A Cross-sectional Survey on the Knowledge and Attitudes towards Zika Virus and its Prevention among Residents of Selangor, Malaysia

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Abstract

Objective: The objectives of this study were to evaluate the knowledge and attitudes towards ZIKV and its prevention among residents of Selangor, Malaysia. **Methods:** A pre-tested, self-administered, cross-sectional survey involving 400 participants was conducted from January to February 2016 in Selangor, a most populated state of Malaysia. Participants were selected using a purposive sampling approach. Descriptive and inferential statistical tests were applied to analyze the data. **Results:** Of 400 surveys included in the final analysis, 286 (71.5%) respondents showed good knowledge towards ZIKV. The mean knowledge score of the participants was 10.94 ± 3.89. A total of 298 (74.5%) respondents showed a positive attitude towards ZIKV and its prevention. The mean attitude score of the participants was 7.10 ± 2.80 (based on 10 questions). One-third of participants (n=132, 33%) did not consider the need of any protective measure if the male partner is suspected of having ZIKV. A large proportion of respondents (n=190, 47.5%) did not consider Malaysia at risk of ZIKV. Participants' main source of information about ZIKV was the internet. **Conclusion:** The findings of this study highlighted important gaps in the knowledge and attitudes of Selangor residents towards ZIKV and its prevention. There is a need for developing customized interventions to bridge these gaps as it is critical to prevent the spread of ZIKV in Malaysia.

Key words: Knowledge, Attitude, Zika virus, Infection, Public, Malaysia

INTRODUCTION

Zika virus (ZIKV) is a flavivirus, belongs to the family Flaviviridae. Zika is an emerging viral disease that transmits through the bite of an infected mosquito, mainly *Aedes*

aegypti, in tropical regions.[1] The same mosquito is also responsible for the transmission of other mosquito-borne diseases like yellow fever, dengue, and chikungunya. Besides, substantial evidence also indicates the transmission of ZIKV from the mother to the fetus during pregnancy.[2] Moreover, sexual transmission of ZIKV to partners of affected male travelers returning from the high-risk region has also been reported.[3] Zika has a similar clinical presentation and transmission cycle as other mosquito-borne diseases. Symptoms of ZIKV include fever, skin rashes, muscle and joint pain, conjunctivitis, headache, and malaise. The major complications of ZIKV include neurological and autoimmune complications, Guillain-Barré syndrome, and adverse fetal outcomes. Zika virus can be diagnosed by testing the blood or other body fluids, such as urine or saliva for the presence of ZIKV RNA. Vector surveillance and control, protection against mosquito bites, and reducing sexual transmission, are reported as the mainstay of the prevention from spreading the virus.[4]

The history of ZIKV dated back to 1947 when it was first identified in Uganda. The first human cases of ZIKV were detected in 1953 in Nigeria and since then ZIKV remained in relative obscurity for nearly 70 years.[5] In 2007, a total of 74.62% population of the Federated States of Micronesia suffered from the ZIKV outbreak.[6] A sudden and explosive rise of a ZIKV outbreak was observed in early 2016 in the dominant part of Latin American and Caribbean nations, with estimated cases of 440,000 –1,300,000 in Brazil alone.[7] Following this epidemic, ZIKV was declared as a public health emergency of international concern by the World Health Organization (WHO).[8] Since January 2007, ZIKV transmission has been reported in a total of 64 countries and territories.[9] Based on a growing body of preliminary research, there is a scientific consensus that ZIKV will likely continue to spread to new areas.[10]

In Asia, in spite of the fact that there are no reports of severe outbreaks yet, sporadic cases have been reported from various parts of that region.[11-13] In Malaysia, ZIKV was first isolated from a mosquito in the 1960s,[14] which suggests the existence of the virus in the country for a long time thus may have caused morbidity and mortality for many years. However, the cases were presumably being underreported due to the confusion of diagnosis with dengue fever, yellow fever or other diseases of unknown origin.[7]

Malaysia is ranked third among countries in the WHO Western Pacific Region (WPRO) in terms of the number of reported cases of the mosquito-borne diseases in the period 1991–2007.[15] Malaysia carries a high density of *Aedes aegypti*, a known vector of several viruses including ZIKV, dengue

virus, yellow fever virus, and chikungunya virus. In view of this, Malaysia has issued a health alert to all public and private health facilities on the ZIKV. In the first quarter of 2016, a total of 42,683 dengue cases have been reported nationally, of whom, ninety-four people succumbed to the disease.[16] In recent years, the epidemics of mosquito-borne disease have become critical in the state of Selangor.[17] In the first quarter of 2016, Selangor recorded the highest number of dengue cases (n=13,306) with highest fatality number (n=18) among other states.[18]

World Health Organization has emphasized on the needs to provide much-needed education to communities about the preventive measures and potential complications associated with Zika virus.[19] The public health challenges presented by ZIKV raise a significant threat for a global outbreak unless and until sufficient knowledge is provided to the communities regarding the ZIKV. The objectives of this study were to evaluate the knowledge and attitudes towards ZIKV and its prevention among residents of Selangor, Malaysia.

METHODS

A descriptive, cross-sectional survey using a validated self-administered questionnaire was conducted from January to February 2016 in Selangor, Malaysia's most prosperous and populated state. This study was conducted in Selangor in view of the reports suggesting a large number of cases related to mosquito-transmitted infections.[17] Moreover, Selangor carries the 60% burden of mosquito-transmitted infections reported nationwide due to a high density of *Aedes* mosquitoes in this region.[20]

A purposive sampling approach was used to recruit the residents of Selangor for this study. The state of Selangor consists of nine districts. A pre-tested questionnaire was used as a study instrument to collect data from the participants. Participants were approached at places of common interest such as educational institutes, shopping places, restaurants, utility stores, restaurants, and hospitals across the district of Selangor. The rationale of choosing these locations was to get a diverse socio-economic sample representative of the Selangor population. Participants were detailed about the outcomes and the objectives this study prior to data collection. Healthy participants aged 18 years or above, with no mental and physical impairment were recruited for this study. Individuals who did not give their consent to participate were not included in this study. Moreover, participants who were not the residents of Selangor were also excluded from the study. The sample size

(n=385) was calculated by Raosoft web, a web-based sample size calculator. The population size was kept as 6,000,000, response distribution was set at 50%, power as 80% while confidence interval and margin of error was set at 95% and 5% respectively. However, by assuming a response rate of 80%, a total of 480 participants were recruited for this study.

First, a comprehensive review of the literature[5, 12, 15, 21-24] was carried out to draft an initial version of the questionnaire. Second, the drafted questionnaire was then reviewed by a panel of infectious disease specialists and academics (n=4). All members of the panel were an expert on survey research and quantitative studies. Following the expert feedback, suggested changes were made to improve the relevancy of the questionnaire. Third, a pilot study was carried out by selecting a sample of target participants (n = 30) to make the questionnaire simpler and shorter and to ensure that the questionnaire could gather reliable and valid data effectively and efficiently. The responses of the pilot study were not included in final analysis. The reliability testing was done by using SPSS v.20. The results showed internal consistency of the items tested with the Cronbach's alpha value of 0.73 and 0.70 for knowledge and attitude items respectively. The translation of English version of the questionnaire to Bahasa Melayu (national language of Malaysia) was performed as per the standard procedure.[25]

The final questionnaire comprised of four sections. The first section consisted of the demographic data and characteristics of the participants. The second section contained 16 questions designed to assess the general knowledge of the participants regarding ZIKV and its components. The knowledge items had Yes/No response categories. Knowledge section was scored with a range of 0-16 and a cut-off level of <10 were set for poor knowledge and ≥10 for good knowledge. The third section of the questionnaire aimed to assess the attitudes of the participants based on 10 questions. Respondents were asked to answer in multiple choice formats. The attitude was assessed by giving a score of 1 to positive and 0 to a negative attitude. The scale classified attitude as negative with a score <6 and positive with a score of ≥6. The last section explored participants' sources of information about ZIKV.

The data were analyzed by using SPSS v.20. Frequencies and percentages were calculated by using descriptive analysis. Normality of the data was tested by using Kolmogorov-Smirnov and Shapiro-Wilks tests. The inferential statistics were used to detect the significance between the demographic variables and dependent variables. Bonferroni adjustment was then applied to examine the significance of intergroup variables. The level of statistical significance was set at $p<0.05$. This study was ethically approved by the Institutional Review Board of the Discipline of Social and Administrative Pharmacy, School of Pharmaceutical Sciences, University Sains Malaysia. Moreover, participants were asked to provide a written consent prior to data collection.

RESULTS

Of 480 people approached, 415 responded to the survey giving a response rate of 86.45%. However, 15 forms were discarded because of non-adherence to the instructions for completing the survey. A total of 400 surveys were included in the final analysis. Table 1 presents the demographic

| Table 1: Demographic information		
Characteristics	N	%
Age		
18-29	144	36
30-39	88	22
40-49	95	23.8
50-59	49	12.3
≥60	24	6
Gender		
Male	183	45.8
Female	217	54.3
Marital status		
Single	259	64.8
Married	141	35.3
Race		
Malay	154	38.5
Chinese	224	56
Indian	22	5.5
Residential status		
Rural	74	18.5
Urban	326	81.5
Qualification		
Primary or lower	6	1.5
Secondary school	159	39.8
Tertiary education	235	58.8
Employment		
Employed	216	54
Unemployed	39	9.8
Student	110	27.5
Housewife	34	8.5
Monthly income (RM)		
<1000	91	22.8
1000-3000	127	31.8
3001-5000	160	40
>5000	22	5.5
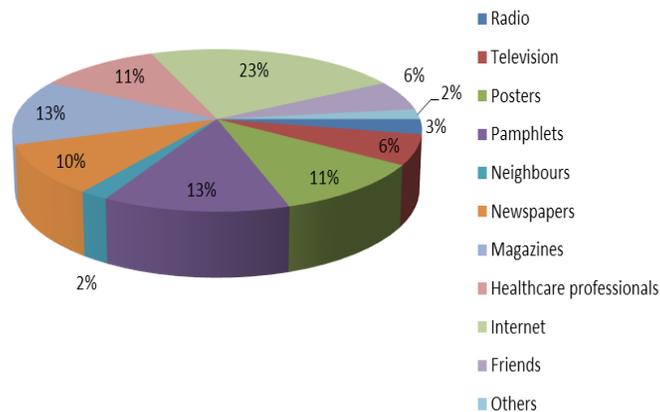
Figure 1: Participants sources of information about Zika virus

Table 2: Knowledge of participants towards Zika virus disease

Knowledge items	Correct answer N (%)	Incorrect answer N (%)
Have you ever heard of a disease termed as Zika?	365 (91.2)	35 (8.8)
Is Zika a viral disease?	280 (70)	120 (30)
Joint pain, fever, conjunctivitis, skin rashes are common symptoms of Zika	295 (73.8)	105 (26.2)
The symptoms of Zika are similar to dengue and chikungunya	286 (71.5)	114 (28.5)
The transmission of Zika Virus is mainly through mosquito bite	343 (85.8)	57 (14.3)
Pregnant women are at risk of Zika virus	328 (82)	72 (18)
Zika virus can also be transmitted through sexual contact	227 (56.8)	173 (43.2)
Zika virus can cause microcephaly in new-born	269 (67.3)	131 (32.7)
Mosquitoes that spread Zika virus bite mostly during the night time	279 (69.8)	121 (30.2)
Travel to an area that has experienced a Zika outbreak is a risk factor	352 (88)	48 (12)
Vaccination of Zika virus is available in market	256 (64)	144 (36)
Zika virus cannot be diagnosed	300 (75)	100 (25)
Antivirals are effective against Zika virus	313 (78.3)	87 (21.8)
Drinking plenty of fluids is essential in Zika virus disease	284 (71)	116 (29)
Antibiotics are first line treatment	240 (60)	160 (40)
Zika can be fatal	312 (78)	88 (22)

Note: Knowledge was assessed by giving a score of 1 to correct answer and 0 to wrong answer. The scale measured knowledge of a maximum score of 16 to a minimum score of 0. Score of < 10 was taken as poor knowledge while ≥ 10 as good knowledge. Mean knowledge score was 10.94 ± 3.89.

characteristics of the participants. Participants' main source of information about ZIKV was the internet as depicted in Figure 1.

Table 2 shows the respondents' knowledge on ZIKV. A total of 286 (71.5%) respondents showed good knowledge towards ZIKV. The mean knowledge score of the participants was 10.94 ± 3.89 (based on 16 questions). Three hundred and sixty-five (91.2%) respondents were aware of the ZIKV. Most respondents stated that travel to an area that has experienced a Zika outbreak is a risk factor (88%). Three hundred and forty-three (85.8%) respondents recognized mosquitos bite a major source of transmission.

Furthermore, 328 (82%) participants agreed that pregnant women are at risk of ZIKV. However, a large majority of the participants (n=173, 43.2%) did not know that ZIKV can also be transmitted through sexual contact. More than one-third of the participants (n=144, 36%) incorrectly answered about the availability of vaccine for ZIKV. Moreover, 131 (32.7%) participants did not know about the possibility of microcephaly in fetuses born to mothers infected with ZIKV.

Participants' attitudes towards ZIKV and its prevention are presented in Table 3. A total of 298 (74.5%) respondents showed a positive attitude towards ZIKV. The mean

Table 3: Participants' attitudes towards Zika virus		
Attitude items	**N**	**%**
Are you concerned about the news of Zika virus worldwide?		
Yes*	281	70.3
No	119	29.8
Do you think Malaysia is at high risk for spread of Zika virus?		
Yes*	210	52.5
No	190	47.5
Have you ever thought you could get Zika virus?		
Yes*	132	33
No	268	67
What will be your reaction in case you know you have Zika Virus disease?		
Fear*	250	62.4
Shame	23	5.8
Surprise	63	15.8
Sadness	64	16
What will you do when you know you have symptoms like Zika?		
Will go to health facility*	376	94
Will stay at home	24	6
Who will you talk to about the disease?		
Physician	250	62.5
Spouse	33	8.3
Parents	62	15.5
Children	4	1
Friends	22	5.5
No one^	29	7.3
What will worry you most in case you are diagnosed with Zika virus disease?		
Fear of death	138	34.5
Fear of transmission of disease to family members	140	35
Cost of treatment	25	6.3
Isolation from the society^	97	24.3
If a male is suspected having Zika vrus disease, how could he prevent his partner?		
Should not have sex at all	172	43
Use condoms	96	24
No need for any measure^	132	33
Will you avoid travelling to a country where Zika virus is found?		
Yes*	275	68.8
No	125	31.2
Do you think it is necessary to take any protective measures in households to avoid contracting Zika virus?		
Yes*	280	70
No	120	30
* Positive attitude ^ Negative attitude		
Note: Attitude was assessed by giving a score of 1 to positive and 0 to negative attitude. The scale classified attitude as negative with a score < 6 and positive with a score of ≥ 6. The mean attitude score was 7.10 ± 2.80		

Table 4: Comparison of Demographic Characteristics and Mean knowledge and attitude scores

Characteristics	Knowledge Score (Mean±SD)	Mean rank	p-value	Attitude Score (Mean±SD)	Mean rank	p-value
Age*						
18-29	12.06±2.94	206.90		7.24±1.93	207.59	
30-39	11.74±3.16	195.15		7.33±1.78	217.81	
40-49	11.47±2.66	174.23	0.074	6.76±1.77	182.23	0.059
50-59	12.65±2.63	229.33		7.27±1.52	206.49	
≥60	12.37±2.79	226.85		7.10±1.8	154.60	
Gender**						
Male	11.63±3.19	191.26	0.138	7±1.91	191.26	0.138
Female	12.2±2.6	208.29		7.19±1.70	208.29	
Marital status**						
Single	11.64±3	188.70	0.001	7.03±1.9	188.7	0.005
Married	12.48±2.62	222.17		7.83±1.61	222.17	
Race*						
Malay	11.41±2.53	198.35		7.1±1.71	201.17	
Chinese	11.37±2.87	191.81	0.301	7.08±1.89	197.53	0.530
Indian	11.32±4.51	188.55		7.41±1.53	226.05	
Residential status**						
Rural	10.93±3.25	161.53	0.001	7.07±2.28	191.53	0.046
Urban	12.17±2.76	209.35		8.11±1.68	209.35	
Qualification*						
Primary or lower	8.83±3.37	161.58		5.3±2.42	112.08	
Secondary school	11.65±3.01	190.08	0.032	6.96±1.73	190.42	0.041
College / University	12.14±2.8	207.27		7.24±1.8	209.58	
Employment*						
Employed	11.97±2.91	201.61		7.13±1.72	202.55	
Unemployed	11.56±3.51	198.91	0.991	6.46±1.8	161.47	0.144
Student	12.01±2.64	197.92		7.06±1.92	202.15	
Housewife	11.94±2.88	203.59		7.28±1.89	209.79	
Monthly income (RM)*						
<1000	11.99±3	207.53		7.26±2.08	206.62	
1000-3000	11.63±3.11	191.69	0.15	7.07±1.74	200.91	0.610
3001-5000	11.99±2.71	196.76		7.08±1.71	200.85	
>5000	13.14±2.16	249.55		6.77±1.54	170.27	
* Kruskal-Wallis Test, ** Mann-Whitney Test						

attitude score of the participants was 7.10 ± 2.80 (based on 10 questions). The majority of participants responded that they will go to a health facility when they experience the symptoms of ZIKV (n=376, 94%). Respondents stated that they will feel free to talk about their disease to their physicians (n=250, 62.5%), parents (n=62, 15.5%), spouses (n=33, 8.3%), friends (n=22, 5.5%) and children (n=4, 1%). Forty-three percent (n=172) respondents agreed that a suspected male partner should not have sex with his partner or use condom (n=96, 24%) to prevent the transmission of ZIKV while 33% (n=132) respondents did not consider any

need for these measures. A large proportion of respondents (n=268, 67%) believed that they could never become infected with ZIKV while 47.5% respondents (n=190) did not consider Malaysia at risk of ZIKV.

The association of demographic variables and mean knowledge and attitude scores is presented in Table 4. Marital status, residential status and qualification of respondents were significantly associated with their mean knowledge and attitude scores. Married participants showed higher knowledge (Mean knowledge score: 12.48 vs 11.64,

p<0.05) and better attitudes (Mean attitude score: 7.83 vs 7.03) than participants who were single. Similarly, participants with college/university education had higher knowledge and positive attitudes than participants with secondary school education (Mean knowledge score: 12.14 vs 11.65, p<0.05) (Mean attitude score: 7.24 vs 6.96, p<0.05) and participants with primary or lower education (Mean knowledge score: 12.14 vs 8.83, p<0.05) (Mean attitude score: 7.24 vs 5.3, p<0.05). Moreover, the mean knowledge and attitude scores of urban participants were higher than the rural participants (Mean knowledge score: 12.17 vs 10.93, 0<0.05) (Mean attitude score: 8.11 vs 7.07, p<0.05).

DISCUSSION

We conducted a survey to assess the knowledge and attitudes of public towards ZIKV and its preventions in Selangor, Malaysia. To the best of our knowledge, there are no previous reports of similar studies except the American survey that assessed the public attitudes toward ZIKV.[21] Therefore, the findings of this study have been compared with other mosquito-borne diseases like dengue, chikungunya, and yellow fever.

The results of this survey indicate that the majority of respondents were aware of the ZIKV and had good knowledge about the major source of infection and the risk factors associated with the disease. While this is encouraging, there is still work to be done to ensure Selangor residents further develop their knowledge about the potential of ZIKV transmission through sexual contacts, the possibility of microcephaly in fetuses born to Zika infected mothers, and the non-availability of vaccine for ZIKV. The lack of awareness surrounding these areas is a particular concern, given the potentially fatal nature of the disease. These results are in line with other published studies.[22,26] The A*edes aegypti* mosquito is known to bite mostly during daytime,[23] however, a large proportion of participants were not aware of this unique behavior of the vector. This result confirms the finding of another study in which participants wrongly believed that A*edes aegypti* bites only early in the morning.[24] Bridging this knowledge gap is essential in the design of educational programs to enhance the understanding of residents on personal protection against mosquitoes.

Another issue of concern here is the participants' false understanding about the availability of vaccines and the use of antibiotics against ZIKV. This finding supports the similar results published in previous studies.[24,27] Furthermore, a survey on the American attitudes towards ZIKV also indicated the lack of information among participants about the availability or unavailability of treatments and vaccines [21]. Our findings are supported by a study that reported the inadequate knowledge of Malaysian population pertaining to the indication of antibiotics in the treatment of viral infections.[28] At present, no vaccine is available in the market and there is no specific treatment for ZIKV. Therefore, it is recommended that Zika prevention educational programs should add focus on increasing the knowledge on the unavailability of vaccines and specific treatment for ZIKV.

The findings suggest that a significant portion of respondents did not consider the need of any protective measure if the male partner is suspected of having Zika. Centers for Disease Control and Prevention (CDC) recommends the use of condoms or not having sex at all for at least 6 months to couples who include a man who has been diagnosed with Zika while these protective measures are recommended for at least 8 weeks to couples who include a man who traveled to a Zika epidemic area but did not develop symptoms of Zika. Evidence of sexual transmission of ZIKV is presented in reports elsewhere. [29-31] Although studies are underway to better understand this issue, it is essential to educate public about the potential sexual transmission of ZIKV and encourage them to take the precautionary measures recommended by the CDC.

A large proportion of participants responded that Malaysia is not at risk of ZIKV. This finding was surprising as WHO has declared Zika a public health emergency of international concern. Malaysian authorities have also sent out a health alert to all public and private facilities about ZIKV. Moreover, the guideline[32] issued by the Malaysian authorities has warned the community to take the preventive measures to keep the virus at bay as Malaysia carries a high density of vector responsible for the transmission of ZIKV. This highlights the possibility of communication failures between the authorities and the public. Given the significantly debilitating impact of mosquito-borne diseases in Malaysia, and the potential complications of the diseases, together with the absence of either a vaccine or cure for any of these diseases, there is an even greater obligation for the authorities to actively promote disease prevention to ensure the dissemination of guidelines and other relevant information to the public. WHO Outbreak communication guidelines would be an effective tool to implement as it is likely to enhance public resilience and guide appropriate public participation in controlling the transmission of the disease.[33] A quarter of the participants responded that isolation from the society will worry them the most in case they are diagnosed with

Zika. This concern might cause a lot of stress and may cause social problems in families and communities. Unverified, inconsistent or contradictory information communicated through social media can cause serious distress and may further exaggerate the social problems. Provision of social services and resources to the community is critical to change the negative attitudes of public towards ZIKV. Moreover, providing accurate information about the disease and its suspected effects is important to reduce anxiety in people and their communities.[35]

Marital status, residential status and qualification of the participants were significantly associated with the knowledge and attitudes of people towards ZIKV. Married participants were more likely to have the higher knowledge and better attitudes than participants who were single. This finding could be better understand in light of the report published by CDC that pregnant women are at highest risk of contracting Zika in their first trimester. Furthermore, researchers suggest that there is presently sufficient evidence to confirm that ZIKV infection during pregnancy is a cause of microcephaly and other severe fetal brain defects.[35] Our study also suggests that respondents with tertiary education level had a significantly higher knowledge and attitude score. Previous research has shown that the level of education has a significant impact on knowledge[27,36] and attitude[24,37] related to mosquito-borne disease like dengue. Thus, more effective education programs for population awareness need to be implemented among people with low education level especially in areas where the mosquito-borne diseases dominate.

Insufficient knowledge and misconceptions are essential drivers in the way individuals comprehend the disease. These variables are more likely the potential barriers to behaviors change. Zika knowledge and attitudes towards its prevention are the crucial aspects of the strategy to improve disease prevention. Aggressive health promotional campaigns and social mobilization by relevant authorities are needed to increase the knowledge about Zika. Emphasis should be placed on the knowledge gaps identified in this study. There is insufficient proof to link knowledge as a determining factor for improving practices.[38] Further studies should assess the practices of participants towards Zika prevention.

This study has few limitations. First, the cross-sectional design of the study did not account for the dynamics of associations between the factors analyzed. A purposive sampling approach was used to recruit participants from Selangor which may not a true representative of the diverse Malaysian population. Another limitation of this study is

that all information obtained from the questionnaire was self-reported and reporting bias due to socially desirable attitudes and behaviors might exist. Since the participation in this study was voluntary, the possibility for self-selection bias remains. Despite these limitations, this study provides essential baseline information regarding the knowledge and attitudes of people regarding Zika, which to our best knowledge is the first study in Malaysia.

CONCLUSION

Overall, the participants had good knowledge and positive attitudes towards ZIKV and its prevention. Still, there is a need for improvement in areas such as transmission of the virus through sexual contacts, unavailability of vaccines, complications of Zika in the new-borns, and the potential of ZIKV to spread in Malaysia. Interventions need to customize to improve the knowledge and attitudes of the public based on the findings of this study. Future studies may include communities from other states of Malaysia to validate the findings of this study.

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CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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