

FACTORS ASSOCIATED WITH DENGUE KNOWLEDGE OF SIGNS AND SYMPTOMS, AND TREATMENT-SEEKING BEHAVIOR AMONG COMMUNITY IN A DENGUE HOTSPOT AREA IN MALAYSIA

Nur Fatini H.¹, Mangantig E.², Soon L.K.^{1*}

¹School of Health Sciences, Health Campus, University Sains Malaysia

²Regenerative Medicine Cluster, Advanced Medical and Dental Institute, Universiti Sains Malaysia

**Corresponding author: Soon Lean Keng, School of Health Sciences, Health Campus, Universiti Sains Malaysia
Email: soonlk@usm.my*

ABSTRACT

Background: Dengue is a major public health problem in Malaysia. Dengue cases continue to increase yearly despite numerous dengue awareness campaigns. Community's level of knowledge regarding dengue and health-seeking behavior is essential for developing an intervention for future treatment and preventative strategies. Therefore, this study aims to determine the knowledge related to dengue signs and symptoms, and treatment-seeking behavior among community living in a hotspot endemic dengue area. This study also identifies factors associated with knowledge of dengue signs and symptoms and treatment-seeking behavior.

Materials and Methods: A cross-sectional study was conducted in Kubang Kerian, a dengue hotspot area in Kelantan. Self-administered questionnaires were distributed to 218 participants. Multiple linear regression analysis was used to identify factors associated with knowledge of dengue signs and symptoms and treatment-seeking behavior.

Results: Factors associated with knowledge of dengue signs and symptoms are education level, dengue fever experience, and awareness of dengue public campaign. For treatment-seeking behavior, associated factors are monthly income and history of hospitalization for dengue treatment.

Conclusion: Early recognition of dengue signs and symptoms are important for prompt treatment to reduce complications and mortality. Delays in getting proper treatment could result in a fatality. Hence, dengue prevention awareness or educational campaigns must also stress the importance of seeking treatment promptly. Such campaigns should target community with lower socio-economic status to enrich their knowledge.

Keywords: Dengue, knowledge, treatment-seeking behavior, Malaysia

1.0 Introduction

Dengue is a mosquito-borne infection transmitted by *Aedes aegypti* mosquitoes. In Malaysia, dengue has become a major public health problem (Haliza & Eva Nabiha, 2015). Dengue cases in Malaysia follow an upward trend. There were 181 dengue cases per 100,000 populations in 2007, which was a fourfold increase since the year 2000 (Farnaza *et al.*, 2014). Due to the absence of vaccine or effective antiviral for dengue, the only effective measure to prevent and control dengue is by preventing transmission of the disease by *Aedes* mosquito. Control measures require support, cooperation and participation by the community. Strategies to reduce the proliferation of mosquitoes includes an introduction of dengue education, awareness campaign and insecticide fogging activities especially in an endemic area (Dickin *et al.*, 2014). However, the effort to reduce dengue infection should not only depend on workers in health agencies but needs community involvement. For instance, putting away mosquitos' breeding sources such as used plastic containers, discarded tires, and flower vases filled with water (Dickin *et al.*, 2014).

In developing countries, high human population density and poor water practice contribute most to dengue endemic (Jeelani *et al.*, 2015). Among other contributing factors were societal changes such as population growth, urbanization, poor hygiene, no awareness, and less efficient vector control such as putting away household rubbish. Tropical countries have a higher susceptibility to dengue endemic due to factors such as greater number of rainy days, more rainfall, higher relative humidity and warmer temperature that contributes to a suitable condition for mosquitos breeding (Suwanbamrug *et al.*, 2013).

In Malaysia, all states were affected with dengue in which most cases were reported in urban areas with high population density. The number of dengue cases increased yearly despite vigorous insecticide fogging campaigns conducted by local authorities with the support of Ministry of Health, national and state level to control *Aedes* mosquitos in urban, semi-urban, and rural areas (Malaysian Ministry of Health, 2010). According to Borneo Post (2014), Kelantan is one of the states in Malaysia with the highest percentage of dengue cases.

Previous studies have reported that community's level of knowledge regarding dengue and health-seeking behavior were significant predictors for developing an intervention for future treatment and preventative strategies (Wong & Sazaly, 2013; Wong *et al.*, 2014). Ability to recognize signs and symptoms of dengue including its warning signs is important to prevent life-threatening complications. Therefore, this study aims to determine the knowledge related to dengue signs and symptoms, and treatment-seeking behavior among community living in a hotspot endemic dengue area in Kelantan, a state in the east coast of peninsular Malaysia. Also, factors associated with dengue knowledge of signs and symptoms and treatment-seeking behavior were identified.

2.0 Materials and Methods

A cross-sectional study was conducted in Kubang Kerian, Kelantan, which is one of the ten localities with dengue outbreak in Kota Bharu district. Data collection was performed from December 2015 to February 2016. Samples in this study were randomly selected from

households in Kubang Kerian. Each house in the area was assigned a number. Then, using a computer-generated random numbers, this allows selection of the houses randomly. Eligibility for inclusion in the study includes residing in Kubang Kerian area, head of the selected houses (husband or wife), aged 18 years or older, literate in Bahasa Malaysia or English, and willing to participate in the study. Individuals with mental illness were excluded from the study.

The calculated sample size required for this study was 218 participants. Several parameters were used for sample size calculation, and the highest estimated sample size was chosen to maximize the required sample size. A simple mean formula, $n = (1.96 \times \sigma / \Delta)^2$ was used to calculate the selected sample size, with standard deviation (σ) of 3.57 and effect size (Δ) of 0.5 referred from Haliza and Eva Nabiha (2015). A 10% dropout rate ($n_{calculated} / 1 - dropout\ rate$) was considered in the sample size calculation to anticipate participants who will not respond to the distributed questionnaires.

The instrument used in this study was a self-administered questionnaire, comprised of three parts. Part I consists of questions related to socio-demographic and general questions about dengue fever experience, part II related to knowledge regarding signs and symptoms of dengue fever, and part III related to treatment-seeking behavior in case of dengue emergency. The socio-demographic questions include age, gender, ethnicity, marital status, educational status, household monthly income, respondent's dengue fever experience, history of household member's dengue fever experience, history of hospitalization for dengue fever treatment, and awareness of dengue public campaign in Kubang Kerian. Part II of the questionnaire consists of 15 questions related to knowledge of dengue signs and symptoms, assessed using a dichotomous response of 'Yes' or 'No'. A score of 1 was given for correct answer and 0 for the wrong answer. The right answers were then summed to obtain the total knowledge score, with higher score indicates higher knowledge. Part III of the questionnaire contains a scenario where the respondent suddenly becomes restless and lethargic due to dengue fever and required to give a response of 'Yes' or 'No' to six actions in case of dengue emergency. A score of 1 was given for 'Yes' and 0 for 'No' response. The score was summed to obtain the total behavior score, with higher score indicates better treatment-seeking behavior. Both part II and III of the questionnaire were adapted from Farnaza *et al.* (2014). The original English language questionnaire was translated into Bahasa Malaysia, and its validity and reliability were assessed in a pilot study of 30 samples conducted in another district in Kelantan. The Cronbach's alpha values of part II and III translated questionnaire were 0.811 and 0.819, respectively, which suggests good instrument reliability.

Ethical approval was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia. After randomly selecting the households, potential participants were approached individually. The purpose of the study was explained and written informed consent was obtained from the participants before administering the questionnaires.

Data analyses were performed using R statistical software. Descriptive analyses were performed, and the mean and its standard deviation were reported for numerical variables. For categorical variables, the frequency and its percentage were reported. Normality distributions were checked for numerical variables. Linear regression analyses were performed to determine the factors associated with knowledge score and treatment-seeking behavior score. The level of significance was set at $P\text{-value} < 0.05$.

3.0 Results

3.1 Participants' demographic characteristics

Table 1 summarizes the demographic characteristics of 218 study participants. The mean age of the participants was 37.1 (12.7) years old, ranged from 21 to 78 years old. The majority were females (53.2%), Malay ethnicity (81.7%), married (89.4%), and had university education level (45.4%). The mean household monthly income was Ringgit Malaysia (RM) 3077.70 (2276.50), ranged from 500.00 to 20,000.00.

Table 1: Participants' demographic characteristics (n=218)

Variables	Mean (SD)	n (%)
Age	37.1 (12.7)	-
Gender	-	-
Male		102 (46.8)
Female		116 (53.2)
Ethnicity	-	-
Malay		178 (81.7)
Non-Malay		40 (18.3)
Marital status	-	-
Married		195 (89.4)
Widowed/divorced		23 (10.6)
Highest educational level	-	-
Primary school		21 (9.6)
Secondary school		58 (26.6)
College		40 (18.3)
University		99 (45.4)
Household monthly income (RM)	3077.7 (2276.5)	-

3.2 General questions about dengue fever experience among participants

Table 2 shows the responses to general questions about dengue experience. The answers to all questions were a dichotomous answer of 'Yes' or 'No'. Only small percentages of the participants in this study had dengue fever experience (12.4%), had a history of a household member with dengue fever (28%), and had been hospitalized for dengue fever treatment (10.1%). The majority (42.2%) of them had an awareness of dengue public campaign.

Table 2: General questions about dengue fever experience (n=218)

Variables	n (%)
Dengue fever experience	
Yes	27 (12.4)
No	191 (87.6)
History of household member's dengue fever experience	
Yes	61 (28.0)
No	157 (72.0)
History of hospitalization for dengue fever treatment	
Yes	22 (10.1)
No	196 (89.9)
Awareness of dengue public campaign	
Yes	92 (42.2)
No	48 (22.2)
Unsure	78 (35.8)

3.3 Knowledge score of dengue signs and symptoms

The participants' mean knowledge score of dengue signs and symptoms was 9.6 (2.9). The minimum and maximum scores were 0 and 15, respectively. Table 3 shows the responses to each question related to knowledge of dengue signs and symptoms. It is encouraging that 89.9% were aware of high fever as common symptoms of dengue, and 68.3% recognized bleeding manifestation as one of the more severe signs of dengue.

Table 3: Knowledge of dengue signs and symptoms (n=218)

Sign and symptoms of dengue	Yes n (%)	No n (%)
High fever is a symptom of dengue fever	196 (89.9)	21 (9.6)
A severe headache is a symptom of dengue fever	183 (83.9)	35 (16.1)
Eye pain is a symptom of dengue fever	146 (67.0)	72 (33.0)
Joint pain is a symptom of dengue fever	169 (77.5)	49 (22.5)
Muscle pain is common in dengue fever	142 (65.1)	76 (34.9)
Low back pain is common in dengue fever	94 (43.1)	124 (56.9)
Petechial rash is common in dengue fever	139 (63.8)	79 (36.2)
Swollen gland is common presentation of dengue	106 (48.6)	112 (51.4)
Abdominal pain is a warning sign in dengue fever	98 (45.0)	120 (55.0)
Bleeding tendencies is a warning sign in dengue fever	149 (68.3)	69 (31.7)
Restlessness is a warning sign of dengue fever	120 (55.0)	98 (45.0)
Pale or cold to touch is a warning sign of dengue fever	109 (50.0)	109 (50.0)
Respiratory disturbances is a warning sign of dengue fever	127 (58.3)	91 (41.7)
Circulatory disturbances is a warning sign of dengue fever	141 (64.7)	77 (35.3)
Frequent vomiting is a warning sign of dengue fever	167 (76.6)	51 (23.4)

3.4 Treatment-seeking behavior score

The participants' median treatment-seeking behavior score was 2, with the range of 1 to 6. The scores distribution was skewed, hence median reported. Table 4 shows participants' treatment-seeking behavior in case of dengue emergency. In a scenario where respondents become restless and lethargic, a majority (70.6%) of the respondents would go to the nearest hospital immediately. Worryingly, only half of the respondents would take antipyretic while waiting for improvement and about 30% would wait for a few hours to see whether symptoms improve.

Table 4: Treatment-seeking behavior in case of dengue emergency (n=217)

Scenario	Action	Yes n (%)	No n (%)
You suddenly become restless and lethargic. What would you do?	Bring self to the nearest hospital immediately	154 (70.6)	64 (29.4)
	Bring self to a general practitioner closest to your house	73 (33.5)	145 (66.5)
	Phone the ambulance	24 (11.0)	194 (89.0)
	Wait for a few hours to see whether symptoms improve	67 (30.7)	151 (69.3)
	Take antipyretics e.g. Panadol and wait to see symptoms improve	109 (50)	109 (50)
	Take natural treatments/remedies options immediately for dengue	24 (11.0)	194 (89.0)

3.5 Factors associated with knowledge score of dengue signs and symptoms

The association of 10 predictors with knowledge score of dengue signs and symptoms were explored using linear regression as shown in Table 5. At univariable analysis, five predictors were significantly associated with knowledge score: age (P -value=0.02), education level (P -value= 1.5×10^{-5}), monthly income (P -value=0.01), dengue fever experience (P -value= 5.5×10^{-5}), and no awareness of public campaign (P -value=0.02). These predictors were included in the multivariable analysis, and only three remained significant: education level (P -value=0.02), dengue fever experience (P -value= 1.06×10^{-3}), and no awareness of public campaign (P -value=0.03). History of hospitalization for dengue treatment showed borderline significance in the univariable analysis but was not included in the multivariable analysis as it was highly significantly correlated with dengue fever experience (correlation=0.89, P -value= 2.2×10^{-3}).

Table 5: Factors associated with knowledge score of dengue signs and symptoms (n=218)

Factors	Simple linear regression		Multiple linear regression*	
	Coefficient	P-value	Coefficient	P-value
Age (years)	-0.04	0.02	-0.01	0.68
Gender				
Female	-	-	-	-
Male	-0.38	0.34	-	-
Ethnicity				
Malay	-	-	-	-
Non-Malay	-0.11	0.84	-	-
Marital status				
Married	-	-	-	-
Widowed/divorced	-0.80	0.22	-	-
Education level				
Higher education	-	-	-	-
Lower education	-1.77	1.47×10^{-5}	-1.13	0.02
Monthly income (RM)	0.24	0.01	0.01	0.15
Dengue fever experience				
Yes	-	-	-	-
No	2.42	5.55×10^{-5}	1.94	1.06×10^{-3}
History of household member's fever experience				
Yes	-	-	-	-
No	0.28	0.54	-	-
History of hospitalization for dengue treatment				
Yes	-	-	-	-
No	0.48	0.09	-	-
Awareness of public campaign				
Yes	-	-	-	-
No	-1.20	0.02	-1.06	0.03
Unsure	-0.57	0.21	-0.50	0.21

*Assumptions for linearity of residuals and homogeneity of variances assumed.

3.6 Factors associated with treatment-seeking behavior score

Table 6 shows the association of 11 predictors with log treatment-seeking behavior score using linear regression. The behavior score was log-transformed in the analysis as the normality assumption for the residuals was not fulfilled. Of the 11 predictors, only four shows borderline significance at univariate analysis: monthly income (P -value=0.06), dengue experience (P -value=0.09), history of hospitalization (P -value=0.07), and knowledge score of dengue signs and symptoms (P -value=0.09). For multivariable analysis, only monthly income and history of hospitalization were included in the model, in which both show significant association with log behavior score (P -value=0.04 for both predictors). As dengue fever experience and history of hospitalization were significantly correlated (P -value= 2.2×10^{-3}), only one of the predictor with the smallest P -value were included in the multivariable model to avoid collinearity problem. Knowledge score of dengue signs and symptoms was also not included in the multivariable model as it shows some correlation with log behavior score (correlation=0.12, P -value=0.09).

Table 6: Factors associated with log treatment-seeking behavior score (n=217)

Factors	Simple linear regression		Multiple linear regression*	
	Coefficient	P-value	Coefficient	P-value
Age (years)	0.002	0.46	-	-
Gender				
Female	-	-	-	-
Male	0.08	0.31	-	-
Ethnicity				
Malay	-	-	-	-
Non-Malay	-0.04	0.68	-	-
Marital status				
Married	-	-	-	-
Widowed/divorced	0.18	0.14	-	-
Education level				
Higher education	-	-	-	-
Lower education	0.04	0.60	-	-
Monthly income (MYR)	-0.001	0.06	-0.003	0.04
Dengue fever experience				
Yes	-	-	-	-
No	0.19	0.09	-	-
History of household member's fever experience				
Yes	-	-	-	-
No	-0.04	0.62	-	-
History of hospitalization for dengue treatment				
Yes	-	-	-	-
No	0.23	0.07	0.25	0.04
Awareness of public campaign				
Yes	-	-	-	-
No	-0.04	0.71	-	-
Unsure	-0.03	0.70	-	-

Knowledge score of dengue signs and symptoms	0.02	0.09	-	-
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*Assumptions for linearity of residuals and homogeneity of variances assumed.

4.0 Discussion

This study assessed the knowledge of dengue signs and symptoms and treatment-seeking behavior in case of dengue emergency among community living in a dengue hotspot area in Kelantan. Then, factors associated with the knowledge score and behavior score were determined.

Factors related to knowledge score in this study are education level, dengue fever experience, and awareness of dengue public campaign. Those with lower education level associated with lower knowledge score compared to those with higher education level. Education level has frequently been reported to influence individual's knowledge of dengue (Itrat *et al.*, 2008; Nahida, 2009). Thus, the target of awareness campaigns should prioritize community with lower education status, especially to community living in rural areas.

Several studies had reported the association of dengue experience with better knowledge of dengue due to exposure from experience (Itrat *et al.*, 2008; Wong *et al.*, 2015). However, this study found an association between having no dengue fever experience and higher knowledge score compared to those with dengue experience. This is probably due to participants in this study lived in an area close to the hospital, where information related to dengue is readily available.

This study found that individual without awareness of public campaign related to dengue has lower knowledge compared to those with awareness. It shows the importance of health education to the public and highlights the need for continuous awareness campaigns. Furthermore, the previous study has demonstrated better knowledge of dengue and dengue prevention as one of the predictors of better practices of dengue prevention (Begonia & Leodoro, 2013).

Factors associated with log treatment-seeking behavior score are monthly income and history of hospitalization. Lower income was associated with lower log behavior score. For individuals with lower economic status, seeking prompt treatment may not be their priority due to various reasons such as having no means of transportation to the hospital or not having an adequate budget for treatment expenses. Poor socioeconomic status has been associated with lower knowledge of dengue (Guha-Sapir & Schimmer, 2005) and poor dengue preventive behaviors (Chanyasanha *et al.*, 2015).

Those without a history of hospitalization for dengue treatment were associated with higher log behavior score compared to those with the history of hospitalization. In this study, history of hospitalization was highly correlated with dengue fever experience. Therefore, it is presumed that individuals who have never had dengue and never been hospitalized due to dengue in this study are more aware of the danger of dengue, hence are more likely to have a better practice towards dengue prevention and treatment-seeking behavior. The majority of the participants in this study were educated and lived close to a hospital, which may contribute to being more aware of getting treatment when ill.

The strength of this study is that it was conducted in a community with frequent dengue outbreaks. As dengue public awareness campaigns have been carried out in the area from time to time, it was possible to assess its effect on the knowledge related to dengue and treatment-seeking behavior among participants in this study. However, this study is limited to only one area with dengue outbreaks in Kota Bharu district. Several factors may affect the participants' knowledge and treatment-seeking behavior. First, living very close to Hospital Universiti Sains Malaysia in Kubang Kerian provides access to health care facilities and vast information regarding dengue. Second, many fogging activities in the area may have reduced risk of dengue infection among the participants. Hence, results in this study may not be entirely generalizable to other regions in Malaysia.

5.0 Conclusion and recommendation

Study findings identified education level, dengue fever experience, and awareness of public campaigns as factors associated with knowledge of dengue signs and symptoms, whereas monthly income and history of hospitalization for dengue treatment associated with treatment-seeking behavior. Early recognition of dengue signs and symptoms are important for prompt treatment to reduce complications and mortality. Delays in getting proper treatment could result in a fatality. Hence dengue prevention awareness or educational campaigns must also stress the importance of seeking treatment promptly. Such campaigns should target community with lower socioeconomic status to enrich their knowledge.

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Declaration

Author(s) declare that the information above is correct and the manuscript submitted by us is original. We have no conflict of interest to declare and certify that no funding has been received for the conduct of this study and preparation of this manuscript.

Author(s) contribution

Author 1: NFH involved with planning, conducting the study under the supervision of author 3, and data analysis and interpretation

Author 2: ME involved with data analysis and interpretation, and writing drafts of the manuscript.

Author 3: SLK involved with study planning, data analysis and interpretation, and critical review of the manuscript.

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