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Public's Attitudes towards Autocidal Trap in Malaysia

Noor Sharizad Rusly [a], **Ahmad Firdhaus Arham** [b], **Latifah Amin** [c]

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Corresponding Author [a]

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Abstract

As dengue incidence rises yearly, there are several reports on the poor effectiveness of conventional vector management techniques. One of the major illnesses that endanger public health and occasionally result in death is dengue. Due to the lack of a specific treatment for dengue, the autocidal trap was selected as an alternate strategy for dengue prevention in the survey. This essay's goal is to evaluate and contrast Malaysians' attitudes toward the autocidal trap as a dengue-prevention strategy across educational levels and age groups. In Malaysia's Klang Valley, a poll of 415 adult respondents was conducted. The study's findings suggested that Malaysians had positive opinions toward autocidal traps. The Malaysians expressed moderate levels of perceived risks when it came to negative effects and harm to the health and ecosystem, despite their high levels of perceived benefits and behavior intentions. This suggests that Malaysians tend to be decisive when expressing their opinion toward an unusual technique like an autocidal trap. A substantial variation in attitudes regarding autocidal traps was revealed by one-way MANOVA across stakeholder groups, educational attainment levels, and age groups. Following the MANOVA, a few univariate analyses as well as post hoc analysis reveal there are significant differences in attitude between stakeholders and educational levels, although there were none across ages. The research's findings help scientists and the government monitor public opinion of autocidal traps so they can employ this method as a fresh strategy for eradicating dengue.

Contents

[a] Pusat Pengajian Citra Universiti, 43600 Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
[b] Pusat Pengajian Citra Universiti, 43600 Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia
[c] Institut Islam Hadhari, 43600 Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia

1 Introduction

According to WHO (2006), dengue is a vector-borne illness with the fastest global spread among humans [NRC 2001]. Over 100 million cases are reported each year, putting 3.6 billion people in 124 countries, or about 55% of the world's population, at risk (Beatty et al., 2007), especially in tropical and subtropical countries (which are more prone to the illness) (Mia et al., 2013), and it also affects the geographic distribution of the illness (Mudin, 2015). Even though these vector control initiatives have had some success, they can only provide control in the short term because locations that have used similar tactics in the past were quickly reinfested. To promote community participation in resolving this issue, a paradigm change in favour of bottom-up strategies has taken place (Hermann et al., 2015).

In 1962, Penang reported the first dengue fever outbreak in Malaysia, which resulted in 41 patients and 5 fatalities. Following that, a string of outbreaks with 1,487 cases and 54 fatalities in 1973, 2,200 cases and 104 fatalities in 1974, and 3,006 cases and 35 fatalities in 1982 were documented. The epidemic then started in 2000 with a continuously increasing incidence rate (IR), and the most cases ever reported were in 2014 (Mudin, 2015), with the majority of cases occurring in Klang Valley (56%) followed by Selangor (49%) and the Federal Territory of Kuala Lumpur-Putrajaya (7%). Between 2000 and 2014, there were 7,103 to 108,698 dengue cases reported annually, with an incidence rate of 31.6 to 361.1 cases per 100,000 people. The condition is now one of Malaysia's top public health threats (Er et al., 2010).

According to several studies, some factors, including urbanization growth (Mudin 2015; Gyawali et al., 2016; Farrar et al., 2007; Subramanian et al., 2020), insufficient or nonexistent drainage facilities (Roslan et al., 2013; Pang & Loh, 2016), as well as the disorganized placement of homes, contribute to rising mosquito populations and affect the intensity of dengue transmission. Therefore, a WHO Asia-Pacific Dengue Strategic Plan (2008-2015) is being created to stop the growth of dengue in Southeast Asia by improving capacity for disease prevention across national boundaries. However, to eliminate mosquito breeding places, manage the environment, and kill adult and immature mosquitoes, an integrated vector management method must be proposed (Packierisamy et al., 2015).

Accordingly, the Ministry of Health (MOH) has begun the project as part of the country's national dengue vector control programme by soliciting assistance from all tiers of government, from the federal to the state and district level agencies, removing breeding places from homes and communities, as well as encouraging people and community leaders to do so, then incorporating other preventative measures (Martin et al., 2019). Based on the data evaluation on the effectiveness of all vector control strategies, Erlanger et al. (2008), concluded that integrated vector control was the most effective methodology in comparison to environmental management, which had little impact. The embryonic aquatic stages (larvae and pupae) of aquatic insects or adult mosquitoes can both be targeted by different dengue prevention strategies. Ong (2016), claims that larvicides like temephos (Abate) (Cheong, 1978; Lee et al., 1984; Lee & Lime, 1989), environment management, source reduction, and house inspection are currently used in Malaysia to control larvae, while fogging is used to kill adult mosquitoes.

The larval and adult stages of the Aedes mosquito are targeted by vector control techniques, according to Talbot et al. (2021). As a result, measures are made to manage larval populations, such as source reduction techniques, the use of Abate larvicide, regular home inspections, and the enforcement of the Destruction of Disease Bearing Insects Act of 1975. Ineffective larvicides like temephos have been linked to increased cancer risks (Davey, 2016), insecticide resistance in mosquitoes, and problems with disease control in Malaysia (Chen et al., 2013; Marcombe et al., 2012; Bisset et al., 2011). Previous studies have also raised questions about temephos' effectiveness as a larvicide.

However, most families did not use the larvicides consistently or in the proper dosage, which resulted in their ineffectiveness. In the meanwhile, the larviciding utilised is primarily dependent on the community itself.

Additionally, the technical issues with the fogger (such as droplet size), treatment timing, circumference factors (such as wind direction), and insecticide effectiveness/resistance may all contribute to the limitations of chemical control approaches using fogging (Chan et al., 2011; Esu et al., 2010; Shafie et al., 2012; Koenraadt et al., 2007; Thammapalo et al., 2012).

The attractiveness of autocidal traps, albeit only a few attempts have demonstrated their attractiveness and efficacy for Ae. aegypti, is typically regarded as uncommon in Malaysia's mosquito control programme (Nazni et al., 2009; Ong & Zairi, 2015). It is a mechanical vector control with a dual purpose, and a modified version of the conventional ovitrap worked to capture both the gravid mother mosquitoes and the larvae. In addition, it is more advantageous than other pesticides and larvicides in that it is affordable, environmentally friendly, user-friendly, long-lasting, and requires little upkeep. Ovtrap devices have been tested as techniques for reducing Ae. aegypti populations, according to research by (Regis et al., 2008; Perich et al., 2003; Rapley et al., 2009).

This paper's objectives are to evaluate and contrast the public's perceptions of autocidal traps in Klang Valley across age groups and educational levels. Although autocidal trapping is a very uncommon practice in Malaysia, it could be a crucial component of an integrated control vector together with other methods (Kim et al., 2009). This study aims to assess the current level of knowledge and attitudes regarding the approach of new alternative techniques for autocidal traps in combating Aedes, as well as the findings that could be used in reducing dengue outbreak in Malaysia. Autocidal traps are widely used as surveillance tools to indicate dengue populations (Suwanbamrung et al., 2010).

2 Materials and Methods

Survey data collection

In the Malaysian Klang Valley region, a poll of 415 adults (those over the age of 18) yielded the research findings. The respondents were divided into two groups based on the stakeholder groups: scientists and the general public who had an interest in dengue prevention in Malaysia. The scientists were selected using a stratified purposive sampling technique, while the general public was randomly selected based on the hotspot dengue information retrieved from the i-dengue website. Given the quantitative nature of this investigation, the minimal sample size needed for each statistical analysis was taken into account. One-way Multivariate Analysis of Variance (MANOVA) was used to compare attitudes among faiths (four groups), education levels (three groups), and both. For a power of 0.80 and a medium effect size (f=0.25 at p=0.05, u=2) for the education level group, a sample of 52 participants is needed, while for the religion category (f=0.25 at p=0.05, u=3), a sample of 44 respondents is needed (Cohen, 1969) (Table 1). A team of skilled enumerators distributed a series of questionnaires to the respondents during the data collection process. Before the questionnaire, the respondents received a brief introduction to contemporary biotechnology and its applications, including the objective of the autocidal trap. Additionally, respondents were allowed to ask a few questions to get a better understanding of the study and the advantages and disadvantages of the autocidal trap technique.

Table 1
Background of the surveyed respondents

Background	Frequency	Percentage	Background	Frequency	Percentage
Stakeholder's group			Age		
Scientists	212	51.1	18-28 yrs old	188	45.7
Public	203	48.9	29-39 yrs old	138	33.6
			≥40 yrs old	85	20.7
Gender			Race		
Male	208	50.1	Malay	179	43.1
Female	207	49.9	Chinese	110	26.5

Background	Frequency	Percentage	Background	Frequency	Percentage
			Indian	93	22.4
			Others	33	8.0
Religion			Education level		
Muslim	191	46.0	Secondary school	34	8.2
Buddhist	92	22.2	Diploma/pre-university	67	16.1
Hindus	66	15.9			
Christian	63	15.2	University	314	74.6
Others	3	0.7			

Instrument

Based on past research (Amin et al., 2011, 2013), a multi-dimensional instrument measuring attitudes towards autocidal traps was developed for this study. Perceived benefits and perceived risks, along with one additional dimension of behavioural intentions (Ajzen & Fishbein, 1975), comprised the three dimensions of attitude towards autocidal traps included in the instrument (Gaskell et al., 2000; Gaskell et al., 2003). These three dimensions were drawn from the Eurobarometer surveys. The items in Table 2 were scored using a 7-point Likert scale, with 1 being the lowest level of agreement and 7 being the most.

Table 2
Measurement scales and reliability

Factor	Item	Standardized factor loading	Corrected item-total correlation	α
Perceived benefits	Useful in preventing the outbreak of dengue fever	0.806	0.83	0.87
	Effective to eradicate dengue	0.811	0.83	
	Beneficial to me and my family's health.	0.804	0.85	
	The benefits outweigh the risks	0.709	0.85	
	This will be dealt with in future research	0.724	0.87	
Perceived risks	Pose harm to the ecosystem and environment	0.853	0.79	0.89
	Indirectly reducing the earth's biodiversity	0.850	0.79	
	Harm other organisms in ways that we do not know	0.870	0.85	
Behavior intentions	Willing to support if there are no better alternatives	0.802	0.86	0.86
	Willing to support if they have the potential to combat dengue effectively	0.748	0.83	
	Willing to support if they have been proven effective in combating dengue in other areas	0.794	0.80	
	Willing to support it if the government can ensure its effectiveness.	0.755	0.80	

Data Analysis

The consistency and unidimensionality of the dimensions were calculated using reliability (Cronbach's alpha) tests and one-way MANOVA in SPSS version 23.0. Additionally, discrete statistics were produced using the mean scores and standard deviation of each factor.

Validity

The factor loadings provided an estimation of the validity measure. According to Hair et al. (1992, 2010), the standardised loadings of all measures were larger than 0.5, indicating satisfactory validity (Table 2).

Reliability

In this study, internal consistency (Cronbach's alpha) and corrected item-total correlation reliability were also assessed. All of the dimensions' Cronbach's alpha coefficients were deemed satisfactory (above 0.60) (Table 2). Correlation coefficients larger than 0.4 were used to judge the quality of the corrected item-total correlations for all items in each dimension (Table 2).

3 Results and Discussions

Perceived benefits, perceived risks, and behaviour intentions were used to examine attitudes towards autocidal traps. To prevent Type I errors after MANOVA, the univariate ANOVA with Bonferroni correction (=0.0167) was used (Tabachnick & Fidell, 2007).

Perceived benefits

The Malaysian population's opinion of the advantages of autocidal traps was generally positive, with a mean score above the median of 4.0 (mean score of 5.41) (Table 7). The public and science both saw significant advantages in the autocidal trap approach. When compared to respondents with other education levels, respondents with a tertiary education level showed the highest level of perceived benefits towards autocidal traps (mean score of 5.89); however, respondents with a diploma or pre-university education ranked the lowest (still having a high mean score of 5.36) (Table 6). In contrast, respondents between the ages of 18 and 28 gave autocidal traps the lowest ratings (mean score of 5.31) while respondents over 40 gave them the highest perceptions of benefits (mean score of 5.76) (Table 7). To compare the opinions of the stakeholders towards autocidal traps and to investigate the impact of age and educational attainment on those attitudes, a one-way MANOVA was used. The variance-covariance matrices were found to be not homogenous as Box's M = 46.92, F = 7.76, p < .001 (for the stakeholders' groups), Box's M = 25.74, F = 2.61, p < .001 (for education levels) and Box's M = 71.37, F = 5.58, p < .001 (for age) (Table 3); hence, Pillai's trace was developed as recommended by previous researchers (Coakes & Bradburn, 2005; Pallant, 2011; Tabachnick & Fidell, 2007).

One-way MANOVA (Pillai's Trace = 0.02, F = 3.420, p 0.05) of attitudes towards autocidal traps among stakeholder groups has revealed significant variations (Table 4). The large difference in attitude between scientists and the general population was underscored by a post hoc study of the advantages of autocidal traps (Table 5). A series of Post hoc analyses of the positive aspects of the autocidal trap also highlighted the significant difference in both education level and age affect the perceived benefits of the autocidal trap (Tables 6 & 7). One-way MANOVA also detected significant differences in attitude towards autocidal trap across education levels and age (Education level, Pillai's Trace = 0.06, F = 4.09; Age, Pillai's Trace = 0.11, F = 8.24; p 0.05).

Table 3
Box's M Test to determine the homogeneity of variance-covariance within the attitude variable across stakeholders, education level and age

Category	Box's M	F	DF 1	DF 2	Sig.
Stakeholders	46.92	7.76	6	1229558.14	0.00
Education level	25.74	2.09	12	42006.99	0.01
Age	71.37	5.58	12	368250.73	0.00

Table 4
One-way MANOVA to determine attitude towards autocidal trap across stakeholders, education level and age

Category	Box's M	F	DF 1	DF 2	Sig.
Stakeholders	0.02	3.420	3	411	**0.017***
Education level	0.06	4.09	6	822	**0.000***
Age	0.11	8.24	6	814	**0.000***

*p<0.05

Table 5
Mean scores, standard deviation and post hoc test results for perceived benefits, perceived risk and behavioural intentions of autocidal trap across stakeholder group

Stakeholders	Mean score + Std dev*. and interpretation **					
	Perceived benefits		Perceived risks		Behavioural intentions	
1) Scientists	5.41 ± 1.13	High	3.72 ± 1.71	Moderate	5.85 ± 1.08	High
2) Public	5.37 ± 0.93	High	3.64 ± 1.36	Moderate	5.68 ± 0.99	High
Overall	5.41 ± 1.12	High	3.86 ± 1.56	Moderate	5.77±1.04	High

∗ Post hoc test results showing significant differences of at least p < 0.05, ** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

Table 6
Mean scores, standard deviation and post hoc test results for perceived benefits of autocidal trap across education level

Education level	Mean score + Std dev*. and interpretation **	
	Perceived benefits	
1. Secondary school	5.48 ± 1.05	High
2. Diploma/pre-university***	5.00 ± 1.21	High
3. University***	5.49 ± 1.10	High

∗ Post hoc test results showing significant differences of at least p < 0.05, ** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

Table 7
Mean scores, standard deviation and post hoc test results for perceived benefits of autocidal trap across age

Age	Mean score + Std dev*. and interpretation **	
	Perceived benefits	
1. 18-28 years old**	5.31 ± 1.04	High
2. 29-39 years old	5.35 ± 1.16	High
3. > 40 years old**	5.76 ± 1.20	High

∗ Post hoc test results showing significant differences of at least p < 0.05, ** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

Perceived Risks

The Malaysian population's impression of the risk of falling victim to an autocidal trap was rated as moderate (mean score of 3.86) even though it fell below the midpoint of 4.0 (Table 5). In this study, it was discovered that the general people (mean score: 3.64) had the lowest sense of the risk associated with autocidal than scientists (Table 5). Their differing opinions on the likelihood of an autocidal trap were further supported by post hoc analysis (Table 5). Compared to the other two education levels (mean scores of 3.80 and 3.45), respondents who attended university thought that autocidal traps posed the greatest risk (mean score of 3.91; Table 8). Further univariate analysis revealed a significant difference in the perceived risks of autocidal trap for respondents in the age range above 40 years old (mean score of 3.99), compared to respondents with an age range between 18 and 28 years old (mean score of 3.47) (Table 9). Univariate analysis also revealed a significant difference in the perceived risks of autocidal trap for respondents in the age range between 18 and 28 years old (mean score of 3.47) (Table 9).

Table 8
Mean scores, standard deviation and post hoc test results for perceived risks of autocidal trap across education level

Education level	Mean score + Std dev*. and interpretation **	
	Perceived risks	
1. Secondary school	3.45 ± 1.14	Moderate
2. Diploma/pre-university***	3.80 ± 1.55	Moderate
3. University***	3.91 ± 1.60	Moderate

∗ Post hoc test results showing significant differences of at least p < 0.05, ** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

Table 9
Mean scores, standard deviation and post hoc test results for perceived risks of autocidal trap across age

Age	Mean score + Std dev*. and interpretation **	
	Perceived risks	
1. 18-28 years old**	**3.47 ± 1.25**	Moderate
2. 29-39 years old	3.94 ± 1.62	Moderate
3. > 40 years old**	3.99 ± 1.79	Moderate

∗ Post hoc test results showing significant differences of at least p < 0.05, ** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

Behavioural intentions

The scientists were the most encouraging group, with a mean score of 5.85. The total mean score for behavioural intentions of the autocidal trap by the Malaysians was shown to be high (overall mean score of 5.77) (Table 5). By post hoc examination, there is no discernible difference between the intentions that scientists have towards autocidal traps. On the other hand, respondents with a tertiary education were discovered to have the strongest intentions towards an autocidal trap (mean score of 5.89; Table 10). According to post hoc analysis, respondents with tertiary education intentions in preventing dengue by using autocidal traps differed significantly from those with a diploma or pre-university (Table 10), and respondents over 40 also had the highest intentions (mean score of 6.07, Table 10). However, univariate analysis was unable to identify any significant differences in the purposeful behaviour of autocidal traps between ages (Table 11), despite the different interpretations for the mean scores of all groups.

Table 10
Mean scores, standard deviation and post hoc test results for behavioural intentions of autocidal trap across education level

Education level	Mean score + Std dev*. and interpretation **	
	Behavioural intentions	
1. Secondary school	5.54 ± 0.90	High
2. Diploma/pre-university**	5.32 ± 1.17	High
3. University**	5.89 ± 1.00	High

∗ Post hoc test results showing significant differences of at least p < 0.05, ** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

Table 11
Mean scores and standard deviation results for intentional behaviour of autocidal trap across age

Age	Mean score + Std dev*. and interpretation **	
	Behavioural intentions	
1. 18-28 years old	**5.75 ± 0.89**	High
2. 29-39 years old	5.63 ± 1.20	High
3. > 40 years old	6.07 ± 1.04	High

** 1.00- 2.99, Low; 3.00-5.00, Moderate; 5.01-7.00, High.

According to this study, rather than the demographic factors of age and education level, autocidal trap approval by Malaysians varied according to complicated interactions between the attitude characteristics. This study employed descriptive and inferential analysis to determine the causes of each element and to compare the results with earlier research (Suwanbamrung et al., 2021). In this study, the overall mean score for perceived benefits (5.41) and behavioural intentions (5.77) are higher than the overall mean score for perceived hazards (3.86), which is constant across all tested groups of age and educational attainment. It demonstrated that Malaysians in the Klang Valley considered autocidal traps as being significantly more reliable because they perceived them to be less dangerous. This suggests that there is an opposite relationship between the perceived benefits and perceived risks of biotechnology products (Amin et al., 2011, 2015; Gaskell et al., 2000; Pardo et al., 2002) and dengue prevention techniques (Chandren et al., 2015; Toledo et al., 2008; Rakhmani et al., 2018; Suwanbamrung et al., 2021).

The Malaysians in the Klang Valley of various ages also believed that autocidal traps would face less resistance; as a result, they would be well-accepted (mean score of 6.07) by those over the age of 40 to prevent dengue with high benefits (mean score of 5.76) (Table 11). Previous research (Chan et al, 1973; Regis et al., 2008; Vartak et al., 1995; Maciel-de Freitas et al., 2008) shows that the public would embrace an autocidal trap if they believed it would have no negative impact. While Amin et al. (2011, 2008), claimed that this required a balanced relationship of the attitudinal components, the application raised the public's intent to practise in controlling dengue when the autocidal trap was viewed as advantageous and less dangerous. Additionally, some earlier studies on behaviour intentions connected to health-seeking provide additional support for this deduction. For instance, the perceived threats, advantages, and barriers of the suggested behaviour are all closely related to the likelihood of achieving particular health behaviours (Elsinga et al., 2015; Montano et al., 2015; Ajzen, 2002).

Even though the complicated relationship between perceived advantages, perceived risks, and behaviour intentions has been amply supported, the Malaysian public occasionally exhibits scepticism when asked what they think of the unusual practice of using autocidal traps as an alternate method of preventing dengue. When stakeholders were compared, it was found that scientists were the most enthusiastic and favourable about autocidal traps, and they viewed their deployment as a good thing. They demonstrated the largest hazards associated with the autocidal trap relative to the general public, as well as a highly significant difference in opinion on the advantages of the device (Table 5). The fact that scientists are directly involved in the creation, regulation, and use of methods for preventing dengue as well as the evaluation and assessment of trials to

gauge the state of research in the nation, should not come as a surprise. The outcome is consistent with the earlier finding of Aerni & Rieder (2000), which implies that scientists view the deployment of modern biotechnology more favourably than government organisations. According to Gaskell et al. (2010), persons with a good foundation in science will be more supportive of science and technology and are more likely to voice a favourable opinion on its application.

In contrast to secondary school and diploma/pre-university students, who also had a high impression of the autocidal trap's advantages, university students also saw it as a useful strategy. This might be because those who were majoring in the sciences, such as biology, biotechnology, or bioscience, were still in school. As a result, they were actively looking for information about new technology and exposure to current issues in universities, which are active hubs for education and various campaigns. Additionally, it may have influenced how positively they viewed the application. Age and educational level are demographic factors that appear to have a relative relationship that affects dengue prevention practices, according to research by Naing et al. (2011). Vazquez-Prokopec et al. (2010) and Naing et al. (2011), also noted that good knowledge inevitably results in good practice, despite research by Hairi et al. (2003), finding that older age groups have a relative advantage in dengue prevention practices.

Finally, eradicating the dengue vector, Aedes mosquitoes, is the only way to stop or slow down the spread of the dengue virus. This study also demonstrated the remote possibility that age and education level may affect the general public's perception of autocidal traps. Following a multivariate analysis of variance (MANOVA), extensive univariate analysis revealed that there are considerable changes in perceived dangers, advantages, and behaviours towards the autocidal trap across education levels and age.

4 Conclusion

The results demonstrated that the public has very favorable sentiments regarding autocidal traps. The intentions to use the autocidal trap as an alternate approach to treat dengue are increasing due to the high perceived benefits and lower risks; this shows that they also tend to be critical when discussing unconventional strategies like the autocidal trap. The gap between knowledge and practice will undoubtedly remain a significant obstacle to controlling dengue, hence Malaysia should implement the WHO's (2006) strict recommendations for dengue prevention and control at all levels of stakeholders.

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Biography of Authors

Noor Sharizad Rusly, **PhD**
Senior Lecturer at the Pusat Pengajian Citra Universiti, UKM has obtained a degree of Bachelor of Biomedical Science (Environment) from International Islamic University Malaysia (IIUM) and a Masters of Environment and Development from the Institute of Environment and Development, Universiti Kebangsaan Malaysia (LESTARI). Possess a Doctor of Philosophy degree (Environment and Development) at LESTARI, UKM. Have interest and inclination in research fields related to the environment and health as well as social sciences.
Email: n.sharizadrusly@ukm.edu.my

Ahmad Firdhaus Arham, PhD
has obtained a Bachelor of Applied Science with Islamic Studies (Genetics and Molecular Biology) and a Masters (Biotechnology) from the University of Malaya. Now he has a Doctor of Philosophy qualification at the Institute of Environment and Development (LESTARI), Universiti Kebangsaan Malaysia.
Email: benferdaoz@ukm.edu.my

Latifah Amin, PhD
is a Principal Research Fellow at Institute of Islamic Civilization, UKM and a former Professor in the field of Biotechnology and Society at the Centre of Liberal Studies, UKM. Experienced as Head of Cross-disciplinary Research Group: Value, Society and STEM (Science, Technology, Engineering and Mathematics) and the Coordinator of Science, Technology and Sustainability at UKM. She was the Vice Chairman (Malaysia) of the Asian Bioethics Association, and she also served as an expert member of the National Bioethics Council from 2012 to 2015.
Email: nilam@ukm.edu.my