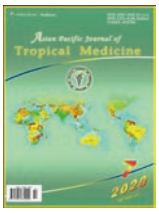

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# Predicting factors contributing to knowledge, attitudes and practices relating to Zika virus infection among the general public in Malaysia

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## ABSTRACT

**Objective:** To identify the predicting factors that contribute to knowledge, attitude and practices relating to Zika virus infection among the general public in Malaysia.

**Methods:** A cross-sectional study was conducted using a validated self-administered questionnaire. Descriptive analysis was done for participants' socio-demographic profile. Contingency table analysis was done to analyse the associations between knowledge, attitudes, and practices (KAP) scores and socio-demographic profile. A Bonferroni-corrected *P*-value was used to find the significance of the associations and multiple comparisons were performed in a single data set. To determine the linear relationship between each independent variable and the dependent variable, Spearman rank correlation was performed. Cohen's correlation coefficient was evaluated to determine the strength of the effect size. Multiple correlations and regression analyses were performed to identify independent variables that predicts the dependent variable.

**Results:** Multiple correlation analyses were conducted between respondents' KAP score and independent variables (Age >60 years; Female gender; Selangor state; At least 1 pregnant woman per household). The independent variables such as 'Female gender', 'Selangor state' and 'At least 1 pregnant woman per household' were positively and significantly correlated with KAP score whereas, age >60 years was negatively and significantly correlated with the KAP scores.

**Conclusions:** There were associations between four independent factors and the KAP scores, while only three factors contributed to changes in KAP scores among the public. Among these contributing factors, respondents' age group was the strongest predictor.

**KEYWORDS:** Zika virus, Infection, Public, Malaysia, Predictors

## 1. Introduction

The World Health Organization (WHO) acknowledged Zika virus infection as an international concern and announced a public health emergency in 2016, with Zika virus affecting several regions across the world[1]. The Center for Disease Control and Prevention instigated numerous initiatives to control the spread of Zika virus infection, as per the WHO affirmation[2]. There were various activities initiated to identify and isolate people affected by the Zika virus in risk zones, and to raise awareness of Zika virus infection in countries across the world[3]. The prevention of the spread of any infectious disease requires the general public to be equipped with the appropriate knowledge, attitudes and practice. To prevent Zika virus transmission, the international health authorities have taken many initiatives such as: health campaigns, emergency fumigation, vector control and larvicide which have helped to control the infection[4,5]. To understand peoples' knowledge of Zika virus, several studies from different epidemic regions have been conducted to learn how the people protected themselves from the infection and a poor understanding of Zika virus infection and improper practices towards its preventive measures have been reported[6–10].

During Zika virus pandemic, many of the Southeast Asian

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countries were listed by the European Centre for Disease Prevention and Control as being at risk of transmission of Zika virus infection; Malaysia is one such country that has been declared as a Zika virus risk zone in 2017[11]. Several cases of Zika virus infection were reported in Malaysia during the global Zika virus outbreak[12-14]. The outbreak of any infectious disease and its spread across the globe demonstrated the requirement for the general public to be aware of the facts on the infections and their consequences. A few studies from Malaysia revealed that pregnant women have a good knowledge of Zika virus and its complications, and they are aware of the link between pregnancy and microcephaly from Zika virus infection and its transmission by sexual intercourse[15-18]. To prevent the spread of any infectious disease, awareness among the public is important. Research is needed to determine which health messages are needed for the target population to reduce the risk of Zika virus infection in particular, among the general public in Malaysia. Many factors may influence the approach of the public towards approaching the management of Zika virus infection[19-22]. There was one descriptive study focused on the overall knowledge, attitude and practices (KAP) in a single Malaysian state, Selangor[18]. However, a lack of research describing the factors contributing to KAP among general public relating to Zika virus infection in Malaysia, remains a concern. In order to address this, it is necessary to investigate factors contributing to KAP related to Zika virus infection. In addition to this, no inferential study has addressed the factors influencing peoples' approach towards Zika virus infection in Malaysia so far. The present study aimed to identify predicting factors of knowledge, attitude and practices relating to Zika virus infection among the general public in Malaysia.

## 2. Materials and methods

### 2.1. Ethical approval and informed consent

The study design and protocol were approved by the Joint Committee for Ethics and Research of the study site [No. BP I-01/14 (55)2017].

Participation was voluntary and a written consent was obtained from all the participants prior to receiving the questionnaire. Anonymity and confidentiality of the participants were guaranteed.

### 2.2. Study design

A cross-sectional study was undertaken among the general public in Malaysia from April 2017 to September 2017 using a validated, self-administered questionnaire. In Peninsular Malaysia, there are 11 states and two federal territories. Among these, at least seven states and one federal territory have either reported or suspected Zika virus infection. Each of these affected states and the federal territory was considered as an independent cluster. Therefore, the participants were selected using a multistage cluster sampling in three stages. In stage one, there was a systematic, random selection of the four clusters. In stage two, there was a systematic random selection of five towns in each of those selected clusters. In stage three, ten locations in each of those towns were selected by the systematic random selection. From each selected location, all the households available were selected to be part of this study. All of these households were invited to participate. All people who were $\geqslant$18 years of age and who were willing to participate in this study were included.

### 2.3. Sample size

A minimum sample size of 374 was calculated using Raosoft software, with power 80%, distribution of response 50%, 95% confidence interval and a 5% margin of error[23]. A total of 2 000 people were approached, and 1 583 were completed the survey, which was more than the required sample size to generalise the findings.

### 2.4. Study questionnaire

A survey questionnaire was used to assess knowledge, attitude and practices towards Zika virus infection. In each household, the questionnaire was administered to one family member, who met the inclusion criteria. The questionnaire had 28 items. There were six items on demographic information, ten items/questions on the knowledge of participants, six items on the attitude of the participants and five items on their practices towards Zika virus infection and one open-ended question at the end in which the participants were required to identify their source of information. For 'knowledge' questions, participants had to choose from the answers (Yes/No); one point was awarded for each correct answer and in order to be considered knowledgeable, a participant had to attain a score of five points. For each item in the 'attitude' section, a 5-point Likert scale was used (strongly agree; agree; neutral; disagree; strongly disagree) in which, strongly agree=5 and strongly disagree=1. The participants had to choose one of the options from the Likert scale. A participant had to attain a minimum of 15 points to indicate a positive attitude towards Zika virus infection. Practices associated with prevention of Zika virus infection were assessed by 'Yes/No' questions, with one point being awarded for each correct

answer. A participant needs to get all five correct to be considered as demonstrating 'good practice. The total KAP score, which was the sum of the scores obtained for each of 'knowledge', 'attitudes' and 'practice' was used to rank the level of knowledge, attitude and practices of the participants. Those participants who obtained KAP score of 25 and above were considered as high level; scores between 15 and 24 were considered as medium level; scores below 15 were considered as low level.

The questionnaire included one open-ended question at the end, in which the participants were required to identify their source of information on the Zika virus infection. The options provided were as follows: radio, television, internet, social media, leaflets, newspapers, healthcare professionals, friends/neighbours, family members and any other source.

### 2.5. Validity and reliability of the study questionnaire

A self-administered questionnaire was prepared based on the WHO resource pack[24]. Face validity was done by the experts looking at the items in the questionnaire and agreed that the tool is valid. For content validity, views on the questionnaire were obtained from a panel of three subject experts and their opinion on the relevance and the significance of the questionnaire was considered. Necessary adjustments were made to the questionnaire based on the experts' opinions. A pilot study was conducted to confirm the reliability of the questionnaire. By using SPSS V.20 the internal consistency reliability was estimated by determining the coefficient alpha index with reference to the Cronbach's alpha value. The scale has a Cronbach's alpha of 0.78 for knowledge, 0.70 for attitude, 0.76 for practice and 0.73. For the final analysis, the data of the pilot study were not used.

### 2.6. Data analysis

Descriptive analysis was undertaken for the participants' characteristics. A contingency table analysis was performed to analyse the associations between knowledge scores and socio-demographic profile. A Bonferroni-corrected p-value was used to determine the significant associations for each independent variable group. The independent variables were age, gender, education level, employment, state of residence and the presence of a pregnant woman in the household. To determine the relationship between each individual independent variable and the dependent variable, a Spearman rank correlation was performed. The Cohen's correlation coefficient was evaluated to determine the strength of the effect size; correlation coefficients from 0.10 to 0.29 represent a weak relationship, coefficients from 0.30 to 0.49 represent a medium relationship, and coefficients of 0.50 and greater represent a strong relationship. Multiple correlations and regression analyses were performed to identify the independent variables that predict the dependent variable.

## 3. Results

Table 1 shows the socio-demographic profile of the participants. Out of 1 583 participants, 909 (57.4%) were above 45 years, 825 (52.1%) were female, and 1 040 (65.7%) were graduates. Most were self-employed. Approximately 25% of the participants were from each of the three states (Selangor, Negeri Sembilan and Melaka) and one federal territory (Kuala Lumpur), and 118 households included at least one pregnant woman.

**Table 1.** Socio-demographic profile of the participants.

| Characteristics | *N* | % |
|---|---|---|
| Age (years) | | |
| 18-30 | 252 | 15.9 |
| 31-45 | 422 | 26.8 |
| 46-60 | 468 | 29.5 |
| >60 | 441 | 27.8 |
| Gender | | |
| Male | 758 | 47.9 |
| Female | 825 | 52.1 |
| Education | | |
| Secondary | 543 | 34.3 |
| Graduate | 689 | 43.5 |
| Post graduate | 351 | 22.2 |
| Employment | | |
| Unemployed | 229 | 14.5 |
| Self employed | 572 | 36.2 |
| Government | 284 | 17.9 |
| Private | 498 | 31.4 |
| State | | |
| Kuala Lumpur | 394 | 24.8 |
| Selangor | 395 | 24.9 |
| Negeri Sembilan | 396 | 25.1 |
| Melaka | 398 | 25.2 |
| Household with pregnant woman | | |
| At least 1 pregnant | 118 | 7.4 |
| None-pregnant | 1465 | 92.6 |

Table 2, 3 and 4 represent the knowledge, attitudes and practice of participants towards Zika virus infection. Most of the participants were not aware of the conditions such as: Microcephaly and Guillain-Barre Syndrome. However, most of the participants were aware that pregnant women are at risk and the infection can be cured. Regarding the participants' attitudes, most of them felt that, if their family members get affected by Zika virus infection, they do not want it to remain as a secret and a person is not discriminated

**Table 2.** Knowledge of participants towards Zika virus infection (%).

| Knowledge items | Yes | No |
|---|---|---|
| Do you know what is Microcephaly? | 21.0 | 79.0 |
| Do you know what is Guillain-Barre Syndrome? | 16.0 | 84.0 |
| Do you know what causes Zika infection? | 66.0 | 34.0 |
| Can Zika infection be spread through sexual intercourse? | 37.3 | 62.7 |
| Is it safe to be with Zika infected person? | 35.0 | 65.0 |
| Can Zika virus disease can be cured? | 71.7 | 38.3 |
| Do you know what medication should not be used to treat Zika? | 10.7 | 89.3 |
| Is pregnant woman at risk of harm from Zika virus disease? | 37.0 | 63.0 |
| Zika virus disease can affect human without showing any symptom? | 40.0 | 60.0 |
| Do you know where to get information on Zika virus disease if needed? | 48.3 | 51.8 |

**Table 3.** Attitudes of participants towards Zika virus infection (%).

| Statement | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| I think I am at risk of Zika infection | 1.0 | 21.2 | 48.0 | 19.3 | 10.8 |
| I think it is my responsibility to prevent myself from getting Zika infection | 22 | 54.8 | 19.3 | 2.3 | 1.8 |
| I think the clinic in my area has sufficient facility to treat a person with Zika infection | 3.8 | 20.3 | 54.5 | 19.0 | 2.5 |
| If my family members get affected by Zika virus disease, I would want it to remain as a secret | 1.3 | 5.3 | 1.3 | 61.5 | 30.8 |
| I think a person will be discriminated or stigmatized because of him getting infected by Zika virus | 2.3 | 10.0 | 1.5 | 66.3 | 21.0 |
| I think all pregnant women should be tested for Zika virus disease | 25.5 | 31.8 | 31.5 | 7.5 | 3.8 |

**Table 4.** The practices of participants towards Zika virus infection (%).

| Practices | Yes | No |
|---|---|---|
| I have taken precautionary steps to prevent myself from getting Zika infection | 56.3 | 43.8 |
| My entire house doors and windows are secured with mosquitoes screens | 51.2 | 48.8 |
| I ensure there is no stagnant water in my household surroundings | 83.0 | 17.0 |
| My house is sprayed or fumigated periodically to prevent mosquitoes | 78.3 | 21.8 |
| I usually stay at home and take medications in case I have a fever | 54.3 | 45.8 |

or stigmatised because he/she is infected by Zika virus. Regarding practices, most participants ensured that there was no stagnant water in their household surroundings. Participants do spray or fumigate their house periodically to prevent mosquitoes.

Table 5 shows the contingency table analysis of socio-demographic profile with respect to the scores of KAP. The independent variable group 'Age in years' had four variables, among which 'Age >60' ($P$=0.005) had a significant association with the KAP scores. The independent variable group 'Gender' had two variables, with 'Female' ($P$=0.004) showing a significant association with KAP scores. The independent variable group 'Education' had three variables, with none having a significant association with KAP scores. The independent variable group 'Employment' had four variables, none of which showed a significant association with KAP scores. The independent variable group 'state' included four variables, among which only 'Selangor' ($P$=0.004) showed a significant association with KAP scores. The independent variable group 'Household with pregnant woman' had two variables, with 'At least 1 pregnant woman per household' associated with KAP scores significantly ($P$=0.004).

**Table 5.** Contingency table analysis of socio-demographic profile with Bonferroni correction.

| Socio-demographic profile | Adjusted Z score residual | *Chi* square value | Bonferroni corrected *P* value |
|---|---|---|---|
| Age (years) | | | 0.005* |
| 18-30 | 1.06 | 1.12 | 0.542 |
| 31-45 | 1.24 | 1.53 | 0.492 |
| 46-60 | 1.29 | 1.66 | 0.337 |
| >60 | 1.84 | 3.38 | 0.005* |
| Gender | | | 0.005* |
| Male | 1.34 | 1.79 | 0.363 |
| Female | 2.04 | 4.16 | 0.004* |
| Education | | | 0.005* |
| Secondary | -1.28 | 1.63 | 0.541 |
| Graduate | 1.64 | 2.68 | 0.413 |
| Postgraduate | 1.70 | 2.89 | 0.286 |
| Employment | | | 0.005* |
| Unemployed | -1.32 | 1.74 | 0.491 |
| Self employed | 1.79 | 3.20 | 0.486 |
| Government | 1.68 | 2.82 | 0.356 |
| Private | -1.35 | 1.82 | 0.306 |
| State | | | 0.004* |
| Selangor | 1.92 | 3.68 | 0.004* |
| Kuala Lumpur | 1.81 | 3.27 | 0.328 |
| Negeri Sembilan | 1.74 | 3.02 | 0.362 |
| Melaka | 1.68 | 2.82 | 0.297 |
| Household with pregnant woman | | | 0.004 |
| At least 1 pregnant | 1.98 | 3.92 | 0.004* |
| Non-pregnant | 1.50 | 2.25 | 0.263 |

*$P$<0.05.

**Table 6.** Correlation results of independent *vs*. dependent variables.

| Variables | Age >60 years | Female gender | Selangor state | At least 1 pregnant in a household | KAP score |
|---|---|---|---|---|---|
| Age >60 years | 1 | - | - | - | - |
| Female gender | 0.32 | 1 | - | - | - |
| Selangor state | 0.43 | 0.17 | 1 | - | - |
| At least 1 pregnant in a household | 0.41 | 0.24 | 0.41 | 1 | - |
| KAP score | -0.59* | 0.55* | 0.32* | 0.46* | 1 |

*$P$<0.05.

Table 6 shows the results of multiple correlation analyses. The independent variables (Female gender; Selangor state; at least 1 pregnant woman per household) had a positive significant correlation and with the KAP score, whereas, the independent variable 'Age >60 years' had a negative significant correlation with the KAP score, $r$=-0.59, $P$=0.014. There was a moderate positive correlation between variables 'At least 1 pregnant woman per household' and KAP score, $r$=0.46, $P$=0.035. There was a weak but statistically significant positive correlation between variables 'Selangor state' and KAP score, $r$=0.32, $P$=0.041. There was a strong positive correlation between variables 'Female gender' and KAP score, $r$=0.55, $P$=0.012. Before conducting regression, multi-collinearity was checked to assess the relationship between the independent variables; visual examination using scatter plots showed no significant correlations among these variables. Stepwise regression revealed two independent variables significantly predicted the KAP scores. In model 1, the $R^2$ value explained 62.8% of variance in KAP scores. In model 2, the $R^2$ value explained 73.9% of variance in KAP scores, as there was a further change in $R^2$ value which added 11.1% more variance. In model 3, the $R^2$ value explained 84.1% of variance in KAP scores. As there was a further change in $R^2$ value which added 10.2% more variance, model 3 was selected in this study. The non-significant contributor was excluded automatically by the SPSS. Outliers were investigated using Mahalanobis Distance which is 7.26 and it was within the limit.

Table 7 shows the beta-weighted standardised regression coefficients. When individual coefficients were analysed to determine the strongest predictor, 'Age >60 years' with the standardised coefficient beta value of -1.28 was the best predictor. When analysed for the shared and unique contribution of the predictors; 'Age >60 years' shared $(0.555)^2$=30.8%, unique $(0.498)^2$ =24.8% to the dependent variable (KAP scores), 'Female gender' shared $(0.489)^2$=23.9%, unique $(0.402)^2$=16.1% to the dependent variable (KAP scores) 'At least 1 pregnant woman in a household' shared $(0.435)^2$=18.9%, unique $(0.322)^2$=10.3% to the dependent variable (KAP scores).

The percentages of participants' sources of information about Zika virus infection are as follows: radio 1%, television 2%, website, 29%, social media 40%, leaflets 1%, newspapers 1%, health care professionals 19%, friends/neighbours 2%, and family members 5%.

**Table 7.** Stepwise regression for strongest predictor.

| Model 3 | b | Standard error | Std Coeff beta | $P$ value |
|---|---|---|---|---|
| Age >60 years | -0.953 | 0.331 | -1.28 | 0.002* |
| Female gender | 0.186 | 0.173 | 0.492 | 0.003* |
| At least 1 pregnant in a household | 0.104 | 0.102 | 0.306 | 0.004* |

*$P$<0.05.

## 4. Discussion

The growing economics and development of urban regions in Malaysia provides the ideal ecological conditions for increased Aedes mosquito populations. This, combined with modern transportation, offers the mechanism to transport both mosquitoes and viruses. The emergence of Zika virus emphasises the need for preparedness and envisioning worst-case scenarios. Maximum efforts have been deployed in recent times to enhance the current knowledge of Zika virus infection. A complete understanding of the consequences of Zika virus infection and knowing the full spectrum of its clinical outcomes of the general public is very important for its prevention[25].

The present findings provide details of social factors and predictors that affect the knowledge, attitudes and practices of the general public in Malaysia relating to Zika virus infection. The high response rate of 79.15% indicated that there is no participation bias. Most study participants were above 45 years of age, which reflects the current population proportion of Malaysia[26]. The majority of the study participants were graduates, reflecting the education level of the general population in Malaysia[27]. Generally, Malaysians prefer self-employment as the earnings and returns are higher than being employed[28], which is reflected in our results. The normal pregnancy rate in Malaysia also reflected in the results, with at least 7% of the households participating in this study had a pregnant woman at home[29].

The strong negative correlation between the KAP score and the participants' age being over 60 years suggested that geriatric health may be at risk. A report by the Ministry of Health Malaysia stated that elderly people have poor knowledge about prevention practices against mosquito bites and keeping the surroundings tidy[30]. It is essential to confirm that all sectors of the population

are informed about the complications of Zika virus infection. This will help the public to understand the consequences of Zika virus infection and their individual role in the national and the global spread of the disease. Personal protection measures and a strategic response framework of the Ministry of Health may improve the knowledge and prevention practices of mosquito bites among elderly people[31,32].

On the other hand, the positive correlation between the KAP scores and the presence of a pregnant woman in the household suggested that members of the family would have updated themselves about Zika virus infection, because of the greater consequences of Zika virus infection on pregnant women. Similarly, female participants had higher KAP scores in this study, which is in agreement with findings from studies in other Zika virus-affected countries[33,34]. This result suggested a greater awareness of the prevention of Zika virus infection among females in countries where the Zika virus is prevalent. This is also an indication that the family members are well informed about the risks of Zika virus infection when there is a pregnant woman in their household.

A descriptive study conducted in 2016 among Selangor State residents suggested that improvement of knowledge about the complications and the spread of Zika virus infection was needed[18]. The KAP scores from this study show that people have sufficient knowledge relating to problems and the spread of Zika virus among the people from this region. This may have resulted from the continuous awareness campaign conducted by the Department of Health and the Environment in Selangor state during the mosquito spreading seasons[35].

Although there were associations between four independent factors and the KAP scores, only three of them contributed to the KAP scores, in which 'an age above 60 years' contributed strongly. The next predictor was being female, which is consistent with other studies demonstrating that females have more knowledge regarding Zika virus infection, whether or not they are pregnant[8,34,36]. The third predictor was the presence of a pregnant woman in the household, again suggesting that members of such households had greater awareness of Zika virus infection and its association with its pregnancy-related complications.

It will be important to determine the ideal method for communicating with the general public to create awareness of any disease prevention. The respondents mentioned that social media and websites are the main sources of information. This is an indication of people moved on from the traditional tri-media (TV, radio and print) as a source of information[9,37,38]. One of the reasons for this is may be the rapidly increasing use of smart phones in day-to-day life[39]. With fast growing internet facilities and the growing number of healthcare professionals in the health services, the Ministry of Health Malaysia can bring a better awareness among the public thus preventing Zika virus infection. Nevertheless, the participants also considered that healthcare professionals were also a source of information. Taking this into account, the Malaysian Ministry of Health can spread awareness about Zika virus infection through social media and websites, as well as through well-trained healthcare professionals who are ready for a Zika outbreak[40]. Such interventions will enhance health security and improve public health capacity[25].

A self-administered questionnaire was used in this study and this may have influenced the results because of the inevitable social desirability bias.

The results of the study provide an overall view of how the general public is prepared for the management of Zika virus infection and its spread. Factors such as age, gender and households with a pregnant woman were the predictors affecting the KAP scores in relation to Zika virus infection in Malaysia, where social media and websites were the main sources of information about the Zika virus for the general public. Hence, more effective and systematic awareness programs using social media and healthcare settings will be helpful to prevent the spread of Zika virus infection in this region. Our findings also highlighted the interest of people in fetal safety, especially those who are pregnant and those having a pregnant woman at their home. The data from this study may be a useful tool for further disease prevention in Malaysia and other Southeast Asian countries.

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## Authors' contributions

KR and MK conceived the study design. YW, WY, SM and YZ conducted the study and prepared the data set for analysis, performed the analysis, interpreted the result. KR and MK collated the data

and drafted written the manuscript. MK revised the manuscript. All authors discussed the results and implication and commented on the manuscript at all stages and approved the final manuscript.

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