First detection of chikungunya infection and transmission in Brunei Darussalam

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ABSTRACT This report describes the chikungunya cases and local transmission detected in Brunei Darussalam for the first time, despite the country being situated in a region that has experienced a multitude of outbreaks over the years. A combined strategy of active case detection, patient isolation and vector control measures was deployed in an attempt to avert further transmission. The findings have important public health implications for international surveillance and control strategies for this re-emerging disease.

INTRODUCTION

Chikungunya virus (CHIKV), an arbovirus of the genus *Alphavirus* and the family *Togaviridae*, was first isolated in Tanzania in 1953.[1] In Southeast Asia, outbreaks have been reported in Thailand, Cambodia, Vietnam, Laos, Myanmar, Indonesia, the Philippines, Malaysia and Singapore.[2,3,4]

Located on Borneo Island between the Malaysian states of Sarawak and Sabah, Brunei Darussalam has endemic dengue transmitted by the same mosquito vectors for chikungunya, namely *Aedes (Ae.) aegypti* and *Ae. albopictus*. However, there has never been a documented report of chikungunya infection in Brunei Darussalam. Routine clinical surveillance via the notification of infectious diseases combined with laboratory confirmation of dengue infection is in place, but chikungunya is not a notifiable disease, and until recently, no laboratory testing capacity was available for chikungunya. Vector control and entomological surveillance are regularly carried out by the Environmental Health Division of the Ministry of Health, with an integrated control programme, including source reduction, larviciding and outdoor ultra-low volume (ULV) spraying.

We report the first two detected cases and local transmission of chikungunya in Brunei Darussalam, and discuss the surveillance and control strategies implemented.

CASE REPORTS

Case 1

The first chikungunya case was detected on March 26, 2011. The patient, a 47-year-old woman from East Java, Indonesia, had arrived on the morning of March 23 on day transit to Jeddah, Saudi Arabia. She had visited a local restaurant and mosque. She reported feeling faint, dizzy and malaise with joint pains since March 21 while in Indonesia, but had no history of fever, rash, nausea or vomiting. The patient's blood sugar level and blood pressure were found to be high, and she was admitted for further assessment. Table I summarises the results of the key clinical investigations carried out. No fever was documented at any time during admission. The patient's blood platelets dropped from 216×10^9/L (on March 23) to 162×10^9/L (on March 25), and dengue was suspected. Serological test results on March 26 were negative for dengue IgM and IgG antibodies (PanBio Dengue IgM Capture ELISA), NS1 antigen (Bio-Rad Platelia Dengue NS1 Ag) and polymerase chain reaction (PCR) influenza A (H1N1 panel), but positive for chikungunya IgM antibody (SD Bioline Chikungunya IgM).

Case 2

On April 14, a second chikungunya case was detected. The patient, a 39-year-old woman, had acute febrile illness, headache, body ache and pain, as well as loss of appetite since April 11. There was no history of rash, arthralgia, nausea or vomiting. Table I shows the results of the key clinical investigations carried out. The patient's blood sample tested negative for dengue and malaria, but positive for chikungunya IgM antibody. Contact tracing identified 11 family members and neighbours (aged 2–50 years) who had had potential contact with this patient. Although all the individuals were asymptomatic, they were screened for CHIKV infection and found to be negative.

Entomological surveillance detected adult and immature *Ae. albopictus* only at the restaurant, mosque and residential neighbourhood. Vector control measures involved source reduction, larviciding with temephos (Abate, 1% GR) and outdoor ULV spraying with cyfluthrin (5% EW). The patients were isolated in air-conditioned and self-contained rooms in order to minimise mosquito-human interaction. The patient's contacts were advised on personal protection against biting vectors and reminded to practise self-surveillance for fever and other symptoms.

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Table I. Summary of the results of clinical investigations.

Clinical investigation	Value		
	Normal range	Patient 1	Patient 2
WBC (10⁹/L)	3.8–11.8	15.9 H	10.1
HB (g/dL)	10.9–14.3	14.0	13.6
HCT (%)	31.2–41.9	42.8 H	40.7
PLT (× 10⁹/L)	179.0–408.0	216.0	343.0
NE (%)	40.0–75.0	76.6 H	84.7 H
Albumin (g/L)	35.0–50.0	36.0	34.0 L
CRP (mg/dL)	0.0–0.50	0.580 H	13.170 H
Dengue IgM, IgG, NS1 Ag	-	Negative	Negative
Malaria	-	Not done	Negative
PCR Flu A (H1N1 panel)	-	Negative	Not done
Urine culture	-	No growth	Contaminants
Blood culture	-	No growth	No growth

WBC: white blood cell; HB: haemoglobin; HCT: haemocrit; PLT: platelet; CRP: c-reactive protein; PCR: polymerase chain reaction; NE: neutrophils

DISCUSSION

The proactive surveillance system set up in January 2011 in Brunei Darussalam, where all dengue-negative samples would be tested for chikungunya, enabled identification of these cases. The incubation period of CHIKV is normally 3–7 (range 2–12) days, with IgM antibody production usually four days after symptom onset.[5] The first patient had developed nonspecific symptoms before entering the country and showed no signs of fever subsequently. We can therefore assume that infection occurred in her home country, classifying her as an imported case. However, the second patient had no travel history, critically inferring local transmission and infection. As persons have been shown to be viraemic for up to nine days from infection onset, both patients had to be regarded as potentially infectious human reservoirs.[6]

The main limitation of this report is the absence of confirmatory PCR or serological (four-fold rise) testing results due to unavailability of such facilities in Brunei Darussalam. The absence of confirmatory gold standard testing capacity should not reduce the confidence in a diagnosis that uses a combination of all available information, which can significantly reduce the likelihood of a false positive. We can confidently say that a case is not a false positive based on the combination of clinical symptoms, signs, blood results, tests to exclude the presence of other similar common infections (such as dengue or influenza A), and a highly sensitive and specific test kit. The clinical findings and investigations in both cases support the clinical diagnosis of chikungunya. Combined with a positive finding using a test kit with a sensitivity of 97.1% and specificity of 98.9%, the odds of a false positive are low. Furthermore, since the submission of this manuscript, a further four patients (three cases and one household contact) tested positive for chikungunya IgM using the same test kit. All three patients had demonstrated positive clinical signs and symptoms of chikungunya. Only one patient had a

travel history to Sabah two months before the onset of symptoms. Therefore, it is unlikely that our detection of chikungunya in Brunei Darussalam was a false positive. Taken together, all the information provides clear evidence to refute the possibility that chikungunya is yet to be confirmed in Brunei Darussalam.

We were unable to identify any epidemiological link between the two cases apart from time, as they were detected within a few weeks of each other. The surveillance protocol that was set up recently could account for this chance temporal association. The first patient was only at risk of being bitten by a vector for a few hours while visiting the restaurant and mosque. However, in the absence of molecular sequencing of CHIKV, we could not confirm a connection between the two cases. The screening of close contacts and symptom monitoring did not indicate that secondary transmission had taken place. However, it is impossible to rule out the potential for transmission further afield, as *Aedes* mosquitoes have been known to disperse easily and rapidly throughout areas of more than 320 m radius.[7] *Ae. albopictus* is highly competent and was identified as the principal vector in numerous outbreaks, including those in Réunion Island,[8] Libreville[9] and Singapore.[4] Furthermore, a single mutation in CHIKV has been shown to affect specificity in this species, with increased epidemic potential.[10] *Ae. albopictus* is ubiquitous throughout Brunei Darussalam, and is commonly detected at all breeding habitats.

Geographically, Brunei Darussalam shares its borders with Sarawak but is closer to Sabah. Sarawak experienced a large chikungunya outbreak in 2009 with 348 cases. Although Sabah reported no cases in 2009, a huge surge was observed in early 2010.[3] It is therefore conceivable that Brunei Darussalam would now be seeing cases. Although infection could have occurred before the setting up of the surveillance system, in view of outbreaks having occurred across the border, these are the first detected cases and indication of local transmission having taken place. The potential for future outbreaks is clear. Thus, continued surveillance, together with effective vector control, is vital to minimise such a risk. This detection also has important implications for international surveillance and control strategies. Furthermore, physicians treating travellers returning from Brunei Darussalam who present with signs and symptoms must now consider chikungunya as a differential diagnosis in addition to other vector-borne diseases such as dengue.

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