REVIEW ARTICLE

Knowledge, Attitude and Practices (KAP) On *Aedes* Mosquito-Borne Diseases Amongst Community Members in Malaysia: A Review

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ABSTRACT

Aedes mosquito-borne diseases such as dengue, chikungunya and Zika are classified as emerging and re-emerging infectious diseases across the globe. There is no permanent treatment or vaccine developed and the effort is still on-going. Several mitigation methods were introduced to control *Aedes* mosquitoes and the outbreak of these diseases. However, they had only been temporarily effective due to the lack of practices and participation of all community members who can contribute to the prevention of *Aedes* mosquito-borne diseases. Awareness on these diseases is still limited while the knowledge, attitude and practice of an individual strongly determines their level of involvement at community level towards prevention. This review highlights an overview of knowledge, attitude and practice studies on *Aedes* mosquito-borne diseases among different communities in Malaysia, the limitation in the knowledge, attitude and practice studies and the improvement that can be made to the knowledge, attitude and practice approach to encourage a more inclusive community involvement in Malaysia.

Keywords: *Aedes* mosquito-borne diseases, Awareness, Community, Intervention, Prevention

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INTRODUCTION

Aedes mosquito-borne diseases have been the longest known infectious diseases to exist and still continue to threaten the lives of humans across the globe. In this case, efforts to establish a broad-spectrum anti-viral drug and vaccine treatment for dengue, chikungunya and Zika, followed by the development of universal Arbovirus insecticides to limit the spread of *Aedes* mosquitoes are still on-going (1). It is challenging to develop effective treatments and vaccines in a near time period, due to the high cost, long establishment durations and disadvantages of vaccine development (2,3). Most of the traditional control practices available are only temporarily effective while modern biotechnology-based interventions and biological control strategies have been introduced to overcome traditional methods (4,5,6). These can reduce *Aedes* mosquitoes and the occurrence of related diseases among humans more effectively. Nevertheless, the effectiveness of the newer strategies become less potent as well after a period of time, as one of the reasons is due to the short - termed sustainability of strategies and inadequate community involvement (7).

In Malaysia, the health authorities have taken significant measures such as anti-larval and anti-adult measures, health education and the enforcement to destroy disease bearing insects and lately the national level vector control program that involves a high cost; which required community involvement (8,9,10). However, without awareness among community members, these strategies may not work effectively. Every individual should have sufficient knowledge, good practices and attitudes towards *Aedes* mosquito-borne diseases as a habitual routine as community participation are crucial in interrupting Arboviruses as they are known to infect all age groups of a community (4,11). In the recent days, the public were advised by the authorities to take responsibility to curb *Aedes* mosquitoes and the related diseases as a number of cases remained emerging in hotspot areas such as Selangor, Johor Bharu and Kelantan (12). Hence, creating strong awareness on *Aedes* mosquito-borne diseases among community members is emphasized as an important element to help control, prevent and to an extent even curb *Aedes* mosquito-borne diseases these days.

In order to determine awareness, several studies using knowledge, attitude and practices (KAP) analysis had been carried out in Malaysia to access the level of knowledge, attitudes and practices of various community members. Therefore, this review briefly discusses the findings of studies based on knowledge, attitude and

practice analysis used to assess awareness among varied communities in Malaysia along with the advantages and limitation in the studies. Recommendations that can be considered to overcome the limitation are also included. This review will be valuable to improve community involvement at all levels and provide insights on the interventional approach to efficiently measure the awareness among community members.

MATERIALS AND METHODS

Search Strategy
Search for articles was conducted based on the systematic literature review, referring to the Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) guideline (13). The selection for related articles was done based on the four stages of process as recommended in the PRISMA guideline. For the first stage, a bibliographic search was performed on journal databases such as Scopus, Science Direct and PubMed with the terms 'Aedes', 'dengue', 'chikungunya', 'Zika', and 'knowledge, attitude and practices' or 'KAP'. Articles from early 2011 until December 2017 were included as part of the review process. Review articles and book chapters were excluded. Articles in Malay and English were both accepted for the review.

The second stage of the process was carried out by screening out any duplicated articles detected. Articles were screened in regards to the title and the abstract of the articles. Knowledge, practice and attitude studies done outside Malaysia were also excluded. For the third stage of the process, the articles were screened based on content of the full text. Only studies that involved cross-sectional knowledge, attitude and practice studies were included. The final stage of the process was the final review and outcome writing of all the selected articles based on their inclusion criteria as above for the systematic review. This search was carried out by two independent authors and information for the review from each article was cross-checked twice to match the suitability of the review content. Figure 1 shows the flow chart representing the stages and number of articles included in each stage until the final stage of the selection process.
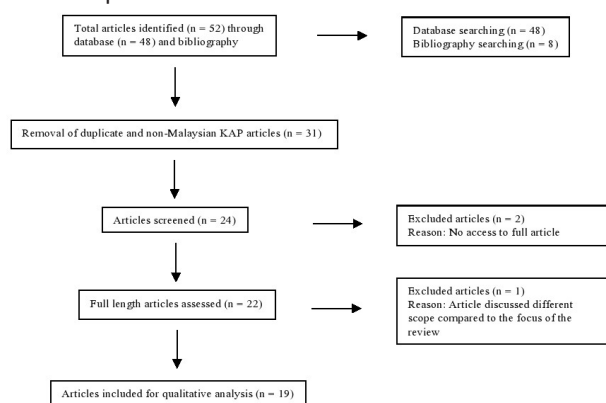

Figure 1: Study flowchart based on the PRISMA guidelines

Data extraction and Analysis
Articles that were included in the final review were separated to represent the three different diseases carried by Aedes mosquitoes, namely dengue, chikungunya and Zika. Data extracted from each of the article were assembled by category in an Excel spreadsheet. Quality analysis on the data obtained from each article was conducted according to type of study design, data collection methodology, geographical area covered, outcome of analysis and the contribution to the knowledge and limitation of the current study. Quantitative and qualitative analysis was conducted for this review.

RESULTS AND DISCUSSION

Search Analysis
A total of 48 articles were obtained from the literature search conducted using various different search engines. Another eight articles were obtained from bibliography searches, increasing the total number of articles accessed to 52 articles. About 31 articles were removed, where these articles were perceived as duplicated records and do not cover Malaysian regions in their respective manuscripts. A total of 24 articles were finally screened, excluding two articles due to the unavailability of full-length articles. Next, 22 full-length articles were accessed for the review process. Three articles were removed as a result of its non-suitability in the content focussed. A total of 19 articles were then used for the final review. Outcome from articles not included had also been discussed where necessary.

Data analysis was conducted based on criteria such as the knowledge, attitude and practice outcome, future contribution and limitations present. A wide range of the target groups consisting of multi-ethnic Malaysians aged 18 and above residing in different settings of the country were used in all papers, where one paper focussed on target with specific conditions such as pregnant women. The sample size used in the papers were relatively based on the time constraints where a longer study duration had more respondents and vice versa. Collectively, all three knowledge, attitude and practice parameters were assessed in the papers involved. Data collection period ranged from nine days to one year. Each paper focussed the outcome from specific geographical area while some had multiple geographical area coverage in general in the study.

As for data analysis, descriptive statistics was used to analyse the most common demographic characteristics such as age of respondents, ethnicity, gender, marital status, education levels, occupation and income. Statistical tests including chi square test and t-tests were frequently used categorical and continuous data respectively; to further analyse the prevalence of knowledge, attitude and practice in all the papers. Each study included in this review had generally identified

limitations such as short duration of study, lack of inclusivity and varied interviewer approach during data collection, sampling approach and limited variables in the study tools were mostly considered as limitation. However, all these studies have been peer reviewed accordingly before publication and have contributed to fill significant information gaps. The overall findings of all papers had been summarized as in Table I.

Knowledge, Attitude and Practice on *Aedes* Mosquito-Borne Diseases Among the Communities of Malaysia
In Malaysia, knowledge, attitude and practices awareness on *Aedes* mosquito-borne diseases had been chosen from almost all states representing the varied communities of the country, including Sabah and Sarawak. In this case, 17 studies from a total of 19 focussed on dengue, two studies on Zika and one on

Table I: Summary of study details and findings on KAP assessment among selected areas

No.	Author (year) / Location	Target group and Aedes mosquito-borne disease(s) involved	Study design and duration	Aims (primary objective being assessed)	Key findings
1.	Arief *et al.* (2017) / Selangor	Residents aged 18 and above Zika	Cross-sectional One month	To evaluate the knowledge and attitudes towards ZIKA and its prevention	Knowledge: High Attitude: Average
2.	Aung *et al.* (2016) / Seberang Takir, Terengganu	Residents aged 18 and above Dengue	Cross-sectional NA	To evaluate the current level of awareness, attitude and practice regarding dengue	Knowledge: High Attitude: Moderate Practice: Good
3.	Rahman *et al.* (2014) / Jempol, Negeri Sembilan	Residents aged 18 and above Dengue	Cross-sectional One month	To determine the perception on dengue and dengue prevention program	Knowledge: Good Perception: Poor
4.	Kamel (2017) / Sepang, Selangor	Residents aged 18 and above Dengue	Cross-sectional Two weeks	To determine knowledge, attitude and practice status towards dengue prevention	Knowledge: Moderate to poor Attitude: Good Practice: Moderate to good
5.	Danial *et al.* (2017) / Northen Malaysia (North and South Seberang Perai)	Respondents aged 18 and above Dengue	Cross-sectional One year	To assess factors affecting awareness and practices on dengue infection and fever	Awareness: Good Practice: Poor
6.	Anwar *et al.* (2017) / Johor Bharu	Pregnant women Zika	Cross-sectional 15 days	To determine the predictors affecting preventive practices on Zika Virus infection	Knowledge: High Practice: High Overall: Adequate knowledge on Zika infection
7.	Hanim *et al.* (2017) / Kuantan, Pahang	Residents aged 18 and above Dengue	Cross-sectional 18 days	To assess knowledge, attitude and practice regarding dengue and its associated factors	Knowledge: High Attitude: Poor Practice: High
8.	Mohammad *et al.* (2014) / Selangor	Oldest residents of each living quarters Dengue	Cross-sectional NA	To identify the factors associated with larval control practices in this particular community	Knowledge: Fair to good Attitude: High Practice: Low
9.	Rao *et al.* (2016) / UPM, Serdang	International university students Dengue	Cross-sectional Six months	To determine the practices and the contributing factors related to dengue fever prevention	Knowledge: Poor Attitude: Negative Practices: Good
10.	Wong *et al.* (2015) / 13 out of 14 states in Malaysia	Malaysian public aged 18 to 70 years Dengue	Cross-sectional telephone survey One year	To examine the demographic factors, theoretical constructs of the Health Belief Model and knowledge about dengue and how these influence the practice of dengue prevention.	Knowledge: Moderate Practice: Low
11.	Lugova *et al.* (2017) / Kuala Lumpur	Individuals 18 and above Dengue	Cross-sectional 26 days	To examine the factors affecting dengue knowledge, attitude and preventive practices	Knowledge: Moderate Attitude: Good Practice: Good
12.	Naing *et al.* (2011) / Seremban	Respondents of household area Dengue	Cross-sectional One month	To determine the level of knowledge and practice of dengue control amongst the study community	Knowledge: Good Practice: Good
13.	Hairi *et al.* (2003) / Kuala Kangsar	Heads of households Dengue	Cross-sectional Nine days	To assess the level of KAP concerning dengue and its vector Aedes mosquito	Knowledge: Fairly good Attitude: Good Practice: Poor
14.	Wong & AbuBakar (2013) / Klang Valley	Multi-ethnic Malaysian citizens aged 18 years and above Dengue	Focus group discussions, Six months	To provide an in-depth understanding of the meaning of dengue fever (DF)	Knowledge: High Practice: Low
15.	Yussof *et al.* (2017) / UNISZA	Respondents from 16 to 65 years Dengue	Cross-sectional NA	To assess the current level of awareness, attitude, and practice regarding dengue	Knowledge: Mostly high Attitude: Mostly neutral Practice: Mostly good
16.	Shafie *et al.* (2016) / Pangkor Island	Malay, Indian and Chinese residents Dengue, chikungunya	Cross-sectional One month	To evaluate the extent of awareness of basic mosquito biology and mosquito borne diseases	Knowledge on mosquito biology & self-protection: High Knowledge on mosquito-based diseases: Low
17.	Chandren *et al.* (2015) / Peninsular Malaysia	Orang asli aged 18 and above Dengue	Cross-sectional 10 months	To look at the knowledge about dengue and its association to dengue prevention practices	Knowledge on signs and symptoms of dengue: Low Knowledge on prevention: High
18.	Said *et al.* (2018) / Kelantan	Community members of Tok Kenali village Dengue	Cross sectional NA	To determine the level of attitude and practices toward dengue prevention among the community residing in a dengue hotspot	Attitude: Good Practice: Moderate
19.	Wong *et al.* (2014) / North, East, West, Centre and South of Peninsular Malaysia, as well as Sabah in East Malaysia	Residential communities aged 18 to 60 years old Dengue	Cross-sectional telephone survey interview One year	To examine factors associated with the seroprevalence of dengue	Knowledge: Low Prevention: Low Association between both: Positive but weak

*NA = Not Available

chikungunya. A seroprevalence study on Zika is also expecting to provide data on the widespread of Zika infection and its correlation with the occurrence of microcephaly and Guillain-Barne syndrome, however data is yet to be published (14). All these studies have contributed to the level of knowledge, attitude and practices or awareness of the public on *Aedes* mosquito-borne diseases as the outcomes in the studies. In order to measure knowledge, attitude and practices levels, all the studies were observed to have conducted by the cross-sectional survey method using questionnaires to obtain information from the public. The studies however vary with different approaches taken consisting of face-to-face interview and telephone surveys as well.

These studies concentrated either in one particular area or a number of states in the country. Among all the studies carried out on dengue infection, outcomes with a positive correlation between good knowledge and attitude towards exhibition of good practices was from a study involving eight states of Orang Asli communities in Peninsular Malaysia (15). It revealed that lower knowledge on the signs, symptoms and prevention of dengue among Orang Asli communities, influenced by factors such as health beliefs and poor living conditions lead to poor prevention practices (15). Initiation of fogging activities and educational campaigns may enhance preventive practices among the Orang Asli communities in Peninsular Malaysia. Other studies indicated socio-demographic factors proving that people with lower education and income tend to have lower knowledge about *Aedes* mosquitoes and associated diseases, lowering good attitude and practices towards the scenario (11, 16, 17, 18, 19).

Knowledge, attitude and practice levels among communities may also show changes depending on the type of environmental setting the communities live in. However, certain studies argued that good knowledge and attitudes does not necessarily produce good practices (3, 20, 21). Again, the predictor of poor practice may be due to reasons such as negative attitudes towards practice, low exposure to information and low knowledge and cases exposure (21). It was also discussed that external factors such as high-rise buildings, rapid urbanization, economic expansion, local temperature and humidity profile can elevate infection rates (3). Considering predictors and external factors as stated above, individuals of a community must have not realized the effects of self-contribution towards curbing *Aedes* mosquito-borne diseases. Most of the community members did not seem to be practicing preventative practices although family or fellow community members were infected with *Aedes* mosquito-borne diseases (19, 22, 23). Good preventive practices and good attitudes also do not necessarily indicate good knowledge among the public (23). Knowledge was specifically poor on the dengue vector, transmission routes and clinical manifestation of the disease among the community in an urban area. However, good preventive practices among the same community members may be present due to the culture and tradition of an individual and a family. The finding of this paper also concluded that the balance between knowledge, attitude and practices could also vary according to socio-economic status, culture and the education levels of an individual (23).

Referring to the studies above, it is evident that health and educational campaigns with strong mobilization and effective information delivering methods are still required in order to improve knowledge in the endemic areas of *Aedes* mosquito-borne diseases along with community engagement to increase exposure. Four other studies were also focused on the factors affecting existing interventions on *Aedes* mosquitoes transmitted virus control, and the dengue disease in the particular community chosen. A study reported that practices on interventions such as larval control procedures were effective when community members had good level of attitude towards the diseases by attending frequent health and educational campaigns (24). The community lacked knowledge in terms of the symptoms, treatment and early detection importance (25). A study that included communities in all states of Malaysia found that individuals with higher susceptibility towards dengue, higher knowledge in the risk of dengue virus infection, less busy lifestyles and higher income or skilled occupation possessed higher involvement in prevention practices (25). It was further added that both urban and rural communities are exposed to the risk of dengue virus infection through different factors; rural communities are targeted due to higher vegetation density and water storing habits since water supply is not available at times while urban communities are targeted due to their living in high-rise buildings, through the presence of pots of indoor ornamental plants complimented by their busy lifestyle of not frequently cleaning potential breeding areas (26).

In terms of chikungunya, it was also found that knowledge on the diseases spread by *Aedes* mosquitoes are low; relatively explaining the low exposure to the prevalence of chikungunya and knowledge associated with its symptoms (22). As for Zika, analysis among Selangor residents showed that knowledge only lacked in terms of transmission information on sexual contacts, risk of public in Malaysia towards the disease, vaccine availability and complications on new–born, where interventions and further studies among different communities in Malaysia were suggested to improve the knowledge and attitudes of the public (19). In Johor, a study among pregnant women showed that the majority of respondents had high knowledge and preventive practices against Zika, however predictors such as the type of living household had a significant effect on the rate of awareness on the Zika infection (27). These studies proved that education on *Aedes* mosquito-borne diseases are significant to familiarize the public

with correct knowledge, attitude and preventive actions to be taken at an individual level. Other two studies discovered that traditional community beliefs affect practices among members of a particular community due to the lack of intensive prevention efforts and exposure on recent treatments and needs to overcome *Aedes* mosquitoes and *Aedes* mosquito-borne diseases (26, 28).

Limitation of Knowledge, Attitude and Practices Studies on *Aedes* Mosquito-Borne Diseases Among Malaysian Community

All the studies were limited to community members above seven years, with the least amount of studies reporting on children in the primary school and kindergartens. Children are the next generation of adults, thus educating them on these diseases is vital to safeguard their health from *Aedes* mosquito-borne diseases. Besides all-age inclusive participation, researches conducted using an intervention approach is also limited. More studies should be conducted using various, education-based interventions, where interventions should also be adjusted to suit the nature of the targeted community members based on their age, background and the type of setting they live in. Lastly, a very low number of studies were carried out on the knowledge, attitude and practices analysis of chikungunya and Zika virus infections, where the baseline knowledge, attitude and practices data in among chikungunya and Zika virus infections in majority of the communities is not known. This wide gap should be narrowed as chikungunya and Zika are classified as emerging threats to the country.

Recommendations Towards Enhancing Knowledge, Attitude and Practice Studies of *Aedes* Mosquito-Borne Diseases in Malaysia

Children at the younger age, appropriately aged five to six years old in the community should be included in studies and researches done regarding awareness on *Aedes* mosquito-borne diseases. The development and validation of suitable picture – based tool using verbal question and answer format for children aged at least five to six will enable more studies to be conducted in many other areas with known *Aedes* mosquito-borne diseases endemics. In fact, a reverse method using children as ambassadors of preventing *Aedes* mosquitoes and related diseases to adults can be considered as a new approach towards increasing awareness among Malaysians. Apart of that, a two-stage study consisting of a cross sectional and an in-depth intervention approach that compares various health education intervention methods should be considered for more effective and positive outcomes, leading to benefit the target group. Consistency of interventions through several follow ups can be the best way to cultivate the right knowledge, attitude and practice and sustainable change to all community members. Existing study tools should also be modified to understand the perception of community towards chikungunya and Zika. This step will raise alertness among the society to protect themselves from further severity in case if these diseases emerge as worsened diseases.

CONCLUSION

Knowledge, attitude and practice analysis on *Aedes* mosquito-borne diseases can be improved in terms of its role of providing necessary baseline information among the Malaysian community. All three aspects stand-alone and in some cases depend on each other. Nevertheless, knowledge, attitude and practices can be improved through inclusive participation and proper planning and implementation of educational interventions amongst community members against *Aedes* mosquito-borne diseases. To enhance such participation, effective measures that can improve awareness in terms of knowledge, attitudes and practices should be done more frequently and consistently, considering all community members to play their part to free from the threat of *Aedes* mosquito-borne diseases. This review will be able to provide valuable judgements for readers of a forward moving community especially when effects of *Aedes* mosquito-borne diseases are non-negotiable and requires a solid base in educating the public on awareness against *Aedes* mosquito-borne diseases.

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