Use of Permethrin-treated Curtains for Control of *Aedes aegypti*, in the Philippines

By

Susana K. Madarieta, Angelita Salarda, Marilyn Rosario S. Benabaye, Milagros B. Bacus, Joseph R. Tagle

Department of Health, Regional Field Office, Jones Avenue, Cebu City
Cebu, Philippines

ABSTRACT

An experimental study on the use of permethrin-treated curtains for the control of mosquito vectors for dengue was conducted in two *barangays* in Cebu city. These two *barangays* are highly endemic for dengue fever and are fairly comparable in relation to their populations and economic levels. Sixty-five houses in Barangay Labangon were included in the study group while 65 houses in Barangay Mabolo were included in the control group. Treatment of the curtains in the study group was done after an entomological survey had been conducted in the area at the start of the study. No chemical intervention was done in the control group after the initial survey.

Entomological surveys were carried out in both *barangays* for six months in order to determine the changes in the vector density levels. Results of the surveys showed that there was a drop in the mosquito larval indices in both groups, although a significant and greater percentage of drop was noted in the study group.

The results of the study showed the effectiveness of the use of permethrin-treated curtains as a vector control measure. This strategy should be given due consideration as one of the major approaches in eliminating the DF/DHF vectors.

Key words: *Aedes aegypti*, Permethrin, Curtains, Philippines

Introduction

DHF is one of the mosquito-borne viral diseases that is increasingly becoming a major public health problem. Based on a ten-year average of morbidity and mortality rates, Region 7 in the Philippines is one of the three regions with the highest number of dengue fever cases in the country. Within Region 7, the highest number of cases are found in the densely populated Cebu city.[1]

Since the disease is transmitted through the bite of the mosquito, strategies for its prevention are focused on integrated vector control. During emergency control, fogging is undertaken; however, the effect is short lived. Thus, the use of permethrin-treated curtains as a form of chemical control in high vector density areas has been resorted to in order to find out if this strategy can provide an effective and long-lasting strategy for vector control[2,3]. The studies were initiated in August 1996 and concluded in May 1997.

Methods and materials

Selection of study areas

The study included two *barangays*, namely, Labangon and Mabolo, which were highly endemic for dengue fever in Cebu city. Labangon was selected as an experimental group while Mabolo was taken as the control group. The two sample sites were chosen on the basis of comparability with regard to the number of dengue fever cases, their populations and socioeconomic status of the inhabitants. The sample households were selected by systematic sampling. The distance between the two *barangays* was more than 200 metres, the normal flight range of the *Aedes* mosquito. Only households having 2-3 curtains made of light cotton material were included. The sample size was computed following a study undertaken in Vietnam[2] on the use of permethrin-treated bamboo curtains for dengue vector control.

Basic data on the socio-demographic profile was collected through structured interviews using the entomological questionnaires. The actual larval collection was done in August, at the start of the rainy season, in 65 sample households each in both the *barangays*. After the introduction of treated curtains in the experimental barangay, larval collection was followed by the entomological teams who were accompanied by barangay officials and health workers in the sample households monthly for the next five months. During the larval collection, actual destruction of breeding places of mosquitoes was carried out in both barangays.

Treatment of curtains

The chemical used in the study was Coopex 25% EC which contains 250 g/litre of the residual pyrethroid, permethrin. Curtains of the 65 sample households in the experimental barangay were soaked in 25% EC permethrin at a 1:20 dilution (1 litre of the chemical to 20 litres of water). Twenty-one litres of the solution was enough to soak 80-100 pieces of curtains made of light cotton material. Two large basins were used, one for soaking the curtains and the other for catching the excess solution from the soaked curtains. After soaking the curtains for at least 2 minutes, they were allowed to drip in the other basin for a few minutes so that the excess solution from the drippings could still be used. The curtains were then air-dried and were not exposed to direct sunlight.

Results

Before the introduction of the treated nets, both sample barangays revealed very high House, Container and Breteau indices, indicating that the vector density was high in

both areas (Tables 1 and 2). After intervention, the indices in both barangays dropped but a greater percentage of decrease was noted in Labangon where treated nets had been introduced. The average decrease of House Index in Labangon was 36.4% as compared to the average decrease of 24.2% in Mabolo. For the Container Index and the Breteau Index, the average decrease in Labangon was 12.4% and 77% respectively, while in Mabolo, the average decrease of these indices was 7.7% and 51.3% respectively. Tests for the level of significance (two-tailed test) in the differences of the percentage decreases in both barangays showed that there was a significant difference in the decrease of the indices between Labangon and Mabolo.

Table 1. *Larval indices by month, Labangon – Exp. Group - (1996-1997)*

Barangay Labangon	Months					
	Aug	Sept	Oct	Nov	Dec	Jan
No. of houses inspected	65	66	61	64	63	63
No. of houses (+) for larvae	46	31	19	23	14	31
No. of containers inspected	382	452	428	325	270	314
No. of containers (+) for larvae	85	52	33	36	25	31
House Index	70.7	46.9	31	35	25.4	33
Container Index	22.3	11.5	7.7	11	9.3	9.8
Breteau Index	131	78.8	54	56	33.3	46

Table 2. *Larval indices by month, Mabolo – Control Group - (1996-1997)*

Barangay Mabolo	Months					
	Aug	Sept	Oct	Nov	Dec	Jan
No. of houses inspected	65	63	67	64	65	67
No. of houses (+) for larvae	34	22	25	12	14	19
No. of containers inspected	389	411	436	321	215	346
No. of containers (+) for larvae	64	45	45	16	22	26
House Index	52.3	34.9	37	18.7	21.5	28.3
Container Index	16.5	10.9	10	4.9	10.2	7.5
Breteau Index	98.5	71.4	67	25	33.8	38.8

The most common indoor containers in Labangon found as the breeding sites of the *Aedes* mosquitoes were jugs, bottles, plastic water containers, drums, flower vases and jars, while the most common outdoor containers positive for the larvae were used tyres, drums, plastic water containers and tin cans.

In Mabolo, the most common indoor breeding sites of the *Aedes* larvae were flower vases, drums and water tanks. For outdoor containers, the most common were tyres, tin cans, pails, plastic water containers and drums. Among the natural containers, bamboo stumps were the most common breeding sites in both areas.

Discussion

Both the experimental and control barangays initially were comparable in almost all aspects like population, household size, average family income, household characteristics, total number of dengue cases and even vector density. Both barangays demonstrated very high vector densities indicating that both areas were at risk of having outbreaks based on the WHO density figure. The comparability of both areas was necessary to control factors that may affect the results of the study.

After intervention, a drop in the mosquito density in both areas was noted because of health education and actual elimination of breeding places conducted during the entomological survey. However, a more significant decrease was noted in the barangay where permethrin-treated curtains were used, signifying the effectivity of the use of such curtains for dengue vector control. In addition, use of these curtains is relatively safe as no side-effects were observed among the household members.

In the fourth month, a slight increase in the indices in Labangon was noted due to the fact that some households had started to change and wash their curtains at this time. In the sixth month, a slight increase in the indices was again noted. By this time, more than 60% of the households had already washed their curtains at least once and 52% of the households were not using their curtains any more.

The breeding places commonly observed in the study areas were plastic water containers or jugs, water storage drums, used tyres, flower vases and tin cans. It is essential to take note of the containers or breeding places of the mosquitoes so that health education and environmental sanitation activities will be focused on these breeding places. Knowing the breeding places would indirectly reveal the attitude and practices of the community with regard to water storage, garbage disposal and environmental sanitation.

Conclusion

Two significant activities in the prevention and control of dengue emerged in this study. First, it is important to do an entomological survey to determine the kind of containers mosquitoes prefer to breed in and the vector density in an area before instituting any intervention. Knowledge about preferred containers as breeding places will aid the health worker in conducting the information, education and communication (IEC) campaign against dengue fever.

Treatment of curtains with permethrin proved to be an effective vector control measure against dengue fever. This strategy, together with health education and environmental sanitation, should be considered when planning for a comprehensive dengue prevention and control programme.

References

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