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Surveillance of dengue and chikungunya infection in Dong Thap, Vietnam: A 13-month study

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ABSTRACT

Objective: To establish a surveillance in Dong Thap, at the border with Cambodia by assessing the presence of DENV serotypes and CHIKV among patients hospitalized at Dong Thap general hospital.**Methods:** Cross-sectional descriptive analysis was conducted on a cohort of 131 patients hospitalized with acute fever and symptoms compatible with dengue or chikungunya. The study was conducted from January 2012 to February 2013. The full clinical picture was established as well as serological and molecular detection. Serological analysis was sequentially performed on blood samples collected on admission and an average of seven days after admission. The detection of IgM antibody to DENV was performed by IgM capture ELISA and the detection of DENV and CHIKV RNA was done by reverse-transcription multiplex PCR.**Results:** 101 patients out of 131 (77%) were confirmed with dengue. All four dengue serotypes were detected with a predominance of DENV2 and DENV4. No chikungunya infection was detected although reported in neighboring Cambodia. A differential efficiency of serological dengue detection was observed. Efficiency was 29% upon admission and 53% after seven days on the same patients. 30 patients out of 131 (23%) were negative with both DENV and CHIKV.**Conclusions:** Dengue is at risk of being underestimated and chikungunya is not systematically detected. Changes in detection and surveillance procedures are therefore discussed to increase efficiency of dengue detection and continue the monitoring the emergence of CHIKV in Dong Thap province and in Vietnam.

1. Introduction

Arthropod-borne viral infections (or arboviral infections) are common causes of fever syndromes worldwide and more than 100 kinds of arboviruses are known to cause disease in humans [1–3]. Dengue fever is caused by a flavivirus belonging to the family of Flaviviridae [4] while the chikungunya virus (CHIKV) is an alphavirus from the family *Togaviridae* [5–7].

Both dengue and chikungunya diseases are transmitted by *Aedes aegypti* and *Aedes albopictus* [6,8] and can cause potentially severe and or debilitating chronic disease [9]. While dengue has been recorded as the most rapidly spreading mosquito-borne viral disease in the world [10,11], chikungunya has recently re-emerged after an interval of several decades. It represents a risk for millions of people in the Indian Ocean areas, Africa, Southeast Asia and more recently has spread to the Caribbean, Pacific and Europe [12–14]. Coinfection with dengue virus (DENV) and CHIKV has been reported on patients from Asian, African and Pacific countries [15–19].

Vietnam is a hyperendemicity country with all four serotypes being present all year long throughout the country [20], but affecting mostly the southern part with major seasonal outbreaks

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during the rainy season from June to December [21]. Since 1960, dengue fever epidemics have become more frequent and widespread with an increasing number of cases and deaths over the past 15 years [21,22]. From 1963 to 1995, 1518808 dengue hemorrhagic fever (DHF) cases and 14133 deaths were reported [22,23]. The dengue surveillance program in the Southern Vietnam has demonstrated the occurrence of epidemic peaks of higher magnitude approximately every 5 years from 1975 to 1987 [24]. Following an 11-year gap a major outbreak of 119429 DHF cases and 342 fatalities occurred in 1998 [24]. 592938 dengue cases were reported during the 2001–2010 decade in 19 southern Vietnam provinces, which corresponds to a median annual incidence of 232 cases per 100000 [20].

DENV and CHIKV are both transmitted by the same mosquito species, *A. aegypti* and *A. albopictus*. Although chikungunya was first described in Vietnam in the 1960's [25], serological evidence of its presence remain scarce and is mainly associated to the Vietnam War era. In 1966, ten American soldiers were identified to be infected with CHIKV [26] and serological surveys among children have detected anti-CHIKV antibodies as early as 1967 [27]. Cambodia which has a long and extensive border with Vietnam, is not only endemic for dengue, but also for chikungunya which has developed recently [28]. Both diseases can easily be imported by travelers, spread rapidly through common vectors and result in social, economic and healthcare system impacts.

Vietnam is at risk to be like Cambodia affected both by dengue and chikungunya and be an overlapping area of distribution for both viruses. Furthermore, owing to the similarity in clinical manifestations and differences in clinical management, clinicians should be aware of the need to include CHIKV in the differential diagnosis of dengue fever. The aim of the study was therefore to assess, through a dual screening of clinical samples of acute febrile episode patients in Dong Thap general hospital in Southern Vietnam, the respective prevalence of dengue and chikungunya.

2. Material and methods

2.1. Cohort design and ethical clearance

The study was approved by the Institutional Review Board of National Institute of Hygiene and Epidemiology, Hanoi, Vietnam (No: 14IRB July 23, 2012) in charge of ethical clearance. Patients were eligible for recruitment if they were admitted to the infectious diseases department of Dong Thap general hospital between January 1, 2012 and February 28, 2013. All hospitalized patients with suspected arbovirus infection were eligible for participating in this study provided they displayed acute fever in addition to two of any of the following symptoms: headache, rash, myalgia, joint pain and arthralgia.

2.2. Study setting

Dong Thap general hospital is located in Cao Lanh city, Dong Thap province. The province is located in the Mekong delta region in southern Vietnam, and bordered with Cambodia to the north (Figure 1). Dong Thap is characterized by a typical tropical climate with two distinctive seasons: The rainy season from May to November and the dry season from December to April. The annual average temperature is around 26 °C. Dong Thap is one of the provinces of southern Vietnam with people movement from Cambodia and display a high rate of dengue infection.

2.3. Patient enrollment, clinical sample and data management

After obtaining informed consent from patients, a total of 131 paired blood samples were collected from January 2012 to February 2013 from acute fever cases suspected to be infected by dengue within 1–14 d from the day onset of illness according to WHO guidelines [2,29]. The collection of clinical samples was performed twice and 3 mL or 5 mL of blood were collected each

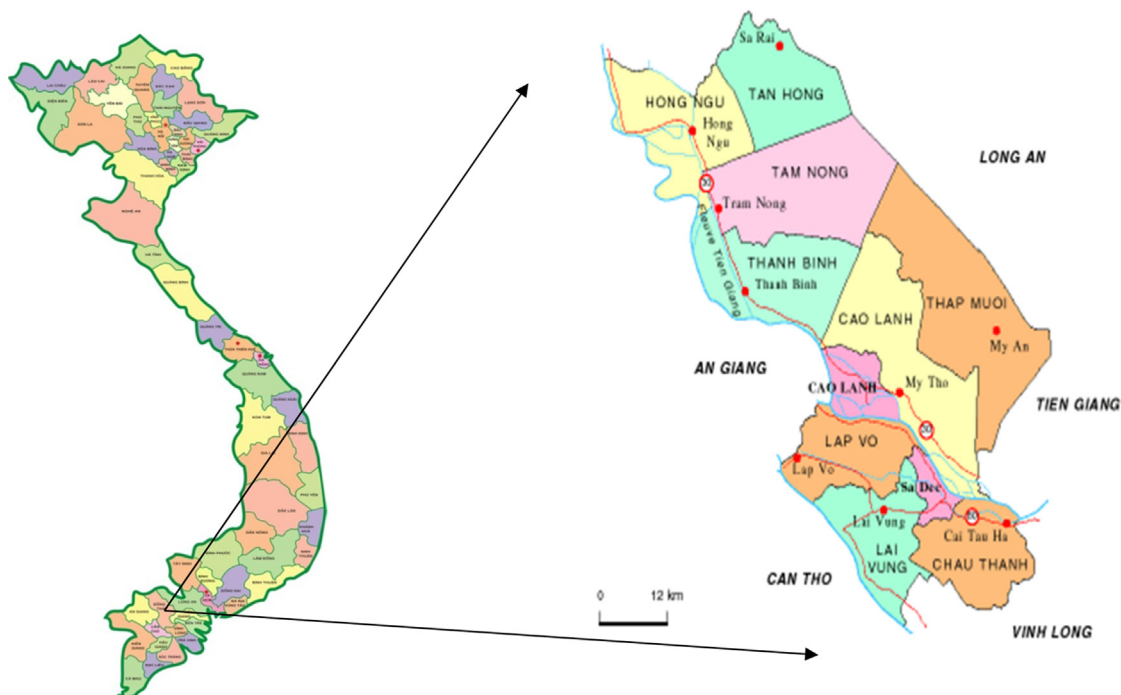


Figure 1. Location and map of the Dong Thap province.

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