Province Government
Province No. 1
Health Ministry
Health Directorate
Health Office Sunsari

Dengue Epidemic and Public Health Actions for its Prevention & Control in Sunsari District

DECEMBER 2022

Advisor:

Mr.Sagar Prasai (MPH)

Senior Public Health Administrator, Health office Sunsari

Study Team Members:

Miss Rusha Upadhyay (BPH/Statistical Officer)

Mrs. Dikshya Shrestha (BPH/Public Health Officer)

Miss Urmila Rai (BNS/Public Health Nurse)

ABBREVIATIONS

BPKIHS: B.P. Koirala Institute of Health Science

DENV: Dengue Virus

ECDC: European Centre for Disease Prevention and Control

EIP: Extrinsic Incubation Period

ELISA: Enzyme-linked Immunosorbent assay

EWARS: Early Warning, Alert and Response System

FM: Frequency Modulation

NHRC: National Health Research Council

NS1: Non Structural protein 1

PCR: Polymerase Chain Reaction

PHC: Primary Health Care

PHEOC: Provincial Health Emergency Operations Centre

RDT: Rapid Diagnostic Tests

WHO: World Health Organization

Introduction:

Dengue is a climate sensitive vector borne diseases, which in recent years has become a public health concern. It is a mosquito-borne viral disease that has rapidly spread to all regions of WHO in recent years. Dengue virus is transmitted by female mosquitoes mainly of the species Aedes aegypti and to a lesser extent, Ae. Albopictus. These mosquitoes are also vectors of chikungunya, yellow fever and zika viruses. Dengue is widespread throughout the tropics, with local variations in risk influenced by climate parameters as well as social and environmental factors. (WHO Fact Sheet, 2022)

Dengue is caused by a virus of the Flaviviridae family and there are four distinct, but closely related serotypes of the virus that cause dengue (DENV-1, DENV-2, DENV-3 and DENV-4).Recovery from infection is believed to provide lifelong immunity against that serotype. However, cross-immunity to the other serotypes after recovery is only partial, and temporary. Subsequent infections (secondary infection) by other serotypes increase the risk of developing severe dengue. (WHO Fact Sheet, 2022)

A.aegypti has been incriminated as the principal vector which is primarily an urban mosquito but sometimes it is also found in the periphery of cities breeding in rain water accumulated in tree holes. The diseases occurs in epidemic form during late monsoon and post monsoon season, as an outcome of increase in breeding places and vector population. However, outbreaks of considerable magnitude have also occurred during the summer and pre-monsoon season as a result of water scarcity and consequent storage of water for domestic purposes. (NHRC, 2009)

Dengue infections have the potential of rapid spread leading to acute public health problems, special attention is required to be paid for its surveillance, prevention and control. (NHRC, 2009)

Epidemiological Characteristics

Agent Factors:

Causative Agent: It is caused by 4 closely related virus serotypes of the genus Flavivirus, family falviviridae. DEN-1, DEN-3 & DEN-4 have been found in Nepal. (NHRC, 2009)

Vector: Dengue is transmitted to humans by the A.aegypti (rarey Aedes albopictus) mosquito, which feeds during day time. (NHRC, 2009)

Reservoir of Infection: DEV infect humans and several species of lower primates. Humans are the main urban reservoir of the viruses. (NHRC, 2009)

Host Factors:

Man is the definitive host and mosquitoes are the intermediate host.

Age & Sex: All ages and both sexes are susceptible to dengue fever. However, it is estimated that 90% of the dengue fever cases occur in children under the age of 15. (NHRC, 2009)

Immunity: There are 4 distinct, but closely related viruses that cause dengue. Recovery from infection by one provides lifelong immunity against that virus but confers only partial and transient protection against subsequent infection by other three viruses. (NHRC, 2009)

Mobility: The movement of people from one place to another has led to the extension of dengue into areas. (NHRC, 2009)

Environment Factors:

Climate: It is an important factor in the epidemiology of dengue as it influences the distribution and densities of vector mosquitoes. Evidence show that season, rainfall, temperature affects dengue transmission. (NHRC, 2009)

Temperature: Laboratory studies indicated that the ideal temperature range for survival through all life phases of Ae,aegypti is between 20 and 30^{o}C (Kristie L. Ebi, Joshua Nealon et al, 2016)

Sign & Symptoms

Dengue should be suspected when a high fever (40^{o}C/104^{o}F) is accompanied by 2 of the following symptoms during the febrile phase (2-7 days). **(**WHO Fact Sheet 2022)

- Severe Headache
- Pain behind the Eyes
- Muscle and joint pains
- Nausea
- Vomiting
- Swollen glands
- Rash

Warning Sign that doctors should look for include:[1]

- Severe abdominal Pain
- Persistent Vomiting
- Rapid Breathing
- Bleeding gums and Nose
- Fatigue
- Restlessness
- Liver Enlargement
- Blood in vomit or Stool
- Bone Break Fever

Transmission:

The modes of transmission are:

Transmission through mosquito bite: The virus is transmitted to humans through the bites of infected female mosquitoes, primarily the Aedes aegypti mosquito. Other species within the Aedes genus can also act as vectors, but their contribution is secondary to Aedes aegypti. The EIP (Extrinsic Incubation Period) takes about 8-12 days when the ambient temperature is between 25-28^{o}C. (WHO Fact Sheet 2022)

Human to Mosquito Transmission: Mosquitoes can become infected from people who are viremic with DENV. This can be someone who has a symptomatic dengue infection, someone who is yet to have a symptomatic infection (they are pre-symptomatic), but also people who show no signs of illness as well (they are asymptomatic). Human to mosquito transmission can occur up to 2 days before someone shows symptoms of the illness. (WHO Fact sheet 2022)

Maternal Transmission: The primary mode of transmission of DENV between humans involves mosquito vectors. There is evidence of the possibility of maternal transmission. While vertical transmission rates appear low, with the risk of vertical transmission seemingly linked to the timing of the dengue infection during the pregnancy. When a mother does have a DENV infection when she is pregnant, babies may suffer from pre-term birth, low birth weight and fetal distress. (WHO Fact Sheet 2022)

Other transmission modes: Rare cases of transmission via blood products, organ donation and transfusions have been recorded. Similarly, transovarial transmissions of the virus within mosquitoes have also been recorded. (WHO Fact Sheet 2022)

Diagnostic:

Several methods can be used for diagnosis of DENV infection. Depending on the time of patient presentation, the application of different diagnostic methods may be more or less appropriate. Patient samples collected during the 1st week of illness should be tested by both methods mentioned below: (WHO Fact Sheet 2022)

Virus Isolation Method

The virus may be isolated from the blood during the 1st few days of infection. Various reverse transcriptase-polymerase chain reaction (PCR) methods are available and are considered the gold standard. The virus may also be detected by testing for a virus production protein called NS1. They are commercially produced rapid diagnostic tests available for this and it takes only 20 min to determine the result and it does not require laboratory. (WHO Fact Sheet 2022)

Serological Methods

This methods like enzyme-linked immunosorbent assays (ELISA), may confirm the presence of a recent or past infection with the detection of anti-dengue antibodies. IgM antibodies are detectable 1 week after infection and remain detectable for about 3 months. The presence of IgM is indicative of a recent DENV infection. IgG antibody levels take longer to develop and remains in the body for years. The presence of IgG is indicative of a past infection. (WHO Fact Sheet 2022)

Treatment

There is no specific medicine for the treatment of the disease. However proper and early supportive treatment can relieve the symptoms and prevent complications and death. Aspirin and Brufen should be avoided in DF, as it is known to increase the bleeding tendency and also it increases the stomach pain. Paracetamol can be given on medical advice. If one or more signs of DHF are seen, the patient should be immediately taken to the hospital. While transferring the patient to the hospital, giving enough fluids to drink is recommended. (NHRC 2009)

Overview of Dengue Situation:

Globally, it is estimated that 390 million dengue virus infections per year, out of which 96 million manifest clinically (with any severity of diseases. The prevalence of dengue estimates that 3.9 billion people are at risk of infection with dengue viruses. Despite a risk of infection existing in 129 countries, 70% of the actual burden is in Asia. (WHO Fact Sheet 2022)

In 2022, among Asian Country Vietnam reported highest dengue cases i.e. 224771 cases and 92 deaths till October 6. The Philippines reported 173233 cases and 508 deaths and Indonesia reported 94355 cases and 853 deaths till October 1. India reported63280 cases and 44 deaths till 30 September, Bangladesh reported 44700 cases and 118 deaths till 25 October. China reported only 8 cases and no deaths till 31July. (ECDC 2022)

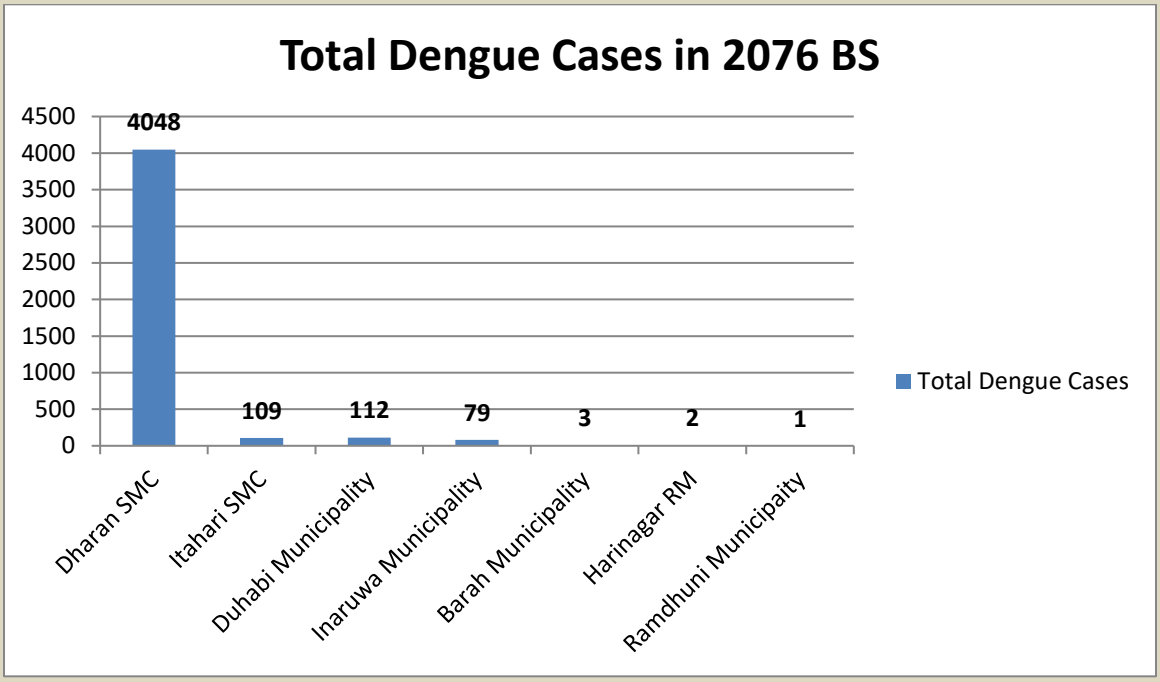
Dengue is endemic in Nepal. The country is experiencing a surge in case that started from the week commencing 8 August to 26 August. Between January to 28 September 2022, a total 28109 confirmed and suspected cases and 38 confirmed deaths have been reported from all seven provinces of Nepal. Bagmati Province which is the second most densely populated province has reported the highest no cases i.e. 78.2% and death 68.4%. (WHO 2022)

According to EDCD, the highest number of cases in 2022 have been reported in the districts of Kathmandu i.e. 9528 (33.8%) cases, Lalitpur i.e. 6548 (23.2%) cases & Makwanpur i.e. 2776 (9.8%) cases. (WHO 2022)

In province 1, total 2137 of dengue cases have been reported till Kartik 24, 2079. (PHEOC Biratnagar)

Situation of Dengue in Sunsari District

Figure No 1: Number of Dengue cases in 2076 BS



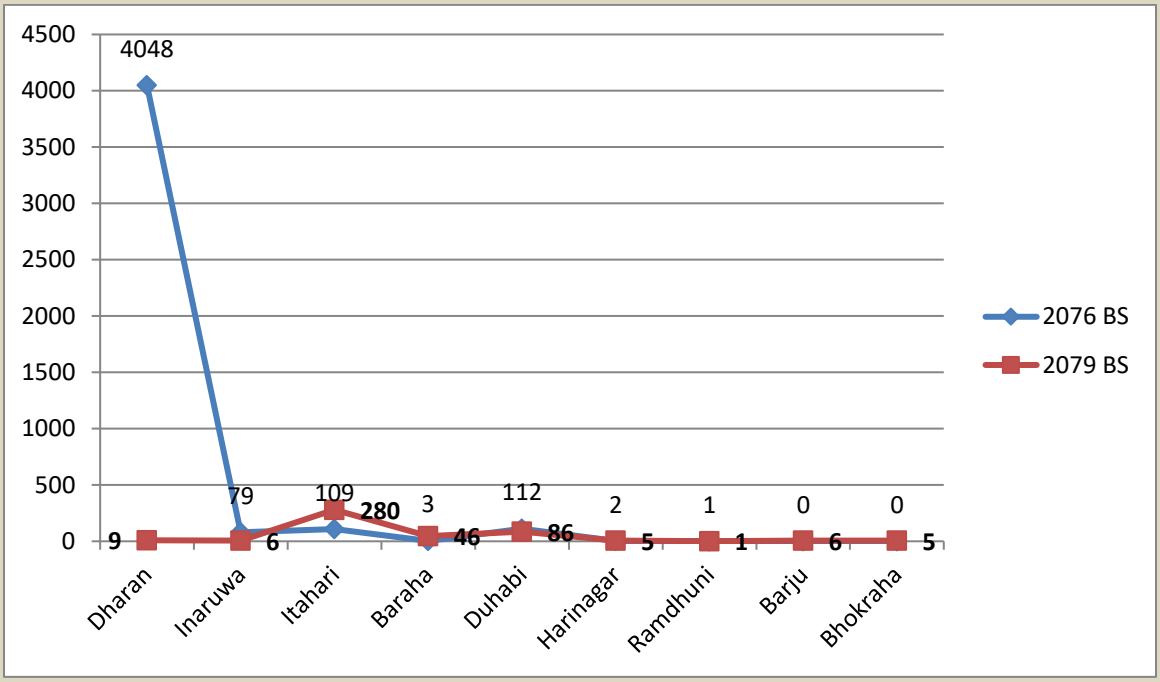
Looking at the previous history, first dengue outbreak was seen in 2076 BS caused by Dengue Type 1 & 2 virus where 4351 people were infected by dengue virus. The first case was diagnosed in 2076-Baishak-30 from BPKIHS. After 28 days on Jestha 28, 257 people were found to be dengue positive from BPKIHS. Among 12 Municipalities incidence was high in Dharan Sub Metropolitan City which lead to dengue epidemic in Sunsari District. After the gap of 2 years dengue cases started appearing again and in 2079 BS 2nd dengue outbreak was seen in the district.

Table No 1: Dengue Cases from 13 Health Institution of Sunsari District till Kartik Month 2079 BS

S.N.	Health Institution	Total Test	Total Kit Supply	Positive Cases		
				Male	Female	Total
1	Itahari Hospital	668	400	150	130	280
2	Inaruwa Hospital	89	100	4	2	6
3	BPKIHS	50		2	7	9
4	Chatara Hospital	586	400	1	0	1
5	Nagar Hospital Baraha	1106		25	20	45
6	Nagar Hospital Duhabi	88	100	39	47	86
7	Nepal Army	196	150	28	17	45
8	Harinagar PHC	70	100	3	2	5
9	Ramdhuni Covid Hospital	7	50	1	0	1
10	Chimdi Health Post	22	50	3	3	6
11	Bhokraha Health Post	6	50	3	2	5
12	Laukahi Health Post	0	50			
13	Dewangunj Health Post	0	50			
	Total	**2888**	**1500**	**259**	**230**	**489**

As per the reported cases from the health institution, among 2888 total tests, 489 positive cases have been reported. Out of which 259 were male and 230 were female. In Laukahi Health Post and Dewanguj Health Post, there were supply of 50 RDT test kit from Health Office, but till date zero cases have been reported.

Figure No 2: Comparison between Dengue 1st and 2nd outbreak in Sunsari District



The line graph shows the variation in Dengue cases in 2076 and 2079 BS

The first dengue outbreak was seen in 2076 BS in Sunsari District, where total 4351 cases were diagnosed. After gap of 2 years dengue cases started appearing again but there is significant decrease in cases as compared to 2076 BS. Dharan Sub Metropolitan City shows 4048 dengue cases and lead to 1st dengue outbreak while after 2 years cases plummeted dramatically. Itahari Sub Metropolitan City showed a significant increase in cases and lead to 2nd outbreak in 2079 BS. There is significant increment of cases in Baraha Municipality as compared to 1st outbreak. In 2nd outbreak cases was also diagnosed from Barju and Bhokraha Rural Municipality while in previous outbreak zero cases has been reported.

Public Health Actions

Following activities were carried out for the prevention and control of Dengue Fever:

Dengue Kit supply:

Due to high number of suspected cases in the community, 1500 units of RDT Kits were supplied to 13 health institutions. Among total kits, 430 units were supported by FAIRMED.

Orientation Program:

With the Chairmanship of Mayor of respective municipalities, orientation on dengue fever and its prevention program was carried out in all 12 local level governments in close coordination with Health Offie, Sunsari.

"Larva search and destroy" campaign:

Community Mobilization is the strength to identify and address community problems. Using that strength during the dengue epidemic, staff and different stakeholders of local level government as well as BPH student of Koshi Health Institution supported during "Larva Search and Destroy" campaign in 12 working municipalities. BISWAS project support was mainly focused on mobilizing community members, partnering with other organizations like Nepal Police, direct involvement in cleaning the source of mosquito breeding, organizing jingles-playing during the campaign, etc.

Development of Radio Jingles and Broadcasting:

Health office, Sunsari supported in development of radio jingles related to dengue with coordination with FAIRMED & 12 rural/ municipalities. The concerned offices used the jingles for miking, FM broadcasting as well using social media for wide circulation of dengue messages.

Flex printing and display:

In the places where high suspected cases were seen Health Office, Sunsari in coordination with FAIRMED supported in printing of flex posters and displaying it through hanging in gates, walls of schools, offices and markets. The flex were also attached to vehicles and e-rickshaw so that messages are reached to a larger audience. A total of 42 flex were printed and displayed in strategic locations of Dhuhabi Municipality, Harinagara Rural Municipality, Ramdhuni Municipality, Koshi Rural Municipality, Bhokhara Narsing Rural Municipality.

Messages broadcasting:

The developed Jingle messages were broadcasted for mass-awareness through miking (across three Rural Municipalities Koshi, Bhokhara Narsing & Harinagara), local FM stations, online

media, Facebook pages and YouTube channel. This effort is believed to take the important messages of dengue deep into the community.

Challenges:

- Complete and quality reporting from the local level government.
- EWARS receives the reports only from the identified sentinel sites and no access to Health Office, Sunsari.
- No supply and utilization of the dengue register
- Low supply of RDTs to the local level government.
- Weak Vector Surveillance due to lack of required resources and programs
- Political Pressure for spraying insecticides (Fogging)

References

- WHO, 10 January 2022. Facts Sheet on dengue and severe dengue. World Health Organization. (Online) Available at http://www.WHO.int/news-room/fact-sheets/detail/dengue-severe
- Dr Maskey.M., Dhimal.M, Thakur.A, Shrestha. S, Dr Banerjee. M, Bhattrai. L, 2009. Environmental Conditions Associated with Vector of Dengue and Corrective actions for its Prevention in Nepal. National Health Research Council. Available at https://nhrc.gov.np/wp-content/uploads/2017/02/Dengue-Report.pdf
- World Health Organization (10 October 2022). Disease Outbreak News; Dengue fever-Nepal. Available at https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON412
- European Centre for Disease Prevention and Control (27 October 2022). Dengue Worldwide Overview. Available at https://www.ecdc.europa.eu/en/dengue-monthly
- Provincial Health Emergency Operations Centre Biratnagar (24 Kartik 2079). Dengue Case Distribution in Province 1. Available https://www.facebook.com/pheoc.biratnagar/
- Kristie L. Ebi, Nealon J, 2016. Dengue in a Changing Climate. Environmental Research. Volume 151. Available at https://pubmed.ncbi.nlm.nih.gov/27475051/

Province Government
Province No. 1
Ministry of Health
Health Directorate
Health Office Sunsari

Annexure

Dengue orientation program at Ramdhuni Municipality

Dengue orientation program at Itahari Sub-Metropolitan city

Search & Destrov Activitv

Province Government
Province No. 1
Ministry of Health
Health Directorate
Health Office Sunsari

Community Awareness Program on Dengue

Search & Destroy of larva lead by Deputy Mayor of Dhuhabi Municipality

Community Awareness Activity on Dengue through miking

Community Awareness through Message dissemination through Flex