

**PRELIMINARY ASSESSMENT ON MALARIA-RELATED KNOWLEDGE,
ATTITUDES AND PRACTICES (KAP) AMONGST VISITORS
AT SELECTED RECREATIONAL PARKS IN PENINSULAR MALAYSIA**

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ABSTRACT

Malaria is a life-threatening, rampant disease and the newly emerged knowlesi malaria brings a new challenge in the management of this vector borne disease. The transmission of knowlesi malaria is closely associated with the long-tail macaque that can be easily found at near forest. Recreational park is usually located near or in the forest and therefore can be a potential area for knowlesi malaria transmission due to the nature of the recreational park which is suitable as habitat not only for long-tail macaque and mosquito that transmit the disease but also a place that is frequently visited by human population to enjoy outdoor activities. This study aims to describe the Knowledge, Attitudes and Practices (KAP) amongst visitors of recreational park with regards to malaria and its prevention. A cross-sectional survey of knowledge, attitudes and practices was conducted at three recreational parks in Malaysia namely Sungai Kedondong Recreational Park, Selangor; Sungai Tekala Reserved Forest, Selangor and Chemerong Reserved Forest, Terengganu. 460 questionnaires were distributed among parks visitors who are willing to participate in the study on voluntarily basis. Analysis were then performed on questionnaire that are filled completely by participants. Out of 460 questionnaires distributed only 296 questionnaires were filled completely. Therefore, all result presented in this study were based on 68% completed questionnaires. Majority of respondents (80.4%) knew about malaria where as high as 77% of the respondents were found to have good knowledge about malaria signs and symptoms. Around 79.1% of the respondents were aware about mosquito as the vector that transmits malaria. 62.5% of them said that malaria can be prevented by using repellent to avoid mosquito bite and 62.2% of them applied repellent before performing outdoor activities at the parks. Although the results obtained may not represent the actual situation of KAP of park visitors with regards to malaria and its prevention since the number

of questionnaires analysed were relatively low, this study nevertheless able to show a pattern of good understanding among park visitors regarding malaria and its prevention. This understanding was significantly influence by participants' level of education.

Keywords: Knowledge, Attitude and Practice (KAP), malaria, recreational park, Peninsular Malaysia, *P. knowlesi*.

ABSTRAK

Malaria adalah penyakit merbahaya dan kemunculan knowlesi malaria mendatangkan cabaran baharu kepada pengurusan penyakit berjangkit bawaan vektor. Jangkitan knowlesi malaria adalah berkait rapat dengan monyet ekor panjang yang mudah ditemui berdekatan dengan hutan. Taman rekreasi yang terletak berdekatan dengan hutan atau di hutan, seterusnya menjadi tempat potensi untuk jangkitan knowlesi malaria disebabkan oleh faktor persekitaran di taman rekreasi yang merupakan bukan sahaja habitat yang sesuai untuk monyet ekor panjang tetapi juga nyamuk yang menjadi vektor penyebar penyakit dan juga tempat tumpuan awam untuk melaksanakan aktiviti rekreasi. Kajian ini bertujuan untuk mengetahui tahap Pengetahuan, Tingkahlaku dan Amalan (KAP) di kalangan pengunjung taman rekreasi berkaitan dengan penyakit malaria dan pencegahan. Tinjauan rentas mengenai tahap Pengetahuan, Tingkahlaku dan Amalan (KAP) dilaksanakan di tiga taman rekreasi iaitu Taman Rekreasi Sungai Kedondong, Selangor, Hutan Simpan Sungai Tekala, Selangor dan Hutan Simpan Chemerong, Terengganu. Sebanyak 460 set soalan telah diedarkan di kalangan pengunjung taman rekreasi yang menyertai tinjauan ini secara sukarela. Analisa dijalankan ke atas set soalan yang telah diisi dengan lengkap oleh responden. Daripada 460 set soalan, sebanyak 296 sahaja yang berjaya diisi dengan lengkap. Oleh yang demikian, keputusan tinjauan ini adalah berdasarkan kepada 68% set soalan yang dijawab secara lengkap. Majoriti responden (80.4%) tahu mengenai malaria di mana sebanyak 77% responden mempunyai pengetahuan yang baik mengenai simptom-simptom penyakit malaria. Sebanyak 79.1% responden mengetahui bahawa nyamuk adalah vektor yang menularkan penyakit malaria. 62.5% responden memaklumkan malaria boleh dicegah dari digigit nyamuak dengan menggunakan repelen dan sebanyak 62.2% responden menggunakan repelen sebelum membuat aktiviti di taman rekreasi. Walaupun keputusan tinjauan yang diperolehi tidak menggambarkan situasi sebenar KAP responden mengenai penyakit malaria dan pencegahannya kerana jumlah soalan yang dianalisis secara relatifnya adalah rendah, kajian ini menunjukkan corak pemahaman yang bagus berkaitan penyakit malaria dan pencegahannya di kalangan pengunjung taman rekreasi. Tahap pemahaman ini adalah dipengaruhi secara signifikan oleh tahap pendidikan responden.

Kata kunci : Pengetahuan, Tingkahlaku dan Amalan (KAP), malaria, taman rekreasi, Semenanjung Malaysia, *P. Knowlesi*.

INTRODUCTION

Malaria is a deadly vector borne disease. According to World Health Organization (WHO), an estimated of 219 million malaria cases were reported worldwide in 2018 (WHO 2018). It is caused by four *Plasmodium* species i.e. *Plasmodium malariae*, *P. ovale*, *P. vivax* and *P. falciparum* (Millar & Cox-Singh 2015; Rahman et al. 1997). In Malaysia, human malaria (caused by *Plasmodium malariae*, *P. vivax* and *P. falciparum*) has achieved 87% reduction in the number of reported cases for the past two decades. Hence, Malaysia is categorized as in its pre-elimination phase by the WHO (WHO 2011). However, although the incidence of human

malaria is decreasing, the incidence of knowlesi malaria in Malaysia appears to be on the rise (WHO 2018).

Knowles and Gupta (1932) documented another plasmodium species known as *Plasmodium knowlesi* that can infect human. *Plasmodium knowlesi* is a primate malaria parasite commonly found in Southeast Asia that causes malaria in long-tailed macaques. It can also infect humans, naturally and artificially. This zoonotic malaria was considered to be extremely rare until a large focus of *P. knowlesi* infections in the Kapit Division of Sarawak, Malaysian Borneo, was described in 2004 (Balbir et al. 2004). With increased deforestation and development activities in areas that are home to macaques, many of them are now coming in close and direct contact with human due to habitat loss (Vythilingam et al. 2008). As a result, more and more people who live in the semi-urban areas are being infected with knowlesi malaria. From 2012 until 2016, a total of 17,111 malaria cases with 9,580 knowlesi malaria cases were reported in Malaysia (MOH 2017). Since then, human cases have been described in virtually all Southeast Asian countries, and *P. knowlesi* is now considered as the fifth species of *Plasmodium* causing malaria in humans (Balbir et al. 2008; White 2008).

In Peninsular Malaysia, the vector for *P. knowlesi* is *Anopheles cracens* (Amir et al. 2013). *An. cracens* is found exclusively in the Thai-Malaysian peninsular area of mainland South East Asia. It is formerly known as *Anopheles dirus* species B and a member of the Dirus Complex (Suwonkerd et al. 2013). The habitats for *Anopheles cracens* are hilly and mountainous areas containing primary or secondary evergreen and deciduous forests, bamboo, and fruit and rubber plantations. Its larvae can be found at shaded bodies of fresh, stagnant water, including ground pools, puddles, animal footprints, and wells (Becker et al. 2002; Prakash et al. 2002). The bionomic of the vector are nocturnal and outdoor biters with peak biting time recorded at 8:00 PM and 9:00 PM and the biting start as early as 7:00 PM (Jiram et al. 2012).

The abundance of mosquitoes in any area depend on the breeding sites. Temporary pools and stagnant water, such as tree holes, abandoned tires, or leaf clogged gutters are most common breeding sites for mosquitoes. It can also be found at pools, sloughs and receptacles containing water. The higher abundance of mosquitos' larva can be found at bamboo internodes and artificial breeding sites while ponds and puddles showed greater richness (Prakash et al. 2002). Some mosquito species prefer a long creek banks or where trees are wrapped with leafy vines as their habitat. These habitats are quite common in many recreational parks.

Recreational parks are popular among Malaysian for spending their weekend outdoor. Nevertheless, recreational parks may also serve as shelter and refuge for populations of mosquito including *Aedes* spp, *Anopheles* spp, *Culex* spp and other species. Species like *Aedes aegypti*, *Ae. albopictus* and *Anopheles maculatus* are vectors for diseases such as dengue, malaria, filariasis as well as Zika virus and other vector borne diseases. Although no data was available to show that transmission of vector borne diseases has taken place at recreational parks, there is a possibility that these recreational parks can be a potential area for the transmission of mosquito borne diseases because they provide an ideal setting to become a common "meeting point" for human and mosquito (Medeiros-sousa et al. 2013). The fact that vector borne diseases are responsible for 17% of the global burden of parasitic and infectious diseases causing over a million death and considerable mortality and morbidity worldwide, their transmission at any area including potential area should not to be taken lightly (Karunamoorthi et al. 2013; Khan et al. 2015).

People are most vulnerable to the mosquitoes biting when they perform outdoor activities such as fishing, hunting as well as camping. In order to prevent mosquito bites, one must take preventive measures. The simplest prevention measure recommended by the Ministry of Health of Malaysia (MOH) is to apply mosquito repellent or to wear long sleeved bright colour clothes (Curtis 1992; Fradin 2001). People are also encouraged to seek treatment if they develop fever two weeks after visited recreational parks.

There is a paucity of information on knowledge, attitudes and practices (KAP) among recreational park visitors in Malaysia regarding malaria. Cross sectional surveys were therefore conducted in order to assess and collect information about knowledge, attitudes and practices among the recreational park visitors with regards to malaria and its prevention.

MATERIALS AND METHODS

Study Setting

This study was conducted at three recreational parks in Peninsular Malaysia randomly selected from more than a dozen parks throughout Peninsular Malaysia with reported knowlesi malaria cases from 2012 to 2016 (8). The study sites were Sungai Kedondong Recreational Park, Ulu Yam, Selangor (N3°25.78' E101°43.7'), Sungai Tekala Recreational Park, Semenyih, Selangor (N3°03.40'E101°51.82') and Chemerong Reserved Forest Dungun, Terengganu (N4° 39.511' E102° 59.966'). Those study sites are recreational parks comprising of a beautiful waterfall and a river that runs through the park (WWF Malaysia 2018). Moreover, the parks are home to numerous flora and fauna, therefore they are well known as great places for family and friends spending their weekend doing outdoor activities such as picnic, camping, campfire and hiking.

Study Design and Methods

A descriptive cross-sectional study was conducted from October 2017 to March 2018 at the selected parks. A questionnaire was developed based on knowledge, attitudes and practices surveys on Zika virus disease and its potential complication (WHO 2016), which then were improvised to suit the malaria disease context. Questionnaires were prepared in two languages; English and Malay. This was then followed by pre-test survey conducted on 10% of park visitors (based on calculation*) to validate and ensure good quality of data gained. Questions were then revised, improved and re-evaluated using Spearman Correlation Test in order to obtain a significant Cronbach alpha value (>0.5) before used in the final questionnaire.

Questions in datasheet were divided into 4 sections: Part A - socio demographic information (sex, age, education, employment status, occupation and income); Part B knowledge about malaria (vector, signs & symptoms and mode of transmission); Part C attitude & practices in relation to malaria and Part D treatment seeking.

A total of 460 questionnaires were disseminated among park visitors at the selected recreational parks. Participants were required to fill in the form and return it on the same day once it is completed. The 460 was calculated based on estimated size of population of people visiting the park, margin of error (0.05), standard deviation (0.5) with confidence level of 1.96. The formula to obtain the estimated size (n) is shown below:

$$* \quad n = \frac{Z^2 \times SD (1-SD)}{(ME)^2}$$

Where by

$$n = 384 \pm 20\% \\ = 460$$

Z^2 = Population size

SD = Standard Deviation

ME= Margin of Error

Participation was on voluntarily basis including male and female visitors aged 18 years old and older.

Statistical Analysis

Descriptive statistical data were analysed using SPSS version 22. Data generated includes frequencies, means and deviations used to tabulate and describe the data. A p-value of below 0.05 was considered statistically significant. For analytical statistics, both binary and multinomial logistic regressions analysis were conducted in order to determine the likelihood of knowledge, attitudes and practices are influenced by factors such as gender, age and education.

RESULTS

Out of 460 questionnaires distributed, 5% of the distributed questionnaires were not returned. Upon analysis, it was realised that out of 437 returned questionnaires, only 296 questionnaires (68%) were completely filled by participants. While the most logical option be taken at this point is to distribute more questionnaires, due to financial, logistics and time constraints have made this option not possible to be performed. It was therefore decided that analysis was to be done on available completed questionnaires.

Respondent Demographic

Data in Table 1 showed that there were more male (59.5%) than female (40.5%) respondents for this study. Data obtained also showed that the age of respondents ranged from 18 years old up to 64 years old. The age of respondent was grouped based on three (3) categories; <30 as young adult, 30-59 (middle age adult) and ≥ 60 (elderly). 66.2% of them received tertiary education followed by 28.4% who completed their education at secondary level and a very small number (3.4%) had only primary education as their highest education received. Around 73.3% of respondents were employed with quite a large percentage (47.6%) working in the private sector compared to 13.9% who were working in government sector. This study also captured information about the monthly income of respondents where the lowest salary is below RM1,000 (\$USD 239) with half of them (56.1%) of the working respondents were in this category. Nevertheless about 40.9% of them received higher monthly income which is between RM 1,000-4,999 (\$USD 239-1,194) while the rest received monthly income of >RM

5,000 (\$USD 1,195). Assumption on this category was made as low, middle and high income accordingly.

Table 1. Respondent Demographic Information

Variable	n (N=296)	%
Gender		
Male	176	59.5
Female	20	40.5
Age, Median (range)		
<30	139	47.0
30-59	153	51.7
>=60	4	1.4
Occupation		
Government sector	41	13.9
Private sector	141	47.6
Self-employed	76	25.7
Unemployed	9	3.0
Student	29	9.8
Monthly income		
<RM 1,000 (\$ 239)	166	56.1
RM 1,000-4,999 (\$ 239-1,194)	121	40.9
>=RM 5,000 (\$ 1,195)	9	3.0
Education		
Primary	10	3.4
Secondary	84	28.4
College/university	196	66.2
Not formal	6	2.0

Respondent Knowledge about Malaria

Data presented in Table 2 exhibited 80.4% of respondents claimed that they knew about malaria. Their sources of information were mainly television (52.7%) and social media such as Instagram, Facebook, blog and others (51.4%). Around 78% of respondents agreed that malaria is dangerous with 77% were able to recognize the signs and symptoms of malaria e.g. fever and joint pains.

This survey also identified 83% of respondents who agreed that mosquito bites are dangerous and 79.1% of them understood that malaria is transmitted by mosquitoes. When they were asked about the type of mosquito that transmits malaria, 49.3% of respondents responded *Aedes* mosquito as the vector and only 22% answered *Anopheles* mosquito. Around 86.1% of respondents agreed that malaria is a treatable disease and 86.8% said it can be prevented as well.

Regarding the control and prevention measures of malaria, 68.6% of respondents believed that malaria can be prevented by eliminating stagnant water, 63.2% of them thought it can be done by cleaning the house and its surrounding while 62.5% believed that using mosquito repellent is also a type of measure that can help prevent malaria. There are also quite a large percentage of respondents who mentioned other methods (Table 2) as measures that can help control malaria.

Table 2. Respondent Knowledge about Malaria

No.	Variable	n (N=296)	%
1	Know about malaria		
	Yes	238	80.4
	No	49	16.6
	No response	9	3.0
2	Know about malaria from (more than one answers is allowed)		
	Newspaper	128	43.2
	social media (Facebook, Instagram, blog etc.)	152	51.4
	Television	156	52.7
	Pamphlet	87	29.4
3	Malaria is dangerous		
	Yes	231	78.0
	No	56	19.0
	No response	9	3.0
4	Know the signs and symptoms (more than one answers is allowed)		
	Fever	228	77.0
	Joint pains	195	65.9
	Diarrhoea	172	58.1
	Headache	186	62.8
	Conjunctivitis (red eyes)	100	33.8
	Haemorrhage (bleeding)	86	29.1
	Rash	108	36.5
	Sickness	79	26.7
5	Mosquitoes bite is dangerous		
	Yes	245	82.8
	No	47	15.9
	No response	4	1.3
6	Mosquito transmit malaria		
	Yes	234	79.1
	No	49	16.6
	No response	13	4.3
7	The mosquito that transmit malaria		
	Aedes	146	49.3
	Anopheles	65	22.0
	No response	85	28.7
8	There is treatment for malaria		
	Yes	255	86.1
	No	25	8.4
	No response	16	5.5
9	Malaria is preventable		
	Yes	257	86.8
	No	23	7.8
	No response	16	5.4
10	Malaria can be prevented by (more than one answers is allowed)		
	eliminating stagnant water	203	68.6

cleaning the house and its surrounding	187	63.2
using mosquito's repellent	185	62.5
cleaning the water storage	175	59.1
using mosquito coil as a repellent	159	53.7
using bed net at night while sleeping	159	53.7
wearing long sleeve shirt and long pants	156	52.7
using larvicide to kill the mosquito larvae	152	51.4
drinking clear water	152	51.4
spraying insecticide or fumigate the house	151	51.0
apply net at window	146	49.3
using bed net on daytime while sleeping	136	45.9

Respondent Attitude and Practice towards Malaria

Table 3 showed that majority of respondents (86.8%) would avoid mosquito bites. The most popular method for avoiding mosquito is using repellent (56.1%) followed by the use of aerosol spray (53.4%). Data also showed 62.2% of respondents used repellent before performing outdoor activities. In terms of frequency of visit to the park, 40.2% of respondents visited park more than seven times in a year. The most popular carried out at these recreational parks was camping (69.7%).

Table 3. Respondent attitude and practice towards malaria

No.	Variable	n (N=296)	%
1	Avoid mosquito bite		
	Yes	257	86.8
	No	17	5.7
	No response	22	7.5
2	Use repellent during outdoor activities		
	Yes	184	62.2
	No	112	37.8
3	Protection applied (more than one answers is allowed)		
	Use treated bed nets	117	39.5
	Use aerosol spraying	158	53.4
	Use repellent	166	56.1
	Close windows and doors at dawn	143	48.3
4	Frequency of visit to recreational park		
	1–2 times a year	79	26.6
	3–4 times a year	45	15.2
	5–6 times a year	30	10.1
	More than 7 times a year	119	40.2
	No response	23	7.8
5	The activity you do at the park (more than one answers is allowed)		
	Fishing	151	51.0
	Camping	205	69.7
	Hunting	64	21.6
	Camp fire	83	28.0

Respondent Health Seeking Behaviour

As far as seeking treatment is concerned (Table 4), 88.2% of respondents said that they would seek treatment if they had a fever after visiting the park. Private clinic or private hospital were their preferred treatment seeking place with 69.3% respondents preferring to go there for treatment. 44.3% of respondents indicated that they would pursue medical attention within 1 to 2 days of the onset of fever.

Table 4. Respondent Health Seeking Behaviour

No.	Variable	n (N=296)	%
1	Seek treatment when having a fever		
	Yes	261	88.2
	No	35	11.8
2	Seek treatment at (more than one answers is allowed)		
	Private clinic/ hospital	205	69.3
	Government hospital	146	49.3
	Pharmacy	73	24.7
	Traditional medication	34	11.5
3	Treatment is seeking on		
	1–2 of fever	131	44.3
	3–5 of fever	92	31.1
	5–6 of fever	21	7.1
	More than 7 days of fever	17	5.7
	No response	35	11.8

Binary and multinomial logistic regressions analysis test was used to obtain results in Table 5. There was no statistical significance difference between gender in relation to knowledge, attitudes and practices regarding malaria. According to the statistical analysis, the respondents with tertiary education were seven times more likely to be aware that malaria is transmitted by mosquitoes and it is a disease that can be treated compared to respondents with primary education. Respondents aged 30 years old and below are four times more likely to seek treatment when they had fever after outdoor activities compared to the other age groups.

Table 5. Associated Factors of Knowledge, Attitudes and Practices Regarding Malaria

Variable	Crude OR	95%CI	p-value
Malaria is transmitted by mosquitoes			
Sex			
Male	1.00	-	-
Female	1.10	0.58-1.71	0.774
Age			
Age<30	2.31	1.15-4.48	0.014
Age 30-59	1.00	-	-
Age>=60	0.14	0.01-1.63	0.117
Education			
Primary	1.00	-	-
Secondary	2.29	0.74-7.11	0.15
College/university	7.13	2.35-21.64	0.00

Fever is one of the signs and symptom of malaria			
Sex			
Male	1.00	-	-
Female	1.13	0.59-2.15	0.710
Age			
Age<30	0.75	0.40-1.42	0.377
Age 30-59	1.00	-	-
Age>=60	0.00	0.00-0.00	0
Education			
Primary	1.00	-	-
Secondary	0.92	0.23-3.73	0.903
College/university	2.28	0.58-9.01	0.241
Malaria can be treated			
Sex			
Male	1.00	-	-
Female	1.86	0.75-4.61	0.181
Age			
Age<30	2.95	1.12-7.66	0.029
Age 30-59	1.00	-	-
Age>=60	0.07	0.01-0.79	0.068
Education			
Primary	1.00	-	-
Secondary	2.60	0.68-9.90	0.161
College/university	6.55	1.77-24.25	0.005
Use repellent during outdoor activities			
Sex			
Male	1.00	-	-
Female	1.30	0.80-2.11	0.283
Age			
Age<30	1.09	0.68-1.75	0.732
Age 30-59	1.00	-	-
Age>=60	0.00	0.00-0.00	0
Education			
Primary	1.00	-	-
Secondary	0.47	0.14-1.57	0.218
College/university	0.56	0.18-1.81	0.333
Seek treatment when having a fever			
Sex			
Male	1.00	-	-
Female	0.89	0.44-1.83	0.766
Age			
Age <30	3.86	1.62-9.21	0.002
Age 30-59	1.00	-	-
Age>=60	0.21	0.03-1.52	0.121
Education			
Primary	1.00	-	-
Secondary	0.98	0.25-3.85	0.978
College/university	2.60	0.67-10.07	0.168

DISCUSSION

Malaria is a vector borne disease that is still haunting the tropical world. The transmission of knowlesi malaria is closely associated with the long-tail macaque that can be easily found at near forest where recreational park is usually located and therefore such parks could become a potential area for knowlesi malaria transmission as human often visit this park for outdoor activities. Knowledge about malaria is important for visitors to recreational park because it could save them from getting infected.

This study demonstrated that recreational park might be one of the favourite places for spending weekend doing fun activities as indicated by the high frequency of visit (3-7 visits per year) by around 40% of park visitors. The types of activities available at this park such as having a picnic, camping, jungle tracking and swimming are suitable for visitors of all ages.

It is important to note that majority of park visitors who participated in this study shown to have some knowledge regarding malaria. They knew malaria is a dangerous disease and at the same time they also knew that malaria is a disease that can be prevented and treated. For example, many came prepared by wearing suitable attire and they applied repellent so that they can enjoy the activities at the park without getting bitten by mosquitoes. Moreover, they seek treatment when they have symptoms of the disease. This finding was in accordance with study done in Vietnam by Mayxay et al. (2013) and in Malaysia by Naing et al. (2011) which indicate the existence of strong association between knowledge and self-reported practices and better observed practices.

The role of media such as radio and television for public health education are undeniably important (Hairi et al. 2003; Swaddiwudhipong et al. 1992) as proven by this study where many of the park visitors claim to have learned about malaria from television. In addition, with social media has now become the top information provider, many park visitors also shown to learn about malaria through this channel. In fact, based on this study newspapers were not that far behind in terms of providing similar information to the public. These sources of information have helped park visitors to take precaution like applying repellent or using aerosol spray when they visit the parks to avoid mosquito bites. The park visitors obviously understand the additional risks other than those risks that may be caused by the outdoor activity itself.

Park visitors also shown to have good understanding regarding the signs and symptoms of malaria and therefore they roughly knew when to seek treatment based on symptoms they have. This was obviously the correct self-practices to be taken because of the empowerment of the knowledge they had. Similar findings were shown by Hlongwana et al. (2009) in their study in Swaziland where respondents went to seek medical attention within 24 hours of onset of malaria.

With all information that they have about malaria, it was clear however that large number of respondents were mistaken in naming the mosquito species that transmit malaria. Many respondents had mistakenly named the vector for dengue, the *Aedes* mosquito as the vector that transmits malaria instead of *Anopheles* mosquito. Dengue is another mosquito borne disease present in Malaysia that had caused around 396,137 cases from 2012 to 2016 (https://www.data.gov.my/data/ms_MY/dataset?q=kes%20demam%20denggi). For that reason, information about dengue is often disseminated to the public through mass media (TV, radio and newspaper) as well. This finding support the study conducted in Vietnam by Mayxay

et al. (2013) and in Cambodia by Kumaran et al. (2018) who found that more often than not public was easily confused between dengue and malaria. Therefore, is not uncommon to have many of participants in similar study naming *Aedes* instead of *Anopheles* as the vector for malaria. Regardless whether they answer the species correctly or not, what is more important is that respondents were aware that mosquitoes can transmit diseases and they understand the need to avoid mosquito bites as method to prevent infection.

Regarding the knowledge about malaria, this study showed that there was no significant difference between genders in terms of their attitudes and practices in relation to malaria. Statistical results however demonstrated that respondents with higher education level were more likely to have a better understanding compared to respondents with primary education level about the mosquito as the vector for malaria, the signs and symptoms of malaria and treatability. People who had higher education would generally have a better ability to acquire, understand and analyse a lot more information including those about malaria.

Based on this study, it appears that dissemination of important and useful information to public through the proper channel seemed to have benefited the public where they were able to use the knowledge obtained to practice suitable actions that can protect them from diseases that might be transmitted at the recreational areas.

This study obviously had its limitation. The limitation of this study was at the end of the survey 23 questionnaires (5%) were not returned. Although 437 questionnaires were returned, 32% of them were unfortunately not completely answered. For data rigour, it was decided to exclude them from the analysis. Therefore, only 296 completed questionnaires (68%) were analysed. Although it was realised at that time that additional sampling was crucial, due to financial, logistic and time constraint, repeat sampling was not able to be conducted. This study may therefore lack the desired representative sample it initially sought to secure although oversample by 20% of the computed number required were calculated. Thus, we may suggest the precision or margin of error to be decrease in the future in order to get more sample returned. However, a pattern of knowledge empowerment among park visitors were observed in this study.

CONCLUSION

In conclusion, this preliminary assessment on malaria-related knowledge, attitudes and practices amongst park visitors demonstrated a pattern of good understanding regarding malaria and its prevention. The understanding however was not significantly influence by participants' age or income but rather by the level of their education. As far as public is concern, awareness programs should continue to serve as a constant reminder to the public about the importance of protecting themselves from mosquito bites as it can save them from being infected with malaria towards Malaysia achieving malaria elimination status.

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