Asian Biomedicine Vol. 7 No. 4 August 2013; 561-566
DOI: 10.5372/1905-7415.0704.212

Brief communication (Original)

Changing epidemiology of dengue patients in Ratchaburi, Thailand

Suwat Tanayapong[a], Krisana Pengsaa[b], Usa Thisyakorn[c]
[a]Banpong Hospital, Banpong, Ratchaburi 70110, Thailand, [b]Department of Tropical Pediatrics, Faculty of Tropical Medicine, Mahidol University, Bangkok 10400, Thailand, [c]Department of Pediatrics, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand

Background: Epidemiological data of dengue patients in Ratchaburi, Thailand have been reviewed from the year 2000 through 2010. However, with the changes in population structure and lifestyle, a more detailed analysis is needed.
Objective: We described the changes in the epidemiology of dengue patients in Ratchaburi province, Thailand.
Materials and Method: Cases of dengue patients reported by Ratchaburi Provincial Office, Ministry of Public Health, Thailand.
Result: During the years 2000 to 2010, the rate of dengue patients in Ratchaburi, Thailand varied from 123.45 per 100,000 population in 2003 to 394.25 per 100,000 population in 2008. The case fatality rate varied from 0–0.62%. The disease was seen all year round with a higher incidence in the rainy season. Although the highest attack rate has been observed amongst children below 15 years old, a trend of shift in age group towards older children and adults has been seen during the past decade.
Conclusion: Dengue patients are common in Ratchaburi, Thailand causing heavy burden on the health system. The case fatality rate was between 0–0.62% throughout the period of study indicating early recognition and improved management of dengue patients. The trend towards higher age in dengue patients during the past decade is a problem of concern and needs further clarification.

Keywords: Dengue, epidemiology, Thailand

Dengue is the most common arboviral infection of humans transmitted by *Aedes* mosquitoes, principally *Aedes aegypti*. There are four antigenically distinct serotypes of dengue virus (DEN 1–4), which can cause a continuum of disease: dengue fever (DF) causes fever, rash, muscle or joint pain, headache and eye pain; dengue hemorrhagic fever (DHF) causes abnormal hemostasis and increased vascular permeability, with severe cases leading to dengue shock syndrome (DSS) and death. Unusual manifestations of patients with severe organ involvement such as liver, kidneys, brain or heart associated with dengue infection have been increasingly reported in DHF and also in dengue patients who do not have evidence of plasma leakage. These unusual manifestations may be associated with co-infections, comorbidities, or complications of prolonged shock. Exhaustive investigations are usually needed in these cases. The clinical spectrum of the infection undermines surveillance activities, particularly because the majority of cases are asymptomatic and remain undetected. Exposure to dengue infection generates life-long, serotype specific immunity, but subsequent infection with other serotypes may increase the risk of severe disease. A large proportion of infected individuals have mild form of the disease which is perceived as not serious enough to warrant professional care and may be misdiagnosed and under-reported. Annually, at the global level there are 2.5 billion people, two fifths of the world's population in tropical and subtropical countries at risk. Of an estimated 50–100 million cases of dengue infections, 500,000 are hospitalized with DHF. They are mainly among children with the case fatality rate exceeding 5% in some areas. Dengue is endemic in more than 100 countries with South-East Asia and Western Pacific regions are the most seriously affected. The global increase in dengue cases and also the potential

Correspondence to: Professor Usa Thisyakorn, Department of Pediatrics, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand. E-mail: usa.thi@mahidol.ac.th

spread of the disease to nonendemic areas because of factors such as environmental and climate change and human movement. Even with estimates of disease burden increasing, dengue is widely under-reported because of misdiagnosis and inconsistencies in diagnostics and surveillance systems. Dengue has spread into new geographical areas affecting both children and adults despite being significantly under-reported. Over half of the world's population lives in areas at risk of infection. Complex disease presentation and sudden development of hemorrhagic symptoms in seemingly stable patients can cause fatal outcomes even in well-prepared hospitals. There is currently neither an approved preventive vaccine nor a specific antiviral treatment against dengue. Main public health preventive interventions consist of mosquito control, which is currently used in endemic countries, and use of vector repellents, both generally with limited results. Development of a dengue vaccine is seen as the best hope to fight this disease. In Thailand, dengue patients were first reported in Bangkok, Thailand in 1958 and then appeared in other parts of the country [1-3]. The aim of this study is to describe the changes in the epidemiological pattern of dengue patients in Ratchaburi province, Thailand.

Materials and methods

A study of dengue patients reported to the Ratchaburi Provincial Office, Ministry of Public Health, was carried out from January 2000 to December 2010. Ratchaburi province is approximately 100 kilometers west of Bangkok and it is among the ten provinces in Thailand with the highest dengue incidence. Hence, it provides a suitable site for clinical trials of candidate dengue vaccines. A field-site for large scale clinical trials for dengue vaccines was developed in Ratchaburi from 2005 up to the present [4]. The diagnosis of dengue patients adhered to clinical and laboratory criteria for the diagnosis of dengue patients as established by the World Health Organization [5]. The study was approved by the Ethics Committee of Banpong Hospital, Ratchaburi, Thailand.

Results

The rate of dengue patients per 100,000 population in Ratchaburi, Thailand during the year 2000 to 2010 varied from 123.45 per 100,000 population in 2003 to 394.25 per 100,000 population in 2008 (**Figure 1**). The case fatality rate varied from 0–0.62% throughout the period of study (**Figure 2**). The incidence during the cold months of December and January is low and starts to increase during the dry hot months of April to June. Epidemics coincide with the rainy season and usually peak 2–4 weeks after the arrival of the rains, which may begin anytime between June to September. The rainy season is usually over in October, but can last into November (**Figure 3**).

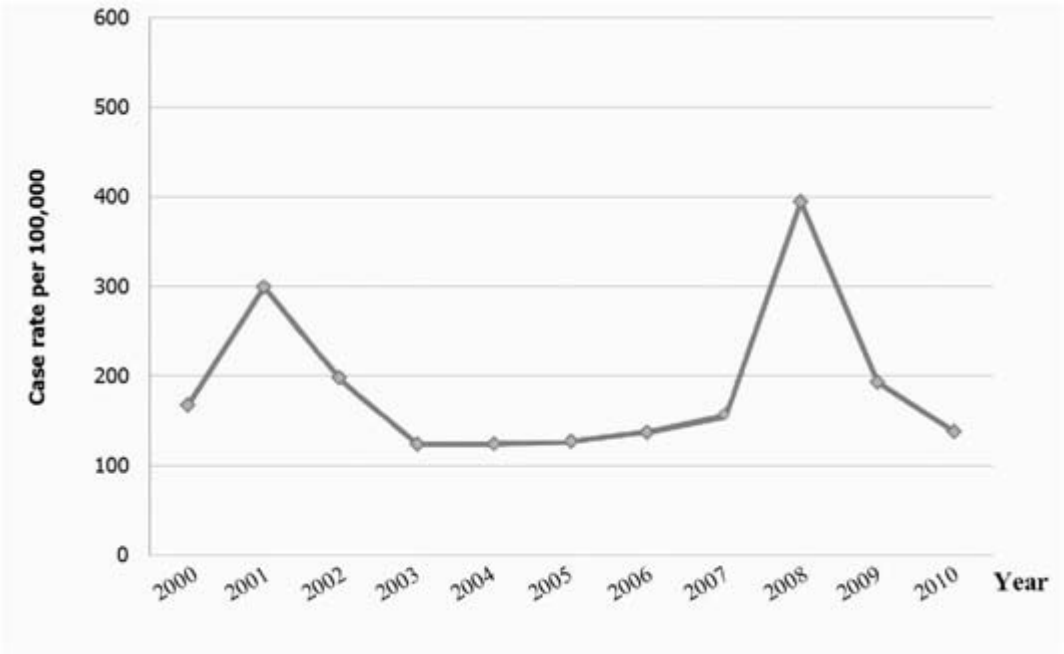

Figure 1. Reported cases of dengue patients/100,000 population in Ratchaburi, Thailand during 2000–2010

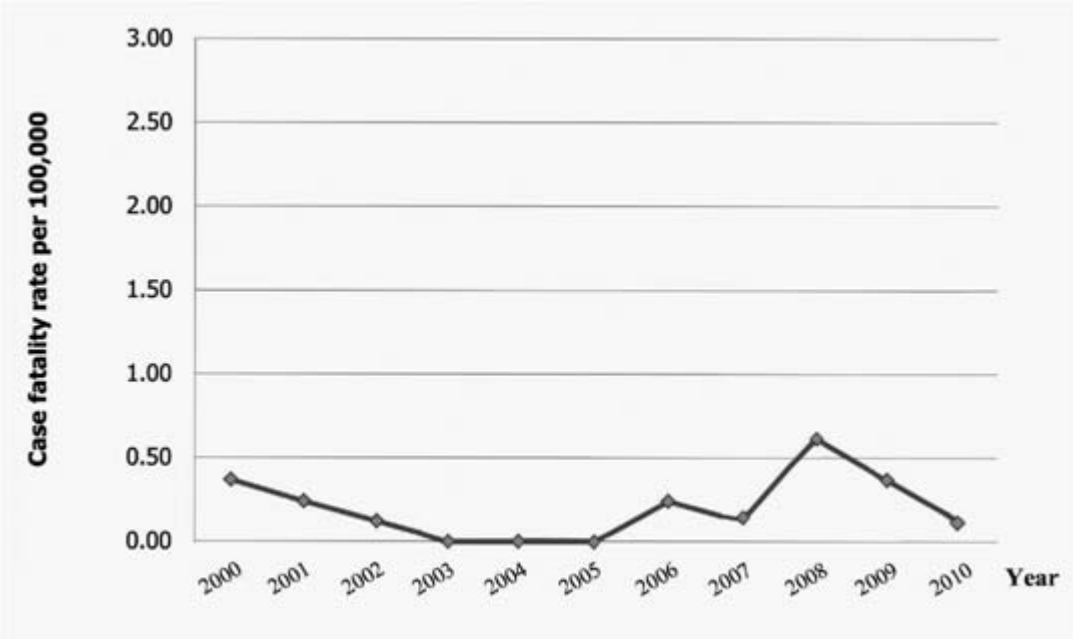

Figure 2. Cases fatality rate of dengue patients in Ratchaburi, Thailand during 2000–2010

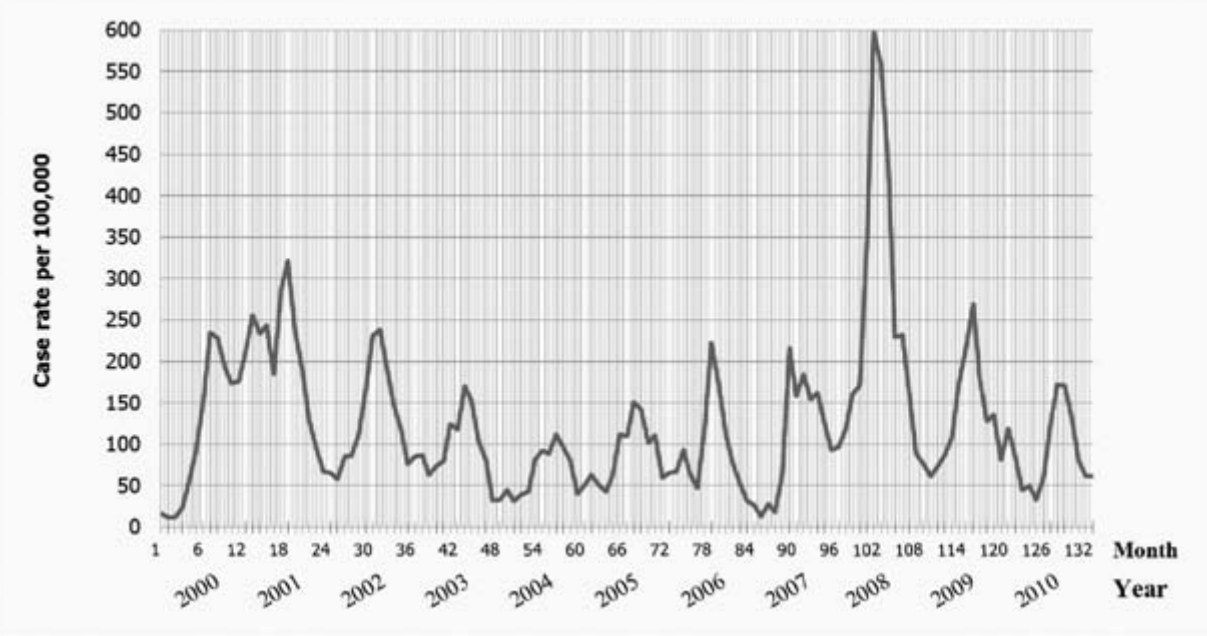

Figure 3. Seasonal distribution of dengue patients/100,000 population in Ratchaburi, Thailand during 2000–2010

Figure 4 shows the incidence by age group. Rates have constantly been high amongst children below 15 years old, with a trend of increasing mean age with time. Rates in older children and adults have increased dramatically during the last decade. The rates in children under and over 15 years in the other study during the last decade is shown in **Figure 5** [6].

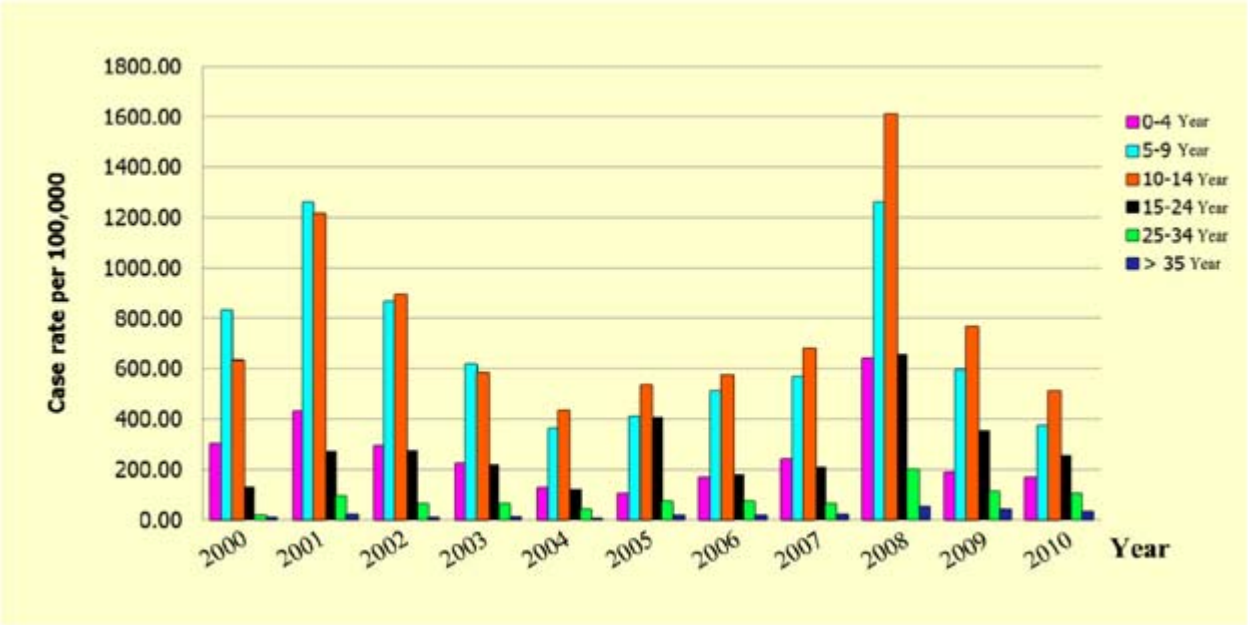

Figure 4. Reported cases of dengue patients/100,000 population by age group in Ratchaburi, Thailand during 2000–2010

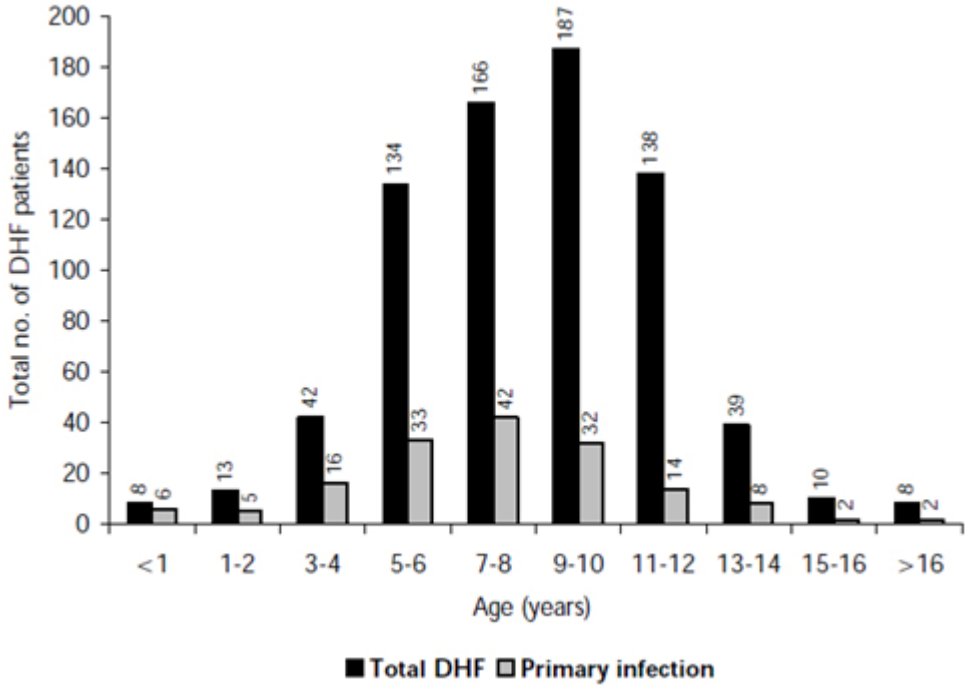

Figure 5. Age distribution of primary infection and total DHF patients in Thailand during 1988–2003 [6]

Discussion

Dengue epidemics are known to have occurred regularly during the past decades in Ratchaburi, Thailand, causing a heavy burden on the health system. The population growth together with the remarkable degree of urbanization has allowed dramatic expansion of the mosquitoes through an increase of urban breeding sites. This may explain the explosive growth in reported cases. A greater awareness and better reporting could have contributed to some of the increase over time. The reasons for the apparent upsurge in dengue are probably multifactorial. Feeding efficiency of *Aedes aegypti* vectors increases with increasing temperature [7, 8].

This may explain the increasing dengue patients during the dry hot season. Global warming may thus also contribute to greater spread of dengue infection [9]. The availability of water and higher humidity, including higher biting rates may augment the epidemic during the rainy period [10]. Weather patterns, with average temperatures and increases in rainfall, are classically seen as factors. Many others may influences the epidemiologic patterns of dengue beside climate, such as movements of mosquitoes, the type of circulating dengue viruses, environmental factors such as temperature and humidity and human behavior and development. Well-targeted operational, such as population-based epidemiological studies with clear operational objectives, are needed to make progress in control and prevention. Dengue remains predominantly a pediatric disease, but the trend towards higher rates in older children and adults during the last decade is incompletely understood, possibly it may be the result of less frequent epidemics in the last decades so that second exposure to dengue virus is postponed. Several studies in both Latin America and Southeast Asia have reported this age shift indicating an epidemiological change in dengue infection in those locations. The trend for increased incidence among adults has important implications for effective control and prevention, which involves demographic, economic, behavioral, and social factors [11]. Generally, the percentage of DHF in adults is lower than in children. Adults with DHF have a course similar to that in children. However, some studies have mentioned less severe plasma leakage in adult patients. Yet there are some countries where most deaths are seen in adults, which could be explained by the late recognition of the disease. In addition, comorbidities in adult patients such as peptic ulcers disease, pre-existing liver disease are more likely to be present in adults than in children and can aggravate the disease severity [12].

There is significant variance of clinical manifestations and severity of dengue in different age groups. Central nervous system manifestations are more common in infants, while DSS is less common in comparison with older children. Thus, proper management of dengue patients must take into account the different age-specific clinical manifestations and severity of dengue disease [13].

In the 1960s the case fatality rate was as high as 6%–8% and it has decreased with time [14]. The case fatality rate less than 1% throughout the period of study indicates early recognition and improved management of dengue patients in Ratchaburi. Prevention of dengue depends on the control of the mosquito vector by limiting its breeding places and treatment of stored water with larvicide. These measures against dengue are effective only with a high level of government commitment, education, and community participation [15]. Ultimately, an effective and long lasting vaccine is needed for further progress. The unique challenge of dengue is the need to provide protection against four antigenically-distinct serotypes of the virus, no vaccine is as yet licensed to protect against this disease. This is despite more than six decades of research. These data show that dengue patients are common in Ratchaburi, Thailand. The case fatality rate between 0–0.62% throughout the period of study and indicates early recognition and improved management of patients. The trend towards higher age in dengue patients during the past decade has important implications for control and prevention.

Better understanding of new paradigms for a changing dengue epidemiology will not only feed into operational policy for dengue control, but also provide fertile terrain for vaccine application strategies in the future. Epidemiological data of this kind will be both valuable for dengue vaccine efficacy trials and for consideration of age group to be vaccinated, which will lead to universal dengue vaccine implementation in the future.

Conclusion

These data show that dengue is common in Ratchaburi causing a heavy burden on the health system. The case fatality rate was between 0–0.62% throughout the period of study indicating early recognition and improved management of dengue patients. The trend towards higher age in dengue patients during the past decade is a problem of concern and need further clarification.

There is no conflict of interest to declare.

References

1. Hemungkorn M, Thisyakorn U, Thisyakorn C. Dengue infection: a growing global health threat. Biosci Trends. 2007; 1:90-6.
2. Guzman MG, Halstead SB, Artrob H, Buchy P, Farrar J, Gubler DJ, et al. Dengue: a continuing global threat. Nat Rev Microbiol. 2010; 8:S7-16.
3. World Health Organization, Regional office for

South-East Asia. Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever. Revised and expanded edition 2011. (SEARO Technical Publication Series No. 60).
4. Sabcharoen A, Lang J, Chanthavanich P, Yoksan S, Forrat R, Attanath P, et al. Safety and immunogenicity of a three dose regimen of two tetravalent live-attenuated dengue vaccines in five- to twelve-year-old Thai children. Pediatr Infect Dis J. 2004; 23: 99-109.
5. World health Organization. Dengue haemorrhagic fever: diagnosis, treatment and control. 2nd ed. WHO, Geneva. 1997.
6. Sriprom M, Pongsumpun P, Yoksan S, Barbazan P, Gonzalez JP, Tang IM. Dengue haemorrhagic fever in Thailand, 1988-2003: Primary or secondary infection. Dengue Bull. 2003; 27:39-45.
7. Watts DM, Burke DS, Harrison BA, Whitmire RE, Nisalak A. Effect of temperature on the vector efficiency of *Aedes aegypti* for dengue 2 virus. Am J trop Med Hyg. 1987; 36:143-52.
8. Kuno G. Review of the factors modulating dengue transmission. Epidemiol Rev. 1995; 17:321-35.
9. Patz JA, Epstein PR, Burke TA, Balbus JM. Global climate change and emerging infectious diseases. JAMA. 1996; 275:217-23.
10. Pant CP, Self LS. Vector ecology and bionomia. In Monograph on Dengue/Dengue Hemorrhagic fever, Regional Publication, SEARO No. 22, Compiled by Prasert Thongcharoen. Regional Office for South East Asia, New Delhi; 1993.
11. Guha-Sapir D, Schimmer B. Dengue fever: new paradigms for a changing epidemiology. Emerg Themes Epidemiol. 1999; 122:161-6.
12. Tantawichien T. Dengue fever and dengue haemorrhagic fever in adolescents and adults. Paediatr Int Child Health. 2012; 32:S22-7.
13. Panpitpat C, Panpitpat A, Hemungkorn M, Thisyakorn U. Dengue patients in different age groups. Asian Oceanian J Pediatr Child Health. 2007; 6:1-7.
14. Chareonsook O, Foy HM, Teeraratkul A, Silarug N. Changing epidemiology of dengue hemorrhagic fever in Thailand. Epidemiol Infect. 1999; 122:161- 6.
15. Rigau-Perez JG, Clark GG, Reiter P, Sanders EJ, Vorndam AV. Dengue and dengue haemorrhagic fever. Lancet. 1998; 352:971-7.