

DENGUE EPIDEMIC CONTROL IN MALAYSIA- BARRIER IN ENGINEERING REGULATION

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Abstract

Dengue fever is one of the most arthropod-borne diseases in Malaysia, and also one of the most difficult to treat once infected. Due to rapid population growth, Dengue mosquitoes have become a significant threat to public health in Malaysia. However, preventive measures against the dengue fever epidemic need to be implemented right away. In Malaysia, particularly in its cities and semi-urban areas, both tropical and subtropical influences are evident. When an infected *Aedes aegypti* mosquito bites a human host, especially if the mosquito has just fed on an infected person, it can spread dengue fever. The dengue virus cannot spread from person to person. The only way to get the disease is to get bitten by a mosquito that already carries. The increasing dengue epidemic in Malaysia is the key area that needs study since it necessitates a focused approach to engineering control, in particular, the improvement of the product's capacity to avert future outbreaks of the disease. This presents a challenge for the researcher, as they need to move to investigate potential engineering solutions. The study's primary focus is on the exponential growth of *Aedes* mosquito populations because of human intervention and understanding on dengue epidemic. Through an Integrated Study of Dengue Prevention and Engineering Control Approach for *Aedes* Mosquitoes Breeding, this research to find a way to stop the spread of dengue virus, which is spread when an infected *Aedes* mosquito bites a human and transmits the disease in areas where dengue mosquitoes breed, commonly in Selangor, Malaysia. Furthermore, the phenomena of *Aedes* breeding grounds can be eliminated with the right strategy and engineering solutions for controlling *Aedes* mosquitoes. More than 88% of respondents said they had taken some kind of precaution against mosquito bites. Methods that focus on social engagement and communication to influence community members' habits receive more attention.

Keywords: *Aedes* mosquitoes, dengue epidemic, dengue prevention, engineering control, social engagement, community perception.

1. INTRODUCTION

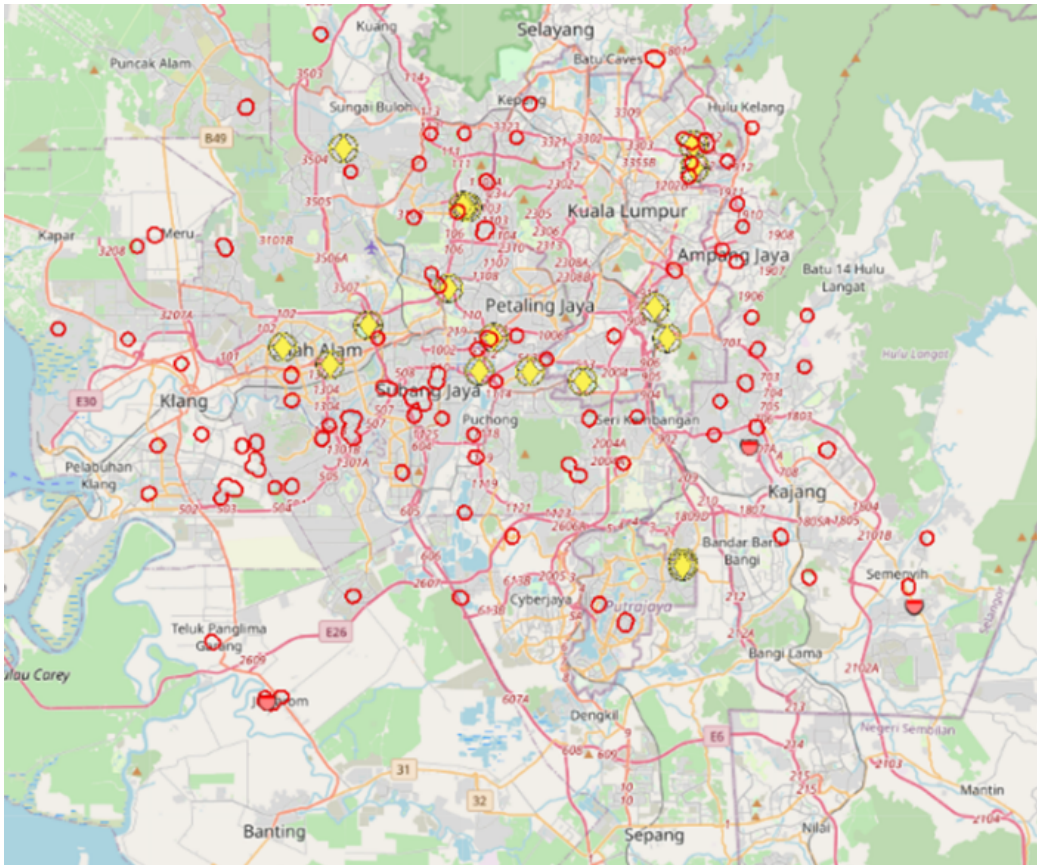


Figure 1. Dengue hotspot major in Selangor, Malaysia

Sources: Ministry of Health Malaysia (idengue 2022)

Dengue prevention in Malaysia relies heavily on medical practitioners and vector control department monitoring (Hazra, Samanta, Karmakar, Sen, & Bakshi, 2017). The Ministry of Health in Malaysia has recorded a considerable number of cases in Selangor this year. The number of confirmed dengue cases in Selangor increased to 30,309 between December 30, 2018, and November 10, 2022. Selangor state is on the west coast of Peninsular Malaysia, right next to the country's capital, Kuala Lumpur. Selangor is a big state, and about 141 cases of dengue are reported every day. This means that the greatest number of Aedes mosquitoes in the world are currently growing (Singh, Bansal, Sandhu, & Sidhu, 2018). The investigation also revealed that Selangor, according to the 2018 estimates from the Malaysian Department of Statistics (DOSM), is the place of residence for 31.53 million people. About 0.22 percent of the world's population of 31.53 million is affected. Selangor accounts for 0.006068 percent, or 141 cases, of the daily dengue cases reported. More study is indeed to find ways to avoid and control dengue epidemics in Selangor state, and the epidemic virus is extremely pervasive throughout the city (Krishnamurthy & Rahman, 2021)

2. MATERIALS AND METHODS

The level of knowledge, behaviour, and outlook toward dengue prevention was measured by a questionnaire. Over this, it was handled independently using several digital media. Since Google's survey platforms are so popular and easy to use, the researcher opted to use this particular platform. The validated survey was distributed to respondents in Putrajaya, Kuala Lumpur, and Selangor. As survey participants spoke both English and Malay, the questionnaire was drafted in both languages. Following the consent section, the questionnaire covers four topics: demographic data, dengue virus detection and transmission, and preventative measures.

3. FINDINGS RESULT

Table 1. Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Female	234	46.8	46.8	46.8
Male	266	53.2	53.2	100.0
Total	500	100.0	100.0	

Table 1 reveals that the vast majority of responders originate from the male gender. Approximately 53.2% of male respondents and 46.8% of female respondents filled out the poll in its entirety. According to the table, the number of male respondents is 266 while the number of female respondents is 234. The percentage of respondents belonging to each gender would emerge as the key data point following the completion of this demographic output.

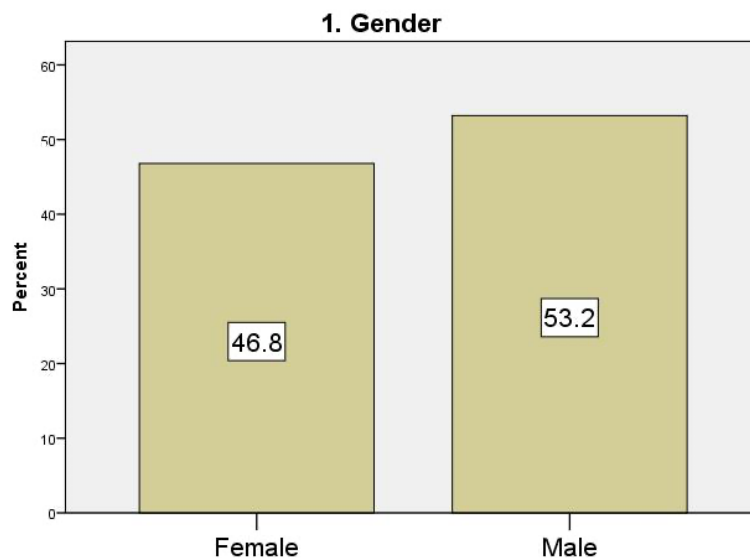


Table 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 18-27 years old	81	16.2	16.2	16.2
28-38 years old	162	32.4	32.4	48.6
39-50 years old	204	40.8	40.8	89.4
50 above	53	10.6	10.6	100.0
Total	500	100.0	100.0	

Table 2 shows that the majority of respondents fall into two age groups between the ages of 39 and 50, and those between the ages of 28 and 38. As a direct result of this, 32.4% of those whose ages ranged from 28 to 38 reported 162 different frequencies of reactions. The data shows that the age group of 50 and over comprises the majority of responders (40.8%, or around 204 total), while the age range of 28-50 comprises the second majority. This demographic output would also result in the percentage of responders, which would serve as preliminary results on which age groups were participating.

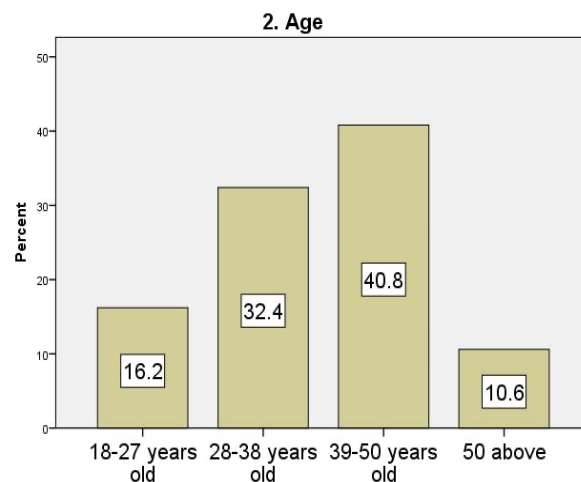


Table 3. Average earnings of your household

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2k-4k	112	22.4	22.4	22.4
4k-8k	239	47.8	47.8	70.2
8k above	92	18.4	18.4	88.6
Below 2k	57	11.4	11.4	100.0
Total	500	100.0	100.0	

According to Table 3, (47.8%) of the valid percentage of 239/500 respondents have a household income of 4k-8k. The frequency of 57/500 respondents (11.4%) are below of 2k of the household income group. The table concludes that the group’s household income of 4k-8k (M40) is a majority of the respondent. As early statistics on different household incomes are combined, this demographic output would lead to the percentage of responders. There will be conflicting perspectives on the approach and technique of taking care of dengue prevention.

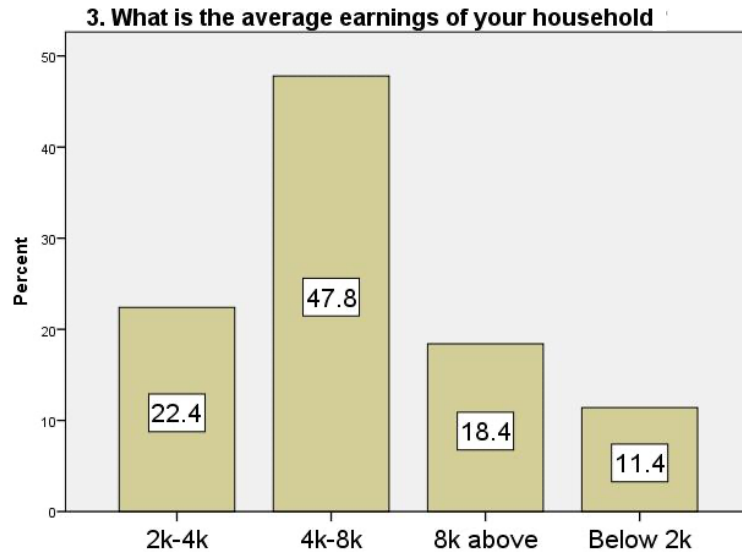


Table 4. Sign and indicators of dengue fever

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Deep muscle and joints pain	131	26.2	26.2	26.2
Diarrhea	157	31.4	31.4	57.6
Extreme high fever	180	36.0	36.0	93.6
Headache	32	6.4	6.4	100.0
Total	500	100.0	100.0	

The critically high fever cases shown in Table 4 represent 36.0% of the total respondents. High fever is a common symptom of dengue fever, and it can be one of the fundamental causes, as stated by (Pang, Mak, & Gubler, 2017). Consequently, only the lowest 6.4% (32 respondents) are under the impression that a headache is an indicator of dengue fever. Dengue fever is thought to cause diarrhea by 31.4% of the population, or 157 out of every 500 people.

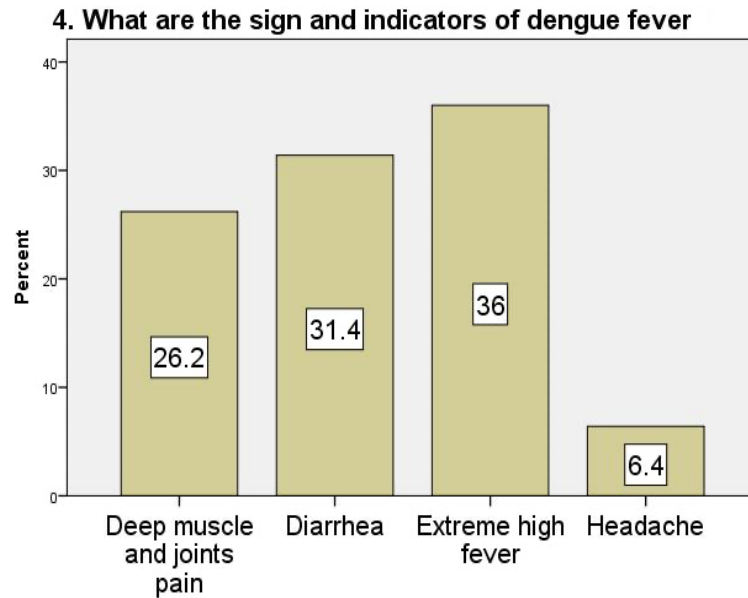


Table 5. Method would be used to prevent mosquitoes from biting

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Aerosol spray	189	37.8	37.8	37.8
Mosquito coil	94	18.8	18.8	56.6
Mosquito sleeping net	165	33.0	33.0	89.6
Ultrasonic mosquitoes repellent	52	10.4	10.4	100.0
Total	500	100.0	100.0	

Among the methods of warding off mosquitoes, 37.8% (189/500) of respondents report regularly using aerosol spray. Figured out from Table 5. Further, 33% (165/500) of respondents favour using a sleeping net. However, this form of prevention is maintained in modern society. Also, among those who responded, 10.4% (52/500) favour an ultrasonic insect repellent. This means that 18.8% of respondents (94/500) like the most traditional method of consuming mosquito coils.

5. What method would be used to prevent mosquitoes from biting

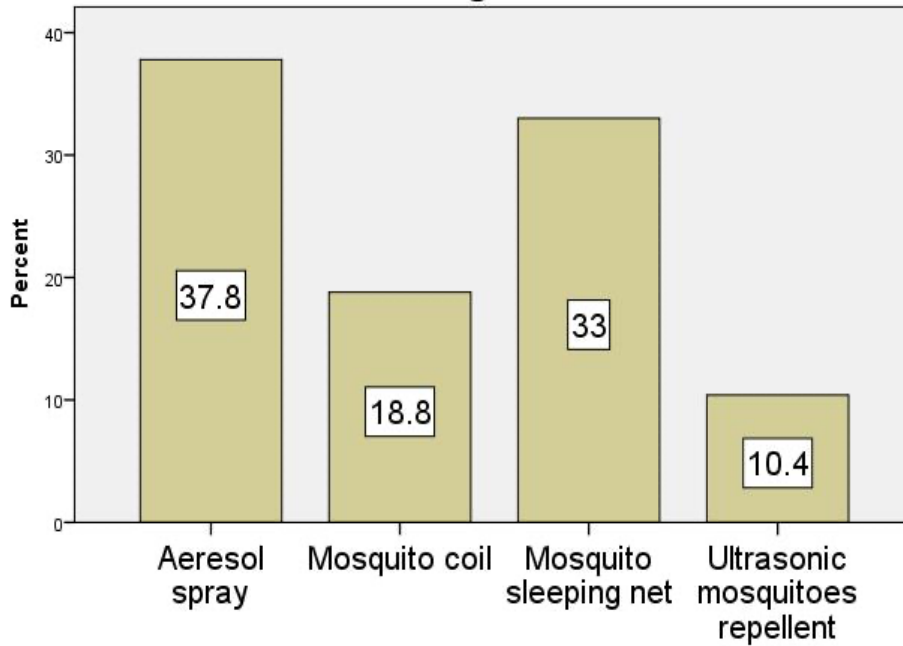


Table 6. Actions if discovered a large number of flying mosquitoes inside home

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	.2	.2	.2
Applying anti mosquitoes lotion	55	11.0	11.0	11.2
Close the windows	196	39.2	39.2	50.4
Spray aerosol	106	21.2	21.2	71.6
Switch on the fan	142	28.4	28.4	100.0
Total	500	100.0	100.0	

Results showed that 39.2% (196/500) of people who were asked would shut the window if they encountered a mosquito inside their home. In addition, when mosquitoes are present, 28.4% (142/500) of responders always turn on the fan. The idea that mosquitoes can't bite in high winds (Kasbawati, Ningsih, Ribal, & Fatmawati, 2019) has led to the practice's lengthy adoption in Malaysia. When mosquitoes enter the home, 21.2% of respondents (106/500) use an aerosol spray. To further protect themselves from mosquitoes, 11% (55/500) of respondents also used an anti-mosquito lotion.

6. What actions would you take if you discovered a large number of flying mosquitoes inside your home

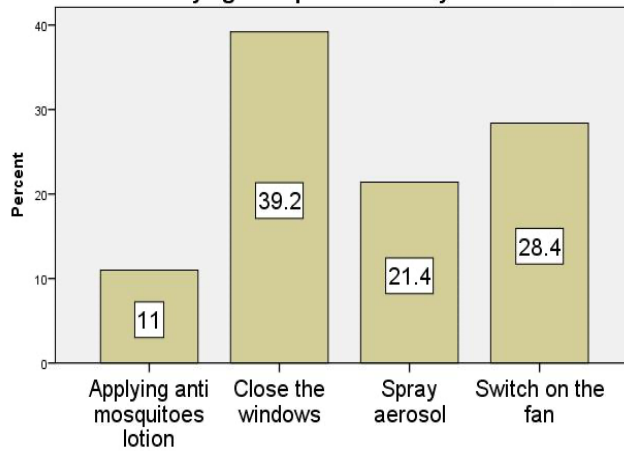


Table 7. Current available insect repellent that considered to be the most effective

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Aerosol spray	75	15.0	15.0	15.0
	Fogging activity	208	41.6	41.6	56.6
	Mat corded	83	16.6	16.6	73.2
	Mosquito coil	134	26.8	26.8	100.0
	Total	500	100.0	100.0	

According to the data in the table above, while the fogging machine is very effective at killing Aedes mosquitoes and stopping dengue outbreaks, 41.6% of respondents (208/500) would use as a mosquito barrier solution. About 15% (75/500) of respondents use aerosol spray, and about 25% (134/500) use mosquito coil smoke, both as barrier products for mosquito prevention. Because the smoke released by the coil is harmful to mosquitoes, it can swiftly and effectively kill them (Lasluisa, Barrios, & Vasilieva, 2019).

7. Insect repellent is considered to be the most effective

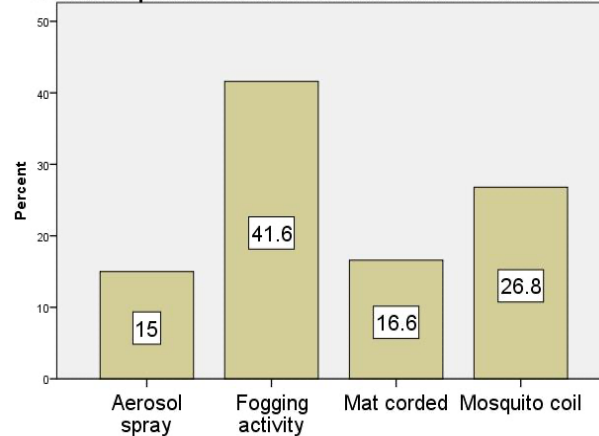


Table 8. Most effective strategy to protect from Aedes mosquito

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Aerosol spray	64	12.8	12.8	12.8
Electric mosquitoes killer	85	17.0	17.0	29.8
Fogging activity	213	42.6	42.6	72.4
Mosquito sleeping net	138	27.6	27.6	100.0
Total	500	100.0	100.0	

The greatest strategy to efficiently battle Aedes mosquitoes is shown in Table 8. 42% (213/500) of participants indicated that fogging action is the best solution. This implies the health department of the Malaysian government is in charge of the fogging operation. An individual using a fogging machine is prohibited from doing so without having a special license and addressing safety concerns (Selvakumaran & Paneerselvam, 2020). The traditional mosquito sleeping net also plays a significant role in modern cities. Over a quarter of respondents, 27.6% (138/500), say they prefer to sleep under a net to protect themselves from Aedes mosquitoes. Because it's just a net and completely non-toxic, you don't need to employ any kind of chemical repellent or other potentially dangerous substance to make it reliable (Hamid et al., 2020)

8. What is the most effective strategy to protect yourself from being bitten by an Aedes mosquito

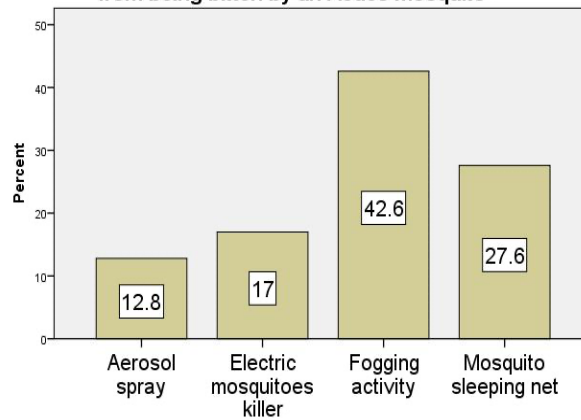


Table 9. Significant design criteria functions to be used in a portable fogging machine

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid All above	203	40.6	40.6	40.6
Button / Switch	43	8.6	8.6	49.2
Colour	74	14.8	14.8	64.0
Size	59	11.8	11.8	75.8
Weight of machine	121	24.2	24.2	100.0
Total	500	100.0	100.0	

Table 9 shows that the majority of respondents would like the fogging machine to use the criteria design elements. All of the majority choice criteria, such as the button, colour, size, and weight of the machine, is a major needed to product as measure in questionnaire to prevent aedes mosquitoes. Throughout, the researcher defines the result of the design criteria meets integrated functions control method for combat aedes mosquitoes breeding aspect. Most responders (202/500), 40.6% prefers the criteria chosen for consideration in the portable fogging machine engineering control approach for preventing Aedes mosquitoes.

9. What are the most significant design criteria to be used in a portable fogging machine, and what elements make up those criteria

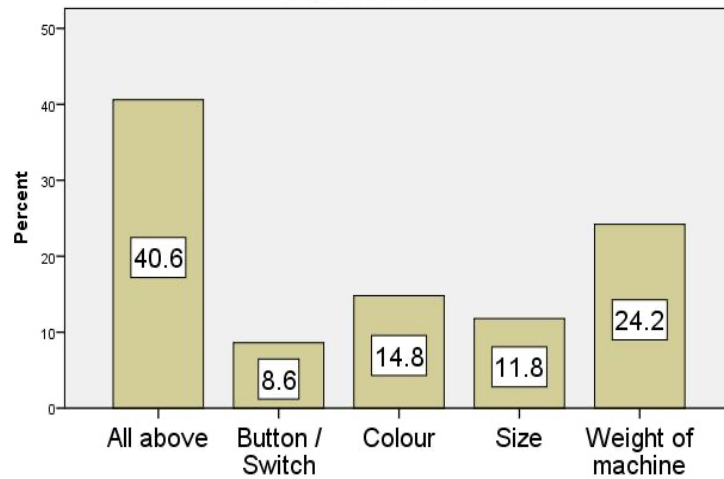
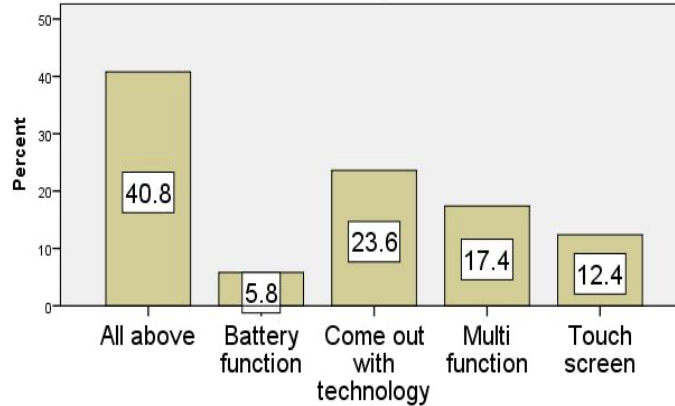


Table 10. Aspect of a fogging machine will be most beneficial in the years to come

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid All above	204	40.8	40.8	40.8
Battery function	29	5.8	5.8	46.6
Come out with technology	118	23.6	23.6	70.2
Multi function	87	17.4	17.4	87.6
Touch screen	62	12.4	12.4	100.0
Total	500	100.0	100.0	

According to the data in Table 10, 40.8% of (204/500) respondents preferred all of the questionnaire’s feature options. The majority of respondents chose “all of the above” from the questionnaire. The results show that people desire battery-powered devices with multiple features and touch screens. Respondents also value compact, portable features design. Out of a total of 500 responders, have sampled 204 respondents to demonstrate the full range of areas where the design of a portable fogging machine might be better.

10. In your view, which aspect of a fogging machine will be most beneficial in the years to come



4. RESULTS

The data generated and listed in order to achieve the aims of this study. The results of this study show that combating Aedes mosquitoes play an important role in preventing the spread of the dengue virus. Most people in Selangor gave sensible and straightforward advice for warding off Aedes mosquitoes. The responders provided an excellent recommendation for the fogging machine, which adds a major technique for prevention (Manaf, Mahmud, Ntr, & Saad, 2021). The researcher conducted these surveys and in-person interviews to compile this data, and the results made sense to a wide range of respondents, leading to the development of an effective fogging device for reducing the spawning of Aedes mosquitoes in residential areas. But there are currently other sectors of the industry that are not associated with Aedes mosquito prevention and fogging technologies. The existing fogging equipment does not match user criteria because of its proportions and functionalities, which are tailored more toward heavy usage than simple designs and conveniences. More importantly, the researcher intended to gauge the urgency of dengue prevention measures based on the survey results. Aedes mosquitoes are able to spread dengue fever. Study authors focused on a portable fogging machine's engineering control and design as a potential to curb Aedes mosquito populations in the case of a dengue outbreak.

5. DISCUSSION

There is a severe form of dengue called dengue haemorrhagic fever, as well as dengue shock syndrome. When bitten by an Aedes mosquito, both types will react within 3-7 days. Human actions, such as factor breeding sites for Aedes mosquitoes by leaving containers of stagnant water, are typically to blame. A severe case of dengue is dangerous because the virus that causes it can be passed from person to another person. High fever, severe abdominal discomfort, frequent vomiting, and rapid breathing are all obvious signs of dengue fever, which can be diagnosed 14 days after an Aedes mosquito infects a human (Zaki et al., 2017). Aedes aegypti is the scientific name for the Aedes mosquito. The Aedes mosquito has a slanted, sideways head. Mosquitoes are present, signalling the need for a biting regulation system. The virus is spread from person to

person via the bite of an infected mosquito. Injecting the virus into a person's veins would initiate its interaction with the human body.

This indicates that the greatest number of Aedes mosquitoes in the world are currently reproducing (Singh et al., 2018). Effective techniques for preventing and controlling dengue epidemics need to be developed. Consequently, since the fogging machine is so useful, it's crucial to conduct an evaluation on efficiency however its comfort, convenience of use, and other user-centered concerns take precedence in scientific investigation. A fogging effort is mandated by law in Malaysia if there are cases of dengue (Zaki et al., 2017) while scientists have been striving to figure out how to prevent a dengue epidemic through proactive measures taken at an early stage. The respondent's choice and the respondent's need combine to form the answer. Those in the predicament have a better understanding of the resources they can use to an outbreak of dengue fever.

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