Dengue fever: A constant threat to Pacific health security

Dengue fever situation in the Pacific

Dengue remains a continuous health security threat in the Pacific with regular outbreaks reported since the 1970s. In recent years up to all four dengue serotypes (DENV-1, DENV-2, DENV-3, and DENV-4) have co-circulated in the Pacific region resulting in both sporadic cases and outbreaks. Dengue outbreaks are usually caused by a single serotype sweeping across the region approximately every 3-5 years. However, in 2012 there were outbreaks of all four dengue serotypes reported for the first time during a single year, and this pattern reoccurred in 2016 and 2017.

Almost all Pacific Island countries and territories (PICTs) have reported outbreaks of dengue. Dengue is the most commonly reported disease in the Pacific, with 73 alerts (33% of the total alerts) notified in the map of epidemic and emerging disease alerts in the Pacific and about 36,270 notifications of dengue-like illness1 reported in the Pacific Syndromic Surveillance System/EWARS from August 2014 to 30 June 2019.

Three dengue virus serotypes (DENV-1, DENV-2 and DENV-3) are currently circulating in the region (Figure 1). Ongoing transmission of dengue, with co-circulation of two serotypes in some instances, has also been reported in a few countries. Deaths associated with dengue fever have been reported in Tuvalu (2), New Caledonia (2) and Fiji (1) this year.

![Figure 1: Epidemic and emerging disease alerts in the Pacific as of 22 July 2019](image)

---

1 Only 15 PICTs are currently using the dengue-like illness indicator; hence the relatively low number of notifications.
Global Perspective

Dengue is one of the fastest-spreading mosquito-borne diseases worldwide. The incidence of dengue has increased 30-fold over the past 50 years. According to WHO, an estimated 2.5 billion people are at risk for dengue globally, about 70% live in Asia Pacific countries. In 2019, several countries in the WHO Western Pacific Region are experiencing unusually high numbers of dengue cases for this time of the year.

Risk Assessment

The Pacific Community (SPC) in its role as the focal point of the Pacific Public Health Surveillance Network (PPHSN) Coordinating Body has continuously monitored changes to the epidemiological situation of dengue fever in the region using both indicator-based and event-based surveillance information. A combined risk assessment with the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) is provided taking into consideration the current context in which outbreaks are occurring such as challenges in early diagnosis and clinical case management, reactive vector control, lack of multi-sectoral dengue preparedness and response plans and weak community engagement and social mobilization.

Risk for further spread

Regional assessment of the risk for further dengue virus spread in the Pacific is considered **HIGH** for the following reasons:

1) It is likely that there is **little immunity** to all four of the serotypes of dengue in our communities as dengue serotype 2 has re-emerged after a lapse of 20 years. Although there is paucity of seroprevalence data to support this, dengue is considered non-endemic in most of the PICTs. While there are a few Pacific countries experiencing ongoing transmission of certain serotypes since a few years now, no PICT has documented endemic circulation of all 4 serotypes. Outbreaks in the PICTs usually occur when a dengue serotype that has been absent from the region or a given country for a long period of time, is introduced or re-introduced. A delayed diagnosis and serotype identification can lead to a delayed response.

2) **Mosquitoes** that can transmit dengue viruses are present in the Pacific Region. These include the principal global vectors of *Ae. aegypti* and *Ae. albopictus*, but other local mosquitoes such as *Ae. polynesiensis* or *Ae. hensilli* are also known to transmit dengue viruses.

3) Large and rapidly growing **population mobility and airline travel** facilitate the spread. Additionally, as up to 80% of dengue infections are asymptomatic in humans, limiting regional spread via travel through screening for clinical signs and symptoms is unfeasible. Increasingly mobile populations, with frequent travel (air and sea) increasing the risk of the virus spreading into non-immune populations with possible severe manifestation of the disease and even death.

4) **Humidity and rainfall** are associated with occurrence of dengue cases as vector borne diseases (dengue fever, zika, chikungunya and malaria) are climate sensitive.

---

Key recommendations for Pacific Island Countries and Territories

The prevention and management of dengue has four key operational components that require strong coordination:

1. Diagnosis and clinical case management
2. Surveillance and outbreak preparedness and response
3. Risk communication, community engagement and social mobilisation
4. Vector control

Diagnosis and clinical case management

Mortality from severe dengue can be reduced from more than 20% to less than 1% by implementing timely and appropriate clinical management which involves early clinical diagnosis and recognition of the warning signs of severe dengue, intravenous rehydration, staff training, and hospital reorganization during outbreaks.  

Warning signs include:

- abdominal pain or tenderness;
- persistent vomiting;
- mucosal bleeding;
- liver enlargement >2 cm;
- clinical fluid accumulation;
- lethargy, restlessness; and
- laboratory: increase in haematocrit at the same time as a rapid decrease in platelet count.

Pocket clinical management cards have been used as tools for training and can be accessed on this link. Clinicians in PICTs who have used these pocket cards have found them to be very useful tool in clinical management of dengue cases.

Laboratory confirmation

Accurate and timely diagnosis of dengue virus is important for early detection of dengue virus infection. Laboratory diagnosis methods for confirming dengue virus infection may involve

- detection of the virus,
- viral nucleic acid,
- antigens or antibodies,
- a combination of the above techniques.

After the onset of illness, the virus can be detected in serum, plasma, circulating blood cells and other tissues for 4–5 days. During the early stages of the disease, virus isolation, nucleic acid or antigen detection can be used to diagnose the infection. At the end of the acute phase of infection, serology is the method of choice for diagnosis.

3 https://apps.who.int/iris/bitstream/handle/10665/75303/9789241504034_eng.pdf;jsessionid=78752BF7082BFBF4A38EB82F27768734?sequence=1

4 Dengue: Guidelines for diagnosis, treatment, prevention and control – New edition. WHO

and CDC Dengue Clinical Case Management Course: https://www.cdc.gov/dengue/training/cme.html
The specimen to be collected and the diagnostic method depend on which clinical phase of the disease the patient is in. Serum is the specimen of choice for dengue diagnosis. Attempts may be made to collect specimens to test tissues from liver, spleen, lymph nodes, and others from patients who died with a clinical suspicion of dengue, using viral isolation, molecular diagnosis, and viral antigen detection. All specimens should be accompanied by the patient’s general information as well as their clinical and epidemiological data.

Figure 2: Approximate time-line of primary and secondary dengue virus infections and the diagnostic methods that can be used to detect infection

A routine rapid diagnostic test introduced in 2006 is currently in use in the majority of L1 Laboratories in PICTs is the NS1 Antigen and Antibody test kit. The test allows rapid detection of the NS1 antigen on the first day of fever, before antibodies appear some 5 or more days later. The presence of dengue NS1 antigen is consistent with acute-phase infection with dengue virus. Positive test for DENV may mean that NS1 antigen is typically detectable within 1 to 2 days following infection and up to 7 days following symptom onset.

Surveillance and outbreak preparedness and response

- Early identification of suspected dengue cases is important to prevent an outbreak.
- National health authorities should ensure that their syndromic surveillance sentinel sites and event-based surveillance contact points report on a timely manner using the standard dengue-like illness (DLI) definition:

  An acute fever illness that lasts more than 2 days with two or more of the following:
  - anorexia and nausea
  - aches and pains
  - rash
  - low white blood cell count
  - tourniquet test positive
  - warning signs
Travel history to an outbreak area or confirmed case should trigger an immediate response, including:

- **Start a line-list of suspect cases:** recording of information on the case(s), including age, sex, place of residence, travel history, identification of geographical cluster and mobilization of affected communities;

- **Enhance surveillance and case finding:** vigilance in identifying other suspected cases in the community especially within the perimeter of confirmed cases;

- **Robust, targeted source reduction:** vector control activities at the community level, focused around the residence of suspected cases, should be undertaken in order to eliminate potential mosquito habitats, considering larvacide applications;

- **Targeted mosquito elimination:** spraying with insecticide to kill adult mosquitoes in the areas where the case(s) reside, work or attend school. Procedures must be clearly laid out and planned with vector control services;

- **Isolate case-patients to prevent further spread:** keeping potentially viraemic patients (within the first five to seven days of the disease) under ideally insecticide-treated mosquito nets and protect from further mosquito bites with repellent, especially if admitted to a health facility;

- **Ensure appropriate clinical management for dengue cases:** Provide updates on the proper diagnosis, classification, and management of dengue cases. All clinicians who provide emergency and inpatient services should receive an update on dengue management using WHO and CDC guidelines (see Useful Links and Materials below).

- **Make sure the community knows:** (1) to control the fever with acetaminophen or paracetamol, and to NOT give ibuprofen, aspirin, or other aspirin containing drugs; (2) to bring a patient for urgent medical care if they show any of the dengue warning signs (e.g. severe abdominal pain or persistent vomiting, bleeding, vomiting blood, black tarry stools, drowsiness or irritability, pale cold clammy skin, difficulty breathing)

- **Implement rapid and effective risk communication and community engagement activities** to allow people at risk to understand and adopt protective behaviours;

**Risk communication using a mix of strategies**

- **Best practices for effective risk communication** on dengue fever and any other public health threats or emergencies include: building and maintaining trust, especially through communicating early and often, even in the face of uncertainty, coordinating with partners, involving and engaging those affected, using a combination of strategies, planning and building capacity during peace time.

- **Key messages for travellers** to the Pacific region:
  - Dengue is a mosquito-borne viral infection.
  - Dengue fever outbreaks and circulation are occurring in several Pacific Island countries and territories

---

5 Pacific Pilot Regional Emergency Risk Communication Training, June 2019 (WHO, CDC, SPC, PIHOA)
- The infection causes flu-like illness that can affect infants, young children and adults.
- The best way to avoid dengue, or other mosquito-transmitted diseases, is by preventing mosquito bites. Travellers are recommended to:
  - Use insect repellents containing tropical strength DEET picaridin, citriodiol, IR3535. Remember to check labels first to ensure you have no allergies and of age restrictions for use.
  - Wear clothing that covers the skin (arms and legs) – light coloured clothing if possible
  - Sleep in rooms that are either screened against mosquitoes or sleep under a mosquito net - especially when sleeping during the day, and in the early morning and around sunset.
- Medical attention must be sought quickly for any feverish illness experienced whilst travelling or on your return home. Don’t forget to tell the doctor that you have been travelling.
- Caution: Do not take ASPIRIN or other nonsteroidal antiinflammatory drugs (NSAIDs) such as ibuprofen or naproxen if you think you might have dengue fever since there is a risk for bleeding complications.

- Useful links and materials can be found below.

**Vector control**

The main prevention and control measure is to proactively eliminate or reduce potential mosquito habitats to minimize mosquito populations, even before cases are reported and reduce dengue transmission via community-based source reduction and application of larvicides. The 2004 WHO Global Strategic Framework on Integrated Vector Management (IVM) recommends a combination of interventions for greater impact. This is further built upon by the WHO Global Vector Control Response (2017-2030) with emphasis on the need to build capacity of human resources, research and upscaling intersectoral and interdisciplinary action.

Priority actions are to:
- Prevent mosquitoes from accessing egg-laying habitats by environmental management and modification;
- Dispose of solid waste properly and removing artificial man-made habitats;
- Apply insecticides through targeted spraying or space spraying during outbreaks as an emergency vector-control measure in densely populated areas;
- Treat water in large storage containers with larvicides, in accordance with sanitary regulations, to kill larvae and eggs. Conduct active monitoring and surveillance of vectors to determine effectiveness of control interventions.

**Communities and households** should be encouraged to:
- Clean surroundings of all waste and garbage that can retain water
- Change water in flower vases, pot plant drip trays or any other water-filled container at least once a week.
- Always keep water in covered containers, tanks and drums. If possible, use mosquito-proof covers.
- Empty, wash or scrub once a week all water storage dishes and containers to remove any mosquito eggs that may exist.
- Drain roof gutters and assure free flow of water.
- Report mosquito breeding grounds in abandoned lots, public spaces, playgrounds and workplaces.
- Report broken pipes or water to the authorities.

- Local authorities and partners should implement campaigns that build awareness and mobilize communities for sustained vector control, especially as the common vector for dengue (*Aedes aegypti*) is known to breed in and around households. Everything that can collect water can be a potential breeding site for mosquito.

- Existing communication material (see links below) can be further adapted and translated by countries to assist them with their community mobilisation campaigns for vector control and management.

We sincerely thank our colleagues from Pacific Island countries and territories for sharing important information on dengue fever and other epidemic and emerging diseases through the epidemic intelligence map and EWARS in the box with their PPHSN colleagues. Please also note that this picture (i.e. map) is not complete, as is indicated by the imported cases of dengue fever reported from New Zealand and Queensland Australia as acquired in the Pacific Region.

Countries and partners are most welcome to share additional information, resources, and experiences on dengue prevention and control with their Pacific colleagues through PacNet.

For more information or technical assistance on dengue surveillance, prevention and control, including risk communication and laboratory confirmation feel free to contact any of PPHSN partners (SPC, WHO, CDC or PIHOA).

**Focal Point of the PPHSN Coordinating Body**
Email: FocalPointPPHSN-CB@spc.int

**Useful links and materials**
- WHO Press Release: Dengue increase likely during rainy season: WHO warns
- WHO fact sheet
- WHO Dengue: Guidelines for diagnosis, treatment, prevention and control
- CDC Dengue Clinical Case Management Course
- WHO Communicating risk in public health emergencies
- CDC fact sheet and posters
- CDC Crisis & Emergency Risk Communication (CERC)

Material developed by SPC for the Pacific. These posters can be adapted, translated into local language by Pacific Island countries and territories. [Contact us](http://purl.org/spc/digilib/doc/cnc5f http://purl.org/spc/digilib/doc/34bh7 http://purl.org/spc/digilib/doc/xwyaj)
References