ENVIRONMENTAL HEALTH KNOWLEDGE ON FREQUENCY OF WATER RETAINING CONTAINERS IN SCHOOL STUDENT HOUSEHOLDS THAT LEAD TO DENGUE CASES IN KG. KONGSI 8, TAWAU

Maznah Awang[1], Nur Azalina Suzianti Feisal[1*], Mohmad Puad Ma'on[1], Murni Amirra Aminuddin[1], Sundara Rajan Mahalingam[1], Nur Faiza Abdul Razak[1] and Nursalfarina Abdul Samad[1] and Noor Haziqah Kamaludin[2]

[1]Department of Environmental Health, Faculty of Health Sciences, MAHSA University, Selangor, Malaysia
[2] Center of Environmental Health & Safety, Faculty of Health Sciences, Universiti Teknologi MARA, Puncak Alam, Selangor, Malaysia

***Corresponding Author, Email:** nurazalinasuzianti@mahsa.edu.my*

ABSTRACT

Malaysians are familiar with the lack of environmental cleanliness and it is not a new issue. Lack of concern from some communities or residents about the collection of garbage contributes to an increase in dengue epidemics. Based on an investigation, most of the larvae were found in the garbage dump zone. To study the knowledge on environmental health and dengue with the frequency of water retaining containers in school students' households in Kg. Kongsi 8, Tawau. This research will evaluate the frequency of water retaining containers in school students' households. About 60 families will involve in this study. A questionnaire will be conducted by obtaining the consent of the subjects involved. The lowest percentage of knowledge on environmental health is disagreed (5.0%) and the highest is strongly agree (42.17%). There are three levels of knowledge identified which are high knowledge (10-20), moderate knowledge (21-30) and low knowledge (31-50). However, the level of school children's knowledge of environmental health is medium (52.0%). the lowest percentage of dengue awareness is not sure (22.17%) and the highest is yes (45.33%). There are two levels of awareness identified which are high awareness (16-30) and low awareness (1-15). However, the level of school children's awareness of dengue is high (77.0%). Moreover, The mean for water retaining containers such as water storage (0.63 ± 0.01), can(1.05 ± 0.01), tyre(0.15 ± 0.01), bucket(0.20 ± 0.01) and glass(0.17 ± 0.01) is respectively. The highest frequency for all graphs is 0 which means most respondents' houses have no water retaining containers. Lastly, there is no significant difference (P>0.05) in environmental knowledge and dengue awareness with water retaining containers. There is no significant level of

knowledge on environmental health and dengue with the frequency of water retaining containers in school student households in Kg. Kongsi 8, Tawau.

Keywords: *Dengue, Environmental, Knowledge, Questionnaire*

Introduction

Dengue is a viral disease transmitted by mosquitoes which has spread rapidly in all WHO regions in recent years. Chikungunya, yellow fever and Zika viruses are the vectors of these mosquitoes. Dengue is widespread in the tropics, affected by rainfall, temperature, relative humidity and unplanned rapid urbanization, with local variations in risk.

During the dengue epidemics in the Philippines and Thailand, extreme dengue was first reported in the 1950s. Extreme dengue today affects most countries in Asia and Latin America and has become a leading cause of hospitalization and death in these regions among children and adults.

There were a total of 14 local hotspots registered in Malaysia in the 51st week / 2020. The majority of the hotspots are 13 localities in Selangor State and 1 locality in Sabah. A death was confirmed that week because of dengue complications. Malaysia reported 130,101 cases (over a 60% increase from 2018) & 182 deaths in 2019. Figure 1.0 shows the rate of death cases in Malaysia from 2000 to 2019. To study the knowledge on environmental health and dengue with the frequency of water retaining containers in school students' households in Kg. Kongsi 8, Tawau.

Methodology

The environmental health knowledge on frequency of water retaining containers in school student households that lead to dengue cases in Kg. Kongsi 8, Tawau. This research evaluates the frequency of water retaining containers in school students' households. About 60 families were involved in this study. The study was conducted by obtaining the consent of the subjects involved.

Kg. Jawa Kongsi 8 is a village in the Tawau district that has long existed. In this village, as many as 300 family people of ethnic races reside. The villagers' status is that of Malaysian citizens. The area is outside the Municipal Council of Tawau. Most of the villagers here are workers that work in private companies.

The condition of the village surrounded by oil palm plantations results in the isolation

and invisibility of the villages from the main road. During the assessment of the village area, the results of the inspection found that there were many piles of garbage in the bush and vacant land.

For this research, a questionnaire had been conducted for 60 respondents. The questionnaire consisted of three sections: Section A is about respondent information, Section B is about environmental health knowledge, and Section C is about dengue awareness. After all respondents' data had been collected, Statistical Package for the Social Sciences (SPSS) software was used to analyze the data.

Results and Discussion

Based on the observation, there are 14 dumping areas identified at Kampung Kongsi 8. Mostly the type of waste is household waste such as plastic bottles, papers, box, can and leftover food. These materials qualify as possible hazardous wastes due to their resistance and sluggish degradability, which accounts for a longer residence period. The retention of water allows these wastes to produce a favourable biotope for the breeding of Aedes (B. Soumyajit, 2015). The residents at Kampung Kongsi 8 manage their wastes by burning or burying them because this area is not in the waste collection area by the municipality.

There are also tyres on the dumping site where clearly improperly stored that can become a breeding ground for thousands of Aedes. Tyres are a great incubator for mosquito larvae due to their design. After a rainfall, tyres fill with water and hold it because parts of the interior regions of the tyres are shadowed continually, preventing the stored water from evaporating. Mosquito egg hatching and larval development can be gradually increased because tyres are partially insulated and hold heat for lengthy periods of time.

Based on Dengue case information from the Tawau Area Health Office, there are two cases at Kg. Kongsi 8 in 2020 which involves 2 children. They are siblings 9 years old and 11 years old respectively. Therefore, this research involved 60 respondents among school children whose age ranges from 8 to 18 years old. This age is categorized into two levels of education which are primary and secondary school. The mean for age is 12.2 ± 0.01 and the highest frequency of age involved in this survey is 11 years old. Most families have an income of less than RM 2500 and number of household in range 4-6 person are involved in this research. There is no significant difference ($P>0.05$) for all these criteria.

Table 1.0: Respondent Information Between Primary Student and Secondary Student.

Variable	Education level		χ^2	P-value
	Primary Number (%)	Secondary Number (%)		
Gender				
Male	22 (62.9%)	13 (37.1%)	0.050	0.822
Female	15 (60.0%)	10 (40.0%)		
Race				
Malay	19 (57.6%)	14 (42.4%)	0.519	0.471
Bumiputra	18 (66.7%)	9 (33.3%)		
Income				
No Income	0 (0.00%)	0 (0.00%)	0.957*	0.798
Less than RM 2500	21 (58.3%)	15 (41.7%)		
RM 2501-RM4500	15 (68.2%)	7 (31.8%)		
More than RM 4500	1 (50.0%)	1 (50.0%)		
No. of Household				
2-3 person	6 (85.7%)	1 (14.3%)	3.948*	0.258
4-6 person	25 (64.1%)	14 (35.9%)		
7-9 person	4 (40.0%)	6 (60.0%)		
10 person and above	2 (50.0%)	2 (50.0%)		

Chi-Square Test
P-value <0.05
*Fisher Exact Test

Several questions have been asked to the respondent to indicate their knowledge of environmental health. The questions are regarding the existence of illegal waste dumping, the no of population influences on the waste generation, and the waste impact on the environment. Instead, the respondent also was asked about their knowledge of waste management such as recycling, waste research and development. and action taken by authorities.

Table 2.0: Environmental Health Knowledge of Respondents

Variable	Education level		χ^2	P-value
	Primary Number (%)	Secondary Number (%)		
Waste Existence				
Strongly Agree	20 (61.8%)	8 (28.6%)		
Agree	2 (50.0%)	2 (50.0%)		
Moderate	6 (66.7%)	3 (33.3%)	5.697*	0.210
Disagree	6 (66.7%)	3 (33.3%)		
Strongly disagree	3 (30.0%)	7 (70.0%)		
Population and Waste				
Strongly Agree	6 (60.0%)	4 (40%)		
Agree	11 (64.7%)	6 (35.3%)		
Moderate	11 (64.7%)	6 (35.3%)	0.780*	0.696
Disagree	2 (66.7%)	1 (33.3%)		
Strongly disagree	7 (53.8%)	6 (46.2%)		
Environment impact				
Strongly Agree	17 (58.6%)	12 (41.4%)		
Agree	12 (75.0%)	4 (25.0%)		
Moderate	7 (100%)	0 (0%)	**13.197***	**0.004**
Disagree	0 (0%)	2 (100%)		
Strongly Disagree	1 (16.7%)	5 (83.3%)		
Education and recycling				
Strongly Agree	16 (66.7%)	8 (33.3%)		
Agree	10 (66.7%)	5 (33.3%)		
Moderate	9 (60.0%)	6 (40.0%)	3.569*	0.469
Disagree	2 (50.0%)	2 (50.0%)		
Strongly Disagree	0 (0.00%)	2 (100.0%)		
Environmental Pollution Reporting				
Strongly Agree	12 (60.0%)	8 (40.0%)		
Agree	11 (64.7%)	6 (35.3%)		
Moderate	12 (66.7%)	6 (33.3%)	3.023*	0.592
Disagree	1 (100.0%)	0 (0.00%)		
Strongly Disagree	1 (25.0%)	3 (75.0%)		
Waste Materials				
Strongly Agree	20 (66.7%)	10 (33.3%)		
Agree	4 (40.0%)	6 (60.0%)		
Moderate	10 (66.7%)	5 (33.3%)	2.518*	0.468
Disagree	3 (60.0%)	2 (40.0%)		
Strongly disagree	0 (0.00%)	0 (0.00%)		
Waste R&D				

Strongly Agree	15 (53.6%)	13 (46.4%)		
Agree	10 (71.4%)	4 (28.6%)		
Moderate	10 (76.9%)	3 (23.1%)	5.362*	0.222
Disagree	2 (66.7%)	1 (33.3%)		
Strongly disagree	0 (0.00%)	2 (100.0%)		
Campaign effectiveness				
Strongly Agree	18 (56.3%)	14 (43.8%)		
Agree	8 (61.5%)	5 (38.5%)		
Moderate	9 (81.8%)	2 (18.2%)	5.801*	0.167
Disagree	2 (100.0%)	0 (0.00%)		
Strongly Disagree	0 (0.00%)	2 (100.0%)		
Alternative disposal practices				
Strongly Agree	18 (61.3%)	10 (35.7%)		
Agree	6 (54.5%)	5 (45.5%)		
Moderate	11 (64.7%)	6 (35.3%)	2.137*	0.814
Disagree	1 (100.0%)	0 (0.00%)		
Strongly Disagree	1 (33.3%)	2 (66.7%)		
Law Action				
Strongly Agree	14 (58.3%)	10 (41.7%)		
Agree	11 (64.7%)	6 (35.3%)		
Moderate	9 (56.3%)	7 (43.8%)	1.892*	0.644
Disagree	0 (0.00%)	0 (0.00%)		
Strongly Disagree	3 (100.00%)	0 (0.00%)		

Chi-Square Test
p-value <0.05
*Fisher Exact Test

All of these questions are about dengue awareness among primary and secondary students. There is no significant difference (P>0.05) for all these questions between primary & secondary students.

Table 3.0: Dengue Awareness of Respondents

Variable	Education level		χ^2	P-value
	Primary Number (%)	Secondary Number (%)		
Dengue Fever				
No	13 (59.1%)	9 (40.9%)		
Not Sure	6 (85.7%)	1 (14.3%)	1.799*	0.452
Yes	18 (58.1%)	13 (41.9%)		
Aedes Mosquito Bites				
No	6 (66.7%)	3 (33.3%)		
Not Sure	4 (80.0%)	1 (20.0%)	0.859*	0.729
Yes	27 (58.7%)	19 (41.3%)		

Preventive Measures				
No	10 (62.5%)	6 (37.5%)		
Not Sure	6 (75.0%)	2 (25.0%)	0.728*	0.750
Yes	21 (58.3%)	15 (41.7%)		
Self *Gotong-Royong*				
No	8 (72.7%)	3 (27.3%)		
Not Sure	14 (63.6%)	8 (36.4%)	1.032	0.597
Yes	15 (55.6%)	12 (44.4%)		
Dengue Outbreak Areas				
No	16 (66.7%)	8 (33.3%)		
Not Sure	8 (47.1%)	9 (52.9%)	2.155	0.340
Yes	13 (68.4%)	6 (31.6%)		
Familiar With Gotong-Royong				
No	9 (75.0 %)	3 (25.0%)		
Not Sure	10 (71.4%)	4 (28.6%)	2.562	0.343
Yes	18 (52.9%)	16 (47.1%)		
Proper Waste Management				
No	11 (64.7%)	6 (35.3%)		
Not Sure	8 (80.0%)	2 (20.0%)	2.196	0.334
Yes	18 (54.5%)	15 (45.5%)		

Chi-Square Test
p-value <0.05
*Fisher Exact Test

There are five types of water-retaining containers found at the dumping area around the respondents' houses such as water storage, water cans, tyres, buckets and glass. The mean for water storage(0.63 ± 0.01), can(1.05 ± 0.01), tyre(0.15 ± 0.01), bucket(0.20 ± 0.01) and glass(0.17 ± 0.01) is respectively.

Generally, the lowest percentage of knowledge on environmental health is disagreed (5.0%) and the highest is strongly agree (42.17%). There are three levels of knowledge identified which are high knowledge (10-20), moderate knowledge (21-30) and low knowledge (31-50). However, the level of school children's knowledge of environmental health is medium (52.0%). The lowest percentage of dengue awareness is not sure (22.17%) and the highest is yes (45.33%). There are two levels of awareness identified which are high awareness (16-30) and low awareness (1-15). However, the level of school children's awareness of dengue is high (77.0%).

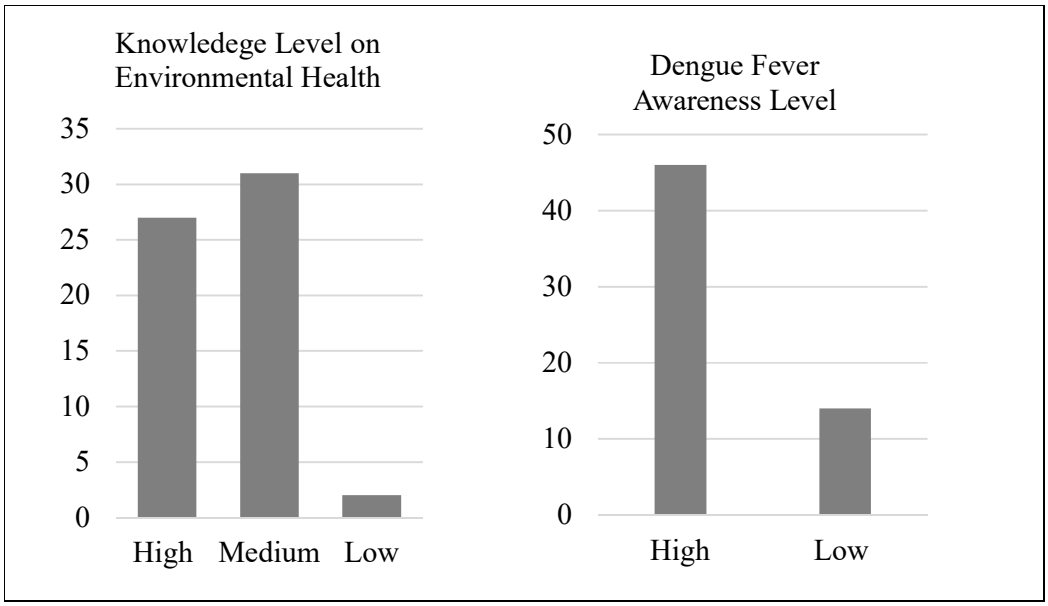

Figure 1.0: Level of knowledge on environmental health and dengue fever awareness level

There is no significant difference (P>0.05) for environmental knowledge with water retaining containers. If there is high environmental knowledge, there is a low risk that can cause of having a water-retaining container for all these types of containers.

Table 4.0 Association of The Knowledge On Environment Health With Frequency of Water Retaining Containers

Variable	Environmental knowledge			χ^2	P-value
	Low Number (%)	Moderate Number (%)	High Number (%)		
Water Storage					
Yes	1 (50.0%)	16 (51.6%)	15 (55.6%)	0.367*	0.897
No	1 (50.0%)	15 (48.4%)	12 (44.4%)		
Tyre					
Yes	0 (0.00%)	4 (12.9%)	5 (18.5%)	0.637*	0.798
No	2 (100%)	27 (87.1%)	22 (81.5%)		
Can					
Yes	2 (100%)	16 (51.6%)	17 (63.0%)	1.863*	0.406
No	0 (0.00%)	15 (48.4%)	10 (37.0%)		
Glass					
Yes	0 (0%)	3 (9.7%)	6 (22.2%)	1.931*	0.481
No	2 (100%)	28 (90.3%)	21 (77.8%)		
Bucket					
Yes	2 (100%)	22 (71.0%)	24 (88.9%)	2.994*	0.213
No	0 (0.00%)	9 (29.0%)	3 (11.1%)		

Chi-Square Test
p-value <0.05
*Fisher Exact Test

There is no significant difference (P>0.05) for dengue awareness with a water-retaining container. If there is no dengue awareness, there is a risk that can cause having a water-retaining container for water storage, can, and bucket. However, there is four times the risk of glass being a water-retaining container if there is no awareness.

Table 5.0: Association of The Dengue Awareness With Frequency of Water Retaining Containers

Variable	Dengue Awareness		χ^2	P-value	OR
	No Number (%)	Yes Number (%)			
Water Storage					
Yes	6 (42.9%)	26 (56.5%)	0.805	0.370	1.319
No	8 (57.1%)	20 (43.5%)			
Tyre					
Yes	2 (14.3%)	7 (15.2%)	0.000*	1.000	0.939
No	12 (85.7%)	39 (84.8%)			
Can					
Yes	10 (71.4%)	25 (54.3%)	1.288	0.256	1.314
No	4 (28.6%)	21 (45.7%)			
Glass					
Yes	5 (35.7%)	4 (8.7%)	5.296 *	0.025	4.107
No	9 (64.3%)	42 (91.3%)			
Bucket					
Yes	13 (92.9%)	35 (76.1%)	2.236*	0.262	1.220
No	1 (7.1%)	11 (23.9%)			

Chi-Square Test
p-value <0.05
*Fisher Exact Test

According to (Diaz-Quijano, 2018), the findings of the study show how variables such as education and demographics such as age may influence awareness of the disease and its transmission, as well as attitudes and behaviours, particularly those that entail the integration of community efforts to reduce the burden of dengue fever. However, this research shows there is no association of the knowledge of environmental health and dengue with the frequency of water retaining containers in school student households in Kg. Kongsi 8, Tawau.

CONCLUSION

There is no significant level of knowledge on environmental health and dengue with

the frequency of water retaining containers in school student households in Kg. Kongsi 8, Tawau. Accept the null hypothesis and reject the alternative hypothesis. The awareness of dengue fever among school students in Kg. Kongsi 8, Tawau is at a high level. Moreover, the frequency of water retaining containers in school student households at Kg. Kongsi 8 is at a low level. Finally, there is no association of the knowledge on environmental health and dengue with the frequency of water retaining containers in school student households in Kg. Kongsi 8, Tawau.

It is recommended for the purpose of the study where the study is conducted in groups and not individually. Hence, more data can be obtained and the time taken to conduct the questionnaire can be shortened. The collection of data from more respondents will result in a more accurate database given the results of the study in the analysis using statistical methods. In addition, local authorities are proposed to organize self gotong-royong activities so that potential container Aedes breeding can be destroyed breeding.

REFERENCES

1. Anis, H., Nazri, C. D., Hazira, R., & Chua, S. T. (2016). Quantifying The Distribution and Abundance of Aedes Mosquitoes in Dengue Risk Areas in Shah Alam, Selangor. Procedia - Social and Behavioral Sciences 234:154 – 163.
2. Azil, A. H., Haile, D. C., Daniels, E., & Mount, G. A. (2010). The Development of predictive tools for pre-emptive dengue vector control:a study of Aedes aegypti abundance and meteorological variables in North Queensland, Australia. Trop Med Int Health 1190-1197
3. Badgie, D., Abu, M. A., Abd, M. L., & Muda, A. B. (2012). Assessment of municipal solid waste composition in Malaysia: Management, practice, and challenges. Pol J Environ Stud 21:539–547
4. Banerjee, S., Aditya, G., & Saha, G. K. (2015). Household wastes as larval habitats of dengue vectors: comparison between urban and rural areas of Kolkata, India. PloSone, 10(10), pe0138082.
5. Brandt, A. A. (2017). Illegal Dumping as an Indicator for Community Social Disorganization and Crime. Master's Theses. 4835.
6. Chua, S. K., Selvanesan, S., Sivalingam, B. (2006). Isolation of monoclonal antibodies-escape variant of dengue virus serotype I. Singapore Medical Journal
7. Commissioner of Law Revision, Malaysia. 2017. Solid Waste and Public Cleansing Management (Act 672). Laws of Malaysia. As at 1 November 2017. Under the Authority of the Revision of Laws Act 1968
8. Diaz-Quijano, F. A. (2018). Association between the level of education and knowledge, attitudes and practices regarding dengue in the Caribbean region of Colombia. BMC Public Health, 10.

9. Duh, D., Hasic, S., & Buzan, E. (2017). The Impact Of Illegal Waste Sites On A Transmission Of Zoonotic Viruses. Virology Journal 14:134.
10. Dutta, P., Mahanta, J. (2006). Potential Vectors of Dengue and the Profile of Dengue in the North-Eastern Region of India: An Epidemiological Perspective. Dengue Bulletin – Volume 30: 234-242
11. Ee LeenPang, Hwei-SanLoh (2016). Current perspectives on dengue episode in Malaysia, 9(4):395-401.
12. Focks, D. A., Haile, D. G., Daniels, E., & Mount, G. A. (1993). Dynamic life table model for Aedes aegypti (Diptera: Culicidae): simulation results and validation. Journal Medical Entomology 30:1018-1028
13. Gubler, D. J., (2001). Dengue. Urbanization and globalization Farah, M. S., Nazri, C. D., & Siti, N, C, (2016). Infestation Profile of Aedes Mosquitoes in Multi-Storey Buildings in Selangor, Malaysia. Procedia – Social and Behavioral Sciences 222:283 – 289.
14. Hara, K. & Yabar, H. (2012). Historical evolution and development of waste management and recycling systems—Analysis of Japan's experiences. J. Environ. Stud. Sci. 2:296–307.
15. Haron, S. A., Paim, L., & Yahaya, N. (2005). Towards sustainable consumption: an examination of environmental knowledge among Malaysians. International Journal of Consumer Studies 29(5):426-436.
16. Jha, A. K., Singh, S. K., Singh, G. P., & Gupta, P. K. (2011). Sustainable Municipal Solid Waste Management In Low Income Group Of Cities: A Review. Tropical Ecology 52(1):123-131.
17. Manderson, L., Aagaard, H. J., Allotey, P., Gyapong, M., & Sommerfeld, J. (2009). Social research on neglected disease of poverty: continuing and emerging themes. PLoS Negl Trop Dis.;3((2)):e332
18. Manise, M., Schleich, F., and Gusbin, N. (2010). Cytokine production from sputum cells and blood leukocytes in asthmatics according to disease severity. Allergy, 65, 889-
19. Ahmad, R. et .al, (2018). Factors Determining Dengue Outbreak In Malaysia, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5825112/
20. Mukhtar, E., Williams, I. D., Shaw, P. J., & Ongondo, F. O. (2016). A tale of two cities: The emergence of urban waste systems in a developed and a developing city. Recycling 1:254–270.896.