REVIEW ARTICLE

PERCEPTIONS, ATTITUDES, AND RESPONSES TO DENGUE EARLY WARNING AMONG URBAN COMMUNITY IN KUALA LUMPUR

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ABSTRACT

Dengue early warning system, based on many different factors including climatic factors, is likely to be a useful tool for predicting dengue cases. This study aims to assess the perceptions, attitudes, and responses to dengue early warning among a sample of residents in Kuala Lumpur, Malaysia as well as the factors associated with their willingness in participating dengue prevention public activity. A community-based cross-sectional study was conducted among residents of Titiwangsa District, Kuala Lumpur. A structured questionnaire was administered via face-to-face interview. About 75% of the respondents perceived dengue early warning as a useful tool for the community to take preventive measures. However, more than half did not know elevated temperature increases dengue cases. More than 80% wanted to know more how climate can be used to predict dengue outbreak. Willingness of participating in dengue control public activity was associated with age (p<0.001), educational level (p=0.005), perception (p<0.001), and attitude (p<0.001). Perception towards dengue early warning was positive among the urban residents. Majority of the participants reported good attitude with regard to dengue early warning while a minority demonstrated a poor response. Educational level, perception, and attitude are significantly associated with willingness to engage in dengue prevention public activity.

Keywords: *Perceptions - attitudes - responses - urban - dengue early warning*

INTRODUCTION

Dengue is the most common and rapidly spreading mosquito-borne viral disease which usually be found in most tropical and subtropical areas[1]. Globalisation, trade, urbanization, travel, demographic changes, inadequate domestic water supplies, and climatic changes are associated with the spread of main vectors: Aedes aegypti and Aedes albopictus[2]. Over half of the world's population resides in areas at risk for dengue transmission, making dengue as one of the most important human viral disease transmitted by arthropod vectors in terms of morbidity and mortality[3]. In Malaysia, dengue was first reported in 1901 in Penang[4]. Since the 1970s, dengue has been endemic in Malaysia with increasing intensity and magnitude of outbreaks in recent decades. The national Incident Rate (IR) increased from 32 cases per 100,000 population in 2000 to 328 cases in 2016, though a temporary reverse trend was observed in 2011 and 2012. At the same time, the case fatality rate decreased from 0.6% in 2000 to 0.23% in 2016[4].

Early warning system for dengue disease is complex due to the involvement of various predictive factors originating from the human and insect sectors as well as the natural history of the disease[5]. Examples of these factors include population size, human population movement, mean temperature, rainfall pattern, relative humidity, breeding percentage of Aedes mosquito, changes of vector control, and circulating serotypes. The main objective of an early warning system is the collection of information leading to timely decision-making processes and disease intervention strategies in order to reduce the burden and effect of the disease on a targeted population[6]. Since no vaccine is currently available in Malaysia, other primary preventions such as vector control and surveillance are the only effective measures in dengue prevention[7]. Thus, dengue early warning could potentially be useful in predicting epidemic-prone dengue infection and providing the information to the community with as ample notice as possible about the likelihood of dengue outbreak. This would

allow the implementation of timely preventive measures[8]. However, effective dengue control and prevention requires community participation. Therefore, perception and attitude of the community towards dengue early warning and the willingness to take preventive measures are important determinants to their participation in community-based programmes. Additionally, few research studies on dengue early warning have been conducted in Malaysia[4]. This study was undertaken to evaluate the perceptions, attitudes, and responses among the urban community in Kuala Lumpur. Our operational definition of dengue early warning is the prediction of increasing dengue cases in the near future based on many different factors including climatic factors such as changes in temperature and rainfall patterns.

METHODOLOGY

Study Design
A cross-sectional study was conducted from 24 July 2017 to 15 August 2017. This study was done by a group of final year medical students of University of Malaya (UM).

Study Setting
The study was conducted at Air Panas, Setapak area which is located at Titiwangsa district, Kuala Lumpur, Malaysia. Dengue cases, reported in Titiwangsa District Health Office, was 6.1% higher than that of last year during the same period of the year, raised from 1496 to 1588. The study area covered 8 blocks of 17-story apartments. This area was chosen because it had been identified as a dengue hotspot by the Titiwangsa District Health Officer. Despite being known as a hotspot for dengue, limited efforts had been taken to promote awareness and precautionary attitude in the community of Air Panas, Setapak area, particularly with regards to dengue early warning.

Study Population
The total population of Program Perumahan Rakyat (PPR) Air Panas, Setapak area was estimated to be more than 10,000 residents. The majority of residents was Chinese (38%), followed by Malay (35%) and Indian (27%). (Source: Pejabat Kecil Dewan Bandaraya Kuala Lumpur Cawangan PPR Air Panas)

Sample Size
We calculated our sample size based on Krejcie & Morgan sample size table. There were more than 10,000 residents in the population and according to the table, the sample size was 373.

Study Sampling
A total of 322 residents from all 8 blocks of the study area who fulfilled the criteria were included. Eligible residents for the inclusion were those who were aged more than 18 years and able to communicate in Malay, Mandarin, or English. Face-to-face interviews were conducted from 24 July 2017 to 15 August 2017.

Ethical consideration
Ethics approval was obtained from the ethics committee of the University of Malaya Medical Centre (MECID Number 20143-68). The objectives and benefits of the study were explained to residents of Air Panas. Participation in the study was voluntary and collected data were kept confidential. Verbal and written consents were obtained from those who agreed to participate.

Instrument
Data were collected using a validated questionnaire obtained from a study entitled as, 'Exploring perceptions and attitudes of the public towards a climate-based dengue early warning in Malaysia' under Malaysian-Swedish Research Link Program conducted by a research team from Umea University and University of Malaya. The questionnaire consisted of four main sections: 1) Sociodemographic, 2) Perception on dengue infection and dengue early warning, 3) Attitude on dengue early warning, and 4) Response to dengue early warning. The respondents were requested to answer yes/no or know/not sure, as applicable.

Data Analysis
All statistical analyses were performed using the IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Frequency and percentages was calculated for categorical variables (e.g. educational level, perceptions, attitudes, responses), while mean and standard deviation was calculated for continuous variables (e.g. age). The association between categorical variables were measured using chi-square test. P-values of < 0.05 were considered significant.

RESULTS

Table 1 Sociodemographic of respondents

Variables		N	%	Mean/ standard deviation
Age:				38.09/ 15.057
Nationality:	Malaysian	318	98.8	
	Non-Malaysian	4	1.2	
Gender:	Male	127	39.4	
	Female	195	60.6	
Race:	Malay	140	43.5	
	Chinese	73	22.7	
	Indian	106	32.9	
	Other	3	0.9	
Marital Status:	Single	106	32.9	
	Married	188	58.4	
	Divorced	9	2.8	
	Widow	19	5.9	
Highest educational level	No formal education			
	Primary education			
	Secondary education	267	82.9	
	Tertiary education			
Occupation	Student	52	16.1	
	Self-employed	50	15.5	
	Government workers	22	6.8	
	Private workers	92	28.6	
	Unemployed	87	27	
	Other	19	5.9	
Do you have previous dengue infection?	Yes	64	19.9	
	No	258	80.1	
Do you know any persons who have been infected with dengue?	Yes	155	48.1	
	No	167	51.9	
Number of people in your household?				4.80/ 1.911
What is your average monthly income?	≤ RM 1000	92	28.6	
	RM 1001- RM 3000	193	59.9	
	RM 3001- RM 5000	34	10.6	
	> RM 5000	3	0.9	

Table 1 displays the profile of the participation in the present study. A total of 322 individuals were interviewed. The average age of respondents was 38.09 (SD 15.06) years. From the table above, 155 (48.1%) of them knew others who had been infected with dengue. Table 2 shows the perceptions of the residents on dengue infection and dengue early warning. Almost all (95.3%; 307/322) reported that they knew about dengue fever and the majority (92.2%; 297/322) agreed that dengue fever could cause mortality. Most of them (64.3%) thought that the dengue situation is serious in the area they live.

Perceptions on dengue infection and climate factors

Table 2 Perceptions of respondents towards dengue infection and climate factors

Variables			N	%
Do you know what is dengue fever?	Yes		307	95.3
	No	15		4.7
Do you think dengue fever can cause mortality?	Yes		297	92.2
	No		11	3.4
	Don't know		14	4.3
Do you think you and your family members could be infected with dengue fever?	Yes		195	60.6
	No		74	23
	Don't know		53	16.5
In your opinion, what is your risk of being infected with dengue fever?	Low		80	24.8
	Medium		149	46.3
	High		93	28.9
Do you think you have sufficient knowledge of the ways to prevent yourself from dengue infection?	Yes		196	60.9
	No		82	25.5
	Don't know		44	13.7
Do you think the dengue situation is serious in the area you live?	Yes		207	64.3
	No		76	23.6
	Don't know		39	12.1
Do you think the number of dengue cases increases after rainy days?	Yes		215	66.8
	No		40	12.4
	Don't know		67	20.8
Do you think the increasing temperature elevates the number of dengue cases in your area?	Yes		141	43.8
	No		76	23.6
	Don't know		105	32.6
Do you think an early warning is a useful tool for the community to take preventive actions to avoid possible infection with sufficient time?	Yes		239	74.2
	No		25	7.8
	Don't know		58	18

There was about one-third of the participants (33.2%; 107/322) who did not know or think that number of dengue cases increases after rainy days. More than half of them (56.2%; 181/322) did not know or think that increasing temperature elevates the number of dengue cases in their area. However, the majority (74.2%; 239) perceived that an early warning is a useful tool for the community to take preventive actions to avoid possible infection within sufficient time.

Attitudes on dengue early warning

Table 3 presents the attitudes on dengue early warning. Majority of them (86%; 277/322) wanted to help in reducing the number of dengue cases in their area and thought that an early warning is important for the prevention of dengue outbreak. 273 (84.8%) respondents felt that the community needs public education about dengue early warning. Some of the respondents wrote in the questionnaire, stating that community of Titiwangsa needed public education very much.

Of the 322 participants, 265 (82.3%) wanted to know how climate factors can be used to predict dengue outbreak. 266 (82.6%) of them wished to receive a periodical update on information of dengue early warning. 266 (82.6%) of them wished to receive a periodical update on information of dengue early warning. Regarding how would the respondents like to receive an early warning for dengue, 101 (31.4%) of them chose Mobile App, 88 (27.3%) preferred SMS, 129 (40.1%) selected Radio, 231 (71.4%) opted for television, 133 (41.3%) respondents preferred Facebook, and 79 (24.5%) chose either Twitter or Instagram.

Responses to dengue early warning

Responses of the urban residents to dengue early warning are presented in Table 4. About half of the respondents (48.6%; 156) did not check current dengue situations or hotspots around their area regularly. Almost half of them (46%; 148/322) felt that chemical fogging by the local authority is good enough to prevent dengue infection. There are 237 (73.6%) of the total respondents who would take part in a public activity for dengue control or removal of mosquitoes breeding sites, however, there were still 85 (26.4%) of them who chose not to participate. Close to a quarter of the total participants did not think that every household is responsible for preventing the spread of dengue disease. Regarding the most effective method in reducing dengue infection, most of them (64%) would search and destroy mosquito breeding sites, however, there were still some participants who preferred mosquito bites prevention (8.1%) and chemical fogging (23.3%).

Associations

Table 5 Educational level, perceptions, and attitudes towards their willingness of taking part in public activity for dengue control or removal of mosquitoes breeding sites. A significant association was found between educational level and willingness to involve in dengue prevention public activity with the *p*-value of 0.005. Residents with lower educational level contributed a higher proportion of residents who were not willing to take part in the public activity. These results are presented in Table 6.

Table 5 also shows the association between perceptions and attitudes of residents towards willingness to take part in the public activity. A significant association was found between knowing the number of dengue cases increases after rainy days and the willingness of engaging in public dengue prevention activity ($p<0.001$). Similarly, a significant association was also found in between knowing increasing temperature elevates dengue cases and the willingness to be involved in dengue prevention activity where *p*-value was 0.001. Residents who know rainy days and increasing temperature elevate dengue cases were more willing to join the public activity for dengue control.

There was a significant association between residents' perception on dengue early warning as a useful tool for the community to take preventive actions and their willingness of involving in a public activity for dengue control or removal of mosquitoes breeding sites ($p<0.001$). Those who knew dengue early warning is useful in predicting dengue outbreak were more willing to participate in a public activity. A significant association was found between the attitude of residents who were eager to know more about how climate can be used to predict dengue outbreak and their willingness of participating in a public activity ($p<0.001$). Those who were willing to learn were more prone to be engaged in a public activity.

Lastly, the association between the attitude of willing to receive a periodical update on information of dengue early warning and the willingness in taking part in public activities was significant ($p<0.01$). Those who were willing to receive information on dengue early warning were more willing to join a public activity.

Table 3 Attitudes of respondents towards dengue early warning

Variables		N	%
I want to help to reduce the number of dengue cases in my area.	Yes	277	86
	No	16	5
	Not sure	29	9
An early warning is important for the prevention of dengue outbreak.	Yes	277	86
	No	19	5.9
	Not sure	26	8.1
The government agency should include information of early warning of dengue outbreak as when they update dengue situations for the public.	Yes	259	80.4
	No	14	4.3
	Not sure	49	15.2
It is pointless for me to take action even with early dengue warning since my neighbors will not.	Yes	114	35.4
	No	208	64.6
The community in my area needs public education about dengue early warning.	Yes	273	84.8
	No	20	6.2
	Not sure	29	9
I want to know more about how climate can be used to predict a dengue outbreak.	Yes	265	82.3
	No	57	17.7
I would like to receive a periodical update information on dengue early warning.	Yes	266	82.6
	No	56	17.4
In what way, would you like to receive an early warning for dengue? Mobile App	Yes	101	31.4
	No	221	68.6
In what way, would you like to receive an early warning for dengue? SMS	Yes	88	27.3
	No	234	72.7
In what way, would you like to receive an early warning for dengue? Radio	Yes	129	40.1
	No	193	59.9
In what way, would you like to receive an early warning for dengue? Television	Yes	231	71.4
	No	91	28.3
In what way, would you like to receive an early warning for dengue? Facebook	Yes	133	41.3
	No	189	58.7
In what way, would you like to receive an early warning for dengue? Twitter	Yes	38	11.8
	No	284	88.2
In what way, would you like to receive an early warning for dengue? Instagram	Yes	41	12.7
	No	284	87.3
In what way, would you like to receive an early warning for dengue? Other media	Yes	31	9.6
	No	291	90.4

Table 4: Responses of respondents to dengue early warning

Variables		N	%
I check current dengue situations or hotspots around my area regularly.	Yes	156	48.6
	No	166	51.4
I will take extra action to prevent dengue infection if I know the risk of dengue is increasing in my area.	Yes	268	83.2
	No	19	5.6
	Not sure	35	10.9
After I receive an early warning of dengue outbreak from the government agency, I will:			
(a) Increase source reduction activities	Yes	211	65.5
	No	44	13.7
	Not sure	67	20.8
(b) Avoid outdoor activities at dawn or dusk	Yes	219	68
	No	56	17.4
	Not sure	47	14.6
(c) Share information with others	Yes	265	82.3
	No	24	7.5
	Not sure	33	10.2
(d) Request chemical fogging	Yes	240	74.5
	No	32	9.9
	Not sure	50	15.5
(e) Call local authorities	Yes	196	60.9
	No	50	15.5
	Not sure	76	23.6
(f)Use mosquito net	Yes	141	43.8
	No	114	35.4
	Not sure	67	20.8
Removal of mosquitoes breeding sites at my premises will reduce the chance of dengue infections among my family members	Yes	252	78.3
	No	30	9.3
	Not sure	40	12.4
The local authority has already provided sufficient effort on dengue control in my area	Yes	187	58.1
	No	58	18
	Not sure	77	23.9
Chemical fogging by local authority is good enough for us to prevent from dengue infection	Yes	148	46
	No	104	32.3
	Not sure	70	21.7

Table 5: Educational level, perceptions, and attitudes towards their willingness of taking part in public activity for dengue control or removal of mosquitoes breeding sites

		Proportion of residents who are willing to take part in public activity for dengue control or removal of mosquitoes breeding sites (%)	Proportion of residents who are not willing to take part in public activity for dengue control or removal of mosquitoes breeding sites (%)	*p-value*	Chi-square value
Highest Educational Level	No formal education	63.6	36.4	0.005	10.420
	Primary	56.4	43.6		
	Secondary	76.1	23.9		
	Tertiary	73.6	26.4		
Knowing the number of dengue cases increases after rainy days	Yes	80.0	20.0	<0.001	13.629
	No	60.7	39.3		
Knowing increasing temperature elevates dengue cases	Yes	83.0	17.0	0.001	11.350
	No	66.3	33.7		
Knowing dengue early warning is a useful tool for preventive actions	Yes	190.0	49.0	<0.001	16.586
	No	47.0	36.0		
Attitude on knowing more about how climate can be used to predict dengue outbreak	Yes	211.0	54.0	<0.001	27.925
	No	26.0	31.0		
Attitude on receiving periodical update information on dengue early warning	Yes	214.0	52.0	<0.001	36.924
	No	23.0	33.0		

DISCUSSION

Perceptions of Residents Towards Dengue Early Warning

This study demonstrated that most of the respondents had some basic knowledge about dengue fever. This may be because dengue prevention and control education programme has been implemented in Malaysian primary school education since 1993[9]. However, there remain 5% of the respondents reported inadequate knowledge about dengue fever. Similarly, almost all respondents knew that dengue fever can cause mortality and only about 3% of them did not know about such fact. Therefore, there remains the need of scaling up the health education campaign on dengue control.

More than 30% of the respondents did not know that climatic variations could affect dengue transmission. Specifically, about 33% of the respondents did not know or unsure that dengue cases may increase after rainy days and about 55% of the respondents did not know or unsure that dengue cases may increase with the increasing temperature. Few researches on climate and dengue have been conducted in Malaysia may explained this finding. On the other hand, no studies on the development of climate-based early warning systems in a local context were identified[10]. Despite that, nearly 75% of the respondents perceived dengue early warning as a useful tool for the community to take preventive measures. Therefore, it is recommended that dengue prevention educational programs should add focus on how climatic variability can be used for early detection of dengue outbreak.

Attitudes of Residents Towards Dengue Early Warning

Majority of the respondents (86%) felt that an early warning was important for the prevention of dengue outbreak. Encouragingly, 82% of the respondents wanted to know more about how climate affects dengue cases through public education and 82.6% of them wished to receive a periodical updates of dengue early warning. In short, more than 80% displayed good attitude in learning more about this issue. Television and social media such as Facebook and Whatsapp were the preferred platform to receive information on dengue early warning. Attractive infographics may be circulated via social media to improve knowledge and attitude of community members towards this disease. School-based education is also important in complementing community education because of the presumed transfer of knowledge and practice from classrooms to homes[11].

Responses of Residents To Dengue Early Warning

There were about a quarter of the total respondents who would not take part in a public activity for dengue control or removal of mosquitoes breeding sites. This could possibly due to the practice of storing water for daily usage which is a deeply ingrained habit[8] and lifestyle of the urban community. Therefore, to ensure a successful dengue control programme, it is recommended to implement dengue health education campaigns through visual and audio educational materials to stress the importance of every individual's participation in fighting dengue infection.

There were about 46% of the respondents who believed that chemical fogging was good enough to control dengue which is in accordance to the finding from a similar study done in 2013 whereby 66% of the respondents thought that fogging was essential enough for dengue prevention. In Malaysia, the main activities of dengue control and preventive measures, conducted by the Health District Office, would follow the guidelines of Ministry of Health and fogging has still been used as the main control measure during dengue outbreak[12]. However, it is important to know that sole dependency on fogging as a major approach to curb dengue infection may lead to insecticide resistance[13]. Hence, conventional measures on dengue control such as public health education, public involvement in search and destroy activities, and environmental management are still the best approach aside from chemical control of mosquitoes.

Factors associated with willingness of taking part in public activity for dengue control or removal of mosquitoes breeding sites

This study has found that respondents with lower educational level had lower tendency to be involved in public activities (p=0.005). A higher level of education was associated with favorable responses of dengue prevention and control, and it was shown that the knowledge of dengue was significantly and positively associated with better responses of dengue prevention and control[7]. Indeed, closing the gap between knowledge and responses will remain an important challenge for dengue control, as well as defining dynamic targets for the reduction of Aedes aegypti populations[7]. Those respondents with a better perception of climatic impacts on dengue transmission were found to be more willing to get involved in any public activities held by health authorities (p<0.001) and the same was also seen among those with a better attitude (p<0.001).

However, a minority of the respondents with good perception and attitude did not translate those attributes into dengue prevention and control. Health Belief Model (HBM) states that individual's health behavior is determined by four main elements: consideration of the susceptibility of the illness, consideration of the severity of the illness, perceived benefits of taking health action, and perceived barriers to take health action[14]. Therefore, HBM should be used as a framework for understanding the effective structure of health communication messages in order to change individual behavior to prevent dengue.

Strengths and Limitations

This study was conducted in a densely populated housing area in Kuala Lumpur. The public health issue surrounding dengue infection in this particular area of Kuala Lumpur needed urgent intervention. The implementation of the study is supported by data from Epidemiology Unit of Titiwangsa District Health Office which showed an increasing trend of dengue cases over the year. The findings of this study could help the health authority to draw a better conclusion on the community perceptions towards dengue issue and thus, plan a specific intervention that able to give impact to them.

The results of this study ought to be discussed in the context of some limitations. Firstly, this cross-sectional study could only provide a snapshot of the information about the residents in Kuala Lumpur. Secondly, there may have interviewing bias. Despite several trainings, different interviewers in the group may have phrased the questions differently which might subsequently influence the respondents' answers. Furthermore, there might also be reporting bias by the respondents who may want to please the interviewers.

CONCLUSIONS

In conclusion, the perception of the residents towards dengue infection, in overall, was positive. However, many of the residents in Titiwangsa district, Kuala Lumpur still did not have the knowledge related to climatic change and its connection to dengue transmission. On the other hand, the majority of the respondents showed good attitudes towards dengue early warning, however, there was still a small portion that portrayed poor attitudes. A minority of the sample population demonstrated a poor response. It was found that perception and attitude of the residents were significantly associated with their responses. In this study, higher educational level, better perception, and good attitude were the important factors that affected community willingness to participate in dengue prevention public activities in Kuala Lumpur. Preventive activities tend to be practiced by younger people with a good perception of dengue. However, a minority of the respondents with good perception and attitude did not translate those attributes into dengue prevention and control. Based on this study, the urban community of Kuala Lumpur still requires public education and information on dengue early warning and the process of response to this warning. Therefore, an educational campaign on dengue early warning should be implemented while the importance of every individual in the effort of fighting dengue infection should be instilled among the community. It is expected that future research will investigate other contributing factors such as political commitment and availability of educational resources.

ACKNOWLEDGEMENTS

Authors would like to thank the healthcare personnel in District Health Office Titiwangsa for their assistance and guidance in data collection and field activities. Authors also would like to acknowledge Early Warning System of Dengue Project (UMRG: RP034A-15HTM) and Swedish Research Link (SRL) Program (348-2014-4040 & E0404001) for the questionnaire used in this study. Finally, a special thank goes to the Department of Social and Prevention Medicine of University of Malaya (UM) Medical Faculty for providing the opportunity to conduct a public health research project in the community.

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