

FACTORS AFFECTING DENGUE FEVER KNOWLEDGE, ATTITUDES AND PRACTICES AMONG SELECTED URBAN, SEMI-URBAN AND RURAL COMMUNITIES IN MALAYSIA

Sami Abdo Radman Al-Dubai^{1,2}, Kurubaran Ganasegeran¹,
Mohanad Rahman Alwan¹ Mustafa Ahmed Alshagga³ and Riyadh Saif-Ali⁴

¹Department of Community Medicine, International Medical School, Management and Science University, Shah Alam, Selangor; ²Department of Community Medicine, International Medical University, Kuala Lumpur; ³Newcastle University Medicine Malaysia, Nusajaya, Johor; ⁴Department of Biochemistry, Faculty of Medicine, Sana'a University, Sana'a, Yemen

Abstract. Dengue fever is a major public health problem in Malaysia. This study aimed to assess factors affecting knowledge, attitudes, and practices regarding dengue fever among a selected population in Malaysia. A descriptive, community-based, cross sectional study was conducted with 300 participants from three different geographical settings in urban, semi-urban, and rural areas within the states of Selangor and Kuala Lumpur. The questionnaire included questions on demographic data, knowledge, attitudes, and practices regarding dengue fever. Mean age of respondents was 34.4 (\pm 5.7) years, and the age ranged from 18 to 65 years. The majority of respondents were married (54.7%), Malays (72.7%) and heard about dengue fever (89.7%). Television was the common source of information about dengue fever (97.0%). Participants answered 4 out of 15 items of knowledge incorrectly. There was no significant association between knowledge score and socio-demographic factors. About one-fifth of the respondents (24%) believed that immediate treatment is not necessary for dengue fever, and the majority of them were not afraid of the disease (96.0%). Attitudes toward dengue fever were significantly associated with the level of education and employment status ($p < 0.05$). Practice was associated significantly with age, marital status, and geographic area ($p < 0.05$) and knowledge on dengue fever ($p = 0.030$). There is a need to increase health promotion activities through campaigns and social mobilization to increase knowledge regarding dengue fever. This would help to mold positive attitudes and cultivate better preventive practices among the public to eliminate dengue in the country.

Keywords: dengue fever, awareness, knowledge, practice, Malaysia

Correspondence: Sami Abdo Radman Al-Dubai, Department of Community Medicine, International Medical University (IMU), N^o 126, Jln Jalil Perkasa 19, Bukit Jalil, 57000 Kuala Lumpur, Malaysia.
Tel: +6017-359 6550
E-mail: samidobaie@yahoo.com

INTRODUCTION

Dengue fever is a mosquito-borne viral infection found in most tropical and subtropical areas of the world. The incidence of dengue has grown dramati-

cally in recent decades. The World Health Organization (WHO, 2009) estimated that almost two-fifths (2.5 billion) of the world's population is at risk from dengue fever, and this trend was expected to rise over the next coming years.

In Malaysia, dengue has become a major public health problem. The reported number of dengue cases in Malaysia rose each year, from 7,103 cases in 2000 to 49,335 in 2008, an increase of nearly 7 times (Ministry of Health, Malaysia, 2010). This increase occurred despite energetic outdoor insecticide fogging campaigns conducted by local authorities with the support of Ministry of Health to control the *Aedes* mosquito in urban, semi-urban, and rural areas.

Four major localities were considered as dengue endemic areas with periodic epidemic outbreaks occurring during hot and rainy seasons, namely Batu and Setapak, located in an urban setting in Kuala Lumpur, while Rawang and Hulu Kelang are rural localities in the state of Selangor. Sungai Buloh, a semi-urban locality, also situated in the state of Selangor, demonstrated cyclical patterns of dengue outbreak annually. There were several issues related to the difficulty of controlling dengue in these hotspots, as cases of dengue have remained uncontrolled and fluctuate due to climate change and tropical seasons in Malaysia (District Health Office, Gombak, 2010, unpublished data). The Ministry of Health Malaysia regards vector control as a gold standard for the prevention of dengue outbreaks, although this effort is often constrained due to operational bottlenecks in the presence of community support and involvement in vector control programs. Prevention programs are more effective if the knowledge and vector control practices of the population are understood and applied

in the main stream of intervention activities (Llyod *et al*, 1992; Swaddiwudhipong *et al*, 1992; Leontsini *et al*, 1993). Therefore, it is essential to enhance knowledge about the community's perception about dengue as well as their vector control practices before and after the launching of any community-based vector control programs.

Rozita *et al* (2006) conducted a knowledge, attitude and practices (KAP) study in an urbanized residential area of Kuala Lumpur and concluded that there is a need to strengthen health promotion activities to increase the knowledge that forms the basis for preventive practices as part of the strategy to control dengue outbreaks. The media are important sources to convey health messages to the public; thus the research and development of educational strategies designed to improve behavior and practices of effective control measures among population is essential (Hairi *et al*, 2003). This study aimed to assess factors affecting knowledge, attitudes, and practices regarding dengue fever among a selected population in Malaysia.

MATERIALS AND METHODS

Study setting and population

A community-based cross sectional study was conducted in three different geographical settings of urban, semi-urban, and rural areas within the state of Selangor and Kuala Lumpur, involving five major localities, namely Sungai Buloh, Rawang, Batu, Setapak, and Hulu Kelang. Batu and Setapak were considered to be urban settings, Sungai Buloh as semi-urban, and Rawang and Hulu-Kelang as rural. The sample size required for this study was estimated as 289 respondents. This calculation, using the Wang and Lemeshow equation (1991), was based

on previous study parameters (Kyu *et al*, 2005). We added 5% of the calculated sample size (14) to compensate for missing data or non-responses (the sample size became 303). Convenience sampling was used to select the participants from the three areas. Residents aged 18 years or more and who lived for at least one year in these localities were included in this study. Respondents were approached at shopping malls and major streets of the selected residential areas.

Ethical considerations

Approval of the study was obtained from the ethics committee of the Management and Science University, Shah Alam, Malaysia (Ref No. JMS07/0162, 2010 May 6). The objectives and benefits of the study were explained to respondents. They were assured that participation was voluntary, and information would be confidential. Written consent was obtained from those who agreed to participate.

Study instruments

A questionnaire was developed from literature for the use in this study (Rozita *et al*, 2006; Ahmad *et al*, 2007). The questionnaire consisted of four parts. The first part consisted of items regarding demographic data, such as age, gender, educational level, marital status, ethnicity, and employment status. The second part included questions on awareness of dengue fever and sources of information about dengue fever. Knowledge about dengue fever was assessed by 15 questions. Response options included 'yes' or 'no' and it included questions on dengue fever transmission, vector, clinical manifestations, and the management and control of dengue fever. The third part assessed attitudes towards dengue fever prevention, such as the role of municipal councils, health care staff, and the

public towards dengue control. This part included six questions, and the response options included 'yes' or 'no'. The fourth part addressed practices of dengue prevention was assessed by 11 questions, and the response options included 'yes' or 'no', and it included questions, such as the use of mosquito repellent, fogging, covering water tanks, and community-based activities.

Statistical analysis

The Statistical Package for Social Sciences (SPSS®) (version 16.0, IBM, Armonk, NY) was used to analyze data in this study. The study included descriptive and bivariate analysis. Questions on knowledge, attitudes, and practices were summed, and the total score of each part was obtained. For each knowledge item, a true answer was coded '1' and the false answer was coded '0', and the total scores ranged from 0 to 15. For attitude items, a positive attitude was coded '1' and the negative attitude was coded '0', and the total scores ranged from 0 to 6. Practice items were coded '1' if the answer was 'yes' and '0' if the answer was 'no'. The total scores ranged from 0 to 11. Student's *t*-tests and one-way ANOVA tests were used to identify any statistically significant associations between explanatory independent and outcome variables.

RESULTS

Socio-demographic characteristics of respondents

Data of 300 respondents were included in the analysis (three questionnaires were excluded due to missing data). The mean age of the participants was 34.4±5.7 years, and ages ranged from 18 to 65 years. Just over one-half of respondents were female (50.3%). Most of the subjects were Malays (72.7%) and married (54.7%).

Table 1
Socio-demographic characteristics of respondents (N=300).

Characteristic	n (%)
Gender	149 (49.7)
Male	151 (50.3)
Female	
Age groups (years)	143 (47.7)
18-30	66 (22.0)
31-40	91 (30.3)
≥ 41	
Marital status	
Single	135 (45.0)
Married	165 (55.0)
Race	
Malay	218 (72.7)
Chinese	21 (7.0)
Indian	57 (19.0)
Others	4 (1.3)
Education level	
High school	120 (40.0)
Tertiary educated	180 (60.0)
Employment status	
Employed (government or private)	157 (52.4)
Self-employed	127 (42.3)
Unemployed	16 (5.3)
Monthly income (MYR)	
≤ 3,000	155 (51.7)
> 3,000	145 (48.3)
Area	
Rural	120 (40.0)
Semi-urban	60 (20.0)
Urban	120 (40.0)
Household members	
≤ 3	65 (21.7)
4-6	179 (59.6)
> 6	56 (18.7)

MYR, Malaysian Ringgit

Eighty percent of the participants were from rural and urban areas, 40.0% each, respectively; while 20.0% were from the semi-urban area. The majority of the respondents (60.0%) had either a university

Table 2
Sources of information regarding dengue fever ranked by number and percentage of respondents cited them as source of information (N=300).

Item	n (%)
Television	291 (97.0)
Newspapers/Magazines	223 (74.3)
Radio	191 (63.7)
Leaflets/Pamphlets	145 (48.3)
Internet	128 (42.7)
Billboards	96 (32.0)
Talks/Seminars	89 (29.7)

or a college degree, while 40% had high school educations or less. Of the total respondents, 52.3% were employed in either government or private sectors, and 42.3% were self-employed. The majority had a monthly income of MYR 3,000 or less (51.7%) (USD 1= MYR 3.0) and had 4-6 members in the family (59.7%) (Table 1).

Awareness of dengue fever and sources of information

Most of the participants (89.7%) were aware of the cyclical dengue outbreak in Malaysia. The main source of information given by them was television (97.0%) followed by printed media and radio (74.3% and 63.7%, respectively). The least source of information was talks and seminars (29.7%) (Table 2).

Knowledge of dengue fever

Table 3 shows the participants' responses regarding knowledge about dengue fever. The majority of respondents (97.0%) knew that vector-borne mosquito, *Aedes aegypti*, causes dengue fever and knew that dengue fever affects all age groups (95.7%). The majority (95.0%) also knew about the clinical presentation of

Table 3
Knowledge of dengue fever; number and percentage of respondents who answered the items correctly (N=300).

Statement	Correct answer	n (%)
Dengue fever is caused by the mosquito; <i>Aedes aegypti</i> .	Yes	293 (97.7)
Life cycle of the <i>Aedes</i> mosquito is one week.	Yes	254 (84.7)
Stagnant water is the main source for mosquito breeding.	Yes	279 (93.0)
Dengue fever affects all age groups.	Yes	287 (95.7)
Dengue epidemics start during hot weather.	No	101 (33.7)
Dengue is a flu-like illness.	Yes	210 (70.0)
Chills and high fever, intense headache, muscle and joint pains are the most common presentation of dengue fever.	Yes	285 (95.0)
Dengue can be transmitted by direct blood contact.	Yes	153 (51.0)
Transmission cycle is "Man-Mosquito-Man".	Yes	216 (72.0)
Mosquitoes transmitting dengue infection bites only early in the morning.	No	137 (45.7)
Control of dengue is by combating the breeding of mosquitoes.	Yes	268 (89.3)
Abate can be beneficial in killing mosquitoes larvae.	Yes	264 (88.0)
There is a vaccine for dengue.	No	130 (43.3)
Paracetamol (Panadol®) is the drug of choice for dengue treatment.	No	110 (36.7)
Do I have to worry if one of my family members was diagnosed to have dengue a year ago?	Yes	249 (83.0)

dengue syndrome. The majority of them answered correctly on most of the items; only four items incorrectly. These items included: 'dengue epidemics start during hot weather', 'mosquito bites only early in the morning', 'there is a vaccine for dengue', and 'paracetamol is the drug of choice for dengue treatment'.

Attitudes towards dengue fever prevention

Of all the respondents, only 4.0% were afraid of dengue fever and its complications, while 95.3% of them believed that the public has a primary role towards curbing the dengue epidemic. Twenty-four percent of subjects believed that immediate treatment is not necessary for dengue fever, and 32.7% believed that elimination of larvae breeding is a complete waste of time (Table 4).

Practices of dengue fever prevention

Table 5 shows respondents' practices of dengue outbreak prevention. The majority of respondents used mosquito repellents (88.7%), covered water jars and tanks (85.3%), and inspected refrigerator trays (80.3%). Abate was used by only 18.0% of respondents for the elimination of mosquito larvae.

Association between awareness of dengue fever and socio-demographic variables

Chi-square test was used to determine the association between socio-demographic variables and awareness of dengue fever in Malaysia. Age group and ethnicity were significantly associated with awareness of dengue fever ($p=0.02$, $p<0.01$ respectively). There was no significant association between awareness and

Table 4
Attitudes towards dengue fever prevention (N=300).

Statement	Agree n (%)	Disagree n (%)
Fogging by the municipal council is essential enough for prevention of dengue.	199 (66.3)	101 (33.7)
It is the responsibility of the public health staff and local government in the prevention of dengue.	223 (74.3)	77 (25.7)
Elimination of larvae breeding is a complete waste of time.	98 (32.7)	202 (67.3)
It is not necessary to seek immediate treatment for dengue fever as there is no cure for it.	72 (24.0)	228 (76.0)
The public has the most important role in dengue control.	14 (4.7)	286 (95.3)
I am afraid of dengue.	12 (4.0)	288 (96.0)

Table 5
Practice regarding dengue fever prevention (N=300).

Practice	Yes n (%)	No n (%)
Cover water jars.	256 (85.3)	44 (14.7)
Cover water tanks.	256 (85.3)	44 (14.7)
Inspect refrigerator tray.	241 (80.3)	59 (19.7)
Examine mosquito larvae both indoors and outdoor pots.	187 (62.3)	113 (37.7)
Drain water from flower pot.	194 (64.7)	106 (35.3)
Examine any discarded material that holds water around your house.	193 (64.3)	107 (35.7)
Use mosquito net or mosquito coil.	177 (59.0)	123 (41.0)
Use mosquito repellent.	266 (88.7)	34 (11.3)
Participate in community 'clean our surroundings' activities.	217 (72.3)	83 (27.7)
Participate in community fogging.	181 (60.3)	119 (39.7)
Using temephos (eg, Abate®) for elimination of mosquito larvae.	54 (18.0)	246 (82.0)

other socio-demographic variables in this study (Table 6).

Association of knowledge, attitudes, and practices with socio-demographic variables

This study found no significant association between knowledge score and socio-demographic variables. Regarding attitudes, participants with tertiary education (university or college degree) had higher attitude scores (2.3 ± 1.2) compared to those who were less educated (1.9 ± 1.3)

($p=0.011$). A significant association was found also between attitude scores and employment status; post hoc test showed that this significant difference was existed between employed participants (2.3 ± 1.3) and non-employed ones (1.3 ± 1.1) ($p=0.013$). With regard to practices, there was a significant association between age and practice scores; post hoc test showed that participants in 31-40 year age group had higher practice scores (8.2 ± 2.4) in

Table 6
Association between awareness and socio-demographic variables.

	Aware <i>n</i> (%)	Unaware <i>n</i> (%)	OR	95% CI	<i>p</i> -value
Gender					
Male	132 (88.6)	17 (11.4)			
Female	137 (90.7)	14 (9.3)	0.8	0.4-1.7	0.54
Age groups (years)					
18-30	122 (85.3)	21 (14.7)			
31-40	59 (89.4)	7 (10.6)			
≥ 41	88 (96.7)	3 (3.3)	-	-	0.02
Marital status					
Single	120 (88.9)	15 (11.1)			
Married	149 (90.3)	16 (9.7)	0.9	0.4-1.8	0.69
Race					
Malay	195 (89.4)	23 (10.6)			
Chinese	56 (98.2)	1 (1.8)			
Indian	17 (81.0)	4 (19.0)			
Others	1 (25.0)	3 (75.0)	-	-	<0.01
Education level					
High school	110 (91.7)	10 (8.3)			
Tertiary educated	159 (88.3)	21 (11.7)	1.4	0.7-3.2	0.35
Monthly income (MYR)					
≤ 3,000	140 (90.3)	15 (9.7)			
> 3,000	129 (89.0)	16 (11.0)	1.2	0.6-2.4	0.70
Area					
Rural	109 (40.5)	11 (35.5)			
Semi-urban	53 (88.3)	7 (11.7)			
Urban	107 (89.2)	13 (10.8)	-	-	0.85
Household members					
≤ 3	58 (89.2)	7 (10.8)			
4-6	162 (90.5)	17 (9.5)			
> 6	49 (87.5)	7 (12.5)	-	-	0.81

MYR, Malaysian Ringgit

comparison with those who aged 18-30 (6.9 ± 2.6) and to those aged ≥ 41 years (7.7 ± 2.3) ($p = 0.002$, $p = 0.025$), respectively (Table 7). Singles had higher practice scores (7.9 ± 2.3) compared to marrieds (6.8 ± 2.7) ($p < 0.001$). Participants from rural area had practice score (8.2 ± 2.5) in comparison to participants from semi-urban areas (6.5 ± 2.5) ($p < 0.001$) (Table 7).

Association of knowledge with both attitudes and practices

Knowledge score was categorized into two groups (knowledgeable and non knowledgeable) according to median value (median=11). Participants scored more than 11 on knowledge were classified as knowledgeable. To assess the relation between knowledge and both

Table 7
Associations between knowledge, attitudes, and practices, with socio-demographic variables.

	Knowledge Mean (SD)	Attitude Mean (SD)	Practice Mean (SD)
Gender			
Male	11.2 (2.0)	2.1 (1.4)	7.3 (2.5)
Female	11.4 (1.6)	2.1 (1.4)	7.5 (2.6)
Age groups (years)			
18-30	11.2 (1.9)	2.2 (1.4)	6.9 (2.6)
31-40	11.4 (1.7)	2.0 (1.3)	8.2 (2.4)
≥ 41	11.3 (1.8)	2.0 (1.3)	7.7 (2.3) ^a
Marital status			
Single	11.3 (1.6)	2.2 (1.4)	6.8 (2.7)
Married	11.2 (2.0)	2.1 (1.3)	7.9 (2.3) ^a
Race			
Malay	11.4 (1.8)	2.0 (1.4)	7.6 (2.5)
Indian	11.0 (2.0)	2.5 (1.3)	7.3 (2.4)
Chinese	11.1 (1.6)	2.2 (1.5)	6.7 (3.0)
Others	9.5 (2.5)	2.5 (1.3)	5.0 (2.0)
Education level			
High school	11.2 (1.9)	1.9 (1.3)	7.3 (2.7)
Tertiary educated	11.3 (1.7)	2.3 (1.2) ^a	7.5 (2.4)
Employment status			
Employed (government or private)	11.3 (1.9)	2.3 (1.3)	7.6 (2.5)
Self-employed	11.3 (1.7)	2.0 (1.4)	7.1 (2.6)
Unemployed	11.3 (2.1)	1.3 (1.1) ^a	8.4 (2.3)
Area			
Rural	11.3 (1.9)	1.9 (1.3)	8.2 (2.5)
Semi urban	11.4 (1.6)	2.3 (1.2)	6.5 (2.5)
Urban	11.2 (1.9)	2.3 (1.4)	7.1 (2.4) ^a
Monthly income (MYR)			
≤3,000	11.4 (1.7)	2.0 (1.3)	7.4 (2.5)
>3,000	11.2 (2.0)	2.3 (1.4)	7.4 (2.6)
Household members			
≤ 3	11.2 (1.9)	2.4 (1.3)	7.2 (2.5)
4-6	11.2 (1.9)	2.1 (1.3)	7.5 (2.6)
> 6	11.6 (1.3)	1.8 (1.4) ^a	7.2 (2.4)

^a *p*-value is significant (<0.05); MYR, Malaysian Ringgit

attitudes and practices, mean scores of attitudes and practice were compared across knowledgeable and non-knowledgeable groups. A significant association between practice and knowledge was found as the

knowledgeable participant had higher mean practice (7.7 ± 2.3) in comparison to the non-knowledgeable participants (7.1 ± 2.7) ($p=0.030$). Mean attitude score of the knowledgeable participants was

Table 8
Associations between knowledge, and both attitudes and practices.

	Attitudes (Mean \pm SD)	Practices (Mean \pm SD)
Knowledgeable	2.2 (1.3)	7.7 (2.3)
Non-knowledgeable	2.1 (1.5)	7.1 (2.7)
<i>p</i> -value	0.500	0.030

higher than that of the non-knowledgeable participants, but this difference was not significant ($p=0.500$) (Table 8).

DISCUSSION

This study found that the awareness of dengue fever was relatively high (89.7%). Previous studies found almost similar rates: 90.0% to 98.5% (Acharya *et al*, 2005; Rozita *et al*, 2006). Other studies found lower rates of awareness, ranging from 67.0% to 78.0% (Swaddiwudhipong *et al*, 1992; Degallier *et al*, 2000). However, a very low rate of awareness was found in a recent study in India in which only 34.5% of the public was aware of dengue fever (Kumar *et al*, 2010).

In this study, television was reported as the most common source of information. This is similar to previous studies whereby mass media was cited to have a major role in disseminating information about dengue (Kittigul *et al*, 2003; Acharya *et al*, 2005; Ibrahim *et al*, 2009). However, one study in Lao PDR found that friends and relatives (43.9%) were the main sources of information regarding dengue fever (Nalongsack *et al*, 2009). Another study in Thailand found that health personnel were the main source of dengue fever information (Swaddiwudhipong *et al*, 1992).

The current study indicated a good knowledge about dengue fever, particularly in the fact that dengue fever is caused

by the vector borne mosquito, *Aedes aegypti*. This finding was similar to other studies from different countries (Degallier *et al*, 2000; Acharya *et al*, 2005; Carmen *et al*, 2005). It was surprising to observe that although 97.7% of respondents in our study mentioned mosquito as a cause of dengue, only 72.0% believed that this disease spreads by mosquito bites. This finding was consistent with a previous study conducted by Acharya *et al* (2005), which observed that although 68.0% of respondents mentioned mosquito bite as a cause of dengue, only 38.0% of them believed that the disease could spread by mosquito bites.

Knowledge about mosquito transmission in the present study was inadequate. More than half of respondents (54.3%) reported that mosquitoes transmitting dengue only bite early in the morning. This finding was inconsistent with the findings of some previous studies, which indicated the majority of respondents knew mosquitoes transmitting dengue might bite either at sunrise or sunset (Degallier *et al*, 2000; Itrat *et al*, 2008). About half (51.0%) of the respondents reported that dengue is infectious and can be transmitted by direct blood contact. A corresponding rate reported from Pakistan was much higher (84.0%) (Itrat *et al*, 2008).

Researchers from several Asian countries have reported that seasonal outbreaks of dengue coincided with

the rainy season (Sulaiman *et al*, 1991; Thongrungrat *et al*, 2003; Rozilawati *et al*, 2007). In this study, 33.7% of the respondents were wrong in their assumption that dengue epidemics start during hot weather. In this study, the majority of the respondents indicated that stagnant water was the main source for mosquito breeding, while the life cycle of mosquito is one week. Previous studies also found that the majority of participants reported that stagnant water is the main source of mosquito breeding (Lee *et al*, 1990; Chen *et al*, 2005; Rozilawati *et al*, 2007).

The majority of the respondents (95.7%) knew that dengue fever affects all age groups, and 95.0% of them were aware of the clinical manifestations of dengue. However, 70.0% of them believed that dengue is a "flu-like" illness. Previous studies have found similar findings (Gupta *et al*, 1998; Carmen *et al*, 2005; Nalongsack *et al*, 2009). Khun and Manderson (2007) found that good knowledge of signs and symptoms of dengue fever is crucial for recognizing the disease and for seeking appropriate health care in a timely fashion. In this study, 63.3% of respondents believed that paracetamol is the drug of choice for dengue treatment. This troublesome finding stressed that correct knowledge and information regarding treatment should be provided to the public to seek early cure of dengue.

In this study, a gap was observed in certain parameters of knowledge and respondents' attitudes towards dengue. Although 89.3% of the respondents believed that control of dengue is by combating the breeding of mosquitoes, about one-third of them believed that elimination of larvae is a complete waste of time. This finding was consistent with that found by Acharya *et al* (2005).

This study found that only 4.0% of the respondents expressed fear about dengue. This situation is alarming, as the majority of them are unaware on the complications of dengue, which may even be fatal. Some (24.0%) of the respondents believed that it is not necessary to seek immediate treatment for dengue fever as there was no cure for it. This finding was not consistent with a previous study by Nalongsack *et al* (2009) that suggested positive attitudes among people of Lao PDR, whereby they sought immediate treatment as soon as dengue manifestations were realized. This positive attitude is important to prevent further complications, such as dengue hemorrhagic fever, which may be fatal.

This study found that the most commonly practiced preventive measures used by the respondents were use of mosquito nets and repellents, examining and draining mosquito breeding sites in both indoor at outdoor pots, discarding unused materials that hold water around the house, and emptying or covering unused water jars and tanks. These findings were consistent with those reported by previous studies (Snehalatha *et al*, 2003; Itrat *et al*, 2008; Ibrahim *et al*, 2009). This study also found that only 18.0% of the respondents used abate (temephos) for elimination of mosquito larvae. This finding was far less compared to the finding observed by Nalongsack *et al* (2009). However, a previous study from Thailand found that temephos was not the preferred choice as the respondents dislike drinking water containing temephos sand or granules (Kittigul *et al*, 2003).

Rozita *et al* (2006) found a significant association between attitudes and education level. However, this present study found a significant association between attitudes and both level of education and

employment status. This study also found a significant association between practice level with both age group and geographical area. Swaddiwudhipong *et al* (1992) found similar findings.

In this study, age was significantly associated with dengue fever awareness. Other studies reported similar findings (Acharya *et al*, 2005; Rozita *et al*, 2006; Ibrahim *et al*, 2009). Ethnicity was also significantly associated with awareness, similar to the findings of Rozita *et al* (2006).

This study found a significant association between knowledge and practices of dengue control. This finding also indicated the importance of knowledge to predict practice. Public education is essential to mitigate the dengue epidemic through improved preventive practices. Previous studies have found similar associations between knowledge and practices (Ben-them *et al*, 2002; Itrat *et al*, 2008; Ibrahim *et al*, 2009). Another important finding of this study was the association between geographical area and practice scores. Rural communities exhibited a significantly higher practice score in comparison to the semi-urban area. This unique finding could be interpreted by the presence of stronger socio-cultural bonds among rural communities in Malaysia, which showcases dynamic unity through a collective community activities organized frequently by the village head or union, known as *gotong-royong* in Malay. During this activity, all residents from a village will come together, for example, to clean up the surroundings of their residences to prevent the breeding of mosquitoes. There has been a practice among the community, especially in traditional rural villages, or *kampung*, in Malaysia to bury old cans or bottles, old tires, and coconut shells underground around their living environments. This prevents stagnant water as

a primary breeding site for mosquitoes. In addition, poor infrastructure development in rural areas (such as poor drainage systems and sewage systems) led to aggressive measures taken by local councils to prevent mosquito breeding sites through frequent fogging and prevention of clogged drains. These measures may raise awareness of dengue fever among those communities.

The results of this study were discussed bearing in mind that there were certain limitations. The sampling method used in this study may be imprecise; therefore, this may result in selection bias because of a sample that was not representative of the overall population.

In conclusion, the suggestion emerged as a result of this study indicated that respondents were aware and knowledgeable about dengue fever, but they were not concerned about the impact of dengue epidemics. Regarding practices, age, knowledge, and geographical area are important factors that affect practices of the respondents to prevent dengue fever.

Aggressive health promotional campaigns and social mobilization by relevant agencies are needed to increase knowledge about dengue fever prevention. Emphasis should be placed on the limitations, such as seeking early treatment as soon as dengue signs and symptoms are noticed. The unique traditional community collaborative activity (*gotong-royong*) frequently practiced in rural villages should be promoted in urban communities as well. Such community participation is essential for Malaysia to eliminate dengue epidemics.

ACKNOWLEDGEMENTS

The authors acknowledge the support, suggestions, and comments made by Dr Rozlan Ishak (Director, District

Health Office of Gombak). We are very grateful to Mohd Razif bin Aridi, Vithya a/p Subramaniam, Mohd Aleef bin Yusof, and Liyana Nadiah bt Kamaruzaman (Management and Science University, Malaysia) for their logistical support and help in data collection.

REFERENCES

- Acharya A, Goswami K, Srinath S, Goswami A. Awareness about dengue syndrome and related preventive practices amongst residents of an urban resettlement colony of south Delhi. *J Vector Borne Dis* 2005; 42: 122-7.
- Ahmad R, Abdul Latiff AK, Abdul Razak S. Myalgia Cruris Epidemica: an unusual presentation of dengue fever. *Southeast Asian J Trop Med Public Health* 2007; 38: 1084-7.
- Benthem VBH, Khantikul N, Panart K, Kessels PJ, Somboon P, Oskam L. Knowledge and use of prevention measures related to dengue in northern Thailand. *Trop Med Int Health* 2002; 7: 993-1000.
- Carmen L, Perez-Guerra, Seda H, Enid J, Gary G. Knowledge and attitudes in Puerto Rico concerning dengue prevention. *Rev Panam Salud Publica/Pan Am J Public Health* 2005; 17: 243-53.
- Chen CD, Seleena P, Masri S, et al. Dengue vector surveillance in urban residential settlement areas in Selangor, Malaysia. *Trop Med Int Health* 2005; 22: 39-43.
- Degallier N, Vilarinhos PT, Carvalho MS, Knox MS, Caetano JJ. People's knowledge and practice about dengue, its vectors and control means in Brasilia (DF), Brazil: its relevance with entomological factors. *J Am Mosq Control Assoc* 2000; 16: 114-23.
- Gupta P, Kumar P, Aggarwal OP. Knowledge, attitudes and practices related to dengue in rural and slum areas of Delhi after the dengue epidemic of 1996. *J Commun Dis* 1998; 30: 107-12.
- Hairi F, Cyril HS, Anwar S, et al. A knowledge, attitude and practices (KAP) study on dengue among selected rural communities in the Kuala Kangsar District. *Asia Pac J Public Health* 2003; 15: 37-43.
- Ibrahim NKR, Al-Bar A, Kordey M, Al-Fakeeh A. Knowledge, attitudes and practices relating to Dengue fever among females in Jeddah high schools. *J Infect Public Health* 2009; 29: 30-40.
- Itrat A, Khan A, Javaid S, et al. Knowledge, awareness and practices regarding dengue fever among the adult population of dengue hit cosmopolitan. *PLoS One* 2008; 9: e2620.
- Khun S, Manderson L. Community and school-based health education for dengue control in rural Cambodia: a process evaluation. *PLoS Neglect Trop Dis* 2007; 1: e134.
- Kittigul L, Suankeow K, Sujirarat D, Yoksan S. Dengue hemorrhagic fever: knowledge, attitude and practice in Ang Thong Province, Thailand. *Southeast Asian J Trop Med Public Health* 2003; 34: 385-92.
- Kumar AV, Rajendran R, Manavalan R, et al. Studies on community knowledge and behavior following a dengue epidemic in Chennai city, Tamil Nadu, India. *Trop Biomed* 2010; 27: 330-6.
- Kyu HH, Thu M, Putton MVD. Myanmar migrant woman caretakers on prevention of dengue fever: A study on knowledge, attitude and practices in Tak Province, Thailand. *AU J Technol* 2005; 9: 99-105.
- Lee HL. Breeding habitats and factor affecting breeding of *Aedes* larvae in urban towns of Peninsular Malaysia. *J Biosci* 1990; 1: 107-12.
- Leontsini E, Gril E, Kendal C, Clark GG. Effect of a community based *Aedes aegypti* control programme on mosquito larva production sides in El Progreso, Honduras. *Trans R Soc Trop Med Hyg* 1993; 87: 267-71.
- Lloyd LS, Winch PJ, Ortega-Canto J, Kendall C. Results of a community based *Aedes aegypti* control programme in Meridia, Yucatan, Mexico. *Am J Trop Med Hyg* 1992; 46: 635-42.

- Ministry of Health Malaysia. Health facts: dengue control 2010. Putrajaya MY: Ministry of Health, 2010.
- Nalongsack S, Yoshida Y, Morita S, Sosouphanh K, Sakamoto J. Knowledge, attitude and practice regarding dengue among people in Pakse, Laos. *Nagoya J Med Sci* 2009; 71: 29-37.
- Rozilawati H, Zairi J, Adnan CR. Seasonal abundance of *Aedes albopictus* in selected urban and suburban areas in Penang, Malaysia. *Trop Biomed* 2007; 24: 83-94.
- Rozita WM, Yap BW, Veronica S, Muhammad AK, Lim KH, Sumarni MG. Knowledge, attitude and practice (KAP) survey on dengue fever in an urban Malay residential area in Kuala Lumpur. *Malays J Public Health Med* 2006; 6: 62-7.
- Snehalatha KS, Ramaiah KD, Vijay Kumar KN, Das PK. The mosquito problem and type and costs of personal protection measures used in rural and urban communities in Pondicherry region, south India. *Acta Trop* 2003; 88: 3-9.
- Sulaiman S, Pawanchee ZA, Jeffery J, Ghauth I, Busparani V. Studies on the distribution and abundance of *Aedes aegypti* (L.) and *Aedes albopictus* (Skuse) (Diptera:Culicidae) in an endemic area of dengue/dengue hemorrhagic fever in Kuala Lumpur. *Mosq Borne Dis Bull* 1991; 8: 35-9.
- Swaddiwudhipong W, Lerdlukanavong P, Khumklam P, Koonchote S, Nguntra P, Chaovakiratipong C. A survey of knowledge, attitude and practice of the prevention of dengue hemorrhagic fever in an urban community of Thailand. *Southeast Asian J Trop Med Public Health* 1992; 23: 207-11.
- Thongrungrakiat S, Jirakanjanakit N, Apiwathnasorn C, Prummongkol S, Samung Y. Comparative susceptibility to oral infection with dengue viruses among local strains of *Aedes aegypti* (Diptera: Culicidae) collected at different seasons of the year. *J Vector Ecol* 2003; 28: 166-70.
- Wanga SK, Lemeshow S. Sample size determination in health studies: a practical manual. Geneva: World Health Organization, 1991.
- World Health Organization (WHO). Dengue guidelines for diagnosis, treatment, prevention and control. Geneva: WHO, 2009.