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**KNOWLEDGE OF DENGUE AMONG STUDENTS IN UNIVERSITI SULTAN
ZAINAL ABIDIN (UNISZA), TERENGGANU, MALAYSIA AND THE INFLUENCE
OF KNOWLEDGE OF DENGUE ON ATTITUDE AND PRACTICE**

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ABSTRACT

Reducing the vector population not only organization responsible, individual itself plays as important role in dengue prevention and control. Upon the understanding of the value of baseline data, a cross-sectional study was carried out in the dengue hotspot areas in Universiti Sultan Zainal Abidin (UniSZA). The study results show that 83.9% of the population had a high level of knowledge, 10.6% had a good attitude and 81.8% were performing good practice against dengue infection. After adjusting confounding variables, age and educational level of respondents, knowledge as well as attitude were found to be significant associated factors for having good practice against dengue. The study findings provide the need for further information to undertake a holistic approach, which is in need of community participation and cooperation.

Keywords: dengue fever; knowledge; attitudes; practice; student.

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1. INTRODUCTION

In Malaysia, cases of dengue are increasing annually. Dengue fever (DF) is a mosquito borne disease; mild dengue fever can cause rash, muscle pain, joint pain and high fever. While, dengue hemorrhagic fever (DHF) more severe form of dengue fever cause a shock, severe bleeding and death. In fact, the incidence of DF and DHF in Malaysia have risen dramatically in the last five years especially in 2014 and 2015 where the dengue cases rise from 43346 (2013) to 108698 (2014) followed by 120836 (2015). In 2015, there were 336 related deaths which were the highest death number compared to years before. Economic burden was caused by dengue fever where the cost mostly on public health care system, on affected families, on productivity and the whole of the society [1]. Most of death and hospitalization cases among adults and children are caused by dengue fever. The disease is now showing geographic spread, with increasing incidence and presence of a new type of disease caused by mosquitoes bite known as Zika virus. Better control strategies must be done to interrupt transmission of dengue. The main risk of dengue outbreaks is basic geographic receptivity affected by climatic conditions, vectorial (*Aedes aegypti*) competency, the extent of its prevalence, virus/host interactions, migration of host and total epidemiological scenario [2].

The spread of dengue infections are strongly related and caused by bad human habits and activities. Millions of cases of dengue infections occur worldwide reported was associated with lack of human knowledge in preventive measure to prevent this infectious disease. The emergence of international trade and urbanization also cause the spread of dengue virus and vectors [3]. Population growth on a massive scale, poorly-planned urbanization, environmental alteration, increased global trade and traveling favour the geographic expansion of both mosquito vectors and the viruses.

Dengue morbidity is predominantly high in the tropics and subtropics like the Americas, Southeast Asia, Caribbean Islands and the Africa [4]. Globally, there are more than 120 dengue-endemic countries and at least 50-100 million people have infected annually [5]. Information to the public is important at the time of outbreaks or epidemics and it should be exhaustive and clear to explain how the causes, causal factors, spreads, control efforts and treatment of the disease. A complete, extensive and practical guideline should be made aware

to the public. Information should include do's and don'ts as to disqualify baseless deleterious information produced by unauthorized parties. The cultural belief, demographic and social of the community population should be assessed regarding dengue fever, as well as the association of dengue vector and the importance of vector control. Community participation is important to (i) help in control the vector from disseminate (ii) help to enhance prevention campaigns, iii) increase coordination of resources and efforts; (iv) concerting of efforts to control the disease to achieve target goals and create control strategy; (v) to promote the importance of responsibilities in control measure, and (vi) to promote empowerment of the community in the control of such diseases [6].

Mainly, through the female mosquitoes breed in species of *Aedes aegypti* dengue virus is transmitted. Dengue is widespread throughout the tropical and subtropical which is influenced by unplanned rapid urbanization, temperature and rainfall. Zika infection, Chikungunya and yellow fever also transmitted by this type of mosquitoes. The early symptom of infection cause fever and occasionally develops into more lethal complication. Today, severe dengue affects most Asian and Latin American countries and has caused the increasing of hospitalization and death among children in these regions. Symptoms of dengue fever can be recognized through swollen lymph nodes, pain muscle and joint, headache, exhaustion, rash and fever. The presence of rash, fever and headache is commonly characteristic of dengue fever. Dengue hemorrhagic fever (DHF) is a specific syndrome that tends occur among children under 10 years of age. This complication of dengue causes abdominal pain, hemorrhage (bleeding) and circulatory collapse (shock). Symptoms of infection typically last 3-10 days and cause a sudden onset of high fever (103-106°F), backache, intense pain in joints and muscles, retro-orbital pain, nausea and vomiting and a rash that usually begin 4-7 days after the mosquito bite [7].

However, more severe and lethal symptoms such shock and hemorrhage can also produce by dengue virus serotype. In reducing vector breeding sites the Centers for Disease Control and Prevention (CDCP) and World Health Organization recommends extensive community educational campaigns a best way for dengue control. This idea is supported and used by various researches showing that community participation and more detail information about

dengue as medium to community can be apply and more effective in reducing dengue vector breeding sites compare to use chemicals only (Espinoza, 2002). Several studies suggest dengue vector prevention practices should start with community and it was one of the best practices of dengue prevention as it comes with better knowledge of dengue [8-10].

Furthermore, the recent outbreaks of dengue in the province especially in wet season necessitated the start of this study. The knowledge that could be obtained in this project would guide related people to initiate initiatives, plan and design and create policies relative to preventive measure which could be used to control the emergence of dengue fever infections.

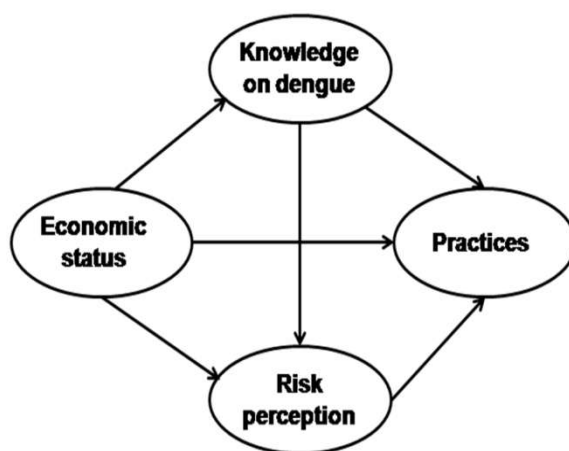


Fig.1. The underlying conceptual model for studying the relationships between knowledge on dengue, risk perception, practice and economic status

Dengue KAP surveys have frequently been used as tools and medium in describing knowledge, attitudes, and practices of the community towards prevention [11]. The underlying hypothesis (Fig. 1) was that knowledge of dengue is associated with good risk perception and good practices. Secondly, that better economic status is directly associated with good risk practices for dengue, with good risk perception and higher knowledge of dengue. Finally, that good risk practices for dengue. This hypothesis suggests that good practices of dengue control not necessarily caused by better knowledge.

Campaign should focus on reducing mosquito and preventing dengue in cost effective way such as environmental measures and control. Educational campaign should more emphasis in breeding site and ecology of dengue transmission. Furthermore, government should provide a wide range of information, skills, and support to increase dengue awareness among the

community. The study is aimed to assess the current level of awareness, attitude, and practice regarding Dengue. To determine the associated factors for preventive practices among the students, being occupants of the hostels in UniSZA main campus. Below are reported incidences in January 2016 until November 2016 in Malaysia (Table 1).

Table 1. The cumulative cases of dengue in Malaysia from January to November 2016

State	Cumulative Case
Johor	9987
Kedah	860
Kelantan	5397
Melaka	2036
Negeri Sembilan	2489
Pahang	2626
Perak	3262
Perlis	166
Pulau Pinang	2362
Sabah	3266
Sarawak	2478
Selangor	47253
Terengganu	1920
WP Kuala Lumpur	7365
WP Labuan	13
WP Putrajaya	482
Total	91962

2. RESULTS AND DISCUSSION

2.1. Result

In this survey, 870 respondents age from 16 years to 65 years respondents were recruited to participate in the investigation consisting of 285 (32.8%) male and 585 (67.2%) female. The

majority of the respondents belonged to the age group of 16 to 25 years old (67.6%) and not married (68.3%). As to education, about more than half of the respondents were graduate and post-graduate persons (87.8%) and have a family monthly income (82.6%). 795 respondents have no dengue history but 505 of respondents has a history of dengue in their relatives and acquaintances.

Based on the findings of the study, people got dengue information from all sources including books/newspaper/pamphlet, mass media, the internet, health campaign and people from the vicinity. There was no one dominant media to convey dengue information to this community (Table 2). Knowledge of dengue fever was assessed using questions aimed at ascertaining the community understanding of the disease process, risk factors and standard preventive strategies. We used a Likert scale to assess knowledge of dengue; respondents reported the following as being commonly associated with dengue: fever (98.4%), shivering (80.2%), nausea and vomiting (82.1%), headaches (80.9%), joint pain (83.7%), muscle ache (68.6%), pain behind the eyes (44.7%), back pain (44.9%), abdominal pain (32.4%), bleeding (59.5%), rashes (60.9%) and cough (47.7%).

While 98% respondents knew that the vector for the dengue is a mosquito and most of them (92.8%) aware that dengue is specifically caused by the Aedes mosquito. Clean water is the most suitable breeding place for Aedes mosquitos. The most important breeding places for the mosquito were reported as uncovered water container (96.8%), pedestal flower pot (96.4%), abandon tire (96.1%), abandon food container (89.5%) and uncovered pond (81.6%).

Concerning the treatment for dengue, 556 people (63.9%) wrongly believed that there is a specific therapy. Most participants (88.5%) choose consuming more water, having enough rest (77.2%), taking paracetamol (29%) and traditional medicine (43.3%) as a treatment for dengue.

Regarding the respondent's attitude towards dengue infection, its prevention and control, 96.8% agreed that dengue fever is a serious illness and 83.3% agreed that everybody has a chance to be contracted with dengue virus.

More than half (63.6%) realized that children are the most vulnerable group to dengue fever, and even old dengue cases can still get a recurrent infection in their life. Furthermore, 80.5%

believed that early stage in dengue fever can still be treated. 66.7% believe that killing the vector mosquitoes is the only means of controlling and preventing dengue infection. While, 49.8% believe that fogging can help in reduce mosquito breeding, 77.8% disagree that elimination of larval breeding source is complicated and a waste of time. 71.4% perceived that health workers need to do house to house inspection.

With regards to the preventive practices, people were generally realized and aware the roles in prevention dengue fever are joint responsible (93.3%), remove stagnant water in pedestal flower pot (89.5%), eliminate containers that can lead to stagnant water (84.3%), always covered water that possibly become breeding place (76.6%), using abate in water storage (38.8%), using bed-net while sleeping (19.4%) and installing mosquito screens on their window (28%).

According to the scoring system stated in the methodology, it was found that 83.9% of the sample population had a high level of the knowledge, 10.6% held good attitude and 81.8% were performing good practice against dengue infection (Table 3). After adjusting the confounding variables, the significant association was found between preventive practice regarding dengue and socio-demographic characteristics comprising age of respondents, marital status, educational level and duration of living in the survey area. Moreover, there was also a significant association between practice score and knowledge score (Table 4).

Table 2. Socio-demographic profiles of respondents and source of information about dengue
(n = 870)

Characteristic (n = 870)		Frequency (%)
Age	16 years-25 years	588 (67.6)
	26 years-35 years	187 (21.5)
	36 years-45 years	55 (6.3)
	46years-55 years	38 (4.4)
	56 years-65 years	2 (0.2)
Gender	Male	285 (32.8)
	Female	585 (67.2)
Race	Malay	838 (96.3)
	Chinese	11 (1.3)
	India	12 (1.4)
	Others	9 (1.0)
Marriage Status	Single	594 (68.3)
	Married	269 (30.9)
	Divorce	6 (0.7)
	Death of spouse	1 (0.1)
Education Level	Never went to school	1 (0.1)
	Primary school	2 (0.2)
	Secondary school	103 (11.8)
	IPTA/IPTS	764 (87.8)
Type of Work	Student	544 (62.5)
	Staff	325 (37.4)
	Others	1 (0.1)
Family income	No income	151 (17.4)
	Have income	719 (82.6)
How long have you lived in this area?	Less than 1 year	192 (22.1)
	1 year-3 years	278 (32.0)

	More than 3 years	400 (46.0)
Have you ever been infected with dengue fever?	Yes	75 (8.6)
	No	795 (91.4)
whether your contacts have been infected by dengue fever	Yes	505 (58.0)
	No	365 (42.0)
Sources of information		
Book/ Newspaper/Pamphlet	Yes	840 (96.6)
Mass media	Yes	847 (97.4)
Internet	Yes	811 (93.2)
Health campaign	Yes	790 (90.8)
Neighboring people	Yes	757 (87.0)
Health worker	Yes	711 (81.7)

Table 3. Knowledge, attitude and preventive practice level on dengue among respondents (n = 870)

Characteristic	Variables	Frequency (%)
Knowledge level of respondents regarding Dengue infection	High level (101-123)	730 (83.9)
	Moderate level (84-100)	135 (15.5)
	Low level (45-83)	4 (0.5)
Attitude of respondents toward Dengue infection	Good Attitude (60-75)	92 (10.6)
	Neutral Attitude (45-59)	748 (86.0)
	Poor Attitude (15-44)	30 (3.4)
Practice of respondents on Dengue infection	Good Practice (32-48)	712 (81.8)
	Bad practice (16-31)	158 (18.2)

Variables	SLR ^a		MLR ^b		
	Crude b ^c (95% CI)	p value	Adjusted b ^d (95% CI)	t-stat	p value
	Gender				
Male	1.00				
Female	-0.342 (-1.264, 0.578)	0.466			
	Age group				
16-25	1.00		1.00		
26-35	1.379 (0.331, 2.427)	0.010	1.232 (0.171, 2.293)	2.279	0.023
36-45	0.366 (-1.410, 2.141)	0.686			
46-55	0.842 (-1.271, 2.956)	0.434			
> 55	3.551 (-5.470, 12.572)	0.440			
	Race				
Malay	1.00				
Chinese	1.746 (-2.120, 5.613)	0.376			
Indian	0.550 (-3.155, 4.255)	0.771			
Others	-2.708 (-6.975, 1.560)	0.213			
	Marital status				

Single	1.00		1.00		
Married	1.824 (0.897, 2.751)	<0.001	1.562 (0.647, 2.477)	3.351	0.001
Divorce	-9.188 (-14.374, -4.001)	0.010	-8.532 (-13.619, -3.446)	-3.3	0.001
Widowed	-2.460 (-15.214, 10.293)	0.705			

Education Level

Illiterate	1.00		1.00		
Primary school	-10.482 (-19.479, -1.485)	0.022	-11.134 (-20.093, -2.175)		
Secondary school	1.595 (0.262, 2.929)	0.019			
Graduate/postgraduate	-1.241 (-2.560, 0.078)	0.065			

Family income

No income	1.00				
Has income	-0.104 (-1.245, 1.038)	0.859			

Duration living of staying in survey areas

Less than 1 years	1.00		1.00		
1 year to 3 years	-1.095 (-2.019, -0.171)	0.020	-0.939 (-1.874,-0.004)	-1.972	0.049
More than 3 years	1.106 (0.242, 1.970)	0.012			
Dengue history (Own)					
No	1.00				
Yes	0.968 (-0.571, 2.506)	0.217			
Dengue history (Relatives)					
No	1.00				
Yes	0.090 (-0.786, 0.966)	0.841			
Total knowledge score	0.155 (0.092, 0.218)	< 0.001	0.155 (0.095,0.216)	5.083	< 0.001
Total attitudes score	-0.104 (-1.245, 1.038)	0.859			

^a Simple linear regression, ^b Multiple linear regression, ^c Crude regression coefficient, ^d Adjusted regression coefficient, $R^2 = 0.057$

2.2. Discussion

Students also known as a health care practitioner in transmission of dengue vector, virus, notification, prognosis, diagnosis and solution treatment needed. Knowledge, attitude and practice (KAP) among students regarding dengue diseases may cause alarm and improve the outcome of dengue disease cases.

The result for awareness of dengue fever was relatively high among respondent also coincide with [12]. Least knows about the species and habits of this vector which was supported by [13] and also found a lack of knowledge about important key points of clinical characteristics of dengue. Despite that, majority of the respondents in this study know and could identify the vector as a mosquito. This could be the reason lead to the lack of protective practice against the mosquito. Knowledge of symptom or disease course or subject also needs to be adjusted as the increase of dengue fever cases.

High utilization tools of dengue preventive measures such as the use of mosquito coils, bed nets, fans and control measures. However, not almost half of the respondents used professional pest control, insecticide sprays and screen windows as ways to decrease amount of mosquito and prevent dengue [14].

With regard to increased knowledge and practices for dengue prevention, studies conducted in [15-16] showed higher knowledge and adoption of best practices for the reduction of *Ae. Aegypti* breeding sites after health education campaign and activities. Our study confirms this relationship related to good KAP towards decrease of dengue disease and suggests that emphasis should be put on more advance ways to prevent dengue. Cumulative knowledge scores of respondents in the population almost similar with the findings from an earlier study done in among rural population in Malaysia [17], which reported 54.6% of the sample to possess sufficient knowledge of dengue. This study reports a slightly higher prevalence of knowledge scores which can probably be attributed to the difference in the study setting. The students' population can be expected to have better knowledge because of their level of education. A study was done by [12] also found a significant association between attitudes and education level. This study also found a significant association between practice level with both age group and geographical area.

Study by [18] found a significant association between knowledge and practices of dengue control. This finding also suggested the importance of knowledge in predict practice. Public education is essential to mitigate the dengue epidemic through improved preventive practices. Previous studies have found similar associations between knowledge and practices [10, 19]. However, it really contradict with from the findings of our present study suggest that in Nepal there are good practices and attitudes regarding DF control despite a low level of knowledge. On the other hand, the knowledge level was statistically significantly lower in mountain than in low level areas [20]

3. EXPERIMENTAL

A cross-sectional survey using a structured questionnaire was conducted in University Sultan Zainal Abidin (UniSZA) in East Coast of Malaysia. A community-based cross-sectional study to be carried out among the students in UniSZA campus an estimated population of 3,500. The campus is an area of high mosquito density. The students are placed in hostels of multiple blocks.

The questionnaires comprised of 4 main sections with 51 questions all in all: 10 questions in section I for socio-demographic data, 13 questions in section II for measure the level of knowledge regarding dengue signs and symptoms, source of information, transmission, treatment and prevention, 12 questions in section III for attitude towards Dengue disease in the aspect of prevention, and the last 16 questions in section IV for household practices in relation to water storage and mosquito reduction.

With respect to scoring, every single sub-item under one question in section II had 3 answer choices: “yes”, “no” or “don’t know.” 0 score was given to a correct answer, 1 for wrong and 2 scores if they answer don’t know. Here were scores for the five-item question for source of information which had just “yes” or “no” answer. Total scores ranged from 0-86 points and knowledge levels were categorized as high level (0-21 scores), moderate level (22-43 scores) and low level (44-86 scores).

Five-level Likert scale was applied in statements of section III in the following fashion: 5 scores were given for “strongly agree” and 1 score for “strongly disagree” in each positive

statement whereas the reverse score ratings were given in each negative statement. The scores were summed up and then classified into 2 levels: 48-60 scores (good attitude) and 36-47 scores (bad attitude).

In section III, each statement has 3 answer options: “yes”, “no” or “not sure.” Yes answer gets 0 scores, no answer gets 1 score and not sure response gets 2 scores. Then, the total scores were regarded as 32-48 scores (having good practice) and 16-31 scores (having poor practice).

Data entry and analysis were done by using IBM SPSS version 20. Descriptive statistics is applied such as frequency (%) for categorical data. Multiple linear regressions were applied to determine the factors associated with having good practice scores. Variables chosen for multiple linear regression analysis were decided not only based on the statistical significance in univariable analysis ($p < 0.05$) but also on principles of biological plausibility and principle of parsimony. The level of significance (α) is set as < 0.05 for this study. Final results were presented by using crude and adjusted regression coefficients with 95% confidence interval (CI), t-statistic and corresponding p-values.

A total of eight hundred seventy (870) respondents were recruited to participate in the investigation consisting of 285 (32.8%) male and 585 (67.2%) female. Majority of the respondents belonged to the age group of 16 to 25 years old ($n = 588$, 67.6%) and not married ($n = 594$, 68.3%). As to education, about more than half of the respondents were a college undergraduate IPTA/IPTS ($n = 764$, 87.8%) and have a family monthly income ($n = 719$, 82.6%).

The questionnaire was validated for its reliability with the statistical value more than 0.80 (Cronbach's alpha). The questionnaire was in a structured format and was undergoing pre-test and pilot tested before distributed to the real respondents in this research. Modifications of questionnaire were done on the basis of pre-test results. Furthermore, questionnaires were validated through expert validation in the field of infectious diseases and medical scope. The questionnaires were handed out by the investigators personally and collected on the spot once they have been completed individually. All data were protected as anonymously.

4. CONCLUSION

In this sense, studies of knowledge, attitude, and practices with regards to this sinister disease are never irrelevant or out-of-date. KAP study is the primary tool of situational analysis of the population's literacy to dengue and its manifestation. Knowledge about dengue and its vector among these endemic dengue areas in Malaysia are good. The attitude and practices of the community to combat the dengue uprising are commendable and are positively associated with the availability of knowledge shown. This study reveals important information on knowledge, attitude and practice of the population which should be highly regarded in the control of dengue by the authorities.

Dengue fevers cause a lot of trouble in society and become an economic burden by going around in affected communities. Unfortunately, even in this era of advanced technology, there is still a lack of effective vaccine and clinical cures for that disease. Thus far, dengue prevention and control is limited to approaches related to reducing its vector population and personal protection.

To accomplish the holistic approach including the elimination of breeding sites, environmental management, use of larvicide and adulticide is in need of community participation and cooperation it is important to impart knowledge and foster good practices in the prevention of dengue in the campus. With the information regarding community knowledge, attitude and practice, the Ministry of Health (MOH) may construct the effective, evidence-based, community-involving vector control programs. To make recommendations based on the study as regards the interventions required. Future students' education should place more information on symptomology factors in order to improve dengue control in this demographic area.

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