Larviciding Practice for Prevention and Control of Dengue among Urban Community.

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ABSTRACT

Introduction: Larviciding is one of the long-term measures that can help to eradicate Aedes larval breeding before they become adults. Local Health authorities have been conducting environmental larvicing activities at regular intervals and this may have altered the community's perception that vector-control activities are now the responsibility of government agencies and that the local community may not be required to practice larviciding. This study aims to determine level of knowledge, attitude and factors associated with larviciding practice among urban community. **Materials & Methods:** A cross-sectional survey was done in selected five local authority areas in Selangor state, Malaysia. Two stage random sampling using cluster random sampling for type of houses and systematic random sampling for selection of houses was used. Respondents were interviewed using structured questionnaire. Descriptive and bivariate statistical test (Spearman's correlation and Mann-U Whitney) were used. **Result:** A total of 2007 respondents were interviewed. About 48% of respondents practiced larviciding in their homes with only 15.8% had good level of practice. Majority (92.7%) of respondents reported that they would practice larviciding only if there is an outbreak of dengue with threat of death in their community. 69.4% of the respondents had good knowledge on larvicide and larviciding. Knowledge was significantly associated with education level ($p<0.05$). About 49.4% of respondents were found to have good attitude towards larviciding. Knowledge ($r= 0.137, p<0.05$) and attitude scores ($r= 0.087, p<0.05$) were found to have a weak but significant positive correlation with practice of larviciding. Higher knowledge level ($U=300173, p<0.05$) and better attitude level ($U=368265, p<0.05$) was found to be significantly associated with larvicide usage. **Conclusion:** Despite having good levels of knowledge and attitude, the practice of larviciding among urban communities in Selangor state during peace time is still low. The level of practice of larviciding is dependent on whether there is an outbreak of dengue in the community or not.

Keywords: **dengue, larvicide, vector, urban, aedes aegypti**

INTRODUCTION

Dengue fever (DF) is one of the arthropod-viral diseases that had become an important public health problem. It is the most important mosquito-borne viral disease affecting humans, with the mosquito vector found in nearly 100 tropical countries. It affects tropical and sub-tropical areas around the tropical and sub-tropical areas around the world predominantly in urban and suburban areas. The global distribution of Ae-

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desaegypti, the mosquito vector for the dengue viruses, is comparable to that of malaria, and an estimated 2.5 billion people live in areas at risk for epidemic transmission. World Health Organization (WHO) currently estimates there may be 390 million cases of dengue infection worldwide every year[1].

In Malaysia, dengue fever, which was first reported in 1902 has now become one of the major public health problems, especially with the emergence of dengue haemorrhagic fever (DHF) in 1962[2]. Since the first report, a few other outbreaks were reported in which almost all had occurred among the urban community of Penang and Kuala Lumpur[3-4]. The incidence rate of DF for 2015 was 396.4 for every 100,000 population which was an increased from previous years. Case fatality rate for DHF was 0.28% in 2015 with a total of 336 deaths of both DF and DHF. Selangor state had contributed highest number of reported and confirmed cases in the country. In Selangor, incidence rate of dengue has been increasing especially for the past four years. In June 2016, the number of reported cases was 29,915 cases which is the highest recorded number ever reported[5].

Over the last two decades there are massive infrastructure development and a very active construction sector for housing and commercial development especially in Selangor, creating many man-made opportunities for Aedes mosquito breeding. Therefore, it is undeniable that prevention and control strategies of DF and DHF needed to be strengthened at all level which should includes healthcare authorities, non-healthcare agencies and most importantly the local community. The main player would be the local community because study in Brazil had shown that community participation and community mobilization would have resulted in more effective intervention for dengue control and prevention program[6-7].

Among the strategies to prevent and control dengue outbreak is the larviciding practice which is one of the permanent and long–term measures that can help to eradicate Aedes aegypti larval breeding before they become adults. Larvicides are a type of pesticide used in mosquito control programmes. The main action is by killing the mosquito larvae. Larvicides used in dengue control and prevention programme in Selangor state includes biological insecticides such as Bacillus Thuringiensisisraelensis (VECTOBAC) and other chemicals such as temephos (ABATE) and oils. Larvicide treatment of breeding habitats would help to reduce the adult mosquito population in nearby areas[8]. Other than that, larviciding process, which is the control of mosquito at the larval stage, is important because of the occurrence of transovarial dengue virus in wild population[9].

The use of larvicide to prevent larval development in water-holding containers is indeed an essential component of dengue prevention and control program. Nevertheless, the continuous application of chemicals by vector control health staff had reinforced community perceptions that the government is responsible for all facets of vector control with little or no responsibility expected from them. This is the reality especially when larvicide was also given freely to the community by the health authorities during and between dengue outbreaks, which was highly endemic in urban areas.

Currently, most national programs are ill-equipped to manage the prevention and control aspects of a dengue program, and the implementer relies heavily on chemical control methods. Operationally, the majority of national dengue control programs provides emergency response to epidemics and is unable to effectively sustain the control of the proliferation of the mosquito. In Selangor, health authorities had found that larval habi-

tats were increasing in urban areas at an alarming rate. This was primarily due to the lack of manpower in local authorities to cover 100% of household inspection for Aedes aegypti. Other than that, there were also other reasons such as increased urbanization where semi-urban areas were lacking in basic infrastructure, the widespread use of non-biodegradable items, lack of adequate trash disposal and sanitary landfill systems as well as situations where local government was seen struggling to control unplanned housing development growth. All of these factors could contribute to increase in larval habitats existence[10]. Hence, the main objective of this study was to assess knowledge and attitude of the community and identify associated factors related to larviciding practice among the urban community.

METHODS:

Study design

This is a prospective cross-sectional study, which was carried out in the Petaling District, of Selangor during peacetime from 1 March 2009 to 31 December 2009. Petaling District is the most urbanised district in Selangor comprising of 1.5 million populations. This study involved urban communities from five local authorities of Selangor state, Malaysia.

Sampling method

The locality with highest reported dengue cases in year 2008 in each local authority was selected. Two-stage sampling method was applied in the selection of respondents. The first stage of cluster random sampling technique was used to sample type of houses, which could either be a high-cost house (include bungalow and semi-detached), medium-cost (included terraces and apartments) and low-cost housing (included landed low-cost and flat). Then, a systematic random sampling technique was used to select the sampled houses in each cluster. All members in the households aged 12 years old and above were given a self-administered questionnaire. Those who were illiterate and not able to understand Bahasa Malaysia or English languages were excluded.

Study instrument

Bilingual (Malay and English) structured questionnaire was used for data collection. The questionnaire consists of four parts which were Part A on sociodemographic data; Part B on knowledge about larvicide and larviciding (10 items); Part C on attitude on larvicide (5 items) and larviciding and Part D on practice of larvicide and larviciding (3 items). This is a newly developed questionnaire based on literature review. Keywords search consisted of dengue, dengue fever, larvicide and larviciding practice were used in library database comprised of PUBMED, Medline, EBSCOhost and search engine of Google Scholar. Three domains of knowledge, attitude and practice were discussed with two experts in epidemiology and communicable diseases for content validity. The questionnaire items were in two languages (English and Malay). Pre-testing of the questionnaire was conducted among selected 30 respondents from the community, internal consistency was acceptable with Cronbach alpha at 0.847 for knowledge domain, 0.638 for attitude domain and 0.433 for practice domain.

The knowledge level was divided into two categories: good knowledge (score ≥6) and poor knowledge (score<5) using the accepted cut off point decided by the expert group of public health specialist after pre-testing of the questionnaire. The cut-off point 5 was set based on minimum score that respondents need to obtain about knowledge on larviciding and larvicide (25% right answer). The attitude level was divided into three categories: good attitude (score ≥9), moderate attitude (score 6 to 8) and poor attitude (score≤5), meanwhile practice level was divided into 2 categories: good practice (score ≥5), and poor practice (score≤4). Cut-off point was decided based on discussion with

the expert panel of public health specialist after pre-testing of the questionnaire.

Data analysis

All data entry and statistical analysis was done using SPSS version 23.0. Descriptive analysis was done and presented as median and interquartile range (IQR) for this study data that was not normally distributed. Hypothesis testing was done using chi square test of indepence and non-parametric test including Spearman's correlation and Mann-U Whitney test.

Ethical statement

This study was approved by the Research Ethics Committee of Universiti Teknologi MARA.

RESULTS

A total of 2007 respondents were interviewed. Table 1 shows the details on the socio-demographic profile of the respondents. The median age of respondents was 38.0 years old (IQR$\pm$ 24). Majority of them were females and married. Most were Malays followed by Indian and Chinese. More than half of the respondents had secondary education while 17.3% and 15.7% had tertiary and primary education respectively. Majority of respondents stayed in medium-cost houses and very small proportion of the respondents stayed in high-cost houses. Furthermore, about one third of the respondents' household income was less than RM1, 000 (USD 250) per month (USD, exchange rate [2008] USD1= RM3.99).

Level of knowledge on Larvicide and Larviciding and association with larviciding Practice

In this study the knowledge score of the respondents ranged between 0 and 19 with median score of 7. Proportion of respondent with good knowledge was 69.4% and further analysis of the questions on knowledge revealed that majority (90.6%) knew about the location and place of mosquito breeding site. However, only less than half of the respondent (44.6%) knew that larvicide could be easily obtained in the market. Chi-square test of independence showed that knowledge level was significantly associated with education level ($p<0.05$). It was also found that knowledge level was significantly associated with practice of larviciding ($r=0.137$, $p<0.05$).

Level of Attitude on larvicide and larviciding and association with larviciding practice

For the attitude score of the respondents it ranged between 0 and 13 with median score of 7. Majority of respondents 49.4% had good attitude while about one third of them (28.2%) had poor attitude. Majority of respondents (92.7%) admitted that they will definitely be willing to consider larviciding if there was death due to dengue in their areas. Furthermore, it was found that attitude level was positively but weakly associated and practice of larviciding ($r=0.087$, $p<0.05$).

Practice of larviciding and users of larvicide

As for the practice of larviciding, the practice score of the respondents ranged between 0 and 6 with median score of 4. Majority (84.2%) of the respondents were found to be poorly practicing larviciding. Only small proportion (15.8%) of the respondents had good practice. Majority of respondents admitted that they were not using larvicide in the past (51.7%).

Association of knowledge and attitude between larvicide users and non-users

The level of knowledge in larvicide users was higher compared to the non-users ($U= 300173$, $p<0.05$). Similarly, higher attitude score was found among the larvicide users compared to the non-users ($U= 368265$, $p<0.05$).

DISCUSSION

Findings from this study revealed that more than half of the respondents had good knowledge score on larvicides and larviciding. This finding echoed findings from two other local studies, which reported good to high level of knowledge on dengue among their respondents. [11, 12] It also supported another study in Thailand in 2006, which had found that knowledge of Abate; which is common larvicide for dengue prevention as a measure to prevent dengue was known by majority of respondents as compared to other preventive measures. [13]

Consequently, level of attitude among the majority of respondents towards larviciding was also found to be good and significantly correlated with the practice of larviciding. These findings also consistent with earlier study by Mohamad et al that stated attitude of respondents on dengue prevention practice were good.[11] For present study, these could be due to the fact that this study locations were in the area of previous dengue outbreak which might have translated into increased level of awareness among respondents which in turn lead to increased level of knowledge and attitude towards larviciding. Rationale for this could be seen as comparable to findings in an earlier study in Thailand which had found that an increased in health education such as knowledge imparted to mothers in their population could resulted in the significant increased in the proportion of mothers with attitude of larvicides were the best control method to prevent dengue. Moreover, this increased in term of knowledge also contribute to positive impact on the attitude and practice on preventive measures of dengue. Another study in Malaysia also reported that respondents with good knowledge also had better attitude towards dengue control measures and significant association was revealed between the knowledge on dengue with level of attitude towards dengue prevention and control. [14]

Unfortunately, majority of respondents had poor practice of larviciding and only small percentages of respondents showed good practice. This was not surprising reason being, these findings appeared to be consistent with one previous study in this country which found that good knowledge on dengue does not necessarily lead to good practice of larviciding for dengue control. [14] This study was conducted during peacetime when there was no outbreak of dengue fever in the community and majority of the respondents have reported that they would practice larviciding during outbreaks. A local study carried out in a rural community in Trengganu during an outbreak did report that almost all of their respondents performed good practice against dengue infection.[12] Thus, as with any communities, preventive measures have a very high uptake whenever there is active outbreak with threat of death and this practice generally drops during peacetime, when the risk of infection and death is at its lowest.

Additionally, in this study almost less than half of the respondents reported using larvicide despite the fact that one of the larvicide, temephos (ABATE) was given free of charge to the community especially during dengue outbreaks in their area. This finding was similar with finding of study in 2016 done among rural community that showed that only 38.8% of respondents used abate in their water containers. This could be a signal of probable negative indicator of community participation in dengue prevention and control in this urban community setting.

Lastly, there was a significant association between knowledge level of users and non-users of larvicide. This finding when added with the result that showed significant association between attitude level of users and non-users of larvicide could means that majority of non-users have poor knowledge

about larvicide and vice versa. As for attitude, majority of larvicide users have good attitude on larviciding as compared to non-users of larvicide.

Study limitation

The limitations in this study were, although significant association was found between variables of interest, the nature of the data that was not normally distributed means that only non-parametric test were able to be conducted and therefore, a more in-depth analysis between variables were unable to be explored further. This study also was limited in term of the geographical area sampled was only confined to previous dengue outbreak areas and hence, further research would be needed to investigate whether communities in non-affected areas also presented with similar findings. The findings were also limited to literate and respondents who understood English or Malay language. In terms of sampling approach, respondents' housing type was not evenly distributed based on random selection of house type clusters from five different localities. Moreover, most of high-cost house owners refuse to participate in this study leading to above-mentioned findings. Nevertheless, the strength of this study was the fact that study respondents was sampled randomly and thus would eliminate any selection bias that might distort this study findings.

In conclusion, this study had found that majority of urban community dwellers in Selangor have good knowledge and attitude on larvicide and larviciding. However, less than half of the community used larvicide as a preventive measure for dengue control. Knowledge and attitude were significantly correlated with practice. Therefore, policy makers and related agencies need to advocate control and prevention measures which optimize and utilize the health education and health promotion aspect on larvicide and larviciding to approach the community especially in the outbreak areas in order to improve community participation for dengue control and prevention.

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