

# Students' Perceptions about Mosquito Larval Control in a Dengue-Endemic Philippine City

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## Abstract

A study was carried out among university students to find out their perceptions about mosquito larval control in a dengue-endemic Philippine city. This formative research was conducted to obtain information for formulating future school-related dengue control strategies. The study was carried out in-class through a semi-structured, open-ended question format. The study yielded information on students' perceptions about the most important measures for mosquito larval control and perceived reasons why people did not implement them. The study also explored the opinions of the students by gender. The study yielded students' knowledge on the types of mosquito larval habitats. Little was expressed about specific indoor mosquito larval control nor about the frequency of conducting source-reduction activities. Perceived barriers to constructing mosquito larval control centred on themes such as apathy, laziness and lack of time. Further studies are necessary to follow-up on these themes in depth.

**Keywords:** Dengue, formative research, mosquito larval control, students, open-ended questionnaire, Philippines.

## Introduction

The control of *Aedes aegypti* mosquito larvae is essential for the control of dengue fever (DF) and dengue haemorrhagic fever (DHF)<sup>[1]</sup>. The need to know the perceptions of key informants is necessary in order to better address the dengue-related control issues in a specific area or community<sup>[2-5]</sup>. Schools are potential mosquito breeding sites<sup>[6-8]</sup>. Also, primary, secondary and tertiary school-age students are principal targets of the *Aedes* mosquitoes<sup>[9-11]</sup>.

Dengue has become a steadily increasing health problem in the Philippines<sup>[9]</sup>.

Consequently, it has become endemic in Dumaguete city, Philippines<sup>[12]</sup>.

*Aedes* control is largely based on source reduction. Therefore, knowledge of the types of mosquito breeding sites is a prerequisite for health personnel, schoolteachers and children and the community at large for the control of dengue. Various types of containers have been identified as potential mosquito breeding sites. These include plastic and metal containers, animal-feeding dishes, tyres, flower vases, coconut shells and water storage drums<sup>[3,4,13,14]</sup>.

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The knowledge about the types of breeding containers alone is not enough to achieve mosquito control. Attitudes and beliefs impact a person's knowledge about mosquito control. For example, the belief that dengue is not a fatal or serious problem impairs a person from carrying out adequate mosquito control practices. Some people believe that mosquitoes within the home and outside are different. So it is believed that mosquitoes inside the house do not carry disease<sup>[15]</sup>.

Gender-related responsibilities for control of certain mosquito breeding containers might also exist. There may be different responsibilities for one gender inside the residence compared to the outside surroundings. Or, there may be a distribution of clean-up activities depending upon ownership of specific items such as tyres<sup>[15]</sup>.

One study in Mexico indicates that informants devalued the use of screens in dengue prevention and believed that the screens were not effective in keeping out mosquitoes<sup>[2]</sup>.

Since dengue is already endemic in this study city in the Philippines, it was presupposed that there would already be a high level of awareness about dengue in general. So, this study sought to explore the more specific topic related to dengue control, through source reduction. Therefore, this objective of the study was to explore the opinions of Philippine university education students about the mosquito larvae control in a dengue endemic city.

## **Materials and methods**

### **Subjects**

The subjects consisted of 43 university major students at Foundation University,

College of Education, Dumaguete city, Philippines. There were 36 female and 7 male subjects. All subjects were Filipinos. The participants were students in a college-based "personal and community hygiene" course. This study took place prior to any course coverage or discussions about dengue fever or any of the mosquito-borne diseases. The participation was voluntary and no student in the class declined it. The results and data were confidentially held. All results were tabulated and reconciled so that the responses would be anonymous.

### **Procedure**

Two open-ended semi-structured questions were administered to the subjects on January 16, 2003. The students' instruction was the facilitation of the questionnaire.

The two questions were as follows:

- (i) What is the best way to control mosquito larvae?
- (ii) Why don't some people use the measure you suggest for question No. 1?

The questions were given verbally. The students were also told that they were allowed to give more than one response per question. The students gave written responses to the questions. The responses were classified by gender. There were no predetermined categories. Categories of responses were created from post-survey results. As categories emerged, sub-categories were created according to their relationship to the broader response categories. The time allotted for the whole process of issuing instructions to the students and completion of response-writing was approximately 15 minutes.

## Results

On the responses to Question 1, the principal categories that emerged concerning mosquito larvae control activities were as follows: outside activities, inside

activities, activities not specified as inside or outside, activities related to specific types of containers, use of insecticide, unrelated activities, and not familiar with mosquito larvae (Table 1).

**Table 1.** Responses to Question 1

Category	Male	Female	Total
<b>I. Outside activities</b>			
A. General outside activities			
A.1. Clean surroundings or yard	5	22	27
A.2. Clean surroundings daily	1	1	2
B. Specific water-containing items outside			
B.1. Turn over coconuts	1	0	1
B.2. Dispose of water in coconut shells	0	1	1
B.3. Put tyres in a safe place	0	2	2
B.4. Dispose of tyres	1	0	1
B.5. Dispose of stagnant water in drums	0	1	1
C. Other environmental activities			
C.1. Clean canals	1	5	6
C.2. Burn grass	0	1	1
C.3. Put trash cans in a safe place (to avoid rain-water entry)	0	1	1
C.4. Throw garbage properly	0	5	5
D. Activities involving other participants			
D.1. Clean-up drive participation	0	1	1
<b>II. Inside activities</b>			
A. Clean house (No specific activities mentioned)	0	4	4
<b>III. Activities not specified as inside or outside</b>			
A. Non-specific cleaning			
A.1. Clean things with stagnant water	1	0	1
A.2. Clean or eliminate stagnant water	1	5	6
A.3. Empty all stagnant water	0	2	2
A.4. Avoid or prevent stagnant water	0	4	4
A.5. Dispose of anything where mosquito eggs are laid	0	1	1
A.6. Kill mosquito larvae in stagnant water (not specified)	0	2	2
A.7. Clean things where mosquito larvae are laid (non-specific item)	0	2	2

Category	Male	Female	Total
B. Activities related to non-specific types of containers			
B.1. Prevent water from entering open containers	0	1	1
B.2. Cover any water container	0	8	8
B.3. Clean water containers	0	1	1
B.4. Dry water containers	0	1	1
B.5. Empty containers	0	1	1
C. Clothes-hanging arrangement	0	1	1
<b>IV. Activities related to specific types of containers</b>			
A. Avoid open cans	0	1	1
B. Cover water containers such as gallon containers	0	1	1
C. Cover water barrels and tanks	0	2	2
D. Put open cans in a safe place	0	3	3
E. Dispose of cans	1	0	1
F. Cover jars	0	1	1
G. Cover basins	0	1	1
H. Clean bottles	0	1	1
I. Replace flower vase water (no time mentioned)	1	0	1
J. Replace flower vase water daily	1	1	2
K. Replace flower vase water weekly	0	1	1
L. Cover garbage	0	2	2
M. Put garbage in a can (No mention of placing over)	0	1	1
<b>V. Other control-related activities</b>			
A. Spraying insecticide	0	4	4
<b>VI. Unrelated activity</b>			
A. Remove an injured person	0	1	1
<b>VII. Not familiar with mosquito larvae</b>	0	1	1
Total	14	94	108
n	7	36	43
No. of students with multiple responses	5	29	34

Table 2. Responses to Question 2

Category	Male	Female	Total
<b>I. Knowledge-related categories</b>			
A. Lack of education	1	1	2
B. Lack of knowledge	0	5	5
C. Lack of consciousness of surroundings or environment	0	3	3
D. Lack of consciousness of health	0	3	3
E. Specific responses related to knowledge	-	-	-
E.1. Do not know that the suggested method of larval control is effective	1	1	2
E.2. Do not know the cause and effect of the mosquito to dengue	0	1	1
E.3. They think that they know everything about mosquito control already	1	0	1
E.4. Not aware of the consequences	0	2	2
E.5. Do not know that the mosquito is dangerous	0	2	2
<b>II. Attitude-related categories</b>			
A. Don't care – apathy	1	9	10
B. Don't care because they have enough money to pay hospital bill	0	1	1
C. Lazy	3	7	10
D. Busy	2	6	8
E. Since people are busy, they only use mosquito sprays to kill adult mosquitoes instead of mosquito larvae	1	0	1
F.1. No time	0	6	6
F.2. Insufficient time or little time	0	1	1
G. No money especially to pay for insecticide spray	0	1	1
H. Tired	1	1	2
<b>III. Practice-related categories</b>			
A. Lack of cooperation with others	0	2	2
B. They just use insecticide spray instead of source restriction environment control	0	1	1
<b>IV. Invalid or unrelated responses</b>			
A. Misunderstood the question (Answered in the affirmative)	1	8	9
B. Either answered Question 1 incorrectly or unfamiliar with the term "mosquito larvae"	0	2	2
<b>V. No response</b>	1	0	1
Total	13	63	76
n	7	36	43
Students with multiple responses	4	20	24

For the responses to Question 2, the principal categories that emerged concerning reasons why people do not undertake mosquito larvae control were as follows: knowledge-related categories, attitude-related categories, practice-related categories, invalid or unrelated responses and no response (Table 2).

## Discussion

In response to Question 1, both female and male students rated "clean surroundings" (Table 1, Category I A.2) with the largest number of responses. This reflects the need for emphasis on specific mosquito control efforts while developing training and health education strategies<sup>[5,14]</sup>.

The higher rating of outside activities compared to inside activities reflects the perceived importance of outside clean-up, and conversely, the relative lack of importance of inside clean-up and control of inside mosquito breeding sites. This may follow the perception as recorded in literature that "house mosquitoes" do not transmit dengue<sup>[2,5]</sup>. Perhaps students believe that the *Aedes* mosquitoes do not live inside houses or other living quarters.

No male subject gave any response related to indoor mosquito control measures (Table 1, Category II). Besides the perception that the indoors lack importance in mosquito control, the males may have deemed the indoors as the domain of females. The role of women as homemakers needs to be considered in vector control programmes. This was reviewed in a number of international settings<sup>[15]</sup>.

Female subjects responded to all but one response, "activities not specified as inside or outside" (Table 1, Category III). Perhaps, the male respondents were not carrying out these activities. The male response emphasis on general response items Table 1 A, "General outside activities" may suggest their lack of specificity in the details necessary to conduct proper dengue-related mosquito control. The largest response in Table 1, Category III, was on the section "cover any water container" (Category III B.2). This practice is consistent with recommendations throughout the literature<sup>[4,6,7,13,14]</sup>. However, these responses in Table 1, Category III B.2, are less than one-third the number of the responses given in Table 1, Category I A.1.

The training of students in environmental surveys and in the environmental action plan known as "4 o'clock habit", has previously been successful<sup>[6]</sup>. It is suggested that this be projected on a larger scale to include other members of the community.

The responses in "activities related to specific types of containers" Table 1, Category IV, were scattered across the item sub-categories by the respondents. Many of these response items could be used as inside containers. Not only is it necessary to cover, empty, and clean containers, but also to indicate the frequency of the activity in order to conduct adequate mosquito control. Only the responses in Table 1, Category IV J, and Category IV K, both dealing with flower-water replacement, and Category I A.2 "clean surroundings daily" mentioned the frequency and timing of activities. This amounted to four responses out of a total of 108 responses in Table 1. Perhaps,

programmes need to stress health education on the mosquito life-cycle and include emphasis on the time interval to conduct successive mosquito control clean-ups. The lack of responses on the frequency of environmental clean-up is in agreement with previous literature on the incomplete understanding about the mosquito life-cycle, and thus, the need to include this topic in future health education programmes<sup>[2,5]</sup>.

Only four female respondents and no male respondent in Table 1, Category V A, indicated that insecticide spraying was the most important mosquito control measure. The overwhelming majority of the respondents discussed general or specific environmental clean-up activities. Source reduction of mosquito breeding sites without the use of adult insecticides has been stressed in dengue-related health education programmes in Honduras<sup>[3]</sup>, Mexico<sup>[4]</sup>, and the Philippines<sup>[6,13,16]</sup>. Since larvicides are not currently being used or promoted in this Philippine study site, the respondents most likely were referring to the use of adult insecticides. In contrast, dengue control programmes in Puerto Rico utilized both source reduction of mosquito breeding sites and insecticide use<sup>[14]</sup>. However, for developing countries, regular adult aerosol insecticides were deemed to be too expensive for regular home use, and thus not recommended for routine control<sup>[13]</sup>.

Only one respondent as seen in Table 1, Category VI, gave a response to an activity unrelated to mosquito control. Also, there was only one respondent as seen in Table 1, Category VII, who responded to the category, "Not familiar with mosquito larvae". These responses validated that the respondents in general had awareness about

mosquito larvae. However, only a minority gave specific details either in types of control measures or in the timing of control activities.

For Question 2, the greatest number of responses among the knowledge-related category was the general category, "Lack of knowledge", Table 2, Category I B. There was no concentration of specific knowledge-related responses. There were nearly twice as many attitude-related responses as knowledge-related responses. Attitude responses were greater than knowledge responses for both male and female subjects (Table 2). Since dengue is endemic in Dumaguete City<sup>[12]</sup>, and various health education programmes have continued for years, it is reasonable to agree that there is a high general awareness about dengue. However, knowledge alone is generally not sufficient to change attitudes and behaviour<sup>[17]</sup>. Health education to increase only knowledge without addressing health behaviours has also been ineffective in the dengue control experience<sup>[5]</sup>.

The greatest numbers of responses were in the attitude-related categories of "Don't care – apathy", Table 2, Category II A, and "Lazy", Table 2, Category II C. The responses of apathy or laziness could have been a result of a weak belief in the effectiveness of the proposed measures from Table 1 to control mosquitoes and dengue. The health belief model may help to explain these responses. Two key components of the health belief model are "perceived benefits" and "perceived barriers." A lower perception of benefits coupled with elevated barriers may result in a lower possibility for change<sup>[18]</sup>. Likewise, people having low self-efficacy (a construct of the

Social Cognitive Theory and also the Health Belief Model), or, in other words, confidence in doing something<sup>[18,19]</sup> could have resulted in their lack of interest to carry out the suggested mosquito control tasks.

The large number of responses found in Table 2, Categories II D, II E, II F1 and II F2, related to the factors of insufficient time to perform clean-up tasks is also suggested in the literature<sup>[15]</sup>. While people may know about various individual mosquito breeding sites source reduction tasks, they may lack the self-confidence necessary to perform a regular, comprehensive environmental clean-up task. Thus, skill development on how to conduct the steps of an environmental action plan for dengue control should be emphasized in order to increase self-efficacy and mosquito control behaviours. This promotion of skill development may, in turn, increase personal efficiency to perform source reduction tasks and thus, decrease the perception of time as a limitation to perform mosquito control activities.

There were only two responses to Table 2, Category III A, "Lack of cooperation with others". This low number may have been due to a high value placed on the important relational imperative or supportive Filipino norm of "*bayanihan*" or cooperation<sup>[20]</sup>. Yet, there were still responses to perceived lack of cooperation as a cause for lower rate of mosquito larval control activities. Addressing this norm through various communications and other health promotion means may help in increasing mosquito larvae control activity.

Increasing the self-efficacy of individuals in the community may help in increasing

the collective efficacy for the desired behavioural change activities. High levels of perceived collective efficacy may increase the likelihood of a group carrying out desired behavioural change activities<sup>[21]</sup>. Therefore, promoting strategies to increase collective efficacy may enhance the likelihood that community mosquito control activities will be carried out and sustained.

Asking the questions orally, rather than in a written form, had some limitations. This may have contributed to the nine respondents who misunderstood Question 2. They answered Question 2 by explaining their reason of choice for the best mosquito larval control, rather than explain why people were not using the best mosquito larval control method. See these responses in Table 2, Category IV A.

This form of questioning was also limited in the lack of in-depth follow-up. The procedure in this study did not allow for follow-up of such responses as the reason for "apathy" as a response to Question 2. Unlike other studies that used interviews<sup>[2-5,14]</sup> or focus groups<sup>[4,5]</sup>, the facilitator of the questions did not interact with the respondents, nor probe for follow-up responses.

The method and procedure also had its strengths. In spite of utilizing open-ended questions, the procedure was very efficient in time and in organization. Unlike a previous study where interviews lasted for an hour per respondent, and at home<sup>[5]</sup>, respondents in this study were able to complete the questions in a matter of minutes, and in one sitting.

All questions were completed at the same time, reducing potential biases that

could result from interaction with others in the outside environment. Also, having the students complete the questions individually, without interaction with fellow students and reduced biased or blended responses.

The procedure also demonstrated the strength of producing a large variety of response categories, multiple responses and overall total responses in a very short period of time. This was evident for both sexes and in response to both questions.

## **Summary and recommendations**

- The study is suggestive that there was an understanding by most students of the term "larvae", and its general relationship to mosquito and dengue control. This was exemplified by the low number of incorrect responses to content unrelated to mosquito larval control as indicated in Table 1, Categories VI and VII, and Table 2, Categories III B, IV B and V.
- There were no male responses for indoor control measures to Question 1. Also, there were almost no specific mosquito control measures mentioned by the male respondents. Further studies should explore the possible gender relationship to mosquito control practices.
- The majority of male and female respondents did not mention indoor mosquito larval control. Therefore, future mosquito control programmes should stress the importance of indoor mosquito larval control measures.

- Efforts are needed to create awareness regarding frequency of mosquito activities.
- There should be an in-depth exploration of the reasons behind the perceived causes of non-participation in mosquito larval control. Especially, the reasons behind "apathy" and "laziness" as perceived causes for non-participation in mosquito larval control should be further explored.
- Activities such as an environmental control action plan and creation of a mosquito control "checklist" and implementation for houses and schools as a means to increase self-efficacy should be promoted.
- The determinants of collective efficacy in mosquito larval control and dengue control should be explored.

Teachers play an important role in facilitating of health promotion in dengue endemic areas. Students and teachers should be properly oriented to carry out personal, school and community mosquito and dengue control measures. Antecedent to this is an understanding of students' perceptions about mosquito-related dengue control. The in-class semi-structured question method is one tool to carry out this type of formative research.

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