

Zika Virus-The Perfect Storm

Roy Rillera Marzo*, Teoh Shun Keat, Melody Tey Siang Min, Shirley Ting Suk Lee, Chong Kel Vin, Amaluddin Ahmad, Turani Talukder, Myat Thida Win, Ye Wint Kyaw, and Navena Kaur

Deputy Dean, Master in Public Health (PH), Fellow in Public Health (UK), Faculty of Medicine, Asia Metropolitan University, Malaysia

Abstract

Background: Zika virus is an arbovirus which transmitted mainly through the mosquito bite, specifically the *Aedes* sp. Its history can be traced to 1947 when it was first isolated in 1947 from a monkey in Zika forest of Uganda.

Aim: Our objective is to assess the factors that affecting the Zika virus transmission among the population in Bandar Maharani, Johor, Malaysia.

Methodology: A descriptive, cross-sectional study design based on simple random sampling, respondents of aged 18 to 65 years old. Data was collected using an adopted questionnaire from WHO that covered 4 parts i.e. sociodemographic data, knowledge regarding Zika virus, attitudes towards Zika virus and Practices of Zika virus prevention. The collected data was then analyzed by using PASW statistics student version 18 and Microsoft Excel.

Results: The study shows that the knowledge of the participants was only moderate. The attitude was neutral and the practice for prevention was also moderate. It was found that Radio/TV was the most common (77.3%) and most trusted source of information (65.4%). There was significant association between knowledge and attitude ($p=0.000$); knowledge and practice ($p=0.000$) and attitude and practice ($p=0.000$). Knowledge was associated with level of education ($p=0.001$), race ($p=0.000$), religion ($p=0.028$) and current work of the respondents ($p=0.000$). Attitude was related with religion ($p=0.030$) and income ($p=0.027$). Practice of prevention was associated with level of education ($p=0.004$), race ($p=0.000$), religion ($p=0.004$) and current work ($p=0.044$).

Significance of study: To determine the correlation of Knowledge, Attitudes and Practice of the public towards Zika virus will provide a direction for developing a strategy to prevent Zika virus from becoming a public health burden to the community in Malaysia.

Keywords: Zika virus; Knowledge; Attitude; Practice; Malaysia

Introduction

Zika virus, from Flaviviridae family, genus Flavivirus is an arbovirus transmitted by *Aedes* mosquitoes including *Aedes aegypti* and *Aedes albopictus*. It is first isolated in 1947 from a monkey in the Zika forest of Uganda hence the name Zika[1]. The prevalence of the disease is hard to trace due to the similarity in the serologic characteristic of other flaviviruses such as dengue virus and West Nile virus[2].

In the past, Zika virus infections usually are asymptomatic or mild. However, during the major outbreak of Zika virus infection occurred in Yap, there are about 18% of patients who shows symptoms[3]. In 2013-2014, there is another outbreak in French Polynesia where Guillain-Barre syndrome and cases of microcephaly in newborns are linked to the viral infection[4]. Most recently, Zika virus has crossed the country in concern (Malaysia) and recording 7 cases to date[5].

In the worry of emerging of the new public health concern, we conducted a research study to determine the correlation of Knowledge, Attitudes and Practice of the public towards Zika virus in order to prevent it to become a public health burden in Malaysia.

Significance of Study

To determine the correlation of Knowledge, Attitudes and Practice of the public towards Zika virus thereby providing a direction for developing a strategy to prevent Zika virus from becoming a public health burden to the community in Malaysia.

Objective of Study

General objective

To assess the different factors that affects Zika virus transmission among the population, Johor, Malaysia.

Specific objective

- To determine the level of knowledge, attitudes and practice of the public towards the Zika virus disease.
- To determine the association between socio-demographic characteristics with knowledge, attitudes and practice of the public towards Zika virus disease.
- To determine the association between knowledge and attitude of the public towards Zika virus disease.
- To determine the association between knowledge and practice of the public towards Zika virus disease.
- To determine the association between attitude and practice of the public towards Zika virus disease.
- To determine the most common and most trusted source of information among the public.

Zika virus, from Flaviviridae family, genus Flavivirus is an arbovirus transmitted by *Aedes* mosquitoes including *Aedes aegypti* and *Aedes albopictus*. It is first isolated in 1947 from a monkey in the Zika forest of Uganda hence the name Zika[5]. The prevalence of the disease

*Corresponding author: Roy Rillera Marzo, Deputy Dean, Master in Public Health (PH), Fellow in Public Health (UK), Faculty of Medicine, Asia Metropolitan University, Malaysia, Tel:+60146785841; E-mail: rmtexas@yahoo.com

Received November 10, 2018; Accepted November 20, 2018; Published November 27, 2018

Citation: Marzo RR, Keat TS, Min MTS, Lee STS, Vin CK, et al. (2018) Zika Virus-The Perfect Storm. Emergency Med 8: 384. doi: 10.4172/2165-7548.1000384

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is hard to trace due to the similarity in the serologic characteristic of other flaviviruses such as dengue virus and West Nile virus.

In the past, Zika virus infections usually are asymptomatic or mild. However, during the major outbreak of Zika virus infection occurred in Yap, there are about 18% of patients who shows symptoms [6]. In 2013-2014, there is another outbreak in French Polynesia where Guillain-Barre syndrome and cases of microcephaly in newborns are linked to the viral infection[7]. Most recently, Zika virus has crossed the country in concern (Malaysia) and recording 7 cases to date[8].

In the worry of emerging of the new public health concern, we conducted a literature review to summarize the published findings. This review aims to identify and address the knowledge gap amongst the public including those in medical field. This is to ease the prevention of Zika virus disease from becoming another public health burden in Malaysia.

Review of related Literature

Searching method

By using the keywords “Zika”, “Zika virus”, “ZIKV”, “Microcephaly”, “Zika SEA”, “Knowledge”, “Attitude”, and “Practice” we searched Google, PubMed, EBSCO, PLOS Neglected Disease and MedLinePlus. We reviewed literatures published through 5th November 2016, including peer-reviewed journal articles, news, guidelines and public health agency information (US Centers for Disease Control and Prevention [CDC] and World Health Organization [WHO]).

Virology and pathogenesis

Zika virus is a RNA virus, from the Flaviviridae family, and has a positive-sense single stranded RNA. The genome length of this virus is 10807 base pairs (bp) [9].

There are two lineage of Zika virus: African and Asian lineage[10]. The virus involved in the outbreaks of Brazil, 2015 is determined to be the Asian lineage virus, which is also to be the cause of the outbreak in French Polynesia, 2013-2014 [11]. No significant evidence has found till date that the virus has undergone mutation in its spreading pattern and pathogenesis[12].

After biting a human host, the virus is inoculated onto the host. The virus enters skin cells through cellular receptors, then transported to lymph nodes and bloodstream. Zika virus antigens are found intracellularly typically in the nuclei. This finding indicates a different location of replication of Zika virus from the other flaviviruses however more studies are required to validate this.

Transmission

Zika virus is transmitted by mosquitoes, typically the genus *Aedes*. Examples of mosquito from this genus are *Aedes*egypti, *Aedes*albopictus, *Aedes*africanus, *Aedes*hensilli. The mosquito in our concern is the *Aedes*egypti which is very common [13-18]

The virus needed a nonhuman reservoir. Unfortunately multiple animal reservoirs are available including nonhuman primates, wild and domestic animals[19]. A study proposes that the incubation period of the virus in mosquitoes are about 10 days.

The virus also can transmit without a vector. Vertical transmission can occur in an infected pregnant lady to her child and during labor[20,21]. Unprotected sexual intercourse, including male to male also being one of the transmission method. Contaminated blood

transfusion, laboratory exposure can also enable the transmission of Zika Virus [22-27].

Level of knowledge, attitudes and practice towards zika virus

Generally, the levels of knowledge about Zika virus is high. Many were aware of Zika virus and were transmitted through mosquito [28]. However, many are not realize the fact that Zika virus also can transmitted through sexual intercourse [29]. The attitude of the public towards Zika virus was positive. They stated that Zika virus was an important issue. They felt that the information about Zika virus up to date was insufficient [30]. Majority of them felt that it was very important to be educated about the Zika virus [31].

The practice towards Zika virus was good that public has taken at least one action in response to the virus [32].

However, the public was inadequately in preventing sexual transmission of Zika virus such as using of condoms, abstaining from sexual activities etc. Practices to prevent mosquito bite such as the usage of bed nets were poor.

Relationship between sociodemographic characteristics and knowledge, attitude and practice towards zika virus

There are no significant relationship between the gender and age with the knowledge, attitude and practice towards Zika virus. However, level of knowledge does related with the income of the population. The level of knowledge was strongly associated with level of education of the public. The occupation of the respondents also affects their level of knowledge.

Relationship between knowledge, attitude and practice towards zika virus

The level of practice of prevention towards Zika virus does not depend on the knowledge of the public [3]. Despite of having high knowledge of Zika virus, the practice of the public towards Zika virus was still poor [26]. There is a significant relationship between attitude and practice. It was found that public that had positive attitudes committed excellent practice towards the Zika virus[32]. The level of knowledge does affect the nature of attitude of the public where if they are having high level of knowledge they will also have positive attitude [13].

Most common source of information

Internet remains as the most common source of information in Malaysia [13] while some other countries chose Television (TV) and Radio [28,29,31].

Most trusted source of information

The most trusted source of information was the TV/Radio [1,24], followed by the internet and interpersonal [1].

Methodology

Study design

This was a descriptive, cross-sectional study of knowledge, attitudes and practices concerning Zika virus disease among communities of Bandar Maharani, Muar, Johor, Malaysia.

Study population

The population in this study was residents of Bandar Maharani who were aged 18-65 and were living there for at least one year.

Study area

Bandar Maharani was selected as the study area because it is one of the dengue hotspot in Muar, Johor. Besides that it has high population density and therefore adequate data is available.

Study period

From 11th November 2016 to 16th March 2017.

Sample size

A computed sample size of 383 respondents was required to fulfill the objective of the study at a 95% confidence level assuming 5% of confidence interval.

Sampling method

Bandar Maharani was chosen among the 10 areas of dengue hotspot in Muar, Johor by simple random sampling. Bandar Maharani has a total number of 96546 populations. A total of 10 residential areas in Bandar Maharani were selected randomly by random sampling software. In every residential area, odd number was chosen. Each members of the selected household was given a questionnaire to complete.

Ethical considerations

The study was approved by the Medical Research Ethics Committee (MREC) of Asia Metropolitan University, Selangor, Malaysia. The participants are informed about the objectives and design of the study ensuring their participation was voluntary. Confidentiality is held utmost throughout the study. Written consent was obtained.

Research instrument

Data was collected by using a modified questionnaire which was adopted from the WHO survey questionnaire.

Content validity was done by the experts in Microbiology, Pathology and Epidemiology field. The Content Validity Index (CVI) was 0.877. Face validity was also done by using the Likert scale in a pilot testing.

Internal Consistency Reliability was done by computing the Cronbach's alpha and was 0.736 (>0.70) therefore it was consistently reliable.

The questions were directed towards acquiring information regarding the community's knowledge, attitude and practice on Zika virus.

The questionnaire consists of 4 parts: The first part is to collect socio-demographic data of the target population listing gender, age, educational level, religion, race, current work and average of monthly income of household.

The second part will be focused on questions on knowledge about Zika virus. This will be assessed by 12 questions that requires only "YES" or "NO" answer. In this part the most common source of information the community acquired from was also identified. A correct answer was given 1 score and 0 score for wrong answer. The score varies from 0-12 and classified into 3 levels using Bloom's cut off point (60-80%); above 80% is excellent and below 60% is poor (Table 1).

The third part assessed the attitudes towards Zika virus disease and it included 9 questions and Likert's scale was used. There were 9 statements which included positive and negative statements. The scoring will be done (Table 2). The respondents are required to identify the correct answers. A correct answer was given 1 score and 0 score for wrong answer. The score measures from 9 to 36 and classified into 3

levels using Bloom's cut off point (60-80%); above 80% is excellent and below 60% is poor (Table 3).

The fourth part determine the practices of Zika virus disease prevention which was acquired by 10 questions and the respondents are required to identify the correct answers by choosing YES or NO. A correct answer was given 1 score and 0 score for wrong answer. The score varies from 0-10 and classified into 3 levels using Bloom's cut off point (60-80%); above 80% is excellent and below 60% is poor (Table 4).

Data Analysis Procedures

The collected data was entered and interpreted using PASW Statistics Student Version 18. The total scores of each part (knowledge, attitudes and practice) were calculated and recorded.

Data analysis involved the descriptive statistics and correlation test. Chi square test was used to test the relation between the socio-demographic characteristics and the knowledge, attitudes and practice of the public towards the Zika virus.

The normality of distribution of data was determined by computing the skewness and kurtosis which involved using the formula of Statistics divided by Standard error where the values were more than -2 and less than +2 (Tables 5,6 and 7).

From the above, the data was normally distributed. Therefore, Pearson Correlation was used for analytical statistic to describe the association between the variables.

Frequency distribution

- Socio-demographic characteristics
- Level of Knowledge about Zika virus
- Level of Attitudes towards Zika virus
- Level of Practice towards Zika virus

Relationship between

- Socio-demographic characteristics with knowledge, attitude and practice
- Knowledge and practice
- Knowledge and attitude
- Attitude and practice

High (80-100%)	9-12
Moderate (60-79%)	7-8
Low (less than 59%)	0-6

Table 1: Knowledge about zika virus.

Positive Statement		Negative Statement	
Answer	Score	Answer	Score
Strongly Disagree	1	Strongly Disagree	4
Disagree	2	Disagree	3
Agree	3	Agree	2
Strongly Agree	4	Strongly Agree	1

Table 2: The attitudes towards zika virus disease.

Positive (80-100%)	29-36
Neutral (60-79%)	22-28
Negative (less than 59%)	0-21

Table 3: The score measures.

Results

Socio-demographic information

A total of 384 respondents (N=384) from Bandar Maharani, Muar were randomly selected to participate in this research. The socio-demographic characteristics of the respondents are shown in the Table 8. The mean age of the participants was 33. The target age range is from 18 to 65 years old. The male participants are slightly more than female participants, 54.3% and 45.7% respectively. Nearly half of the respondents (44.1%) have a secondary school education (SPM); both diploma and degree holders accounted for 18.1% each. Out of 54.6% of the respondents was Malay, followed by Chinese 31.3%, Indian 12.3% and others (1.8%). There were 25.2% of students took part in this study including medical students. About 34.1% of the respondents have an average monthly income of RM1000-RM1999 (Table 8).

Source of information about Zika virus

The respondents were allowed to choose more than one answer in the sources of information about Zika virus. The main source of information chosen was Radio/Television (77.3%) followed by Printed materials (57.3%) such as newspaper, brochures, pamphlets, magazines. Another source of information was Internet 54.2% and the least 34.9% by family and friends. The most trusted source of information about Zika virus was Radio/Television (65.40%), followed by Printed materials (48.20%), Internet (34.60%) and Family and friends (31.50%)(Figures 1 and 2).

Knowledge about Zika virus

In the distributed questionnaire, there were 12 questions related to knowledge of Zika virus. Mean total knowledge score generally was 8.55 with standard deviation of 2.10. There were 16 participants that answer all the questions correctly.

The range of knowledge score was 0-12. About 62.2% of the respondents have moderate knowledge, 14.8% have poor knowledge and 22.9% have excellent knowledge.

Attitude towards Zika virus

A sum of 9 questions contributing to a maximum of 36 scores. Table 6 shows the distribution of attitude towards Zika virus. 58.9% of the respondents have neutral attitude, 8.9% have negative attitude, while 32.6% have positive attitude. Mean score was 26.99 with standard deviation of 3.93. There were only 2 participants that scored fully.

Excellent (80-100%)	9-10
Fair (60-79%)	6-7
Poor (less than 59%)	0-5

Table 4: The practices of zika virus disease prevention.

Knowledge	Statistics	Std. error	Statistic/Std Error
Skewness	-0.043	0.125	-0.344
Kurtosis	-0.330	0.248	-1.331

Table 5: The knowledge, attitudes and practice of the public towards the zika virus.

Attitude	Statistics	Std. error	Statistic/Std Error
Skewness	-0.137	0.125	-1.096
Kurtosis	-0.488	0.248	-1.968

Table 6: Statistics divided by standard error.

Practice	Statistics	Std. error	Statistic/Std Error
Skewness	-0.059	0.125	-0.472
Kurtosis	-0.414	0.248	-1.670

Table 7: Analytical statistic.

Characteristics	N(%)
Gender	
Male	208(54.2%)
Female	175(45.6%)
Level of Education	
SPM	168(44.1%)
Diploma	69(18.1%)
Degree	69(18.1%)
Others	74(19.3%)
Current Work	
Not Working - Student	76(19.8%)
Not Working - Non Student	34(8.9%)
Working - Medical Field	11(2.9%)
Working - Non Medical Field	179(46.6%)
Race	
Malay	209(54.4%)
Chinese	120(31.3%)
Indian	47(12.2%)
Others	7(1.8%)
Religion	
Islam	209(54.7%)
Buddha	107(28.0%)
Hindu	42(11.0%)
Christian	23(6.0%)
Others	1(0.3%)
Average monthly income	
Below RM1000	18(4.7%)
RM1000-RM1999	59(15.4%)
RM2000-Rm2999	41(10.7%)
RM3000-RM3999	21(5.5%)
RM4000-RM4999	11(2.9%)
Above RM5000	23(6.1%)

Table 8: Socio-demographic characteristics of respondents (N=384).

Practice towards Zika virus

Total of 10 questions are required to answer. Table 7 shows the distribution of practice scores. Mean score was 6.64 and standard deviation of 1.78. 61.0% of respondents have moderate practices towards Zika virus, 14.9% have poor practice, and 24.1% have excellent practices. 24 respondents have scored 10 out of 10 (Table 9).

Relationship between knowledge and attitude

It was found that the relationship between knowledge and attitude was very significant (p=0.000) (Table 10).

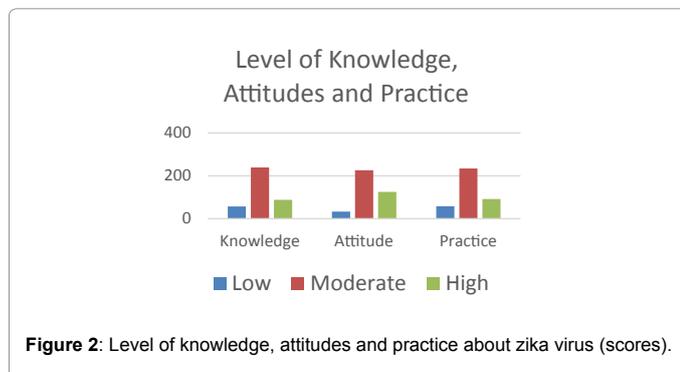
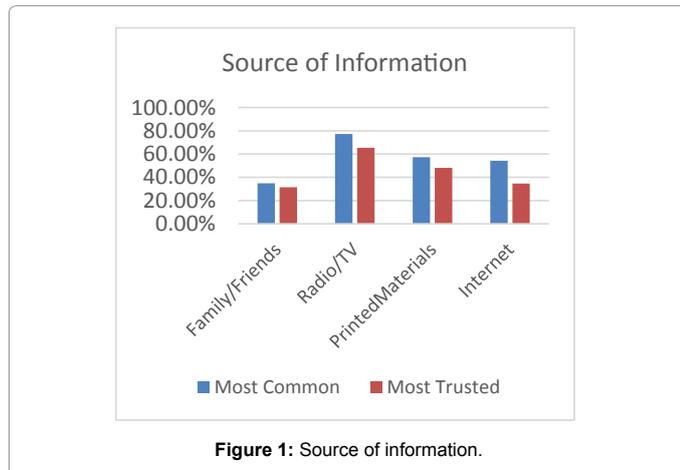
Relationship between attitude and practice

The relationship between attitude and practice was significant (Table 11).

Relationship of sociodemographic characteristics and the knowledge, attitudes and practice

There was a significant relationship between the socio-demographic characteristics and the knowledge; level of education (p=0.001), race (p=0.000), religion (p=0.028) and current work (p=0.000) (Table 12).

There was a significant relationship between the socio-demographic



characteristics and the attitude; Religion ($p=0.030$) and current work ($p=0.000$) (Table 13).

There was a significant relationship between the sociodemographic characteristics and the knowledge; level of education ($p=0.004$), race ($p=0.000$), religion ($p=0.004$) and current work ($p=0.044$) (Table 14).

Discussion

Knowledge about Zika virus

About 62.2% of the respondents have moderate scores and 22.9% of them have excellent knowledge of Zika virus. This is contradictory from a study carried out in Selangor, Malaysia where 71.5% of respondents had good knowledge of Zika virus. The reason for this might be the different in location leading to a different accessibility of the source of information.

In our study, it was found that most of the respondents have heard about Zika virus (96.6%). Only 3.4% that does not heard about Zika. This is different to a study that shows 4 in 10 Americans have heard only a little (24%) or nothing at all (15%) about Zika.

Nearly three quarters of respondents (74.7%) stated that Zika are closely related to microcephaly. This was similar to a study carried out in United States that about 77% of respondents are aware that the association between Zika virus and the birth defect microcephaly.

94.0% of respondents identified correctly that Zika can spread through mosquito bite. This is correct according to WHO. This was same as the the study carried out in America that shows 90.0% of the respondents correctly identify the answer.

Almost half of the respondents (49.7%) had falsely answered that Zika cannot spread through sexual intercourse. This was similar to a study carried out on Americans (57.0%).

Based on a study carried out in Texas, 40% of participants identified the patients with Zika virus can have fever. However our study shows that 90.9% of respondents correctly identified that person with Zika virus can be feverish.

About 31.7% of the respondents says that the person with Zika will not necessarily show symptoms. This is similar to the report in United States where 40% of the respondents know that the viral infection may be asymptomatic.

Attitudes towards Zika virus

Based on the Likert scale, more than half of the respondents had neutral attitudes (58.9%). This is different from a study carried out in Salvadoran urban community where 92.1% of the respondents have positive attitudes (Roberto Mejía, Alexandre Ribó, Edgar Quinteros, Alejandro López and Paola Villegas, Xavier F. Vela and Ada Ruth Membreno, 2016). It was also contradictory to a research carried out in Malaysia that shows that there were 74.5% of respondents (N=400) having positive attitudes towards Zika virus.

There were 51.8% of respondents felt that the information about Zika virus is not enough. This was similar to the study carried out in El Salvador where 51.88% of respondents stated insufficiency of information regarding Zika virus.

		Knowledge	Attitude
Knowledge	Pearson Correlation	1	0.220
	Sig(2-tailed)		0.000
Attitude	Pearson Correlation	0.220	1
	Sig (2-tailed)	0.000	

Table 9: The relationship between knowledge and attitude.

		Knowledge	Practice
Knowledge	Pearson Correlation	1	0.575
	Sig (2-tailed)		0.000
Practice	Pearson Correlation	0.575	1
	Sig (2-tailed)	0.000	

Table 10: The relationship between knowledge and practice.

		Attitude	Practice
Attitude	Pearson Correlation	1	0.140
	Sig (2-tailed)		0.006
Practice	Pearson Correlation	0.140	1
	Sig (2-tailed)	0.006	

Table 11: The relationship between attitude and practice.

Sociodemographic	Value	df	Sig. (2-sided)
Gender	4.835	2	0.089
Level of Education	22.088	6	0.001
Race	24.390	6	0.000
Religion	17.203	8	0.028
Current Work	31.987	6	0.000
Average Monthly Income of Household	6.860	10	0.739

Table 12: The relationship between sociodemographic characteristics with the knowledge.

Sociodemographic	Value	df	Sig. (2-sided)
Gender	4.736	2	0.094
Level of Education	5.600	6	0.435
Race	11.886	6	0.065
Religion	17.042	8	0.030
Current Work	5.260	6	0.511
Average Monthly Income of Household	9.637	10	0.473

Table 13: The relationship between socio-demographic characteristics with attitude.

Sociodemographic	Value	df	Sig. (2-sided)
Gender	2.476	2	0.290
Level of Education	19.250	6	0.004
Race	29.843	6	0.000
Religion	22.632	8	0.004
Current Work	12.939	6	0.044
Average Monthly Income of Household	7.090	10	0.717

Table 14: The relationship between sociodemographic characteristics and practice.

Practices towards Zika virus

The mean score of Practice towards Zika virus is 6.64 out of 10. The standard deviation is 1.78. Almost three quarters of the studied population (72.7%) answered YES when asked whether they have taken any actions to prevent from getting Zika. This was different to a study carried out in United States where only 30% of the respondents have taken steps to prevent Zika.

Only 37.5% of the respondents used mosquito net. This was different compared to the people in Villavicencio city, Colombia where 51% of the respondents used bed net.

There are 38.8% of respondents answered NO when asked whether they are going to use a condom if they are going to have a sexual relationship to prevent Zika virus; while 30.2% stated that they never had a sexual relationship; only 31.0% of respondents answered YES. This is similar to a report where 24.0% of the respondents stated that they will use condoms or other forms of birth control to prevent sexual transmission.

There is a satisfactory level of respondents in practice of cleaning water storage units (69.3%). Among the studied population, 76.3% have covered the water source/storage unit/water containers. This was similar to the study carried out in Salvadoran urban community where 89.1% of the respondents have practice removal of stagnant water.

Relationship between knowledge and attitude

There is a significant relationship between Knowledge and Attitude. This was same as the study carried out in Selangor Malaysia that shows the level of knowledge does affect the nature of attitude of the public where if they are having high level of knowledge they will also have positive attitude.

Relationship between knowledge and practice

There is a significant relationship between Knowledge and Practice. However this was different from a report from New York University that the level of practice of prevention does not depend on the knowledge of the public. Despite of having high knowledge of Zika virus, the practice of the public towards Zika virus was still poor.

Relationship between attitude and practice

There is a significant relationship between attitudes and practice.

This was similar to a case study carried out by London School of Hygiene & Tropical Medicine where the public whose having positive attitudes had excellent practices towards Zika virus.

Relationship of socio-demographic characteristics and the knowledge

The result of this study showed that there were significant association between Level of Education, Race, Religion, Current Work and the level of knowledge. This was similar to the study carried out in Singapore where the medical field workers i.e. physicians are having high level of knowledge.

Relationship of socio-demographic characteristics and the attitude

There were insignificant relationship between the socio-demographic characteristics and the attitude of the public towards Zika virus. This was similar to a study carried out in Salvadoran Urban Community. The only exception is Religion that significantly associated with Attitude.

Relationship of socio-demographic characteristics and the practice

There were significant association between Level of Education, Race, Religion, Current Work and the Practice. This was different to a study stated where women has taken actions to prevent Zika transmission compared to men.

The most common and most trusted source of information

During the study, it is found that Television and Radio were the most common source of information regarding Zika virus (77.3%), they were also the most trusted source of information (65.40%). This was similar to the study carried out by Zika Community Assessment for Public Health Emergency Response (CASPER) in Austin/Travis Country where 81.0% of the respondents chosen the Radio/TV as the most common source of information and 51.0% chosen those as the most trusted source of information. Therefore the dissemination of information should be stressed through these.

Conclusion

It could be concluded that Radio/Television was the most important sources of information of the population regarding Zika virus. It was conclusive that the level of knowledge of the population are still inadequate (majority are moderate) leading to inadequate attitude and practice towards Zika virus.

Level of education was significantly associated with the knowledge and the practice of the public towards Zika virus. Race and Religion was found having significant relationship with the knowledge, attitudes and practice towards the Zika virus. Respondents' current work also significantly associated with the knowledge and the practice of the public towards Zika virus.

Recommendation

1. Responsible authorities including government and nongovernment organizations should empower the educational events to increase the knowledge of the public in order to improve their attitudes and practices thereby prevent the outbreak of Zika virus amongst the community.
2. Health promotional activities shall be reinforced by distributing informative, educational printed materials such as pamphlets

and brochures in the public areas such as school, shopping mall, and recreational park and health centers in order to increase the dissemination of information.

- Health care providers should be given sufficient training so that they would be able to provide helpful advises regarding prevention of Zika virus other than giving treatments only.
- Prevention of the Zika virus, by promoting the preventive measures such as encouragement of removing breeding sites of the vector, should be stressed.
- Community mobilization should be highlighted in order to promote intersectoral collaboration and involving more private and public as the stakeholders in preventing Zika virus.
- Improvement of the literacy of the medical and scientific information for easier understandings.
- Health educational activities such as talks, demonstration and discussions about the Zika virus should be held more often to embolden the attitude and practice of the public towards the virus.
- Internet should be encouraged to be one of the main source of information as it can spread the news rapidly and improve the knowledge of the public by ease. However, the information should be validated to ensure its clarity.
- Knowledge about Zika virus should be integrated into the sex education i.e. apply protective measures with partner that shows symptoms or at risk in order to prevent sexual transmission of the Zika virus.
- Vector protection measures such as using screens for doors, windows etc. should be encouraged to prevent the biting of the vector.

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