into climatic conditions from subtropical to arctic mentioned by Nepal Tourism Board, 2006. JE cases are observed mostly in Terai area (The lowland plains of the Terai lie at an altitude of between 67 and 300 m (220 and 980 ft tropical climate) (Joshi, 1983). In Southeast Asia it is thought to cause up to 50000 clinical cases and 10000 deaths per year (WHO/SEARO, 1979). The earlier reports have shown that the case fatality rate (CFR) is high in Nepal, and nationwide it has ranged from 15% to 46% for the years 1978 to 1994. There are 75 districts, 14 zones and five development regions in Nepal. Out of 75 districts 36 districts are affected by Japanese encephalitis.

Japanese encephalitis (JE) has been occurring in the South-East Asia and Western Pacific Regions for a long time. In Nepal, it has occurred first time in Rupandehi district then in Sunsari, Morang and latter in all 23 districts of Terai and inner Terai (Joshi, 1983). Incidence of this disease has been recorded first time in different years in the following countries. Japan, China and Republic of Korea have reduced the incidence of this disease now (WHO/SEARO, 1979).

The entomological survey conducted in May/June, 1981 at the endemic areas of western region of Nepal, have recorded the prevalence of the following species such as (a) *Culex tritaeniorhynchus*, (b) *Cules vishuni*, (c) *Culex gelidus*, (d) *Culex fusecephalus*, (e) *Culex epidemas* (f) *Culex bitaeniorhynchus* (g) *Mansonia annulefera* (h) *Mansonia indiana* (i) *Mansonia uniformis*, (j) few species of genus *Aedes*, genus *Armigeris* and genus *Anopheles* (Pradhan, 1981).

These mosquitoes can breed in sub-urban and peri-urban area provided the ecological conditions similar to rural area are present (Pradhan, 1981, Khatri et al., 1981, 1983). These mosquitoes can breed same environment wherever it is favourable.

|                               |                    |
|-------------------------------|--------------------|
| Japan                         | 1949 to 1950       |
| Egypt                         | 1977               |
| Republic of Korea             | 1949 to 1958       |
| China                         | 1949               |
| Malaysia                      | 1955 to 1960       |
| Indonesia                     | 1955 to 1960       |
| Philippines                   | 1950 to 1955       |
| Singapore                     | 1955 to 1960       |
| Bangladesh                    | 1977               |
| Vietnam                       | 1958 to 1969       |
| India                         | 1955 (South), 1973 |
| Burma                         | 1974               |
| (West Bengal), U.P. and Bihar | 1978               |
| Thailand                      | 1969 to 1970       |
| Sri Lanka                     | 1968               |
| Nepal                         | 1978               |

**Table 1.** Historical reviews of JE outbreak worldwide.

## 2. Infected population and death cases from Japanese encephalitis (JE) disease in Nepal (EDCD/DHS)

High Risk Population: 12.5 million

High Risk Population: (Below 15 Years) 5.5 millions

JE Cases: 26658 people during the year 1978-2003

Death Cases: 5370 people during the year 1978-2003

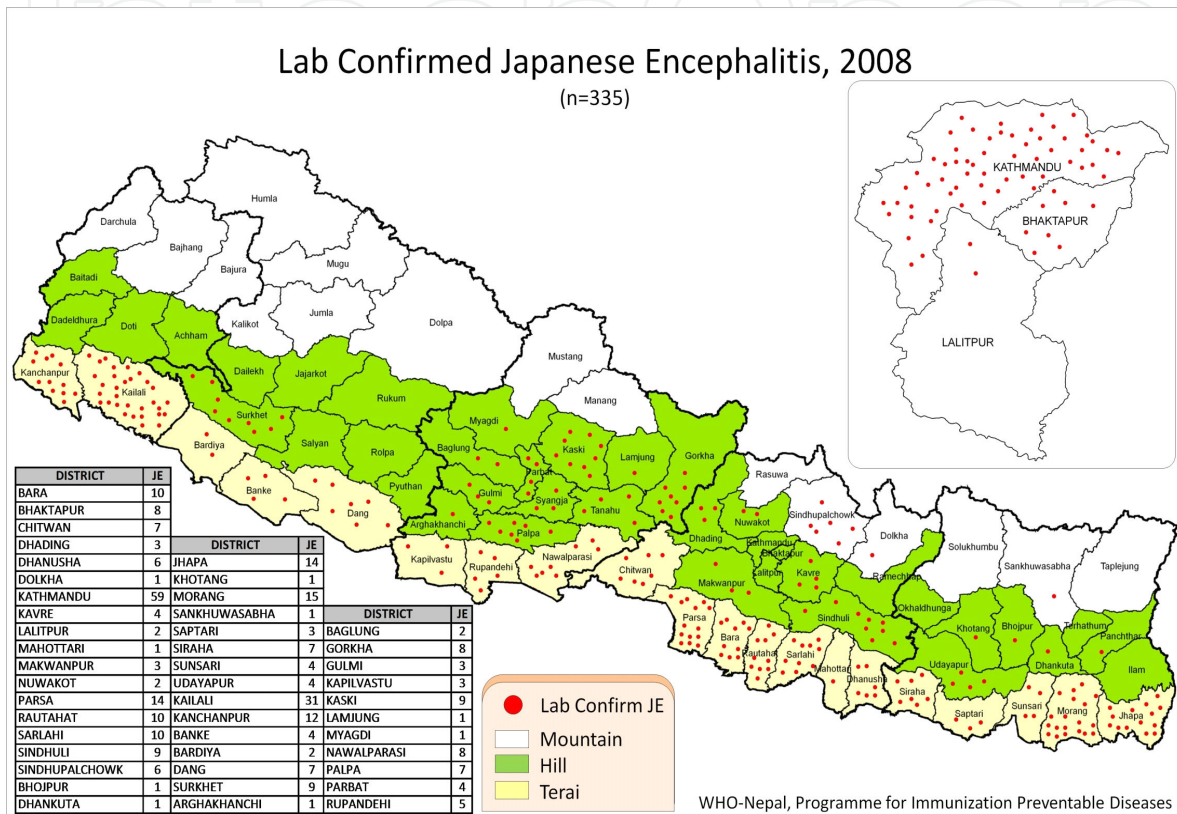
Mortality: 5 to 25%

Incidence: 50% (Below 15 Years)

In Nepal JE has been recorded and reported as a seasonal disease in Nepal. "Shrawan" (July and August) appears to have been the deadliest month for the Nepalese as far as human casualties from JE are concerned.

### 3. Japanese encephalitis distribution in Nepal

This JE virus is transmitted through a series of bites -when the mosquito bites a pig, for instance, it transmits the virus to the pig which acts as a host to the virus. The virus is further transmitted to humans when bitten by mosquitoes who have already bitten the pig.



Scheme 1. Map 1.

The virus attacks the central nervous system of human, causing encephalitis-an infection of the brain. The patients starts vomiting, suffers severe headache and fever gradually becomes unconscious and nears death due to brain swelling. Even if the patients survive they remain with a lot of defect- both physical and intellectual. Such a deadly disease, so wide spread in Nepal and without a cure. Preventing mosquito bite is thus so very important. But unlike for dengue virus, there is a vaccine for Japanese B virus which the government is trying to make available in mass. Japanese encephalitis virus also called Japanese B virus.

The mosquitoes that transmit this disease breed in and around dirty, stagnant water and in areas where the pigs are farmed. We all know that there are many places in and around Kathmandu that fits into this description, so I would urge you to hurry and get vaccinated. Another disease Filariasis- is also transmitted through the disease vector that is the female *Culex* mosquito. Filariasis is spread from infected persons to uninfected persons by mosquitoes that release large numbers of very small worm larvae, which circulate in an affected

person's blood stream. The worms grow and live in an infected person's lymph vessels for about 7 years and divide in the lymphatic system. This causes inflammation and eventually blocks the lymphatic system and causes a lot of disfiguration.

The government is trying again to eradicate this disease by distributing the drug called Diethylcarbamazine- a three tablets-at-a-time treatment, and a single tablet treatment of Albendazole. However the medical fraternity is in doubt about its continuation. Saving the most important of all disease for the last, malaria, which is transmitted by the female Anopheles mosquito, causes febrile disease. One of the agents called Plasmodium Falciparum causes very severe malaria, which can lead to death. Again there is no vaccine against this agent. But effective drug prophylaxis has been in use to prevent the disease. Nonetheless mosquito prevention and control is the key against all these disease.

#### 4. Epidemiological cycle of Japanese encephalitis

Japanese encephalitis (JE) is caused by a Flavivirus that, in a human case, causes severe encephalitis leading to death or permanent disablement. It is a zoonotic disease, transferred from animals (commonly domestic pigs but wild boars and migratory birds may also be important amplifier hosts and reservoirs) by a mosquito vector to humans. Important social factors may also play an important role in JE transmissions with the poorest sectors of the population most often affected (e.g. people sleep outside during hot humid months where the vector density is at peak, and often sleep close to pigs). JE has been occurring in the South-East Asia and Western Pacific Regions for a long time. In Southeast Asia it is thought to cause up to 50000 clinical cases and 10000 deaths per year (WHO, 1979). Japan, China and Republic of Korea have reduced the incidence of this disease now (WHO/SEARO 1979). These countries had very well developed long term plan to control the epidemicity of JE by regular vaccination in children and pigs they had also improved pig husbandry system and also vector control by draining the water from the rice field on a regular interval period.

JE cases are observed mostly in Terai region of Nepal (Joshi, 1983). The earlier reports have shown that the case fatality rate (CFR) is high in Nepal, and nationwide it has ranged from 15% to 46% for the years 1978 to 1994 (Joshi, 1983, 1986, 1987, Joshi et al., 1994). In Nepal, JE occurred first time during the year 1978 in Rupandehi district then in Sunsari, Morang and has since become endemic in all 24 districts of Terai and Inner Terai (Joshi, 1983). JE is a seasonal disease in Nepal, it occurs as an epidemic form only in the rainy (monsoon) season (July to October).

In Nepal, about 5000 people died due to JE from the year 1978 to 2006. Every year 3000 to 4000 people at risk and about 200-300 people die from complications associated with JE. About 12.5 million people in Nepal live in JE risk areas. Children who are less than 15 years of age are more likely to develop disease during a JE outbreak. Approximately 50% of JE survivors are left with chronic neurological syndrome and organ damage.

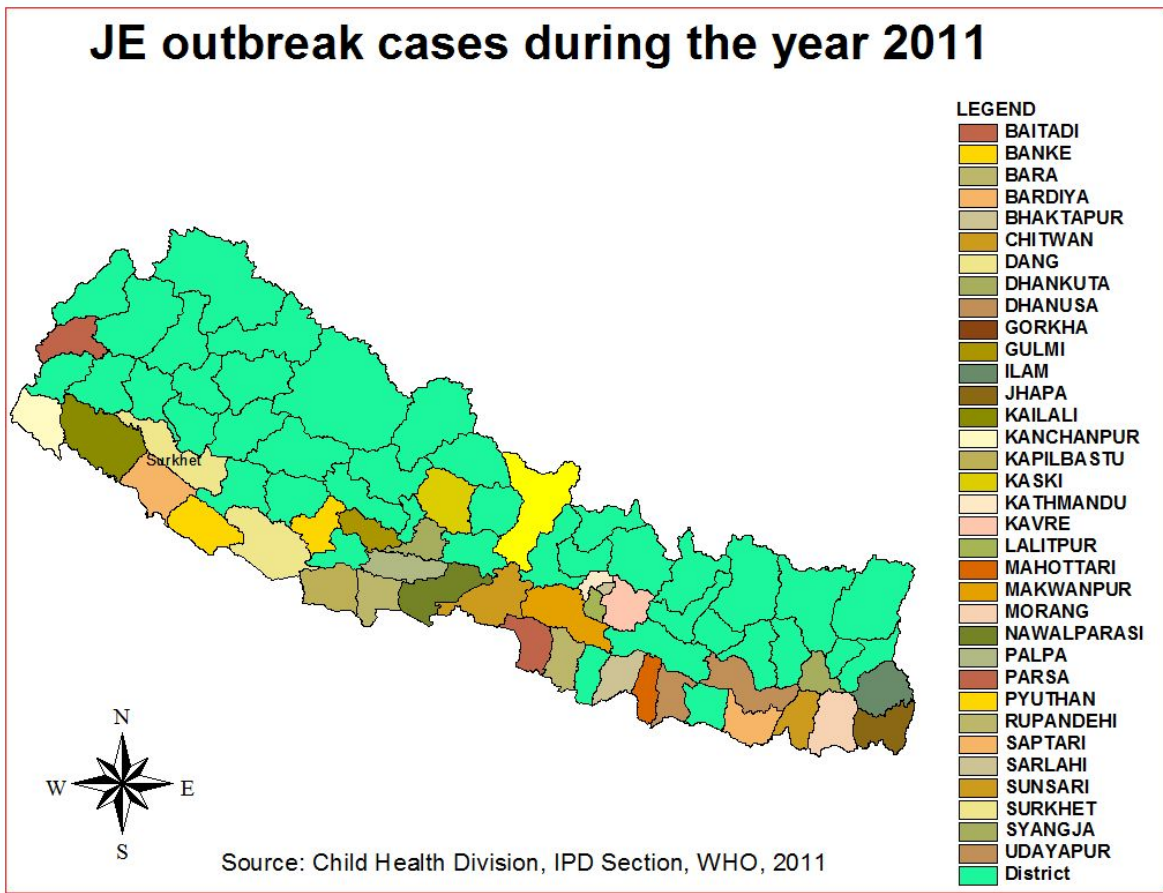
The highest morbidity 7.94% was seen in Kailali district. JE cases diagnosed, reported and recorded by Child Health Division of DHS, during the year 2011 in Nepal are shown in table no. 2.

| <b>1. District</b>    | <b>Total JE Cases</b> | <b>Morbidity</b> |
|-----------------------|-----------------------|------------------|
| 2. Baitadi            | 1                     | 0.79             |
| 3. Banke              | 7                     | 5.56             |
| 4. Bara               | 2                     | 1.59             |
| 5. Bardiya            | 2                     | 1.59             |
| 6. Bhaktapur          | 1                     | 0.79             |
| 7. Chitwan            | 4                     | 3.17             |
| 8. Dang               | 3                     | 2.38             |
| 9. Dhankuta           | 2                     | 1.59             |
| 10. Dhanusha          | 7                     | 5.56             |
| 11. Ghulmi            | 1                     | 0.79             |
| 12. Gorkha            | 1                     | 0.79             |
| 13. Illam             | 2                     | 1.59             |
| 14. Jhapa             | 4                     | 3.17             |
| 15. Kailali           | 10                    | 7.94             |
| 16. Kanchanpur        | 5                     | 3.97             |
| 17. Kapilbastu        | 2                     | 1.59             |
| 18. Kathmandu         | 9                     | 7.14             |
| 19. Kaski             | 1                     | 0.79             |
| 20. Kavre             | 4                     | 3.17             |
| 21. Lalitpur          | 2                     | 1.59             |
| 22. Mahottari         | 5                     | 3.97             |
| 23. Makwanpur         | 1                     | 0.79             |
| 24. Morang            | 6                     | 4.76             |
| 25. Nawalparasi       | 9                     | 7.14             |
| 26. Palpa             | 3                     | 2.38             |
| 27. Parsa             | 4                     | 3.17             |
| 28. Pyuthan           | 1                     | 0.79             |
| 29. Rautahat          | 6                     | 4.76             |
| 30. Rupandehi         | 2                     | 1.59             |
| 31. Saptari           | 1                     | 0.79             |
| 32. Sarlahi           | 1                     | 0.79             |
| 33. Sunsari           | 9                     | 7.14             |
| 34. Surkhet           | 1                     | 0.79             |
| 35. Syangja           | 3                     | 2.38             |
| 36. Udayapur          | 4                     | 3.17             |
| <b>37. 2011 total</b> | <b>126</b>            | <b>100</b>       |

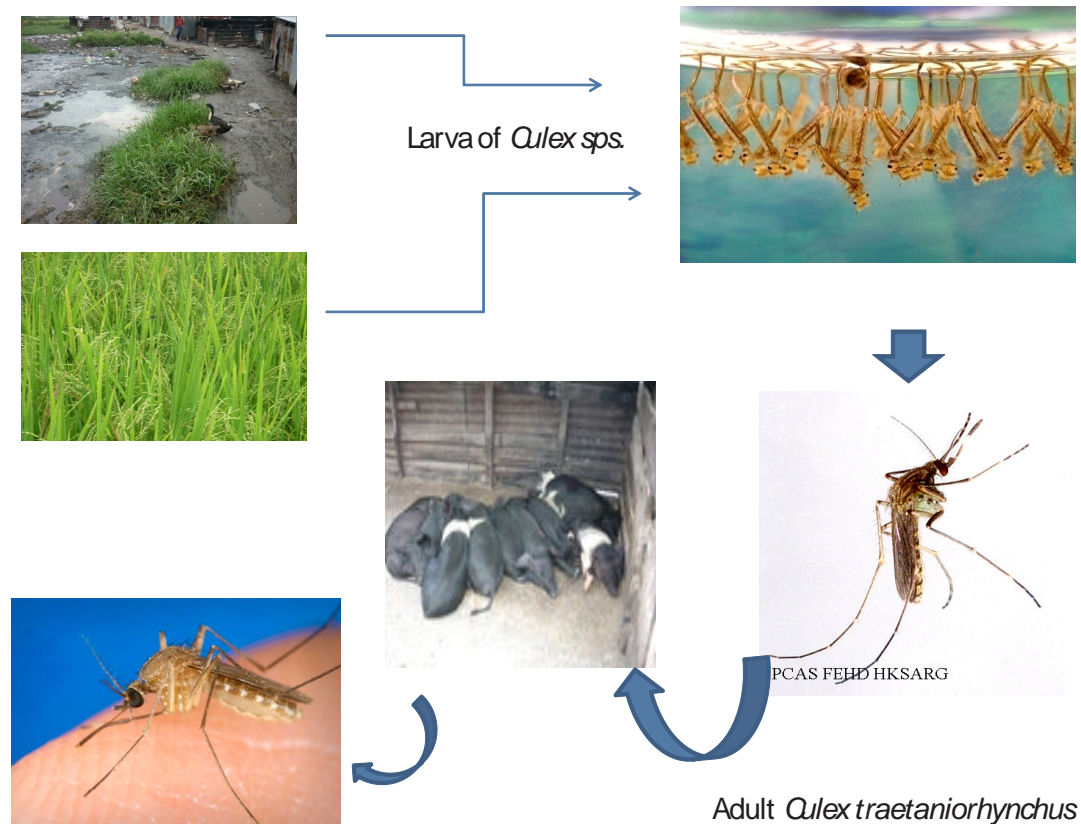
Source: Child Health Division, IPD Section, WHO, 2011

**Table 2.** JE cases diagnosed, reported and recorded by Child Health Division of DHS, during the year 2011 in Nepal

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**Scheme 2.** Map 2. JE outbreak cases in Nepal during the year 2011; Source: Joshi, et al., 2012.



**Figure 1.** Epidemiological cycle of JE transmission. Source: Joshi, et al., 2012.

## 5. District (province) wise JE cases recorded during the year 2011:

### Bhaktapur District

#### Bhaktapur hospital sees surge in Japanese encephalitis (viral fever) patients

The number of viral fever patients has increased in most of the hospitals in Bhaktapur district coinciding with the change in weather. Many people suffering from viral fever have been coming to the hospitals and health centre in the district. Along with the upsurge in the number of viral fever patients, the number of people suffering from typhoid and jaundice has also increased according to the District Public Health Office, Bhaktapur.

Superintendent at the Bhaktapur Hospital, Dr. Indra Prajapati said the diseases might take epidemic proportion if timely measures are not taken. Health Official in the district say the spread of viral fever is also because patients in the rural areas of the district have the habit of only taking paracetamol tablets that they buy at local drug stores instead of visiting the doctors for a thorough check-up. As many as 100 people suffering from fever come to the Bhaktapur Hospital daily for treatment, and many of them only after advanced stage of the



disease. The District Public Health Offices said on an average 500 patients suffering from viral fever are said to come to the hospitals, medicals, health centre and drug stores throughout the district in a day. **(Sources: Rising Nepal 2011 August 15, 2068)**

### **Kathmandu District**

#### **Illness due to Japanese encephalitis Vaccine**

Kathmandu: Debaki Bhandari, 48 yrs of 13 Kavre Panauti, became ill after taking vaccine. According to Doctor, she became ill after taking vaccine immediately. Shir Memorial Hospital of Banepa referred her to Kathmandu for treatment.

#### **Student became ill due to viral (Japanese encephalitis) disease**

Benighat 9, almost students of Orbang Primary School became ill. After unable to go to school, health assistant Kashiram and ANM Sunita Thapa visited their home and treated them. According to health assistant, Kashiram Sharma of Beni Health Post, out of 77 sick students, 15 had neck problems, 12 had viral fevers and remaining was normal condition. This was due to climatic changes and poor sanitation, he added. **(Source: Kantipur, 20<sup>th</sup> October 2011)**

### **Chitwan District**

#### **Japanese encephalitis (viral fever) identified as influenza AH3**

INFLUENZA AH3 virus has been linked with a viral fever outbreak in Chitwan, health officials said. Blood samples collected from various parts of the district tested positive for the Influenza AH3. Ram Kumar KC of the vector control programme of District Public Health Office (DPHO) said apart from influenza AH3, Japanese encephalitis was also detected in some patients.

"We didn't have any encephalitis case last year," he said. According to the DPHO, over 1,500 people suffering from viral fever visited major hospitals in Chitwan in the last three weeks. Most of the patients were in the 16-50 years age bracket. Health officials warned that the number of patients could rise in the coming days. **(Sources: Kathmandu Post, August 19, 2011)**

### **Kaski District**

#### **Japanese encephalitis (viral fever) grips Pokhara**

The pressure of patients at Western Regional Hospital and health posts in Pokhara is alarmingly increasing owing to flu of typhoid and viral fever for past few days. Among the total number of the patients visiting the health posts, 35-40 per cent of them are suffering from typhoid and viral fever, said the hospital.

Buddhi Bahadur Thapa, Medical Superintendent of the hospital said the number of typhoid and viral fever patients increased during the change of season. Most of the patients are suffering from fever, cough and common cold, he added.

As the infection of common cold and fever increasing across the district, the number of patients visiting the private hospitals and taking medicine from pharmacies are increasing from the past few days. Informing that some patients who suffer from the viral fever also

picked up asthma, diabetes and heart related problems. Thapa said that the people who got infected the immediate medical treatment.

Doctors informed that Padam Nursing Home, Charak Hospital and Fewa City Hospital registered the large number of patients. Thapa said that as the viral fever was a communicable disease, many persons were easily infected with the flu. Since last few days the people of Syangja, Tanahu, Parbat, Lamjung and other adjoining districts have been suffering from the viral fever and typhoid and the flu is developing into the pandemic.

When the local hospitals of these districts couldn't stand the pressure of the patients, they recommended patients for the hospital of Pokhara. Likewise, the number of viral flu patients is increasing in Dolakha. Especially the children and elderly people are infected with the flu.

GauriShanker Campus of the district remained close for Sunday when the principal vice-principal of the campus caught the flu of viral fever. Health worker at the Primary Health Centre Charikot Shanti Neupane said that viral fever was pandemic in both the urban and rural areas of the district this year. **(Sources: Rising Nepal, August 15, 2011)**

### **Bara District**

#### **Two children dead due to Japanese encephalitis**

Bara, 29 Mangsir, two children were dead in Bara last night. According to local person, Gajendra Kumar, son of Upendra Jaiswal and Aman Kumar of Lal Babu Prasad Jaiswal were dead during treatment at national medical college Birgunj. They were referred to national medical college. JE is caused by mosquitoes – borne viral fever. **(Sources: Annapurna Post December 16, 2011)**

### **Tanahun District**

#### **Japanese encephalitis (viral fever) regime in Damauli**

Viral fever is said to be raging in Damauli and it's surrounding areas over the past few days. Damauli Hospital and private clinics are receiving an increasing flow of patients since the start of the Nepali month of Shrawan. Out of total 200 patients that the hospital receives daily, around 100 are the patients of viral fever. The situation inside the Damauli jail is worrisome. Out of 95 inmates serving jail sentence, 75 are suffering from viral fever. The spread of viral fever has prompted the Department of Health to send a team of health officials said the Districts Public Health Office. **(Source: Rising Nepal, July 23, 2011)**

### **Arghakhanchi District**

#### **Japanese encephalitis (viral fever) and Pneumonia outbreak**

Arghakhanchi, District hospital was fully occupied due to large number of viral fever and pneumonia cases. Due to large number cases and lack of beds, patients are being treated on floor.

Patients have admitted forty to fifty within one week of time. There are only 15 beds but 40 to 50 patients are sick, hospital informed that more than 30 patients are being treated on the floor. Children are sicker than other age group; this age groups belong to 1 to 2 yrs. According to Chief,

Acting District Hospital Dr. Ram Prasad Sapkota, viral pneumonia patients are more in hospital. He told that it has been difficult to doctor and medical people because of full of patients in hospital. He added that more than 100 patients are being treated in OPD on Sunday. Patients complained that lack of bed, more patients treated and patients are brought for hospital for treatment and they have to stay in hotel. 25 pneumonia patients are admitted in hospital daily. Patients are coming from not only headquarter but also from urban areas for treatment. CMA told that patient flow rate is increased more in health and sub-health post in VDC. Four doctors complained that they are faced problem due to outbreak of disease. Dr. Sapkota told that lack of bed, pneumonia patients are treated lying on the floor. He added more that patients are increasing day by day and most of the patients are seriously due to form pneumonia and viral fever, they came to hospital for treatment. **(Source: Kantipur, September 26, 2011)**

### **Dang District**

#### **Pig farming ban in Dang**

Pig farming has been banned inside the Tribhuvannagar Municipality area. The ban was levied by the municipality in wake of the spreading out of the Japanese encephalitis in the Terai region. The ban is effective within Chbhaisota in the north, Ratnapur-Bharatpur road in the South, Runway-Bharatpur in the east and Sewar River in the west. The municipality has also begun killing the stray pigs and ducks that are left unclaimed even after repeated request to the owners to get rid of them, said Mayor Amar Bahadur Dangi. The Nepal Bank Ltd., Agriculture Development Bank and other financial institutions have also been requested not to issue loans for pig farming in the region, adds Dangi. The municipality has so far killed 40 pigs and two ducks found unclaimed in various wards of the municipality, it is learnt **(Source: Rising Nepal, July 5, 2002)**.

### **Banke District**

#### **JE stalks mid-western Terai district**

Japanese encephalitis, a mosquito-borne viral disease, has stalked the mid-western Terai districts lately, claiming one life and taking scores others ill. Gumi Rana of Chaulahi from Dang district died of Japanese encephalitis on Monday while undergoing treatment at Nepalgunj based Bheri Zonal Hospital. The hospital sources said the flow of encephalitis patients is surging in recent days. According to Dr. Bimal Dhakal, the chief at the hospital, 11 Japanese encephalitis patients have been admitted to the hospital in the past one month and some of them are still receiving treatment. The hospital data shows that most of the patients are from Dang, Banke and Bardiya districts. Mid-western Terai districts come under the grip of fatal Japanese encephalitis during the monsoon every year. Last year, 105 Japanese encephalitis patients were admitted to Bheri Zonal Hospital and 23 of them died of the disease. Dr. Dhakal is of the opinion that the fatal disease is beyond control due to the lack of public health awareness. Ram Bahadur Chand of District Public Health Office Banke, however, claimed the office has been working to prevent the spread of the disease. **(Source: Kathmandu Post, August 17, 2011)**

#### **One died from JE**

Ram Bahadur Chand, Focal person of District Public Health claimed that awareness programme about JE activities is being disseminated. Bed nets were distributed for the consumers

across Rapti river areas. Insecticides could not be sprayed due to heavy rains, he agreed. Insecticide will be sprayed after cease of rain. According the public health office, JE regular vaccine is giving under one year child to control the JE. JE is controlled due to vaccine. Doctor advised that, people have to use bed net regularly, clean and cut unnecessary bushy and make tidy filling water ditch to save from JE disease. Altogether 105 JE patients were admitted out of which 23 patients were died in Bheri Zonal Hospital last year. **(Source: Kantipur, August 17, 2011)**

### **Japanese encephalitis claims two lives**

Two persons died of Japanese encephalitis, a viral disease transmitted by mosquitoes, while undergoing treatment at Bheri Zonal Hospital on Friday. Krishna Tharu, 40, of Kailali and Chandra Shahi, 13, of Surkhet died of the disease. A hospital source said that the number of patients suffering from the disease is surging in the mid and far western Terai districts in the past few days. On Monday, eight-years-old Gomi Rana of Dang succumbed to the ailment during treatment. **(Sources: Kathmandu Post 2011 August 21)**

### **Two persons died due to Japanese encephalitis**

Two persons died of Japanese encephalitis on Friday. Krishna Tharu, 40, of Kailali and Chandra Shahi, 13, of Surkhet died of the JE disease while undergoing treatment at Bheri Zonal Hospital. On Monday, eight-years-old Gomi Rana of Dang Chailahi died. Number of JE patients are increasing. A total 15 patients are admitted till now.

Dr. Chudamani Bhandari, Director, Kathmandu Epidemiology and Disease Control Division told that he didn't get any information from that disease. Japanese encephalitis caused by Flavi virus. This virus is found in pig and bird. It is transmitted by culex mosquito. But JE isn't transmitted from one person to another person. We can save from mosquito in spite of there is no drug of JE. **(Sources: Kantipur, 2011 August 22)**

### **More one dead due to JE**

Banke: more one kid dead due to JE, 7 - Sorhawa, Bardiya 7 - years old Asmita Chaudhari was dead during treatment period and 3 were dead due to JE before. JE cases are raised and 33 persons are admitted in Bheri Zonal Hospital till Tuesday. According to hospital source, patients are also admitted in Nepalgunj and Kohalpur.

According to Director Bimal Dhakal, patients flow like encephalitis disease is raising. Child ward is fully occupied. According to hospital source, most of patients have come from Bardiya districts. Nine patients from Bardiya, 7 from Banke, 7 dang, 1 Jajarkot, 8 Kailali, 1 Salyan and 1 from Surkhet are admitted.

Before this, 40 years Krishna Tharu of Baunia, 13 years Chandra Shahi, Tatopani of Surkhet, 8 years Goma Rana of Chaulahi of Dang were dead.

When rainy season begins, JE cases are seen in Western Terai district of Nepal. Last year, 105 patients were admitted for treatment, among them, 23 were dead. No. of total patients admitted – 33 (Bardiya – 9, Banke – 7, Dang – 7, Jajarkot – 1, Kailali – 8, Salyan – 1 and Surkhet – 1). **(Source: Kantipur, August 31, 2011).**

### Three died due to Japanese encephalitis in Banke

Nepalgunj: Three persons died of encephalitis in Banke district during the Nepali month Saun. Five others are undergoing treatment in local Bheri Zonal Hospital and seven others returned after the treatment. The hospital has been providing the medicines Cyanula and Fluide at free of cost to the patients of encephalitis who are undergoing treatment in the hospital. (Source: *Rising Nepal* 2011, August 20)

### Kailali District

#### Four deaths due to Japanese encephalitis

More than 36 persons are affected by JE in Dhangadhi in this year. According to DPHO Kailali, 36 were admitted for treatment, among them 4 were dead. Twenty six were returned to their home after recovery and 6 were referred to other place for treatment. Hasulia and Mashuria are highly JE affected area. JE outbreak after the 2<sup>nd</sup> week of Ashar in this year, said Karki.

Last year 5 persons were dead due to JE and more than 50 were affected by this disease. Since 2 years, JE cases are decreasing due to vaccination. According to DPHO officer Karki, JE cases seem till 3<sup>rd</sup> week of Ashoj. (Source: *Kathmandu Post*, September, 2, 2011)

### Japanese Encephalitis claims four in Dhangadhi

Four persons died of encephalitis while receiving treatment at Seti Zonal Hospital, Dhangadhi. Hospital's official Dilip Shrestha said altogether four persons died since second week of July in this year. The deceased persons include Khagisar Joshi, 6 of Bauniya VDC, Sarita Chaudhary, 22, of Hasuliya VDC. Kamala Shahi, 11, of Pahalamnpur of Kailali district and Mani Ram Oli, 28, of Kanchanpur district, said the hospital. Altogether 36 persons have been admitted to the hospital for the treatment of encephalitis and six patients among them have been referred for further treatment. The hospital providing free treatment facility for the encephalitis patients, said Shrestha. (Sources: *Rising Nepal*, September 2, 2011).

### Kanchanpur District

#### Four deaths due to Japanese encephalitis

Four people died due to Japanese encephalitis in Kanchanpur district. They died while undergoing treatment in Mahakali Zonal Hospital. Raju Chaudhari from Raikwar Bichwa VDC died while undergoing treatment in Seti Zonal Hospital. The deceased persons include Bindu Dhama – 24yrs., of Bauniya VDC-8, Dalbir Tamata 48 yrs. of Daiji VDC-5 and Dhani Budha – 60 yrs. from Badampur of Bhimdatt municipality said the hospital. According to Keshab Datt Awasthi, Medical Recorder Officer from Mahakali Zonal Hospital, JE patients are increased in the hospital.

He said that, altogether 35 persons have been treated of encephalitis and 15 patients went to home after treatment. 13 patients among them have been referred for further treatment and rest 2 patients went without information in the hospital.

More patients pressured in the month of Bhadra but only 2 patients have been admitted in the month of Asoj. Last year, 26 persons have been admitted, out of which 2 persons were died. According to Dr. Dipendraman Singh, Chief of hospital, JE cases are seen in patients due to unvaccination. (Source: *Gorkhapatra*, September 30, 2011)

## 6. JE Vaccination in children

About 103% vaccination coverage in children population targeted were in Kailali and Banke districts and 100% coverage in Dang district, 73% in Bardiya district but in Rupandehi and Kanchanpur district 40 and 41% JE vaccine coverage respectively, which was very low coverage (See table no. 3).

| Area       | Age group | Total  | Male   | Female | Sex Ratio |
|------------|-----------|--------|--------|--------|-----------|
| Rupendehi  | 0-4 yrs   | 85964  | 43957  | 42007  | 1.05      |
|            | 5-9 yrs   | 100724 | 51855  | 48869  | 1.06      |
|            | 10-14 yrs | 93215  | 48354  | 44861  | 1.08      |
|            | Total     | 279903 | 144166 | 135737 |           |
| Dang       | 0-4 yrs   | 59987  | 30284  | 29703  | 0.098     |
|            | 5-9 yrs   | 67656  | 34279  | 33377  | 1.02      |
|            | 10-14 yrs | 65860  | 33411  | 32449  | 1.05      |
|            | Total     | 193503 | 97974  | 95529  |           |
| Banke      | 0-4 yrs   | 48809  | 24612  | 24197  | 1.06      |
|            | 5-9 yrs   | 56410  | 28955  | 27455  | 1.02      |
|            | 10-14 yrs | 51041  | 26698  | 24343  | 1.03      |
|            | Total     | 156260 | 80265  | 75995  |           |
| Bardiya    | 0-4 yrs   | 47789  | 24246  | 23543  | 1.03      |
|            | 5-9 yrs   | 58875  | 29670  | 29205  | 1.02      |
|            | 10-14 yrs | 52823  | 27215  | 25608  | 1.06      |
|            | Total     | 159487 | 81131  | 78356  |           |
| Kailali    | 0-4 yrs   | 79693  | 40843  | 38850  | 1.05      |
|            | 5-9 yrs   | 95326  | 48698  | 46628  | 1.04      |
|            | 10-14 yrs | 86588  | 44590  | 41998  | 1.06      |
|            | Total     | 26160  | 134131 | 127476 |           |
| Kanchanpur | 0-4 yrs   | 49777  | 25506  | 24271  | .099      |
|            | 5-9 yrs   | 55802  | 28545  | 27257  | 0.096     |
|            | 10-14 yrs | 52438  | 26790  | 25648  | 0.097s    |
|            | Total     | 158017 | 80841  | 77176  |           |

Source: CBS 2001 population census.

**Table 3.** JE Risk six districts population of children between 1 to 15 age, sex and sex ration in Nepal

## 7. Discussion

The earlier reports have shown that the case fatality rate (CFR) is high in Nepal, and nationwide it has ranged from 15% to 46% for the years 1978 to 1994 (Joshi et al., 1981). It has been proved that JE virus causes encephalitis in humans and abortion in pigs while no symptoms in other animals and birds. Mostly children aged five to fifteen is victimized than adults. About fifty percent of the JE survivors are left with neurological syndrome and damage to the organs (Joshi, 1983, Pradhan, Khatri et al., 1981, 1983).

The people in the districts are dying due to Japanese encephalitis, and it threatens to assume epidemic proportions. The government has just started its second round of vaccination under mass vaccination program for the disease, which should have been completed by 2006. Because of the delay in vaccination, the number of patients suffering from Japanese Encephalitis may increase and take an epidemic form.

The vaccine "anti JESA-14-14-2 live attenuated" is produced in China and that it was found to be above 98 percent effective in Chinese children (RSS, 2006). In Nepal, some two million people live in the Terai regions considered to be highly affected areas. In order to prevent the epidemic, more than three million doses of vaccines had been arranged during the year 2005.

Vaccination campaign against Japanese encephalitis has been started in Banke district from 26 July 2006. It is said that all 422,000 people above one year of age from Banke district were vaccinated in the campaign, which would continue until August 18, 2006. The full dose vaccine has been provided by the district public Health office. According to the schedule, the campaign would remain until July 17, 2006 in Nepalgunj municipality and from July 27 to August 18, 2006 in 46 VDCs of the districts (JE vaccination report of Banke, 2006).

The reduction in case incidence of Japanese encephalitis, in some countries like China, Japan and Korea has been achieved by applying certain measures such as:

- i. Mass vaccination of susceptible group of population,
- ii. Vaccination of piglets of endemic areas,
- iii. Anti-mosquito campaign, i.e. vector control measure both larva and adult.

3.5 million of JE vaccine doses was procured by the Ministry of Health during the year 2006/2007. The vaccine is made in China by Chengdu Institute of Biological Product. This vaccine will be used in children under 15 years of age of 24 districts of JE risk and high-risk areas of Nepal.

In Nepal twenty-four districts of Terai are declared as JE prone disease area. About 12.5 million people in Nepal are in JE risk category. Children who are less than 15 years of age are more prone to suffer in case of a JE outbreak. In China, JE vaccination in childrens has shown 98.4% immunity which is very encouraging (EDCD and IPD, 2006). During the year 2007 about 35,00,000 doses of JE vaccine is going to be procured. So far about 5000 people died due to JE from the year 1978 to 2006. Every year 3000 to 4000 people yet risk and about 200-300 people die due to JE.

## 8. Conclusion

For the reduction of JE cases in Nepal mass vaccination programme should be carried out every year for children in high risk districts of JE. Except symptomatic treatment there is no specific treatment for Japanese encephalitis. There is a Japanese encephalitis vaccine prepared in Japan, China and Russia. There are two types of vaccines one liquid and other freeze dried. Vaccination can be done subcutaneously two doses of 1 ml each above 3 years of age and 0.5 ml. For children upto 3 years of age at an interval of 7-14 days. Third doses should be given before one year. This will protect for 3 years in the endemic zone. One more booster dose after 3 years has been recommended which will give life long immunity to an individual (Joshi et al., 2003).

To conclude, mosquito borne disease is on the rise. There are many methods for mosquito control and depending the situation, source reduction (e.g., removing stagnant water) bio-control (e.g. importing natural predators such as dragonflies), trapping, using nets and using pesticides can be helpful. In endemic areas, there should be spraying of insecticides every day. People should stay inside between dusk and dark if possible. When outdoors, wearing pants and long-sleeved shirts is a must. Exposed skin should be sprayed with mosquito repellants (Neopane Arpana, 2011).

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## References

- [1] Annapurna National Daily News Paper 2011.



- [2] Annual Report of Child health Division, Department of Health Services IPD Section WHO, 2011.
- [3] Banke District Public Health Office. JE vaccination report for the year 2006.
- [4] Gorkhapatra National Daily News Paper, 2011
- [5] Japanese Encephalitis Campaign Central Plan. Epidemiology and Disease Control Division and Child Health Division, Immunization Unit Department of Health Services 2006.
- [6] Joshi, D. D. and Gaidamovichs. Serological Surveillance of Virus Encephalitis in Nepal, II Serological survey of pigs, birds and other animal population for JE in the epidemic area following outbreak in 1970 and 1980. Bull. Vet. Sc. & A.H. Nepal. Vol. 10 and 11 1981;82:8-12.
- [7] Joshi, D. D., Bista, P. R. and Joshi, H. Japanese Encephalitis A Zoonotic Public Health Problem in Nepal. NZFHRC. 2003;1-3
- [8] Joshi, D. D., Pant, D. K. Shah, Y., 2012. Review on Japanese Encephalitis Outbreak Records Reported by Different Media, News and Survey during the year 2007 to 2011 in Nepal. Published by NZFHRC. PP 39-50.
- [9] Joshi, D.D. Incidence of Japanese Encephalitis in Children during 1978, 1979 and 1980 Outbreak. Nepas J. 1983, 2, 18-25.
- [10] Kantipur National Daily News Paper. 2011.
- [11] Khatri, I.B., Joshi D.D. and Pradhan, T.M.S. Epidemiological Study of Viral Encephalitis in Nepal. J. Inst. Med., 1981; 4: 2;133-144.
- [12] Khatri, I.B., Joshi, D.D., Pradhan, T.M.S. and Pradhan S. Status of Viral Encephalitis (Japanese Encephalitis in Nepal). JNMA 1983;66:21;1:97-110.
- [13] Neopane, Arpana, 2011. Mosquito Borne Disease. Published in Kathmandu Post. April 18, 2011.
- [14] Pradhan, S. Role of mosquitoes in the transmission of JE, Seminar on VE. Siddhartha Jaycees Souvenir, 23 Jestha 2038, Bhairahawa, 1981;6-8.
- [15] RSS Report published in the Rising Nepal June 19 2006.
- [16] The Himalayan Times Daily News Paper. 2011.
- [17] The Kathmandu Post Daily News Paper. 2011.
- [18] The Rising Nepal, Daily News Paper. 2011.
- [19] WHO/SEARO. Report Technical Information of Japanese Encephalitis and Guidelines for Treatment, New Delhi, India, 1979.