International Journal of Community Medicine and Public Health
Menon VTK et al. Int J Community Med Public Health. 2019 Feb;6(2):659-663
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20190187

Original Research Article

A study on mosquito density in rural Kerala before and after floods

V. T. Krishnadas Menon*, Jerry Rachel, C. R. Saju, M. Mohamed Rafi, Vidhu M. Joshy

Department of Community Medicine, Amala Institute of Medical Sciences, Thrissur, Kerala, India

Received: 16 November 2018
Revised: 31 December 2018
Accepted: 01 January 2019

***Correspondence:**
Dr. V. T. Krishnadas Menon,
E-mail: vtkmenon@gmail.com

ABSTRACT

Background: Mosquito borne diseases are a major public health problem in Kerala. Mosquito density assessed by larval surveys is easier and quicker to perform. The larval indices are an important practical predictor of outbreaks of mosquito borne disease and are valuable in taking preventive measures. This study is done to calculate standardized larval indices namely house index, container index and Breteau index and to identify the major breeding sources of mosquitoes in the residential environment in a rural of Thrissur, Kerala.
Methods: A cross-sectional study selecting 80 houses from 1 wards of Konnikara village under Thrikkur Panchayath under the field practice area of rural training centre, Amala Institute of Medical Sciences Thrissur. Every water holding container indoors and outdoors was counted and searched for larval presence and noted on a pretested format.
Results: In this study, 80 houses were surveyed in 2 days initially in June and in September. All the entomological indices were found to be above the critical level in the initial survey in June. House index=36% container index=44%; Breteau index=143% showing high chances for outbreaks of mosquito borne diseases. In September though the indices were very low house index 1.25% container index 2.77% and Breteau index.
Conclusions: The area is prone for mosquito borne disease outbreaks like dengue fever and after interventions the vector indices and potential risks came down.

Keywords: Vector survey, Breeding sites, Containers, House index, Container index, Breteau index, Kerala

INTRODUCTION

Mosquitoes can be found all over the world and commonly known to pose a significant threat to public health. Common mosquito borne diseases are dengue, malaria, filariasis, yellow fever, and Japanese encephalitis. The most common is the dengue virus which is transmitted to humans by the infected *Aedes aegypti* and *Aedes albopictus*. As the effective vaccine for dengue is not yet available, dengue control is limited to reduction of the vector population a. Over 2.5 billion people are now at risk from dengue. WHO currently estimates there may be 50-100 million dengue infection worldwide every year.[2] In India, dengue fever (DF), dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) have been documented in different parts of the country including southern part of India.[3] There were as many as 87018 cases with 151 deaths in 2017 the southernmost state of Kerala had 18908 cases with 35 deaths.[1]

Any containers, natural or artificial that can accumulate water for the above period of time can be a potential breeding habitat for aedes mosquitoes or anopheles mosquitoes. These containers can be indoors or outdoors. Entomological surveillance is used to determine the geographical distribution of major breeding sites and pinpoint high risk areas; Thus various larval indices can be calculated namely house index (HI), container index (CI), Breteau index (BI). HI denotes percentage of houses

or premises positive for mosquito larvae. HI is extremely important for epidemiological purposes as it indicates potential for spread of diseases. However, HI does not take into account number of larvae positive containers in a house. Similarly, CI denotes only percentage of water holding containers positive for larvae. BI on the other hand establishes relation between positive containers and number of houses. It denotes the number of positive containers per 100 houses inspected in an area. Hence it is the most useful single index for estimating vector density in a location. HI and BI are commonly used for determination of priority areas for vector control activities to prevent outbreaks. Generally, 10% and 5% are taken as critical levels for HI and BI respectively beyond which epidemics are likely to occur. If the BI is above 50%, it is considered a very high risk area and between 5–50% is considered as moderate risk.[3] These larval indices are used to predict the outbreak of mosquito borne diseases and take preventive measures.

Objectives

- To calculate important vector (larval) indices namely HI, CI and BI in the rural field practice area of Amala Institute of Medical Sciences, Thrissur.
- To determine the major breeding sources for mosquitoes in the peri-domestic environment in the above area and also to compare the vector indices in June and September.

METHODS

Study area

The study was conducted in Konikkara Panchayat under the field practice area of Rural Health Training Centre, Amala Institute of Medical Sciences Thrissur. Study Design: This study was conducted as a cross sectional survey sampling technique: Houses were selected randomly from 1 ward a total of 80 houses.

Study period

The study was conducted in 2 days during June 7th to 8th, 2018. The survey was done by two team - one intern accompanied by a staff (Health Inspector / medico-social worker) trained for the study in each team. This same study was repeated on 13th and 14th September in the same area. Severe floods affected Kerala in the month of August. The tools used in the larval survey included a survey form, pipettes, plastic bottles, plastic bags, a specimen vial with stoppers, pens, a label and a flashlight. All of the indoor and outdoor containers at the selected houses had been inspected and from each positive container, a larva was pipette into a plastic cup or plastic bag and brought back to the laboratory for identification.

80 houses were randomly selected from ward 1. Each team covered 10 houses a day and the survey was completed in 2 days. After getting the consent from the head of the house, the premises of the house were meticulously searched for all possible water collections and containers both indoors and outdoors. Details regarding potential mosquito breeding sites and those positive for larval presence are collected and entered on a pretested performa.

The larval survey data were calculated and analyzed in terms of different larval survey techniques like HI, CI, and BI. The calculation of larval indices is based on the following mathematical formulae:

$$\text{Breteau index} = \frac{No.of\ houses\ inspected \times 100}{No.of\ positive\ containers}$$

$$\text{Container index} = \frac{No.of\ containers\ positive \times 100}{No.of\ container\ inspected}$$

$$\text{House index} = \frac{No.of\ positive\ houses\ inspected \times 100}{No.of\ houses\ inspected}$$

Data analysis

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

RESULTS

In this study a total 80 houses were surveyed from the 1 wards coming in the field practice area of rural health centre, Amala Institute of Medical Sciences.

Table 1: Table showing characteristics *Aedes* larval collections from containers inside and around homes done in June.

Container type	Wet container surveyed	Positive containers	Dry containers
Coconut shell	59	23	60
Plastic container	80	32	59
Banana leaf	14	7	4
Rubber tyre	28	21	5
Egg shell	33	11	40
Tarpaulin sheet	11	5	4
Flower vase	15	9	15
Unused well	2	1	1
Earthern pots	7	2	1
Other	4	1	1
Total	259	114	190

There were potential breeding sites (with or without larvae) in 80 houses (97.6%). Positive containers (with larvae) were present in 53 of these 80 houses showing a calculated house Index of 66.255% (95% confidence

interval=18.57–31.73). Out of 259 artificial water collections with potential for *Aedes* breeding, larvae were identified in 114 leading to a calculated Container index of 44.36% (95% C.I=4.95–15.76) and Breteau index of 142.6% (95% C.I=68.46–81.59). This is depicted in Table 1. All the entomological indices were found to be above the critical level for occurrence of out breaks of mosquito borne diseases. Total number of potential containers- 259, number of containers positive for larvae-122, and the main potential containers with chances for mosquito breeding were plastic containers (32), followed by coconut shell (23) and tyres (21). A total of 10 adult mosquitoes 7 *Aedes albopictus* 2 male and 5 females were collected from outside. 3 *C. quinquefasciatus* females were also collected from indoors.

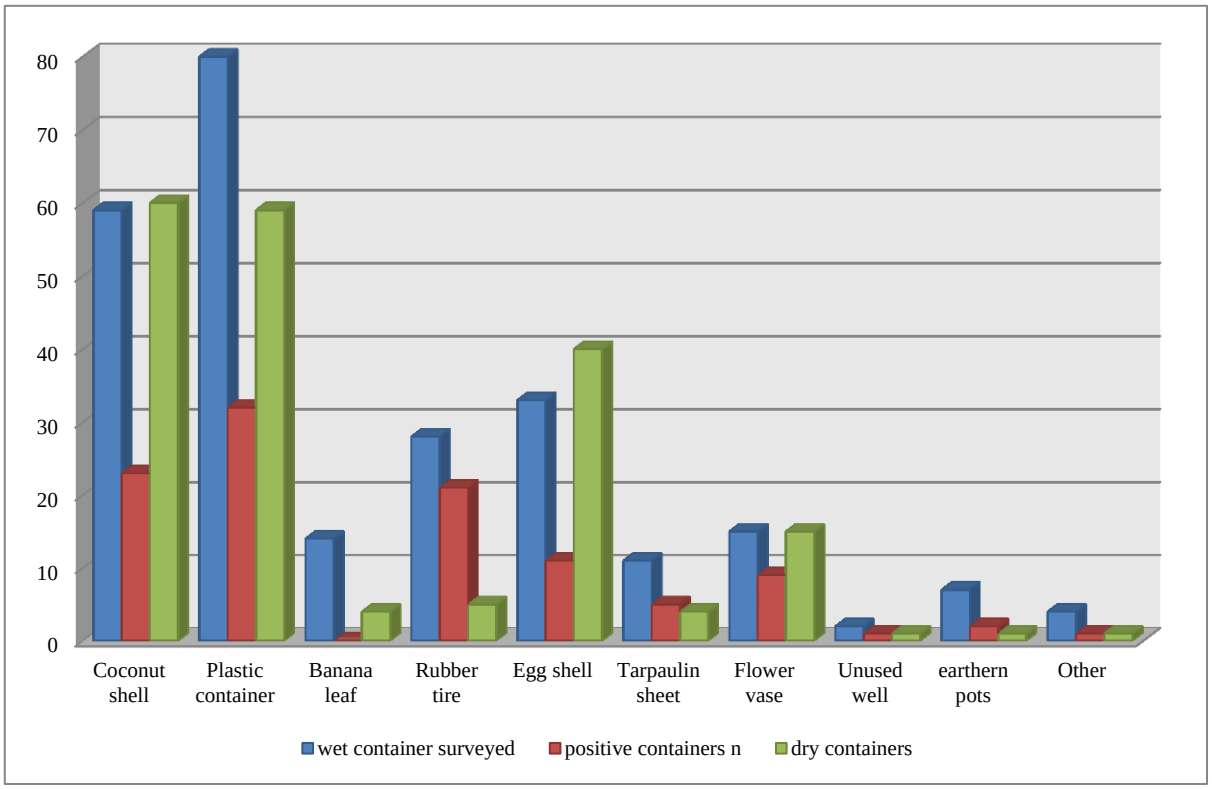

Figure 1: Graph showing type of containers surveyed in June.

Table 2: Table showing calculated indices for June.

Survey results		Larval indices		
No. of houses surveyed	80	House index	Container index	Breteau index
No. of houses positive for larvae	53			
Total number of potential containers	259	53/80×100= 66.25	114/259×100= 44	114/80×100= 143
No. of containers positive for larvae	114			

Table 3: Characteristics of *Aedes* larval collections from containers inside and around homes in September.

Container type	Wet container surveyed	Positive containers	Dry containers
Coconut shell	6	0	91
Plastic container	14	1	92
Banana leaf	0	0	0
Rubber tyre	4	0	17
Egg shell	0	0	13
Tarpaulin sheet	5	0	8
Flower vase	4	0	59
Unused well	0	0	0
Earthern pots	1	0	23
Others	2	0	10
Total	36	1	190

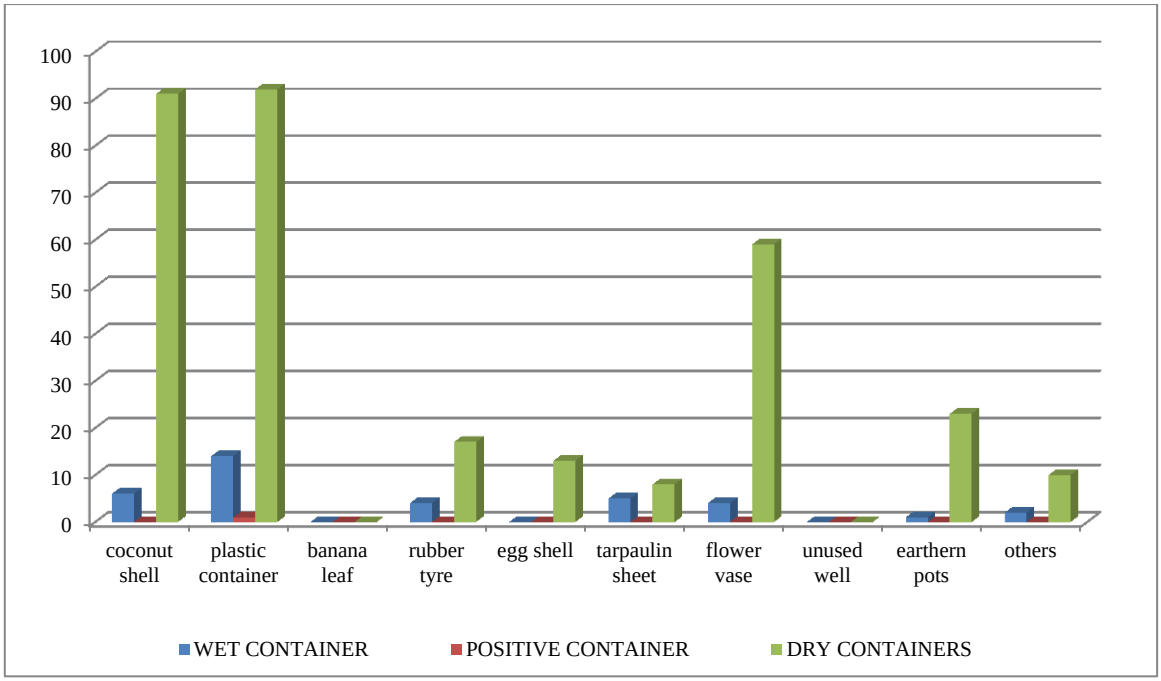

Figure 2: Graph showing containers in the September survey.

Table 4: Table showing calculated indices for September.

Survey results in September		Larval indices		
No. of houses surveyed	80	House index	Container index	Breteau index
No. of houses positive for larvae	1			
Total number of potential containers	36	1/80×100= 1.25	1/36×100= 2.77	1/80×100= 1.25
No. of containers positive for larvae	1			

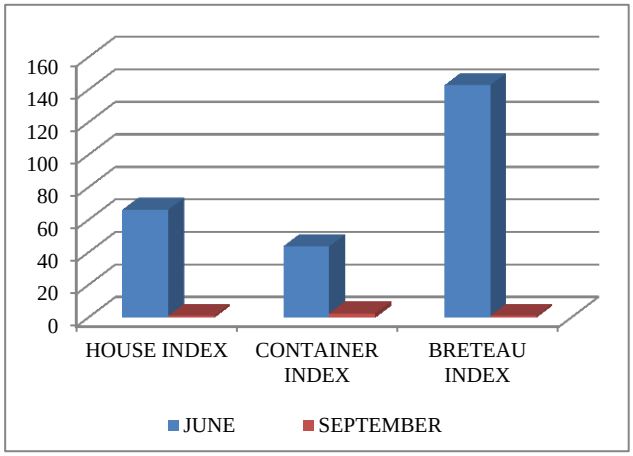

Figure 3: Indices comparison between June and September.

DISCUSSION

Our studies showed that of 80 houses surveyed there were 259 wet containers and 114 positive containers and 190 dry containers in the survey done in June The most common positive containers were plastic containers followed by coconut shell quite similar to studies done at Thiruvanthapuram.[2,3] Our studies showed a very high HI, CI and BI in the June survey. A study done at Perinthalmanna, Kerala showed HI 25.15% CI of 10.36% and BI of 73.5%. A study done at Thiruvananthapuram in 2014 showed HI of 62.8. CI 31.8 and BI and 129.8 5% in Kottapuram Panchayath.[3] Another study done at Thiruvananthapuram in 2014 showed HI of 18 and CI 13.28 BI was 16.57.[4] This was similar to a study done at Coimbatore which showed a HI of 60 CI of 30% and BI of 60.[5]

Another study done in Mumbai showed a HI and 16.7% and CI 12.5%, resp. than BI (17.24) was relatively high.[6] Another study done in Tirunelveli, Tamil Nadu showed variations the HI, CI, BI, and PI varied from 5.00–43.33, 0.87-7.50, 5.00–63.33 and 00–200.00 respectively.[7] **S**tudy done in Sumatra Indonesia also showed HI in the range of 60-76 CI 32-40 and BI from 100 to 199.[8]

In the survey done in September the House Index went down to 1.25 while the CI went down to 2.77 and the BI went down to 1.25.The marked decrease in the indices in the second survey can be attributed to three causes. Firstly was climatic changes between June and September Second was the effect of a well attended awareness class held in Konikkara village highlighting

the various indices and also stressing on the importance of a dry day. Another major factor was the unprecedented floods in Kerala which was in mid August 2018.While this flood resulted in large scale damage to houses it was followed by a massive relief and cleaning operations which also brought about a change in the indices as many containers were destroyed.

CONCLUSION

This study clearly proves that while mosquito vector density can be very high based on the various indices leading to potentially explosive disease outbreak situations. HI was 66.65, CI was 44 and BI was 143 in the month of June. HI was 1.25, CI was 2.77 and BI was 1.25. Plastic container was the most common positive container in June and September.

Recommendations

It can also be reduced through proper methods like health talks, introduction of dry days and proper cleaning of houses. It is recommended that such periodic cleaning takes place regularly on a regular basis in all Panchayath along with awareness classes.

Limitations

This study was done in a single ward of one village in a Panchayath and it may be possible that the results could be different in other villages.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kerala, Karnataka, Tamil Nadu worst hit by dengue this year. India has reported a total of 87,018 dengue cases and 151 deaths until 15 October. Available at: Livemint.com. Accessed on 3 August 2018.
2. Jesha M, Sebastian N, Haveri SP, Shabeer MI, Manu AY. 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.
3. Samuel PP, Thenmozhi V, Nagaraj J, Kumar TD, Tyagi BK. 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;51:313–9.
4. Vijayakumar K, Anish TS, Sreekala KN, Ramachandran R, Philip RR. Environmental factors of households in five districts of Kerala affected by the epidemic of Chikungunya fever in 2007. National Med J India. 2010;23(2):82-4.
5. Suganthi P, Govindaraju M, Thenmozhi V, Tyagi BK. Survey of mosquito vector abundance in and around tribal residential areas. J Entomol Zool Studies. 2014;2(6):233-9.
6. Bhat MA, Krishnamoorth K. Entomological investigation and distribution of Aedes mosquitoes in Tirunelveli, Tamil Nadu, India. Int J Curr Microbiol App Sci. 2014;3(10):253-60.
7. Kumar K, Sharma AK, Sarkar M, Chauhan A, Sharma R. Surveillance of Aedes aegypti (L.) Mosquitoes in Mumbai International Seaport (India) to Monitor Potential Global Health Risks. J Insects. 2014;2014:951015.
8. Siregar FA, Makmur T. Survey on aedes mosquito density and pattern distribution of aedes aegypti and aedes albopictus in high and low incidence districts in north sumatera province. IOP Conf. Ser: Earth Environ Sci. 2018: 130.

Cite this article as: Menon VTK, Rachel J, Saju CR, Rafi MM, Joshy VM. A study on mosquito density in rural Kerala before and after floods. Int J Community Med Public Health 2019;6:659-63.