

An Outbreak of Dengue Fever in Yap State

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Abstract

Between May and December 2004, Yap State experienced an outbreak of Dengue Fever, type 1 with a final total of 658 recorded clinically compatible cases, including 42 hospitalisations and 12 cases of dengue haemorrhagic fever / shock syndrome. There were no fatalities. Lessons learned from this outbreak include: the importance maintaining a high index of suspicion and on-site diagnostic capability for dengue fever, the importance of prompt in-service training for health care workers, the danger posed to neighbors by local lapses in outbreak prone disease surveillance and the utility of the Pacific Public Health Surveillance Network in responding to such diseases, the importance of active disease surveillance in outer island populations, and the importance of instituting preventive measures against the nosocomial spread of dengue fever. (PHD, 2005 Vol 12 No 2 Pages 99 - 102)

Background

As for most of the smaller Pacific island states, dengue fever is not usually present in Yap. Large outbreaks have occurred in 1995 (type 4) and 1988 (type 1),¹ each time with large numbers of hospital admissions and several deaths. In addition to the morbidity and mortality associated with these outbreaks, the hundreds of cases present a significant burden on the health care service, and have both direct and indirect economic consequences, by impairing the local workforce and discouraging tourist visits. The most destructive typhoon in memory, Sudal, struck the main islands cluster of Yap State in early April, 2004. The destruction of homes, the gathering of people in temporary shelters and tents and the large amounts of debris left by the typhoon together favored the proliferation of mosquito vectors and contacts with their human hosts, conditions that favored the rapid transmission of dengue fever.

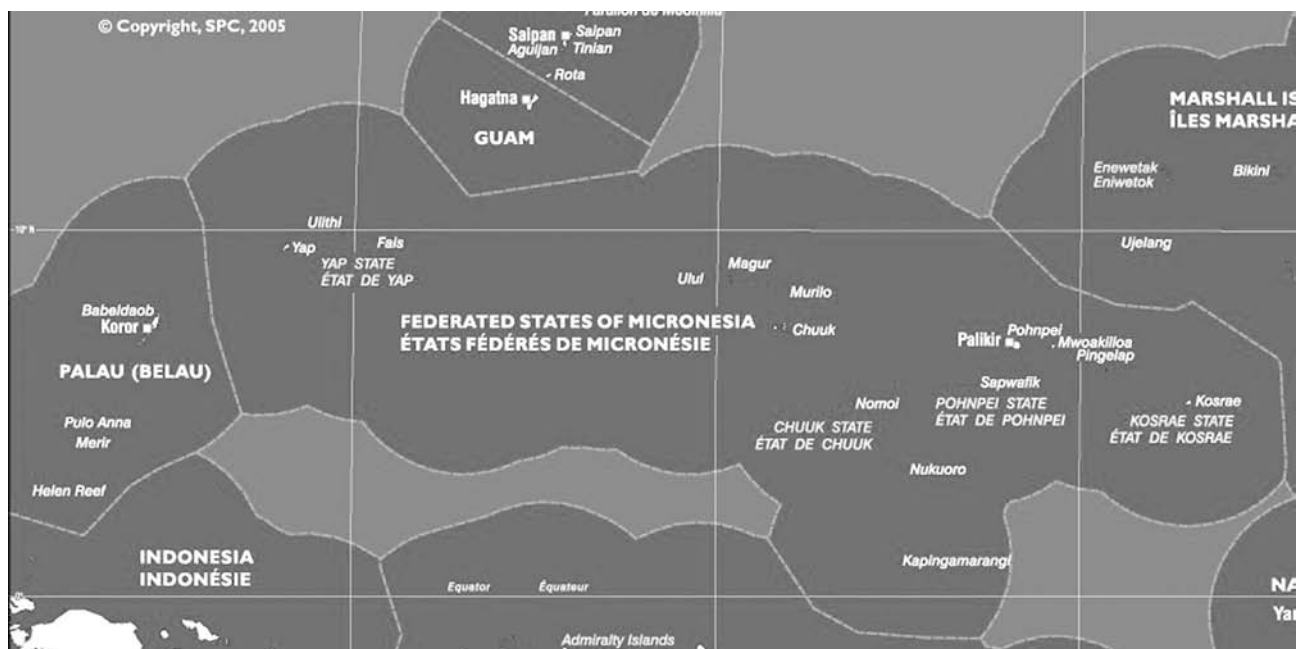
Index Case

On May 29, 2004 a 16 years old Yapese student developed a headache and fever, one day after completing his final exams at his private high school in Chuuk state. The next day he boarded a plane to return home to Yap for summer vacation. A Yap Public Health Nurse who happened to be in transit through the Guam airport on the same day as the student, observed that, "... he complained of severe headache and body aches and fever. He looked very sick and could hardly drag himself to the plane."

The student spent the next two days at his family home in Tomil municipality in Yap. He continued to have high fever, headache and body aches. He developed watery diarrhea, vomiting and became unable to walk. On the 4th day of illness he was admitted to Yap State Hospital with a diagnosis of "possible pneumonia". He was treated with antibiotics and IV fluids. His total white blood cell count was 3500/ μ l [normal 5,000-10,000/ μ l] and platelet count, 36,000/ μ l [normal 120,000-350,000/ μ l] and he developed nosebleed on one occasion. His urinalysis, chest x-ray and tuberculin skin test were normal. His renal and liver function tests were normal except for a serum aspartate aminotransferase of 56mg/dl [normal 20-40mg/dl]. He made a gradual recovery and was discharged to home on the 5th hospital day with a diagnosis of "fever of unknown cause".

Recognition and Evolution of the Outbreak

During the second week of July, 2004 several patients with fever and joint pain were discussed at morning medical staff report at the hospital. Two of these had low positive anti-streptolysin O (ASO) titers suggesting



possible streptococcal infection and were treated as cases of possible rheumatic fever. The possibility of dengue fever, viral encephalitis and leptospirosis were also discussed. Plans were made to send sera to a Pacific Public Health Surveillance Network (PPHSN) Level 2/3 reference laboratory for testing when the patients returned for follow-up.

During the third week of July several members of a dance group from Yap became ill in Palau, where they had gone to perform at the Pacific Arts Festival. Eventually, eight of the Yap delegation of 130 individuals became ill and tested positive for dengue fever by the PanBio rapid immunochromatographic card test at Belau National Hospital, where several were admitted. It was from these diagnoses in Palau that we learned of the probable existence of dengue fever in Yap.

Immediate Response to the Outbreak

Our outbreak response ("EpiNet") team consists of a lab supervisor, health statistics technician, sanitarian, hospital administrator and two physicians. This team was activated and met daily to plan disease control measures. Sera from several patients with suspected dengue fever were sent to the Institute Pasteur in New Caledonia for confirmatory testing and typing by polymerase chain reaction (PCR). This testing confirmed the presence of dengue fever and identified the strain as type 1.

Most doctors, health assistants and nurses now working in Yap State were no longer familiar with the diagnostic criteria and management recommendations for dengue fever, dengue hemorrhagic fever, or dengue shock syndrome. We obtained case definitions, guidelines for patient assessment and management from the Pacific Public Health Surveillance Network (PPHSN) website.²

By the time our EpiNet team was activated this outbreak was already well in progress and the opportunity to eliminate it at an early stage had passed. The outbreak increased the workload of the Department of Health Services substantially. Preparing an organized response required daily meetings of the EpiNet team initially, arranged in the following areas:

Public Awareness: daily radio updates; distribution of flyers; phone conferences with national officials in Pohnpei; postings for the region on the PacNet list server.

Disease Surveillance: messages to public to come for evaluation of suggestive symptoms; soliciting case reports from doctors in the main islands of Yap and health assistants in the outer islands.

Environmental intervention: dispatching sanitation teams to villages where cases had been recorded, with a view to the elimination of *Aedes Aegypti* breeding sites (cans, coconut shells, rain catchment tanks and drums, clogged gutters, discarded automobile tires); radio messages to the public for elimination of breeding sites and personal protection from bites of *Aedes* mosquitoes; briefing sessions for councils of traditional leaders to solicit assistance with vector control.

Isolation of cases (from mosquitoes): written instructions given to patients with a clinical diagnosis about how and why to avoid mosquito bites during the febrile phase of illness.

Case Management: distribution of PPHSN case management guidelines to all practicing physicians and health assistants in Yap State; in-service training sessions for nurses and doctors at Yap State Hospital;

Figure 1: Clinical case definitions

Dengue

- 1. Sustained fever (at least 2 days)
- PLUS 2. At least two of the following:
 - a. nausea or vomiting
 - b. myalgias or arthralgias
 - c. headache or retro-orbital pain
 - d. rash (maculopapular or petechial) or flushing

OR Sustained fever plus evidence of spontaneous bleeding

(can include epistaxis, bleeding gums, haematemesis, melena, haematochezia, menorrhagia, petechiae, purpura, ecchymoses, or a positive tourniquet test)

DHF

- 1. Sustained fever
 - PLUS 2. Evidence of bleeding (as above)
 - PLUS 3. Platelet count less than 100,000
 - PLUS 4. Haemoconcentration
- Haemoconcentration may be suspected if: Hct > 45 or Hct more than 20% above baseline

Dengue signs and symptoms, in order of usual frequency of occurrence:

Fever, headache, myalgias, arthralgias, nausea, vomiting, abdominal pain, rash, pruritus, retro-orbital pain, diarrhoea, cough, bleeding, hepatomegaly, neurological signs

Figure 2: Guidelines for hospitalisation

Consider hospitalisation in all cases of DHF, if possible (see DHF case definition, above).

Alternatively, the following indicators of clinical deterioration may suggest higher critical risk of impending shock, and suggest the need for hospitalisation:

Bleeding	Cold or cyanotic extremities
Rapid or weak pulse	Acute abdominal pain
Inability to drink	Lethargy
Reduced urine output	Restlessness
Hypotension or narrow pulse pressure	Hepatomegaly

a week long distance training exercise conducted with outer island health assistants by our outer island radio network.

Lab Support: arranging of off island transport and testing of specimens from the first few of our patients, development of capability for on-island dengue testing for future use.

Course of the Outbreak and Ongoing Management

In total, 658 cases were recorded from the start of the outbreak until the last case on 20 December 04. Cases ranged in age from 2 to 54 years, with a median of 22 year, and an equal male: female incidence. Of the total, 42 (6%) required hospital admission, 12 (2%) met criteria for dengue hemorrhagic fever or dengue shock syndrome and there were no deaths.

Despite in-service training, the accurate ascertainment of case counts was difficult. This problem was solved by attaching checklists of PPHSN criteria for the clinical diagnosis of dengue fever, dengue hemorrhagic fever, and dengue shock syndrome to the standard registration form used for all outpatient encounters in the main island cluster of Yap (figure 1). Active surveillance was then conducted by checking the inpatient ward for new admissions, the logbook for tests at the central lab of Yap State Hospital and the outpatient encounter forms each day. A checklist of criteria for hospital admission of dengue cases (figure 2) was also included on the encounter form, which contributed to effective case management by guiding the decision for hospital admission.

Despite in-service training by radio of outer island health assistants, dengue fever became well established on several outer islands before we became aware of any outer island disease activity. We became aware of these cases only when a physician from Yap State Hospital made an outer island public health field trip. In order to improve outer island surveillance we then instituted a system for the active solicitation by radio net of any new clusters of illness (including dengue fever) on a weekly basis. The outbreak eventually affected six of the nine inhabited outer island groups of Yap.

Initial cases in this outbreak were clustered in Tomil municipality and in Colonia town. These were the two places where the index case was staying during the febrile phase of

his illness. The disease in Colonia especially affected staff members of Yap State Hospital and residents of homes adjacent to the hospital, suggesting that these may have been secondary cases spread by the index case during his hospitalization. We discovered that the doors to the hospital ward were usually kept open in the evenings, allowing mosquitoes free access to patients and staff. We then instituted standing orders for three times daily application of insect repellent to all patients with a diagnosis of possible dengue fever, and a policy for keeping screen doors at the ward closed at all times. Measures to decrease mosquito breeding sites in the vicinity of the hospital were also taken.

We continued active surveillance for dengue fever for 6 weeks after the last case on December 20, 2004 and declared the outbreak over in the first week of February 2005.

Lessons learned

In dealing with this outbreak, our EpiNet team’s capability for use of epidemiological tools like line lists, spot maps and epidemic curves for describing the time course of an outbreak have improved. The experience has also strengthened our ability to develop strategies and implement activities for the control of outbreaks. As a result of our experience we have secured our lab’s capability to perform rapid slide tests for screening of dengue fever and leptospirosis, and culture media and reagents needed for preliminary diagnosis of cholera and typhoid fever. We are also maintaining our system of weekly active surveillance by radio for the detection of new outbreaks in the outer islands of Yap State.

The team also learned several important lessons, summarised below:

1. Health care workers in places which have not experienced recent dengue fever epidemics may not have the knowledge and skills needed to manage dengue fever patients properly. Teaching proper assessment, monitoring and treatment protocols to community health workers, nurses and doctors early in an outbreak can prevent dengue fever deaths and should be part of the standard response to an outbreak. The PPHSN website is a good place to go for guidance and tools that can be put into service without delay.
2. Because periods of years without disease may separate large epidemics of dengue fever in small islands states, health care workers tend to have a low index of suspicion for the disease. Measures to maintain an awareness of the risk and presentation of dengue fever might help to avoid delays in recognition.
3. Onsite testing capability at the district level for outbreak prone diseases such as dengue fever is essential in order for prompt recognition of these

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diseases to occur. Prompt recognition is essential if the “window of opportunity” for containment of the outbreak is not to be missed. (Once the occurrence of an outbreak has been confirmed, of course, cases can be identified and managed by clinical criteria and test kits can be reserved for use in confusing and severe cases).

4. Epidemics of dengue fever consume large amount of resources. The expenditure of resources to recognize and prevent such outbreak is warranted.
5. Islands with inadequate outbreak recognition and response systems are a danger to their neighbors and large community or international gatherings have the potential to amplify an epidemic (as demonstrated in this case).
6. Early awareness of outbreaks at remote sites requires regular active surveillance.
7. The PacNet list server is a very useful tool both for spreading awareness of health events with regional repercussions and for sharing approaches to outbreaks.
8. The protection of dengue fever patients from mosquito bites on hospital wards must be ensured to prevent secondary cases among hospital staff, visitors and neighbors.

References

1. Kiedrzyński T, Souares Y, Stewart T. Dengue in the Pacific: an Updated Story. Pacific Health Dialog March, 1998: 5(1); 129-36.
2. O’Leary MJ. PPHSN guidelines: dengue fever (DF) and dengue haemorrhagic fever (DHF) clinical management guidelines. Inform’ACTION. Noumea, New Caledonia: Secretariat of the Pacific Community, 2001: 9 (supplement). Available at: <http://www.spc.int/phs/PPHSN/Outbreak/Dengue.htm> (last access, September 29, 2005).

**There is no such thing as a global village. Most media are rooted in their national and local cultures.
(Rupert Murdoch – 1989)**