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Research Article

Identifying the Sources of Dengue Infection and Prevention Practices at Household Level in Seremban District, Malaysia

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Abstract

Background and Objective: Dengue illness is one of the most relevant public health problems in Malaysia. The incidence of dengue infection in the country has increased steadily during the last decade Seremban is one of the highly affected districts by dengue in the country. This study aims to identify the sources of dengue infection in Seremban district, Malaysia. The study also reveals the prevention practices used by the households to protect themselves from dengue infection. **Materials and Methods:** Structured interviews were conducted at household level in order to obtain primary data for the study. A total of 120 patients with confirmed dengue illness were enrolled in the study. Purposive random sampling method was applied to select the samples. Descriptive statistics viz. summation, mean, standard deviation, percentage, maximum and minimum value and ratios were applied to analyze the data. **Results:** Majority (45.8%) of the study patients reported that they got dengue infection at park/garden while a significantly lower portion (2.5%) of the respondents claimed to be infected at tourist spots. The most frequently used prevention measure by the households to protect the family members from infection was found to be insecticides aerosol spray (54.16%) followed by mosquito coils, mats, etc. (49.16%). A greater portion of the households reported that they chose these prevention measures due to their high effectiveness (46.67%) and convenient to use (42%). **Conclusion:** The findings of the study provide a detailed knowledge or insight about the sources of dengue infection and prevention measures used by the households in the district which might assist policy-makers in implementing more effective control strategies for the disease at district as well as national level.

Key words: Dengue, infection, preventive measures, mosquito, insecticide

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Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Dengue is a mosquito-borne viral infection. It has become an important public health concern all over the world since 1950s^{1,2}. Particularly, the disease is growing most rapidly in tropical and subtropical countries, where majority of the world's population resides^{3,4}. Compared with 9 reporting countries in the 1950s, today the geographic distribution of the disease includes more than 100 countries worldwide⁵. The disease is particularly suited to urban and semi-urban environments and people from all income levels (e.g., rich and poor) within the endemic regions suffer from morbidity and mortality of the disease. However, the incidence of dengue has increased by 30 fold⁶⁻⁹, parallel with the increasing geographic expansion from urban to rural areas during the past 50 years¹⁰⁻¹³. There are many factors that have created the ideal conditions for this expansion, especially in low and middle-income countries of the world. The high transmission of the virus is associated with high rates of population growth, unorganized urbanization and the proliferation of slums, crowding, poor water, sewer and waste management systems^{14,15}. The other factors include global warming, rise in global commerce and tourism, changes in public health policy, decreasing resources for vector prevention and control and the development of hyper-endemicity^{16,17}. Among the above mentioned factors, urbanization and globalization are, no doubt, the ones at the root of the problem¹⁸. In recent years, dengue hemorrhagic fever has become a leading cause of hospitalization and death among children in most of the Asian countries¹⁹. The disease imposes sizeable economic burden at household level in the endemic regions.

Dengue illness is one of the most relevant public health problems in Malaysia^{17,20}. The incidence of dengue fever and dengue hemorrhagic fever in the country has increased steadily during the last decade²¹. The warm and humid tropical climate of the country is favourable for the *Aedes* mosquitoes to breed and survive²²⁻²⁴. Moreover, rapid industrialization and economic growth have resulted in massive infrastructure development and improper solid-waste disposal which provide fertile grounds for *Aedes* breeding and the rise of dengue transmission in the country²². The dengue incidence is prevalent throughout the country with the highest incidence among the most developed and densely populated territories and states²⁴. The disease is predominant in urban areas where majority of the country's total population resides. Seremban is one of the highly affected districts by dengue infections in Malaysia. The district is the greatest contributor to dengue infections in the state of Negeri Sembilan²⁵. However, there is lack of research in the assessment of disease burden of dengue in the district.

This study aims to identify the sources of dengue infection in Seremban district, Malaysia. The study also reveals the prevention practices used by the households to protect themselves from dengue infection. This study is the first attempt that focuses on the disease burden of dengue at household level in the district.

MATERIALS AND METHODS

Seremban is one of the 7 districts of Negeri Sembilan state in Malaysia. It is the capital of the state and occupies an area of 950.53 km⁻² of land. It is the 16th most populated city in Malaysia with total population of 555,935²⁶. The population of the district comprises several ethnic groups' viz. Malays and Bumiputeras (52%), Chinese (24%), Indians (16%) and others (8%)²⁶. The district has a number of public and private health care facilities. There are 5 hospitals of which 1 is government and 4 are private. In addition, there are 11 public health centers serving various zones of the district. Seremban is one of the most affected districts by dengue infections in Malaysia²⁵. The disease is a major cause of morbidity in the district.

Structured interviews were conducted at household level in order to obtain primary data for the study. Primary data included socio-demographic information of the dengue patients and their households, duration of illness, sources of dengue infection and prevention practices by the households. The data were collected through interviewing a total of 120 dengue patients registered at the Tuanku Ja'afar Hospital (formerly known as Seremban General Hospital) in Seremban. Purposive random sampling method was applied to select the samples. The study selected, randomly laboratory-confirmed dengue patients without any previous knowledge of the socio-economic and ethnicity status of the patient. Selected patients or legal guardians (if the patient was a child) were contacted primarily via home visits but the telephone was used when available and asked to participate in a face to face interview. All the respondents were interviewed once in person, either at the respondent's house or at work. The survey was conducted from November, 2010-February, 2011.

Ethical considerations: The study was approved the Medical Research Ethics Committee (MREC), Ministry of Health, Malaysia (MREC Code No. NMRR-11-730-9099). The study did not provide any financial or other incentives to the respondents or their families to participate in the survey.

Statistical analysis: Descriptive statistics viz. summation, mean, standard deviation, percentage, maximum and minimum value and ratios were applied to analyze the data.

RESULTS AND DISCUSSIONS

Demographic characteristics of the respondents: Table 1 describes the demographic characteristics of the interviewed dengue patients. Table 1 shows that nearly two third of the study patients were male. More than half of the dengue episodes occurred among the married persons. The predominance of urban incidence of dengue was observed among the respondents while a minority of the patients came from rural households. The findings showed that while all ethnic groups were infected by the disease, the majority of the study patients were among the Malays, followed by the Chinese and Indians. It was also found that more than two thirds of the surveyed households were living in terraced houses and the rest living in other types of houses such as semi-detached houses, apartment buildings, Bungalow/detached houses and traditional Malay houses.

Educational status: Figure 1 depicts the educational status of the study patients. It was found that a minority of the respondents had no formal schooling. Similarly, a significantly lower portion of the participants received or were receiving primary education. It can be noticed that, collectively

two-third of the total respondents completed lower secondary school and SPM/ O-Level. However, the proportion of the participants having A-Level, certificate/diploma or graduation was found to be low.

The present study revealed that majority of the study participants completed PMR/lower secondary school and SPM/O-Level. Another study on dengue in Seremban district reported that majority of the respondents had received secondary education²⁷. The multicounty study by Suaya *et al.*,¹¹ found that a greater portion (59%) of the study patients in Malaysia completed secondary school. Similar findings regarding educational status of dengue patients were obtained in Can Tho province, Vietnam²⁸. The authors reported that two-third, on a collective basis, of the respondents had received elementary and secondary education. Similarly, the study in Kampong Cham province, Cambodia figured out that majority of the respondents completed high school²⁹. These findings demonstrate that dengue cases tend to occur less often in households with a high educational status.

Income distribution: Figure 2 shows the distribution of monthly income of households of the respondents. The findings revealed that there were no surveyed households whose monthly income was below MYR800 (US\$254). It can be seen that the monthly income of majority of the participating families was within the level of

Table 1: Demographic characteristics of the respondents

Characteristics	(n = 120)	(%)
Gender		
Male	79	65.8
Female	41	34.2
Marital status		
Single	53	44
Married	67	56
Status of pregnancy for female patient	8	7
Residential status		
Urban	118	98
Rural	2	2
Ethnicity		
Malay	60	50
Chinese	35	29
Indian	25	21
Housing status		
Terraced house	93	77.5
Semi-detached house	8	6.7
Apartment building	6	5.0
Bungalow/ detached house	5	4.2
Condominium building	1	0.8
Traditional Malay house	6	5.0
Others	1	0.8

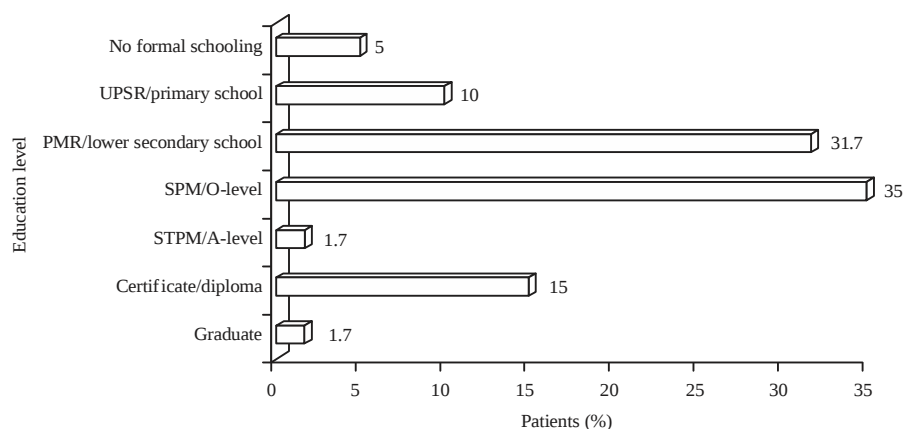


Fig. 1: Educational attainment of the study patients

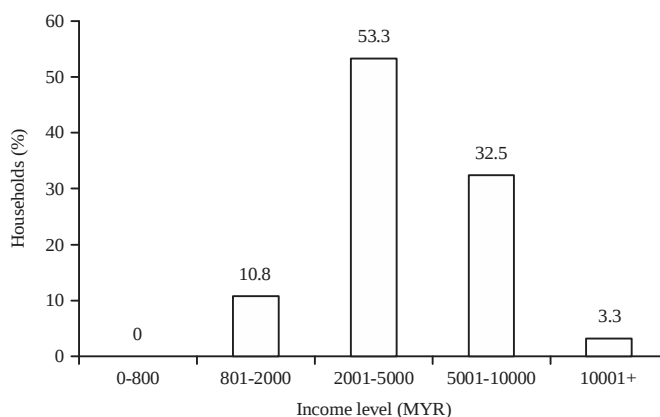


Fig. 2: Income distribution of the respondents' households¹

¹Government in Malaysia has determined the poverty line income (PLI) at MYR800. Therefore, the first range of income distribution of the respondents' households for this study has been determined at MYR 0- 800 to include the people whose monthly earnings are within the PLI of the country. The subsequent ranges i.e., MYR801-2000, MYR2001-5000, MYR5001-10,000 and MYR10,001 and above have been determined to represent the lower income, lower middle income, higher middle income and higher income people

MYR2001-5000 (US\$637-1590). Approximately one-third of the households earned MYR5001-10000(US\$1591-3180) per month. And the proportion of the surveyed households generating above MYR10000 (US\$3181) per month was found to be low.

Findings of this study reveal that the income per month of majority of the surveyed households (MYR 2001-5000 or US\$ 637-1590) was above the poverty line income (PLI) (MYR 800) in Malaysia³⁰. The study in Kampong Cham Province, Cambodia reported that half of the surveyed households were found to be very poor²⁹. In Singapore, a study was performed to examine the association between socio-economic variables and dengue incidence³¹. The study revealed that areas with a high proportion of socio-economically disadvantaged residents had also a higher DF and DHF incidence.

Sources of dengue infection among the respondents:

Figure 3 shows the distribution of potential sources from here the study patients contracted dengue. Individual source of infection ranged from educational institutions, tourists spots, parks/gardens, offices/working places, friends/relatives house to own house. It was found that majority (45.8%) of the study participants claimed that they got dengue infection at park/garden which is a great reservoir of mosquitoes. More than one-fifth (21.7%) of the respondents claimed that they were affected by the disease from their own houses. A total of 15% of the study patients mentioned that they contracted dengue fever at their offices/working places. The proportion of the respondents who claimed educational institution (school/college/university) as the source of their dengue illness is 7.5% while the equal percent of the patients reported to be infected by the disease at their

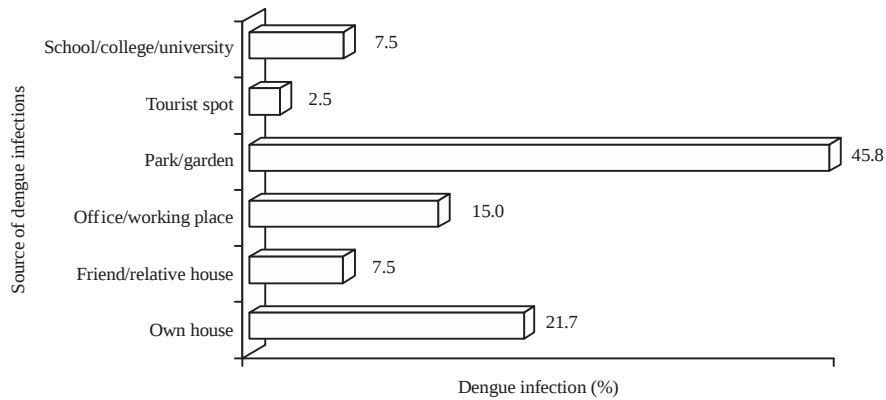


Fig. 3: Sources of dengue infection among the respondents

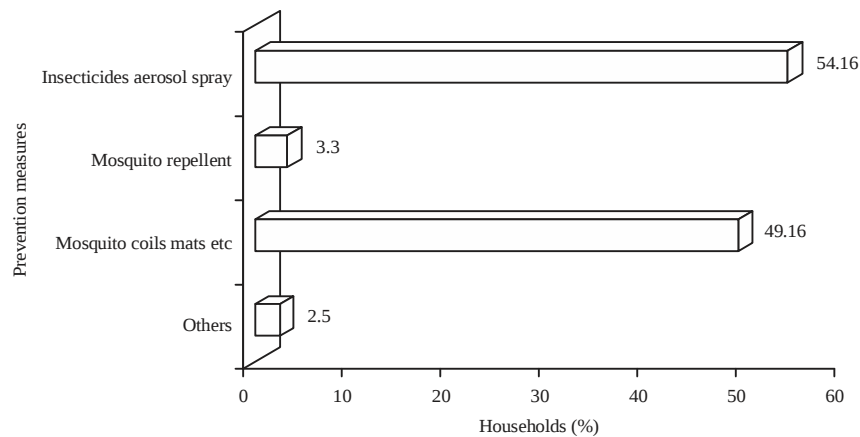


Fig. 4: Prevention measures for dengue by the study households

friend/relative houses. However, a significantly lower portion (2.5%) of the study participants found to get dengue fever at tourist spots.

Prevention practices for mosquito control at the household level: Figure 4 highlights the prevention practices by the study households to control mosquito infection. It can be seen that households used a wide range of prevention measures to protect themselves from mosquito bites. It was also mentionable that many of the study households used more than one prevention measures at a time. The findings showed that more than half (54.16%) of families used insecticides aerosol spray to kill the mosquitoes. And approximately half (49.16%) of the households made regular use of mosquito coils, mats, etc. to protect their family members from infection. However, mosquito repellent was found to be practiced among only 3.3% of the households participated in the study and a substantially lower portion (2.5%) of the participating

households applied other prevention measures such as electric bats to kill mosquitoes.

Reasons for choosing the prevention measures by the study households: The present study also focused on the reasons for choosing the prevention measures by the study households for mosquito control (Fig. 5). It is important to note that many of the households mentioned more than one reasons for choosing the prevention measures during their interviews. It was found that 46.67% of the participating households chose the prevention measures due to their high effectiveness. Approximately 42% of the study families applied the prevention measures as they were convenient to use. And a total of 16.67% of the respondent households chose the prevention measure because they were less expensive. However, a lower portion (4.16%) of the families reported that they used their chosen prevention measure due to its availability.

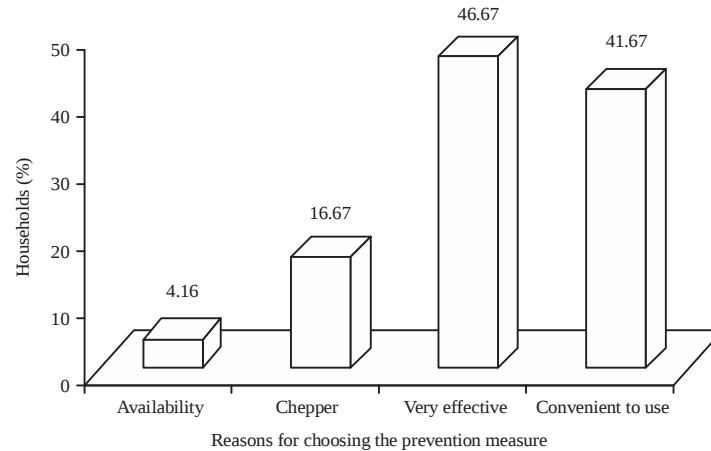


Fig. 5: Reasons for choosing prevention measures for dengue by the study households

CONCLUSION AND FUTURE RECOMMENDATIONS

This study identified the sources of dengue infection and prevention practices used by households in Seremban, Malaysia. Findings showed that sources of infection ranged from educational institution, tourist spot, park/garden, office/working place, friend/ relative house to own house of the respondents. The study also found that households used a wide range of prevention measures to protect themselves from mosquito bites. The findings of the study might assist policy-makers in implementing more effective control strategies for the disease at district as well as national level. Moreover, the knowledge about sources of dengue infection would increase awareness among people in the community for preventing dengue infection. However, this study did not focus on pain, suffering, anxiety and the psychosocial consequences associated with dengue illness. Thus, future research can be conducted to address these issues.

SIGNIFICANCE STATEMENTS

This study discovers the sources of dengue infection and prevention measures used by the households in Seremban District, Malaysia which can be beneficial to community as well as policy-makers in implementing more effective control strategies for the disease at district and national level. This study will help the researchers to uncover the parameters that contributes to disease burden of dengue that many researchers were not able to explore.

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