INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND ANALYSIS

ISSN(print): 2643-9840, ISSN(online): 2643-9875

Volume 05 Issue 07 July 2022

DOI: 10.47191/ijmra/v5-i7-05, Impact Factor: 6.261

Page No. 1620-1625

A Study on Mosquito Density and Trend of Larval Indices from a Hospital Campus of Rural Area, Thrissur District Kerala.

Nithya M C [1], Sruthi M V[2], C R Saju[3], M Mohammed Rafi[4]

[1]Junior resident, Department of Community Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India

[2]Assistant Professor, Department of Community Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India

[3]Professor and HOD, Department of Community Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India

[4]Entomologist; Department of Community Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India

ABSTRACT

Introduction: Dengue is one of the most important arboviral disease in Kerala. Development of the control measures mainly depends upon the knowledge regarding the bionomics of mosquito. The larval indices are one of the methods of entomological surveillance, which can predict the outbreak of mosquito borne diseases. The hospital premises need to be mosquito free and need to be safe place for staff and patients. Hence, the present study was done to calculate the standardized larval indices, trends and to determine major breeding source in hospital campus of, Thrissur district, Kerala.

Methods: A cross-sectional study was conducted over a period of five months in a hospital campus. The team of investigators consisting of 1 post graduate student, 5 undergraduate students, and one MSW, under the guidance of entomologist visited the houses and hospital premises. The houses were surveyed for indoor and outdoor water holding containers and inspected for the presence of mosquito larvae. The larval indices like House Index (HI), Container Index (CI) and Breteau Index (BI) were calculated.

Results: In this study, all the entomological indices were found to be above critical level from August (CI=20.33, HI= 35.71%, BI= 69) to November (CI= 25.86%, HI= 48.57%, BI=86). Health education & source reduction was done during the time of survey. In December the indices showed a decline trend (CI=17.95%, HI= 7.14%, BI=10). The commonest species of mosquito identified was Aedes albopictus.

Conclusions: Mosquito borne diseases can be avoided by health education & source reduction.

KEYWORDS: Hospital campus, larval indices, Thrissur

INTRODUCTION

Public health is threatened by vector-borne diseases, such as dengue, chikungunya, malaria, Japanese encephalitis and filariasis. These diseases are transmitted by viruses and parasites. We have been fighting mosquitoes constantly since the 1950s as part of the malaria control program. After the initial success, the war now seems lost because the density of mosquitoes has increased over the past two decades, leading to new epidemics. (1) Several reports of sudden outbreaks of these diseases have emerged in the past few years, sug gesting the re-emergence of these diseases with multiple foci of outbreaks and continuous circulation of pathogens in nature. (2) There are reports of an increase in the incidence of these diseases due to many factors including unplanned urbanization and climate change which favours vector proliferation. (3)

Dengue is one of the most important arboviral diseases in Kerala. It is especially crucial to establish sufficient control against dengue and other mosquito-borne illnesses and infections in healthcare settings, including hospitals, given that health services provide care for the sick and vulnerable. Hospitals are places where thorough knowledge of the function of mosquitoes in disease transmission would be expected and suitable tactics would be adopted because they are positioned at the front lines in combating mosquito-borne diseases. In addition to biting patients and hospital employees, individuals who are hospitalised owing to illnesses spread by mosquitoes may also be sources of infectious diseases that the mosquitoes may spread further. (4)

Both entomological and epidemiological surveillance data are often collected in the country, but there are few examples of health services integrating and fully utilizing such information to control outbreaks and prevent their spread. Ideally, surveillance activities include fever surveillance, effective clinical and laboratory diagnostics, vector surveillance, and identifying the

environmental and social risk factors for dengue development to ensure early and rapid detection of transmission of dengue fever. [4]

Development of the control measures mainly depends upon the knowledge regarding the bionomics of mosquitoes. The larval indices are one of the methods of entomological surveillance, which can predict the outbreak of mosquito-borne diseases. Effective vector control measures are important for achieving and maintaining dengue-related morbidity. Prophylactic and vector-controlled interventions are aimed at reducing the transmission of dengue fever, thereby reducing the incidence of infection and preventing the outbreak of disease. [5]

This study aims to strengthen mosquito control in the hospital where the study was conducted through health education during the vector survey, most importantly to reduce the risk of transmission of mosquito-borne infections through source reduction but also to lessen discomfort to both patients and staff.

OBJECTIVES

- To determine the standardized larval indices- CI, HI, BI from a hospital campus of a rural area of Thrissur district, Kerala.
- To determine the major breeding sources for mosquitoes in the hospital campus of arural area of Thrissur district, Kerala.
- To study the trends in larval indices from August to December 2021 in the hospital campus of a rural area of Thrissur district, Kerala

MATERIALS AND METHODS

A Cross-sectional study conducted in the Hospital campus of a rural area, Thrissur district. The campus was divided into 70 houses including the doctor's quarters, major hospital blocks, auditorium, ground area, canteen, hostels, biomedical waste treatment plant, nursing college blocks. The team of investigators consisting of 1 post graduate student, 5 undergraduate students, and one MSW, under the guidance of entomologist visited the houses and hospital premises. The houses were surveyed for indoor and outdoor water holding containers and inspected for the presence of mosquito larvae & adult mosquitoes. From each positive container, the larva was pipetted into a plastic cup/ plastic bag and were brought to the laboratory for identification. The type of positive containers, larval presence was entered on a pretested proforma. All the campus areas including the indoors of student's hostel were included in the study. Quarters that were locked, not consented were excluded.

Larval surveys: House Index (HI), Container Index (CI), Breteau Index (BI) the larval indices were calculated:

- CI = Container index = (No. of positive containers / No. of containers inspected) x 100
- HI = House Index = (No.of positive houses / No.of houses inspected) x 100 • BI = Breteau index = (No.of positive containers / No.of houses inspected) x 100 Critical levels for HI, BI are taken as 10%, 5% respectively. BI > 50- high risk area; 5-50- moderate risk.

Pupae surveys: Pupa Index (PI) & Adult surveys

The collected larvae were undergone the species identification and those difficult to identify were kept in the barraud cage for growing it into adult and their species also identified.

Prioritizing areas depending on the potential for outbreak, an area can be placed into one of the four categories. [5]

- Priority I: Death due to dengue confirmed.
- Priority II: HI >5, BI >20.
- Priority III: HI <5, BI <20.
- Priority IV: despite active search, no breeding sites found positive

DATA ANALYSIS

Descriptive analysis was done manually to calculate the larval indices and the proportion of different types of containers.

RESULTS

In this study, the hospital campus was surveyed monthly from august to December 2021. Highest number of wet containers (236) found in the month of January. The most common site for vector breeding as per the survey was identified to be plastics containers except plastic bucket (49.89%) followed by coconut shell (14.10%) and the least was tile piece (0.22%). Different types

of containers were identified as shown in Figure 1. Aedes albopictus was the major species identified (Table no:1). The potential vector breeding sites which were identified during the survey are given in Table 2.

Table No: 1 Mosquito species identified

	August		September		October		November		December	
	female	male	female	male	female	male	female	male	female	male
Aedes albopictus	**7**	0	**11**	3	**10**	1	**8**	1	0	0
Aedes vittatus	1	0	0	0	0	0	0	0	0	0
Culex quinquefasciatus	7	1	5	1	10	0	7	0	0	0

FIGURE:1 TYPES OF CONTAINER (INCLUDING WET & DRY)

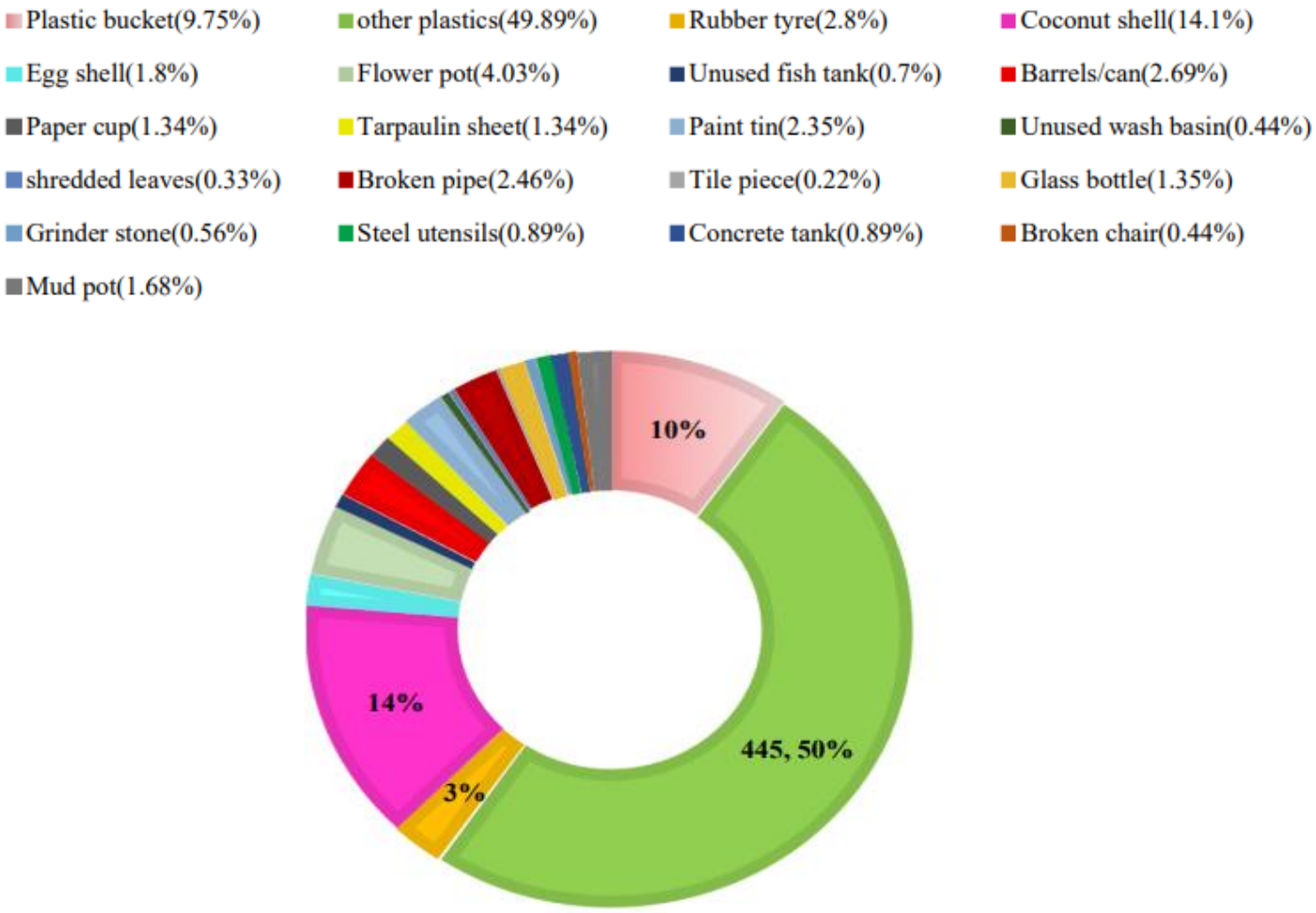

Table no. 2: Number and type of containers with larval presence from August – December 2021

Container	August		September		October		November		December	
	Wet	Positive	Wet	Positive	Wet	Positive	Wet	Positive	Wet	Positive
Plastic bucket	16	**9**	17	**7**	26	**8**	28	**6**	6	**2**
Other plastics	80	**9**	114	**21**	127	**11**	124	**24**	20	**0**
Rubber tire	8	**6**	8	**5**	4	**2**	4	**4**	1	**1**
Coconut shell	60	**14**	29	**12**	14	**7**	22	**3**	1	**0**

Egg shell	9	**1**	5	**0**	1	**0**	1	**0**	0	**0**
Flower pot	9	**1**	16	**5**	7	**0**	4	**0**	0	**0**
Unused fish tank	5	**2**	1	**0**	0	**0**	1	**0**	0	**0**
Barrel / can	10	**2**	7	**1**	0	**0**	2	**1**	9	**2**
Paper cup	11	**0**	0	**0**	1	**0**	0	**0**	0	**0**
Tarpaulin sheet	8	**0**	0	**0**	3	**2**	1	**1**	0	**0**
Paint tin	7	**3**	9	**1**	5	**1**	0	**0**	0	**0**
Unused wash basin	1	**1**	0	**0**	1	**0**	2	**1**	0	**0**
Shredded leaves	0	**0**	2	**1**	1	**0**	0	**0**	0	**0**
Broken pipe	6	**0**	9	**1**	0	**0**	7	**0**	0	**0**
Tile piece	0	**0**	2	**1**	0	**0**	0	**0**	0	**0**
Glass bottle / beer bottle	0	**0**	3	**2**	3	**0**	6	**4**	0	**0**
Grinder stone	2	**1**	2	**1**	0	**0**	0	**0**	1	**1**
tree hole	0	**0**	1	**0**	0	**0**	0	**0**	0	**0**
Steel utensils	0	**0**	0	**0**	4	**0**	4	**1**		**0**
Metal sheet	0	**0**	0	**0**	2	**0**	0	**0**	0	**0**
Concrete tank/bricks	1	**0**	4	**0**	0	**0**	3	**2**	0	**0**
Thermocol	0	**0**	0	**0**	2	**0**	2	**1**	0	**0**
Metal container	0	**0**	0	**0**	1	**1**	1	**0**	0	**0**
Broken chair/stool	0	**0**	0	**0**	3	**0**	1	**1**	0	**0**
Broken stool	0	**0**	0	**0**	2	**0**	0	**0**	0	**0**
Cardboard box/cartoon	2	**0**	2	**0**	1	**0**	4	**4**	0	**0**
Mud pot	0	**0**	6	**2**	1	**1**	8	**6**	1	**1**
Small pit	0	**0**	0	**0**	2	**0**	0	**0**	0	**0**
Test tube	0	**0**	0	**0**	0	**0**	2	**0**	0	**0**
Aluminium container	1	**0**	0	**0**	0	**0**	0	**0**	0	**0**
Cement sack	0	**0**	0	**0**	3	**0**	2	**0**	0	**0**
Waste basket	00	**0**	0	**0**	0	**0**	1	**1**	0	**0**
Total	**236**	**48**	**228**	**60**	**212**	**32**	**232**	**60**	**39**	**7**

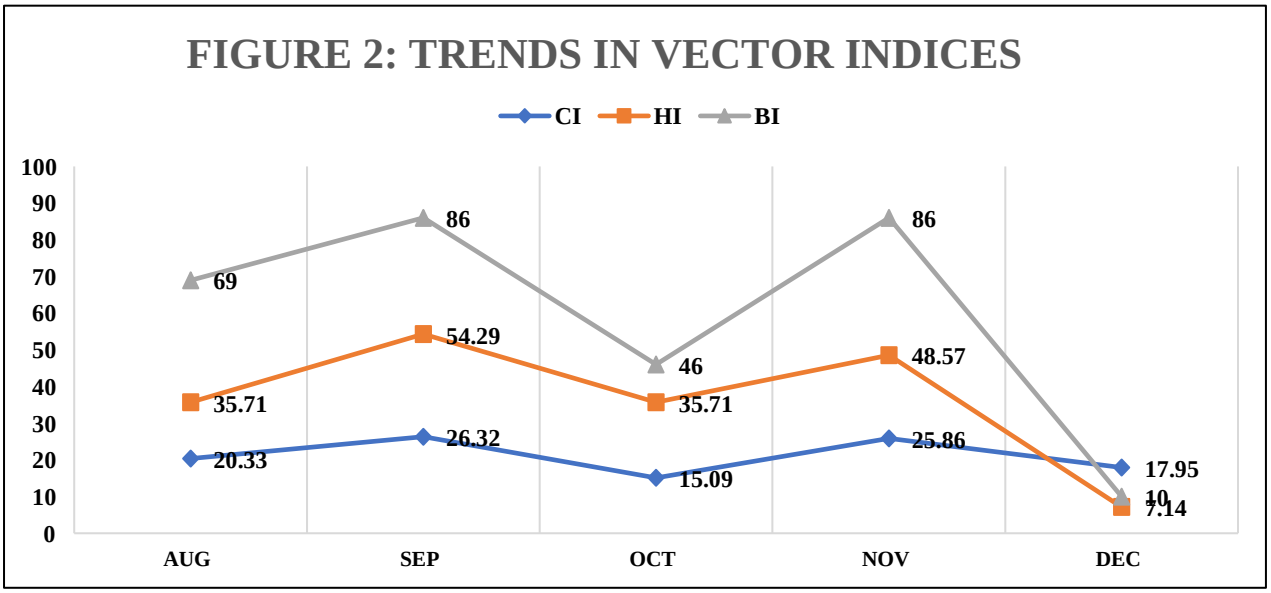

Fig 2: Trends in larval indices, CI, HI, BI were fluctuating from August to November. In the month of December there is a decline in all indices.

DISCUSSION

The hospitals of rural settings, which tend to achieve high mosquito catches and are important for assessing rural transmission of arboviruses. According to the fever surveillance, 20 dengue fever cases had been admitted in the hospital during the study period. So, this hospital-based study has epidemiological importance because patients who are arboviral carriers visiting the hospitals that have large catchments in the area can set off a transmission chain in the neighbourhood through capable mosquito vectors.

In our study, the most common site of vector breeding was identified as plastic containers. This was similar to study done at Thiruvananthapuram [6], Perinthalmana [7]. The major species identified were that of Aedes albopictus among the collected adult mosquitoes & also in larvae. The larvae's collected which were grown into adult and species identified, Aedes albopictus was the major species identified. Similar result found in study from Thiruvananthapuram [8]. It is also the commonest species of Aedes found in South India.

In our present study the larval indices were CI/HI/BI (21.1/36.28/59.14). The result larval indices from other studies Thiruvananthapuram (24.7/17.2/35) [6], Maharashtra (13.6/2.8/10.3) [9], Rachi (53.9/19.38/177.06) [10] compared with our results. The difference may be due to the longer time period of the study and the region where the study was conducted.

The larvae of Aedes mosquitoes breed in areas with artificial water stagnation. Plastic containers, water tanks, coconut shells, tires, leaves or anything that can hold water in it makes a perfect environment for the breeding of these mosquitos. In this study, favourable habitats coexisted with mosquito abundance and species variety. Therefore, effective management of these habitats in rural settings can help much in preventing the spread and outbreak of arboviral diseases. In our study the active source reduction & health education had an impact on the reduction of vector indices.

Images taken during vector survey in hospital campus.

CONCLUSIONS

This study gives a very clear indication that the study area is highly prone to potential dengue outbreaks, it can be avoided by health education & source reduction. Comes under priority II for vector borne diseases like dengue fever. Discarded plastic containers were a major source of vector breeding. There were fluctuations in the larval indices from August to December. Elimination of these preventable breeding sites can greatly reduce the intensity of vector prevalence and thereby the incidence of the diseases caused by them. Limitations of our study were, Due to the COVID pandemic, we were not able to fully explore the indoors of hospital quarters & hostels for the larval presence & Rainfall pattern during the study period was not measured, the density of dengue mosquito fluctuates with temperature, rainfall, and humidity.

RECOMMENDATIONS

Plastic waste control measures, clearing of water-holding containers, Health education regarding the importance of source reduction is important for preventing dengue outbreak.

REFERENCES

1) Vector-borne diseases. WHO/ 2 March 2020
2) Devendra T. Mourya et al. Emerging/re-emerging viral diseases & new viruses on the Indian horizon, Indian J Med Res. 2019 Apr; 149(4): 447–467.
3) James Whitehorn et al. Global warming and arboviral infections, Clin Med (Lond). 2019 Mar; 19(2): 149–152.
4) Akinwale M. Efunshile et al. Mosquito control at a tertiary teaching hospital in Nigeria, Infection Prevention in Practice Volume 3, Issue 4, December 2021, 100172
5) Promoting dengue vector surveillance and control, WHO, Activities.
6) Anna Susan Paul, Jose Vincent et al. A Study on Larval Indices of Aedes and Risk for Dengue Outbreak in a Rural Area of Thrissur District, Kerala Vol. 52 No. 1 (2020): Journal of Communicable Diseases
7) Samuel PP, Thenmozhi V, Nagaraj J et al. Dengue vectors prevalence and the related risk factors involved in the transmission of dengue in Thiruvananthapuram district, Kerala, South India. J Vector Borne Dis 2014; 51: 313-319.
8) Jesha M, Sebastian N, Haveri SP et al. Mosquito density in urban Kerala: a study to calculate larval indices in municipal area of Perinthalmanna. Indian J Forensic Community Med 2015; 2(1): 7-12.
9) K Vijayakumar, T K Sudheesh Kumar et al, A study on container breeding mosquitoes with special reference to Aedes (Stegomyia) aegypti and Aedes albopictus in Thiruvananthapuram district, India, J Vector Borne Dis 2014 Mar;51(1):27-32.
10) Sharma RS et al, Entomological Studies During Outbreak of Chikungunya in Marathwada Region of Maharashtra. Indian Journal for the Practising Doctor, 2006; 3(5).
11) Singh RK, Das MK et al, Preliminary Investigation of Dengue Vectors in Ranchi, India. Journal of Vector Borne Disease, 2008; 45:170-173
12) Minhas S, Sekhon H et al. Entomological survey for dengue vector in an institutional campus to determine whether potential of dengue outbreak exists. International Journal of Medical and Applied Sciences 2013; 2(4): 164-171.