The Application of Geographical Information System Technology to the Study of Aedes Albopictus (Skuse) Breeding Sites and Its Implication to Dengue Transmission (In Lundu District, Sarawak)

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Abstract

A study was carried out to elucidate the association of various risk factors with dengue cases reported in Lundu district, 1999, by analyzing the interaction between environmental, entomological, socio-demographic factors. The study used GIS technology on Aedes albopictus in the rural dengue transmission to achieve the goals. Seven villages were chosen based on the high number of dengue cases reported. A total of 551 households were surveyed. An overall description of the socio-demographic background and basic facilities was presented together with entomological and geographical profiles. Serological tests indicated that 23.7% of the 215 samples had experienced asymptomatic dengue infection. Two samples (0.9%) were confirmed by IgM positivity and 49 samples (22.8%) had IgG responses. A total of 32,838 Aedes eggs were collected in 56 days of trapping. The data collected were analyzed using SPSS version 10.01. To determine the association between variables and dengue cases reported, and to describe the differences between the two clusters of border and roadside villages, two sample t-test, and Pearson's Chi-Square were used. Accurate maps were produced with overlay and density function, which facilitates the map visualization and report generating phases. This study also highlights the use of differential Global Positioning System in mapping sites of 1 m accuracy. Analysis of the data revealed there are significant difference in clusters of villages attributable to container density, house density, distance of the house from the main road, and number of Ae. albopictus eggs from ovitraps set indoor, outdoor and in dumping sites (Person’s Chi-Square=6.111, df=1, p<0.01). Further analysis using t-test showed that house density, container density, indoor mosquitoes egg count, outdoor mosquitoes egg count, and dumping sites mosquitoes egg count were higher at the roadside villages compared to border villages. A number of potential risk factors including those generated from GIS was investigated. None of the factors investigated in this study were associated with the dengue cases.

Keywords: Dengue, Aedes albopictus, environmental risk factors, geographic information system

Introduction

Dengue fever (DF) and dengue haemorrhagic fever (DHF) are the most common arthropod-borne diseases worldwide with an increasing incidence in the tropical regions of Asia, Africa, and the Central and South America (Gubler and Clark 1955). In Asia, Ae.