Strong correlation between rainfall and the prevalence of dengue in central region of Thailand in 2004

Viroj Wiwanitkit *MD*

Department of Laboratory Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand

Abstract

Dengue infection, one of the most important mosquito-borne viral diseases of humans, has been a significant problem in many tropical countries for decades. Surveys of disease prevalence are useful for prevention and control and have been continuously performed in Thailand. In this study, the correlation between the rainfall and the prevalence of dengue in a central region of Thailand, the highly endemic area, was investigated in 2004. The least square equation plot prevalence (Y) versus rainfall (X) was Y=17.5X+24.2 (r=0.88, p<0.05), which suggests that the prevalence of dengue in this area is significantly affected by rainfall. Increased surveillance and mosquito control in the studied area during the periods of high rainfall is recommended.

Keywords: Precipitation, vector-borne disease, dengue, rainfall, Thailand

Introduction

Dengue infection, one of the most important mosquito-borne viral diseases of humans, is now a significant problem in several tropical countries. DHF is characterized by fever, bleeding diathesis and a tendency to develop a potentially fatal shock syndrome (Udomsakdi 1973). Despite decades of control success and a competent network of country-wide health infrastructure, dengue remains an important health threat in rural Thailand (Thisyakorn and Thisyakorn 1994). The human infection is common in Southeast Asian countries, especially for Thailand. The surveys of the disease prevalence are useful for prevention and control of disease (Udomsakdi 1973; Thisyakorn and Thisyakorn 1994; Gratz 1993; Pancharoen et al 2002) and have been continuously performed in Thailand.

Establishing links between climate and disease is a good idea and this study has information of value. Recently, Goncalves Neto and Rebelo (2004) reported a positive correlation with the amount of rainfall and relative humidity. Similar results were also reported by other studied groups in the recent years (Guzman and Kouri 2003; Chakravarti and Kumaria 2005). The correlation between rainfall and infection rate of dengue is of interest. Here, the correlation between the rainfall and the prevalence of dengue in central region of Thailand, the highly endemic area, in year 2004 was investigated.

Methods

Dengue prevalence data (/1,000,000 population) for 2004 in a central region of Thailand were derived from the reported registry data on dengue of Ministry of Public Health (epid.moph.go.th). Rainfall data (average inches) in the studied area were derived from the Royal Irrigation Department, Thailand. The correlation between the rainfall and the prevalence of dengue was assessed by regression analysis. The least square equation plot prevalence (Y) versus rainfall (X) and the correlation coefficient (r) was calculated. All statistical analysis was performed using SPSS 10.0 for Windows.

Results and Discussion

The details of dengue prevalence in 22 provinces of a central region of Thailand and the average rainfall in each province is presented in Fig 1. In this study, the least square equation plot prevalence (Y) versus rainfall (X) is $Y = 17.5X + 24.2$ ($r = 0.88$, $p < 0.05$). The main aim of this retrospective study was to investigate the correlation between the rainfall and the prevalence of dengue. The work described the effect of rainfall on dengue prevalence, which is important because of the need to develop tools to forecast variations in disease incidence and the risk related to the impact of change in climate. A significant association can be shown in this study.

This study confirmed the effect of rainfall on the prevalence of dengue as reported by Goncalves Neto and Rebelo (2004), Guzman and Kouri (2003) and Chakravarti and Kumaria (2005). Indeed, there was a recent report on seasonal variation in dengue prevalence in Thailand, which indicated the peak prevalence in the rainy season when the rainfall is very high (Gratz 1993). According to this study, the prevalence of dengue infection in central region of Thailand may depend on rainfall. Indeed, the high rainfall is reported for its strong correlation with the spreading of the vector mosquitoes (Indaratna et al 1998).

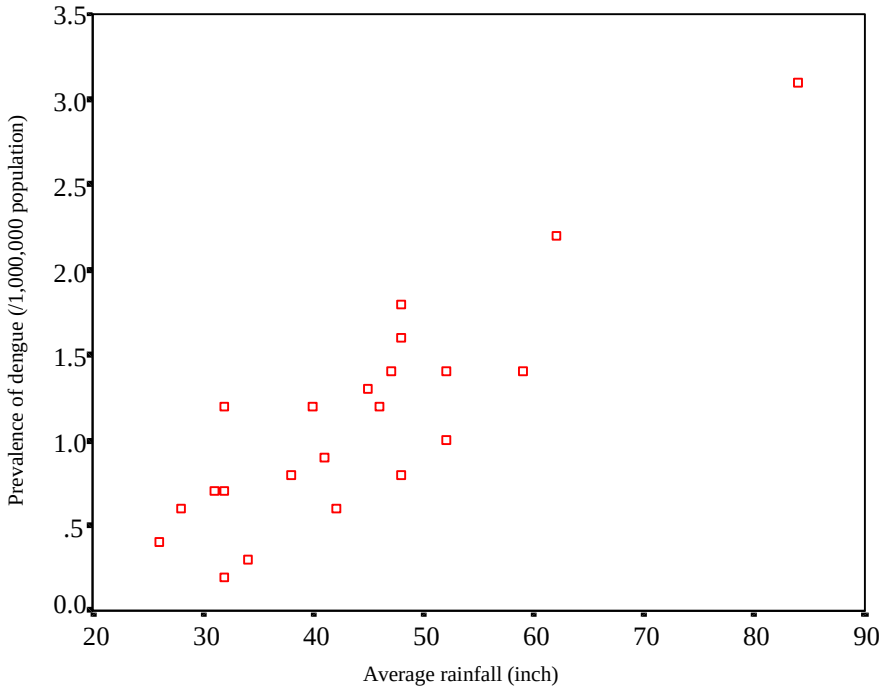

Figure 1. Scatter plot showing prevalence of dengue/1,000,000 population and average rainfall in the studied area in year 2004

Therefore, the surveillance and control of mosquitoes in the studied area during the period with high rainfall is recommended. However, it should take into account other confounding factors, that affect the transmission of dengue, including other seasonal factors like ambient temperature and humidity, before concluding that the increased prevalence is a result of rainfall alone (Goncalves Neto and Rebelo 2004). Further similar studies that include confounding factors are required to confirm this observation. Application of geographical information systems to co-analysis of disease and economic resources is also recommended (Paupy et al 2005).

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