

**Effectiveness of a planned source reduction programme on  
Aedes mosquito control in a selected community in  
Malappuram-Kerala.****Kishorekumar.P<sup>1</sup>, Mujeeb.VK<sup>2</sup>**<sup>1</sup>Vice Principal, College of Nursing, EMS Memorial Co - Operative Hospital and Research Centre, Perinthalmanna. <sup>2</sup> Al Shifa College of Nursing, Perinthalmanna.**Abstract**

*A study to assess the effectiveness of a planned source reduction programme on Aedes mosquito control was conducted in a selected community in Malappuram district of Kerala State. The objectives were to identify the entomological monitoring parameters of Aedes aegypti in the selected community and to develop and assess the effectiveness of a planned source reduction programme on control of selected entomological monitoring parameters for Aedes mosquito. A quantitative - one group pre - test and post - test design was used. Planned home visits were conducted to 50 neighborhood households which were randomly sampled to carry out the pretest, on first visit and for and interventions on subsequent 2 weeks and a post test on last visit. After due validation of the experts and Delphi discussions with the practitioners in nursing and public health, a planned source reduction programme appropriate for the current Community Health Nursing practice through home visit was developed.*

*96 % ( n = 48) of the selected households reported mosquito breeding and 42 % ( n= 21) of them were not visited by any health worker or agencies for mosquito control activities in the last year. The planned source reduction programme was effective in significantly reducing the number of households affected with Aedes mosquitoes from 34 % ( n = 17) to 16 % ( n = 8) chi square value 4.320 ( p < 0.05 ). The House Index and the Breteau Index were 24 during pre test which is a high risk level for mosquito borne diseases especially those transmitting by Aedes mosquitoes. The Stegomyia Index was also at high level which was 328.3 during pre test. All these three indices were significantly reduced after the planned source reduction programme to a level of 14, 14 and 141.4 respectively ( p < 0.05). The reduction in the Container Index after planned source reduction was statistically not significant as it remains at low risk levels from pre test (1.05) to post test (0.82) ( p > 0.05).*

*The planned source reduction programme developed was highly effective in mosquito control especially of Aedes mosquitoes and recommends far and wide practice of the same by incorporating the intervention in planned home visits carried out by the community health nurses, other health workers and agencies in the community as well as by the family members themselves in their household.*

**Key words : Aedes; Source Reduction; Mosquito Control; Entomological monitoring parameter; Breteau Index; House Index; Container Index; Stegomyia Index.**

**I. INTRODUCTION**

In recent years Vector Born Diseases have emerged as a serious public health problem in South East Asia including India. Mosquito born diseases especially those caused by Aedes aegypti mosquitoes such as Dengue, Chikungunya etc constitute a major share of this burden<sup>1</sup>. Aedes mosquitoes are spreading and increasing its density. The spread of Dengue throughout the world can be directly attributed to the proliferation and adaptation of Aedes aegypti and Aedes albopictus mosquitoes which are the vectors of Dengue viruses<sup>2</sup>. Changes in this bio-geographical pattern are linked to intensive destruction of natural forests through accelerated urbanization and rapid anthropization. The increasing density of Aedes mosquitoes and its susceptibility towards both Chikungunya and Dengue strongly suggest that this species can be implicated as the main vector of these two arboviruses<sup>3</sup>.

40% of the world's population is at risk of Dengue fever<sup>1</sup>. Mosquito-borne disease, especially Dengue Fever, Chikungunya and Japanese Encephalitis caused serious public health problems in Kerala state<sup>4</sup>.

An important fact is that these diseases can be easily controlled by man through environmental modification. A Comprehensive and integrated mosquito management program including source reduction, chemical control with resistance management and biological vector control are essential. WHO Expert Committee on Vector Biology and Control defined environmental management as an important component among the three areas of vector surveillance such as environmental modification, environmental manipulation, and changes in human habitat or behavior<sup>3</sup>.

The source reduction programme adopted in this study was a structured set of activities practiced by the community health nurse along with the family members during home visit for elimination of mosquito breeding places or for making the breeding places unsuitable for mosquito breeding or for preventing mosquitoes from reaching the breeding places in and around the houses as well as motivating the family towards practicing these activities. This intervention was the independent variable in the study. The effectiveness of this intervention was tested using reduction in the entomological monitoring parameters of Aedes mosquito control.

The need of the time is sensitization and mobilization of the family and community as well as the field health workers towards mosquito control through source reduction which is the potentially ideal and most environment friendly method for controlling mosquitoes. The control interventions can change the spatial and temporal dispersal of Aedes mosquitoes and perhaps the pattern of habitat utilization<sup>5</sup>. Hence entomological studies should be conducted before any vector control operations, especially against Aedes mosquitoes.

Accordingly a study to assess the effectiveness of a planned source reduction programme on Aedes mosquito control was conducted in a selected community in Malappuram district of Kerala State. The objectives of the study were to identify the entomological monitoring parameters of Aedes aegypti in a selected community and to develop and assess the effectiveness of a planned source reduction programme on control of selected entomological monitoring parameters for Aedes mosquito.

## **II. METHODOLOGY**

A quantitative approach following one group pre - test and post - test design was used in this study. 50 neighborhood households were randomly sampled from the selected community. Planned home visits were conducted to these selected households to carry out the pretest during first visit and for interventions on subsequent visits during a period of 2 weeks and for a post test on last visit. After due validation of the experts and practitioners in nursing and public health, a planned source reduction programme appropriate for the current Community Health Nursing practice was developed for the study. It was designed specifically for easy incorporation with various steps in home visit. As a part of this intervention a self instructional booklet on mosquito control through source reduction was also developed and distributed among the households.

The study was conducted in 50 households clustered in to 5 groups in the selected community. The data was collected using structured observation checklists and questionnaires after obtaining necessary sanctions from local government, health authorities and an informed consent from the head of the family. The baseline information about the household and entomological monitoring parameters was assessed. Major Entomological Monitoring Parameters identified for testing the effectiveness of the Planned Source Reduction Programme were Breteau Index, House Index, Container Index and Stegomyia Index.

House or premises index, container index, Breteau index and Stegomyia larval index are the most widely used larval indices. Stegomyia indices were developed to monitor the progress of vector eradication efforts and to protect Aedes aegypti free zones from re-infestations. The house or premises index has been used most widely, but it neither takes into account the number of containers with

immature mosquitoes nor the production of adults from those containers. The container index provides information on the proportion of water-holding containers. The Breteau index establishes a relationship between positive containers and houses. Breteau Index is an indicator of prevalence rather than abundance<sup>7</sup>. The method of calculation and interpretation of these indices were done as follows.

**Methods of calculation and interpretation of Entomological Monitoring Parameters**

SI No	Entomological Monitoring Parameters	Formula for calculation	interpretations
1	<b>Container Index CI or Source Index</b>	$\frac{\text{Number of mosquito breeding sources or containers positive For Aedes mosquito larvae}}{\text{Total number of containers inspected}} \times 100$	High risk : > 5 Low risk : ≤ 5
2	<b>House index HI or Aedes Index AI</b>	$\frac{\text{Number of houses positive for Aedes mosquito larvae}}{\text{Total number of houses inspected}} \times 100$	High risk : >10 Moderate risk : 1-10 Low risk : <1
3	<b>Breteau Index BI</b>	$\frac{\text{Number of mosquito breeding sources positive For Aedes mosquito larvae}}{\text{Total number of houses inspected}} \times 100$	High risk : >10 Moderate risk : 1-10 Low risk : <1
4	<b>Stegomyia Index SI</b>	$\frac{\text{Number of sources or containers positive for any kind of mosquito larvae}}{\text{Number of people living in the area}} \times 1000$	

**III. RESULTS**

The adult mosquitoes were observed for their presence or absence in any of the indoor and outdoor areas in selected households was carried out in this study. The number of mosquitoes present such as mosquito counting using various instruments like ovitraps etc were not carried out in this study as World Health Organization (W H O) and other organizations are not much favoring the adult mosquito counting nowadays especially in areas which are at high risk for mosquito borne diseases. 96 % (n=48) of the selected households reported mosquito breeding, and 34 % of them were specifically affected with Aedes mosquitoes. This finding reveals that Aedes is an important species of mosquitoes prevalent in our community.

42% of selected households were not visited by any health worker or agencies for mosquito control activities in the last year. This shows the poor co ordination and organization of the mosquito control activities by the health and local authorities in the selected community. An effective and integrated approach for mosquito control with good community participation is essential for controlling the mosquito breeding.

The planned source reduction programme developed as a part of the study was highly effective in reducing all most all of these entomological monitoring parameters. The reduction in the households affected with Aedes adult was statistically significant after the planned source reduction programme ( $p < 0.05$ ) whereas the reduction in adult mosquitoes in general was not statistically significant ( $p > 0.05$ ).

During pre test the House Index of the community was 24, Container Index was 1.05, Breteau Index was 24 and Stegomyia Index was 328.3. All these indices were reduced during post test as follows.

**Table showing reduction in selected entomological monitoring parameters (N=50)**

SI No	Entomological Monitoring Parameters	Pre Test	Post Test	T test Value
1	House index HI or Aedes Index AI	24.00	14.00	3.162*
2	Container Index CI or Source Index	1.05	0.82	2.033
3	Breteau Index BI	24.00	14.00	3.162*
4	Stegomyia Index SI	328.30	141.40	4.096*

\* Significance at a level of  $p < 0.05$

The House Index was 14 with a reduction of 41.7%, Container Index was 0.82 with a reduction of 89 21.9%, Breteau Index was 14 with a reduction of 41.7% and the Stegomyia Index was 141.4 with a reduction of 56.9%. The planned source reduction programme was effective in significantly reducing the number of households affected with Aedes mosquitoes from 34% (n=17) to 16% (chi square: 4.320;  $p < 0.05$ ).

The House Index and the Breteau Index were 24 during pre test which is a high risk level for mosquito borne diseases especially those transmitting by Aedes mosquitoes. The Stegomyia Index was also at high level which was 328.3 during pre test. All these three indices were significantly reduced after the planned source reduction programme to a level of 14, 14 and 141.4 respectively ( $p < 0.05$ ). The reduction in the Container Index after planned source reduction was statistically not significant as it remains at low risk levels from pre test (1.05) to post test (0.82) ( $p > 0.05$ ).

The reduction in the risk level from high risk status to moderate and low risk level was not achieved after the planned source reduction programme in this study, even though there was a significant reduction in most of these entomological monitoring parameters after the intervention. The finding can be interpreted that the House Index, Breteau Index and Stegomyia Index were very high during the pre test which remained at high risk level even after a significant reduction in their index scores. The Container Index was at a low risk level during the pre test itself in which no further reduction in risk level was possible.

#### **IV. CONCLUSION:**

Mosquito born diseases are one of the major public health problems in every developing country. The planned source reduction programme developed was highly effective in mosquito control especially in the control of Aedes mosquito and recommends far and wide practice of the same by incorporating the intervention in planned home visits carried out by the community health nurses, other health workers and agencies working in the community as well as by the family members themselves in their own household environment.

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