

ORIGINAL ARTICLE

Exposure Risk of Household Insecticide: Identification of the Knowledge, Attitude and Practice Levels among Kuantan Population, Pahang

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ABSTRACT

Introduction: Dengue is a mosquito-borne flu-like illness which massively caused Malaysian morbidity and mortality. The prevalent of cases influenced by high humidity climate and urbanization which enhances the mosquito breeding. Thus, the utilization of household insecticide became a necessity among the urban community especially in the Kuantan city, Pahang. The insecticide is made of type 1 pyrethroids chemicals that are recognized to be safe. However, there were reported insecticide intoxication cases that suggested insufficient studies on insecticide usage and its exposure effects. Hence, the study aimed to assess the community's knowledge, attitude and practice (KAP) level upon household insecticide and its associated factors among Kuantan's public. **Method:** A cross-sectional survey was conducted among 199 respondents via a self-administered questionnaire concerning sociodemographic and KAP's domain data was distributed and collected. **Results:** Most respondents had adequate KAP scores. Statistical analysis confirmed that marital status group ($p = 0.047$) affected knowledge singles and married person had higher knowledge score. There were significant association between females with levels of knowledge ($p = 0.003$) and attitude ($p = 0.024$). A strong positive correlation between knowledge and attitude ($r = + 0.800$, $p = 0.010$), between knowledge and practice ($r = + 0.760$, $p = 0.010$), and a good positive correlation between attitude and practice ($r = + 0.740$, $p = 0.010$). **Conclusion:** The finding of Kuantan public' KAP data can be used as a reference to formulate effective health promotion intervention to reduce the insecticide exposure risk among wider public community.

Keywords: Community health, Insecticide, Knowledge, Attitude and practice, KAP

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jump of cases in Pahang state for the year 2019 with 190.2 % case occurrences as compared to the previous year with a total of 2873 of cases with Kuantan district has the highest number of cases (3, 4).

INTRODUCTION

Dengue illness is considered as one the mosquito-borne diseases which massively caused human morbidity and mortality in Malaysia (1). The prevalence of cases in the country is influenced by high humidity climate and urbanization which enhances the breeding of the mosquito especially in urban residential areas in such Kuantan, Pahang (2). According to iDengue system which is an online platform system developed by the Malaysia Ministry of Health, there was a significant

The Ministry of Health Malaysia (MOH) acknowledge dengue fever as a major community health concern and take necessary steps by employing a vector control program as the gold standard to prevent the disease outbreak (5). The vector control program encourages the community to employ vector elimination practices at home such as the usage of household insecticide at home as a disease prevention method (6). With the growing fear of emergence and resurface of other vector borne diseases in Malaysia such as chikungunya, malaria and yellow fever which also can be transmitted

by the mosquito, the vector control method in the form of insecticide aerosol sprays is a necessity for the community of households in Malaysia (7, 8).

Most of the commercial household insecticide aerosol sprays is made of combination chemicals of pyrethroid group which is a synthetic form of pyrethrin. These chemicals are classified as type 1 pesticides which are recognized by World Health Organization (WHO) to be safe and have minimal toxic effects on humans (9). Although, the production of insecticide undergone strict law and safety regulation by the United States Environmental Protection Agency (EPA), there were documented medical cases of deliberate and incidental insecticide intoxication. Hence, it suggested insufficient studies on personnel's contributing factors which are the knowledge, attitude and practice of insecticide application towards the exposure along with its medical symptoms presentation that is alike in regards to other chemicals which attributed to possible misdiagnosis (10).

In general, these insecticides not only exhibit toxicity potency towards the target organism of the pest but to the non-target organism as well as the human due to its broad-spectrum toxic nature (11). Pyrethroid also poses a health hazard threat due to its short and long term exposure which attributed to health illnesses including cancer, endocrine, respiratory and other health-related diseases (12). It exerts toxic effects through generating multiple nerve action potential as well as interacting with enzyme and receptor which leads to tremors, hyperexcitability and cellular damage (13).

According to cases study by Cha and Kim (14), 39.9% of the patients admitted due to acute exposure of pyrethroid presented with respiratory problems while Bradberry and Cage (15) indicated symptoms of seizure, vomiting and abdominal pain due to the exposure. Studies also suggested that long term exposure of pyrethroid is associated with cancer, developmental, neuron and reproductive diseases (16).

These insecticide chemicals can be exposed to humans through three major exposure pathway which are inhalation, ingestion and dermal absorption as a result of insecticide household application (17). The use of carpet and home furniture may accumulate the deposited insecticide chemicals residuals which may intensify the exposure risk through accidental inhalation and indigestion of insecticide vapor (18). Domestic insecticide usage also permitted insecticide chemicals to be released in an aerosol form into the home environment air and fall to the floor as dust and exposed directly or indirectly to human especially child due to hand to mouth behaviour (19).

Despite the insecticide's toxic effects concern, the insecticide aerosol consumer product remains a primary

choice in domestic vector control efforts (17). Therefore, health promotion initiative by public health authority is crucial in terms of education and prevention of accidental insecticide exposure in the home environment.

Hence, due to the lacking of community's exposure risk studies, the knowledge, attitude and practice (KAP) on household insecticide of community information are massively crucial to provide baseline data to facilitate public health education efforts in ensuring a safer home environment and create awareness regarding the exposure among the community.

MATERIALS AND METHODS

Description of the study design, setting and participants

The study was considered as a cross-sectional study design using a population-based survey performed based on the simple random sampling method in the public areas of the Kuantan district in Pahang, Malaysia. It was carried out from 1st August 2019 to 2nd February 2020. The inclusion criterion is the public community in the study areas of Kuantan district in Pahang State. The respondents aged between 18 and 59 years old were universally selected, according to their availability and willingness to involve in the study. The sample size was calculated by using single proportion sample size with a specified level of precision by using the prevalence from previous study as reference, the investigator selected 95% confidence interval ($Z = 1.96$) with desired precision of 0.05 units for the sample size (20, 21). Based on the calculation, the study population was 199 in order to reject the null hypothesis with the power of 80% and 95% confidence interval.

The information regarding KAP towards household insecticide and socio-demographic data of respondents' age, gender and ethnicity were collected by using self-administered questionnaire. The questionnaire contains two sections which were section 1 concerning sociodemographic data and section 2 covered the knowledge, attitude and practice (KAP) on household insecticide information of the respondents and the instrument was adopted and adapted from previous studies (17, 22).

The KAP's domain contained 5 items each. The questionnaire's medium also was translated to local language of Bahasa Malaysia to made it relevant and acceptable for the study population. The questionnaire was also pre-tested on a sample who was non-target community but living within the same urban areas settings. The result of pre-test was reviewed to ensure appropriate vocabulary and no loss of translation.

Measures and analysis (22)

Several parameters were established in the study to determine the Kuantan population's knowledge, attitude and practice levels towards the household insecticide.

Each KAP's domain was described as followed.

Referring to Table II, the knowledge questionnaire indicated awareness of safe handling of insecticide aerosol spray, safe handling of insecticide aerosol spray, a good understanding of spray can's label, health effects to human and environment as well as the purpose of insecticide aerosol spray were considered to have "good knowledge" or "bad knowledge".

As for the attitude, the respondents whose claimed to that the insecticide is the only vector disease control method, the importance of safety upon insecticide usage, child and elderly not recommended to use insecticide aerosol spray, the negative effects of insecticide aerosol spray to the environment, non-target organism and the human were considered as "good attitude" or "bad attitude".

Respondents' who reported to close windows, doors, covering food and moving people and pets outdoor when use insecticide spray, shaking the spray can before usage and wait for 20 minutes before opening windows and doors upon entering back the room, making sure the room properly ventilated, applying insecticide directly over the insect to the extent possible and moving from interior to exterior part of furniture and home spaces to the exit door when applying the insecticide were considered as "safe practice" or "unsafe practice"

Each survey's question had two answer choices which are "yes" and "no" with a score of 1 and 0 respectively given based upon each individual question. Each "yes" answer indicates "good knowledge", "good attitude", "safe practice" and vice versa. The maximum total score was 5 and the minimum score was 0. The scores were classified into two levels which are "not adequate" (score less than 2.49) and "adequate" (score more than 2.50) for each of KAP's domain.

Ethical Considerations

The respondents were approached in the streets or public places and explained regarding the purpose the study with written and verbal consent were given as well as approved by International Islamic University Malaysia (IIUM) Research Ethical Communities in August 2018 (IREC 2018-232). Each respondent confidentially was ensured and allowed to exercise their right at any given time for a possibility to withdraw from the study for any reasons (22).

Statistical Analysis

The data were entered into IBM statistical package SPSS version 24 (Chicago, Illinois, USA) and analysed. The statistical descriptive analysis was initially performed to explore and describe the socio demographic and KAP data (2). The mean score of each component of KAP was compared and analysed using one-way ANOVA (Analysis of Variances), the association between gender variable and each domain of KAP was analysed using

Chi-square test and the relationship between KAP was explored using statistical Pearson' coefficient correlation and analysed based on coefficient cut off value from a previous study (23)

RESULTS

Socio-demographic data

A total of 199 respondents participated in the study. Most respondents were female (71.9%), aged between 31 – 41 years old (72%), has ethnicity of Malay (88.4%) and were married (63.8%). Other demographic data is demonstrated at the given Table I.

Table I : Demographic data of the respondents in Kuantan, February 2020

Demographic Data		Frequency n (%)
Gender	Male	56 (28.1)
	Female	143 (71.9)
Age	21 – 30 Years Old	61 (30.7)
	31 – 40 Years Old	72 (36.2)
	41 Years Old and above	66 (33.2)
Ethnicity	Malay	176 (88.4)
	Chinese	13 (6.5)
	Indian	7 (3.5)
Marital Status	Single	65 (32.7)
	Married	127 (63.8)
	Others	7 (3.5)

Knowledge on household insecticide

Regards to the table II, 79.9% claimed to have an awareness regarding safe handling of the insecticide product. While among the respondent, most of them (71.9%) were informed on safety precaution of handling insecticide aerosol spray. The majority of respondents (89.4%) also believed that they understood the instruction printed in the label of the product. Most respondents also are knowledgeable about the adverse effects of household insecticide aerosol spray to human and environment (93%) as well as the purpose of the usage (97%). As for the purpose applying of insecticide, 97% respondents acknowledged the use of insecticide to kill insect.

Table III demonstrates the result of ANOVA of various variables on knowledge score of the respondents. The result illustrated that there were statistically significant differences ($p < 0.050$) for the marital status groups. A Post hoc test which was performed indicated that there were higher statistical significance of knowledge mean scores reported between single and others group, married and others group pairs as compared to other remaining pairs which were found to be insignificant.

Table IV illustrates a significant association between gender and levels of knowledge. The result of the study

Table II: Knowledge, attitudes and practice on household insecticide among the respondents

Variables	Frequency n (%)	
	Yes	No
Knowlegde		
Do you have any awareness about safety handling of insecticide aerosol spray?	139 (79.9)	40 (20.1)
Do you know how to handle insecticide aerosol spraying safely?	143 (71.9)	56 (28.1)
Are you able to understand the instructions printed on the label?	178 (89.4)	21 (10.6)
Do you know that insecticides spray could have an adverse health impact on human beings and other living things?	185 (93)	14 (7)
Do you know what the purpose of insecticide spraying is?	193 (97)	6 (3)
Attitudes		
Do you think that the use of insecticide aerosol spray is the only option to control insect vector of diseases?	50 (25.1)	149 (74.9)
Do you believe that the safety precautions are important during insecticide aerosol spraying?	188 (94.5)	11 (5.5)
Is it advisable for kids and elderly to use insecticides aerosol spray?	11 (5.5)	188 (94.5)
Do you think that insecticides aerosol spray is harmful to the environment and non-target organisms?	178 (89.4)	21 (10.6)
Do you think insecticides spray are harmful to human beings?	184 (92.5)	15 (7.5)
Practice Variables		
Do you close the windows and doors, covering food, and moving people and pets outdoors when using insecticide aerosol spray?	157 (78.9)	42 (21.1)
Do you shake the spray can before applying the insecticide aerosol and then allowing 20 minutes before opening windows and doors and going back indoors?	116 (58.3)	83 (41.7)
Do you make sure the room is properly ventilated upon entering?	158 (79.4)	41 (20.6)
Do you apply the insecticide aerosol directly over the insects to the extent possible?	176 (88.4)	23 (11.6)
Do you apply the insecticide aerosol in corners and under or inside furniture, moving from the interior of the home to the exit door?	140 (70.4)	59 (29.6)

indicated that female respondents were found to have a better knowledge score than the male.

Attitudes towards household insecticide

The data shown in Table II describes the information regarding respondent’s attitude towards household insecticide. The majority of respondents (74.9%) claimed that insecticide aerosol spray is not the only option to control spreading of vector diseases. Most of the respondents (94.5%) mentioned the importance of safety precaution during application of the insecticide spray. More than half of the respondents also claimed that insecticide aerosol spray is not advisable for elderly

Table III: ANOVA of knowledge, attitudes and practice score for each variable

Knowledge Variables	Mean (SD)	DF	F Statistic	p Value
Age				
21 – 30 Years Old	3.15 (0.96)	2	2.16	0.120
31 – 40 Years Old	3.48 (0.89)			
41 Years Old and above	3.32 (0.88)			
Ethnicity				
Malay	3.33 (0.68)	2	1.34	0.880
Chinese	3.32 (1.03)			
Indian	3.18 (1.14)			
Marital Status				
Single	3.27 (0.92)	2	2.74	0.047*
Married	3.31 (0.91)			
Others	4.10 (0.78)			
Attitudes Variables				
Mean (SD)				
Age				
21 – 30 Years Old	3.07 (0.82)	2	2.47	0.090
31 – 40 Years Old	3.31 (0.76)			
41 Years Old and above	3.05 (0.77)			
Ethnicity				
Malay	3.18 (0.77)	2	2.33	0.100
Chinese	3.17 (0.80)			
Indian	2.63(0.99)			
Marital Status				
Single	3.11 (0.82)	2	2.14	0.120
Married	3.13 (0.77)			
Others	3.74 (0.62)			
Practice Variables				
Mean (SD)				
Age				
21 – 30 Years Old	2.92 (1.01)	2	0.80	0.450
31 – 40 Years Old	3.15 (1.13)			
41 Years Old and above	3.05 (0.99)			
Ethnicity				
Malay	3.07 (1.02)	2	2.43	0.090
Chinese	3.29 (0.87)			
Indian	2.38 (1.49)			
Marital Status				
Single	3.01 (0.99)	2	1.32	0.270
Married	3.03 (1.07)			
Others	3.67 (1.08)			

Significant ($p < 0.050$)
 *Post Hoc Analysis: The mean difference between pairs of Single and Others, Married and Others but no significant difference between other pairs

Table IV : Chi-square test between gender and knowledge, attitudes and practice score for each variable

Knowledge Variables	Not adequate n (%)	Adequate n (%)	X ² (df)	p Value
Gender				
Male	16 (28.6)	40 (71.4)	9.010 (1)	0.003*
Female	16 (11.2)	127 (88.8)		
Attitude Variables				
Not adequate n (%)				
Gender				
Male	19 (33.9)	37 (66.1)	5.128 (1)	0.024*
Female	27 (18.9)	116 (81.1)		
Practice Variables				
Not adequate n (%)				
Gender				
Male	19 (33.9)	37 (66.1)	0.528 (1)	0.487
Female	41 (28.7)	102 (71.3)		

Significant ($p < 0.050$)

and children. The data also shown that approximately (90%) of respondents belief that the insecticide aerosol spray is harmful to non-target organism, human as well as the environment.

Table III illustrates the result of comparisons of the effects of various variables on attitude score of the respondents. The result indicated that there was no statistical significance of the mean attitude score between socio-demographic data.

However, the gender group has a significant association ($p < 0.050$) with attitude levels (Table IV). The data noted that female respondents had a significantly higher attitude score than male towards insecticide usage

Practice on household insecticide

The finding of the present study regarding respondents' household insecticide practice and it's frequency is illustrated in Table II. 78.9% of respondents claimed to close the doors and windows, covering food and removing people and pets to the outdoors during the application of insecticide aerosol. Approximately more than half of respondents (58.3%) also suggested that they shake the spray can before applying it and wait for 20 minutes before opening the windows and doors and entering the particular place. The majority of the respondents (79.4%) also deemed to make sure the room is properly ventilated upon entering the room. Almost all of the respondents (88.4%) stated that they apply the insecticide directly over the insect to the extent possible. 70.4% of respondents also practice applying insecticide in manners of moving from the interior to exterior areas part of the furniture and from home space to the exit door.

The result of ANOVA and Chi-square between variables and practice levels are tabulated in Table III and Table IV. The findings illustrated that all variables have insignificant differences and association on the mean practice score of the respondents ($p > 0.050$).

Relationship between KAP's domain

The result (Table V) indicated a strong positive correlation ($r = + 0.800$, $p = 0.010$) between knowledge and attitudes, a good positive result ($r = + 0.740$, $p = 0.010$) between attitude and practice and a strong positive correlation between knowledge and practice ($r = + 0.760$, $p = 0.010$).

Table V : Correlation between knowledge, attitude and practice on household insecticide among the respondent

	<i>r</i>	<i>p</i> value*
Knowledge v.s. attitude	+ 0.800	0.010
Attitude v.s. practice	+ 0.740	0.010
Knowledge v.s. practice	+ 0.760	0.010

*Pearson correlation

DISCUSSION

Knowledge on household insecticide

The findings supported the outcome of the previous study whereby most of the respondents had an awareness and knowledge regarding the safe handling of insecticide (22). The result indicates that the public acknowledges the potential risk of exposure of insecticide aerosol spray and tend to adopt necessary steps to prevent the exposure. However, most of the public's knowledge regarding the matter was questionable since it is indicated that most of public were found had no formal training in theory and practical on handling the instrument (24). According to a study, most public in Malaysia may gain knowledge on the use of insecticide for dengue prevention purpose through media mass, friend and family which can be varied compared to information were given by health professional (25). The data also found to be higher than the previous study done in Uganda which approximately half of the respondents do not read the manufacturer's product label (26). The latter study suggested that most of the respondents were illiteracy and cannot understand the instruction which contributes to the habit of not reading the product's labels. The finding may suggest that most of the respondent from the current study had a better knowledge score from the previous study since respondents taken from urban areas (27). It is also a fact that urban areas population seems likely have better literacy due to their accessibility to government education facilities rather than rural areas population (28). The outcome was found to be similar to other studies whereby, most of the respondents (80% and 93%) acknowledge the harmful effects as well as the purpose of it as part of the vector control program (22, 29). A study indicated that respondents having the awareness of its harmful effects based on their experience of self-reporting medical symptoms such as breathing problem, itching and redness of skins during handling the insecticide indoor spray (24). The toxic effects of insecticide towards human and environment as well as the exposure risk associated with the handling of it were confirmed by studies (30). It can also be postulated that respondents in the current study may also attain the awareness due to feeling discomfort in breathing when applying insecticide spray in the household due to the exposure. It is suggested that most public acknowledged the purpose of domestic insecticide use as a vector disease control tools a part of other methods such as making sure the house clean and eliminating breeding ground of vector organism (17, 31)

The study was found to be inconsistency to previous studies in the country whereby gender factor was found not to be significantly contributed to respondent's knowledge scores (25, 32). However, there was a study indicated that female was likely had perceived better health belief and their motherly nature which can be good health predictor as they tend to seek health related knowledge to take care themselves (33). Hence, the

female respondents in the present study may attain knowledge regarding household insecticide aerosol spray in order to take care of themselves and family and prevent vector related disease. The present study also revealed that marital status had a statistically significant higher insecticide knowledge score. The outcome was correlated with previously conducted study in Malaysia which suggested that marital status influenced the knowledge scores on insecticide (34). The finding can be explained with the Health Belief Model which well regards health predictor model that emphasize the interaction between personal perceived health benefits and taking positive health action (31). It can be assumed that the respondents who were married may take consideration of their significant other as well as their family's health interest to an account and tend to obtain related insecticide knowledge.

Attitudes towards household insecticide

The data is consistent with the previous study which demonstrated that respondents refuse to believe in fogging practice as a sole vector disease control tool (34). However, it can be assumed that respondents' differed attitude towards these two vector prevention methods due to perception of respondents' role in the home prevention level which distinguishes from a fogging activity in the local community level which falls under the responsibility of a local public health authority. This can result in, the respondents felt they had fulfilled the role at a home level which leading them to feel some personal empowerment and entitlement to deserve credit in term of disease prevention efforts rather than acknowledge the role of local health authority (35). Eventually, the attitude of respondents can be influenced by their own personal perception. The finding deems to be similar to a study done in Nepal whereby, more than half of respondents believed in the safety precaution measure when handling the insecticide (22). Even though the latter study involved insecticide residual spray workers as the respondents, it can be noted that public person may have the good attitude due to their experience as they come across exposure associated mild symptoms such as headache during the handling the insecticide (32). The report was found to be correlated from the previous study which respondents not recommending untrained personnel to handle insecticide due to the risk of exposure pose (22). It is reported that behavioural and biological factor of certain group of the age of a person may pose a greater risk of household insecticide exposure especially young children and elderly. The behaviours such as hand to mouth as well as poor hand hygiene awareness among children make them susceptible to be accidentally exposed to household insecticide (36). Where else, biological factor such as dry skin or other disease-related such as Alzheimer poses a greater risk of exposure to the elderly (37). The data is relatively similar with the former study which majority believed that insecticide were harmful to human and considered to be toxic and dangerous (24). The safe attitude towards

the insecticide can be contributed by the awareness of the respondents itself. It is noted that, the awareness of the respondents is the integral part of developing good attitude towards insecticide (10). The awareness usually was correlated with the literacy level of the respondents since it allows them to require the necessary knowledge in relation to insecticide safe perception. According to study, a person in a particular community with sufficient literacy level enables him or her to understand the colour code and the label of insecticide product ensuring positive insecticide attitude (38). It can be assumed that the respondents from the study poses good level of educational background and literacy permitted them to have insecticide toxicity awareness.

The finding is consistent with another study which illustrated that the respondents' attitude towards a willingness to use household insecticide product was varied between gender (39). The result can be explained by the fact that educational background and experience can positively influence the gender's attitude towards insecticide (40). The variety in attitude between genders towards the use of household insecticide could be influenced by the experience and educational background. Although current study not explored the education level of respondents but a previous study in the similar setting provide data that the public in Kuantan had at least had received an education of secondary school level (25). In regards for the experience, it is been known that male and female may have no differ experience as it is shown in a study whereby, both gender complained the similar insecticide exposure associated symptoms such as eye redness (33) Hence, the awareness may influence their attitude towards the insecticide.

Practice on household insecticide

The result is supported by the previous study which stated that most respondents had the awareness regarding the risk of food contamination after insecticide disposal and preferred not to eat and drink after insecticide application as a safety precaution measure (41). In regards to the practice, a literature suggested that the insecticide aerosol spray substance called pyrethrin can be easily exposed to food and water which eventually can pose accidental poisoning risk to the family members in a particular household (42). The result was similar from a study done by Wang, Jin (43) which claimed that respondents were aware of the risk of insecticide exposure during inhalation and opted to use a mask during the application of insecticide. It also has been suggested that inhalation is a major pathway of insecticide exposure as it distributed into the environment during domestic use (36). With regards to the present study, it can be pointed out that most respondents from the current study had a good safe practice of household insecticide product and well verse with exposure risk involving domestic insecticide usage (17). The result is similar to a previous study which indicated that

the importance of the proper probing method upon application of insecticide to prevent direct exposure due to the reverse movement of airflow of the wind (43). According to a study, most respondents practicing the direct application of insecticide to the pest insect as it was flying on the walls. However, another method such as the aerial application was found to be more hazardous as it produce a higher amount of insecticide residual to the house floor compared to the direct application of the product (26). The data is supported by the previous study which claimed that respondents had practiced the correct way of insecticide application from the interior to exterior areas of the home (17). Insecticide application for the domestic purpose may cause deposition of insecticide into indoor dust which accumulates especially upon a narrow space in a room such as under and between furniture eventually lead to a greater concentration of insecticide in indoor areas (36). Subsequently, it contributed to the insecticide inhalation exposure threat (44). The application insecticide practice of the present study indicated that the respondents had a safe-protective behaviour which demonstrated that there was awareness regarding health risk associated with household insecticide application (45).

The data agrees with related study in a region which pointed out there was a statistically insignificant association between the socio-demographic factor and the respondents' practice levels (32). However, there was a study done in Malaysia that stated the role of the community itself and the public knowledge that facilities vector control practice which includes the use of domestic insecticide (27). Compared to the current study, these two variables was not been explored in the study.

There are many variables which can influence an individual belief of a safe practice behaviour. According to a health behavioural theory called the Health Belief Model (HBM), it describes the importance of a demographic data that shapes health behaviour of a person to employ a safer insecticide practice in their own house (31). With regards to the current study, the model framework itself is complex in nature and interchangeable which demanding further exploration of other variables to understand the factor associated with safe insecticide practice behaviour of a person (46).

Relationship between knowledge and attitude of household insecticide

The finding is correlated with a previous study was done in a region demonstrated a significant association between respondents' knowledge and attitude on insecticide product (32). The study also supported by Mazlan and How (47), which suggested the knowledge was significantly correlated with the attitude towards the safe handling of insecticide products.

With regards to the correlation between knowledge and

attitude of a person towards safe handling of insecticide, a study explained that the correlation's areas of these two variables based on the KAP's principle framework developed in his study represents the simple basic knowledge of the respondents such as the self-awareness regarding hazardous nature of insecticide which mediate into a logical thinking of a respondents to employ the safe approach of insecticide handling (47). It can be postulated that there was awareness regarding the effects of domestic insecticide usage in the current study which facilitates positive attitude towards safe handling of insecticide among the respondents.

Relationship between attitude and practice of household insecticide

The finding was found to be similar to another study which claimed there was an association between attitude and practice of respondents on safe insecticide handling (47). However, the study result was found to be contrasting to a regional neighbouring country which demonstrated that there was no association between the variables (32). Information regarding the insecticide received by the respondents was based from varied sources such as mass media, newspaper, public health authority or social media may shape the respondent's attitude on the safe handling practice of insecticide (25). The attitude and practice also suggested to be influenced by the information and experience passed from a relative, neighbouring and even community eventually lead to respondents to practising based on recommendation and fact from previous user (48). It can be concluded that the respondent's attitude and practice in the study were positively influenced by various sources variables which not prominently explored in the study ensuring in mediating a household insecticide exposure risk.

Relationship between knowledge and practice of household insecticide

The result was found to be supported by a previous study which pointed out that the knowledge was significantly associated with the practice regarding vector control program which involve insecticide usage (49). The findings also correlate with a similar study done by Manzoor, Afzal (50) that claimed the association between preventive practice and knowledge.

The knowledge of insecticide allowed the respondents to identify the exposure route such as ingestion, inhalation, and skins absorption prompt the respondents to engage safe behaviour practice as well as following the insecticide's manufacturer-recommended instruction upon daily domestic usage (47). The extent of a person's insecticide knowledge also may determine the willingness of a person to invest in employing safer handling practices such as wearing a mask or even other vector control methods (17). In conclusion, the public's knowledge regarding insecticide is a necessity in promoting safer domestic insecticide practice while navigating their daily home vector control routine.

CONCLUSION

The study established that Kuantan community had the adequate KAP towards household insecticide. The study can be suggested to be a reference for public health authorities in terms of health promotion efforts to formulate effective intervention to catch the risk insecticide exposure among wider public community especially the other urban areas in the country in terms of promoting the public to make a better decision and taking necessary step upon daily domestic insecticide usage to maintain their health wellbeing.

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