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SHORT COMMUNICATION

An Entomological Study on Dengue Vector in the Nilgiri Hills, Tamil Nadu.

Pranab Jyoti Bhuyan*, Joghee Hiriyan, Anjan Jyoti Nath*****

Abstract:

Background & Objectives: The surrounding areas of Nilgiri hills in Tamil Nadu, particularly some parts of Kerala state were often experiencing the dengue infection and Aedes albopictus was considered as the lone epidemic vector.The objectives of the study were- i) To find out the density and distribution (time, place) of Aedes mosquito in the Nilgiri hills,Tamil Nadu. ii) To study the different stages of Aedes mosquito life cycle. *Methods:* The Conventional Method Survey and Ovitrap technique were followed. The eggs and larvae were brought to the entomology laboratory and reared to adult. Larvae and adults were identified using standard keys by the entomologist /epidemiologist.

Results: The Aedes mosquito was found (92.05%), out of which Aedes albopictus (70.40%) and Aedes aegypti (2.81%). The major breeding habitats were cemetery vases (74.5%) and waste tyres (61.5%) . The ovi trap index and the mean egg density were comparatively higher during June – August. Poor survival of larvae and prolonged mosquito life cycle of Aedes mosquito had been observed in the study.

Summary: Aedes albopictus was the dominant species, mostly bred in cemetery vases and waste tyres, but had poor survival of larvae and prolonged mosquito life cycle.

*** Public Health Specialist.**
Urban Health Unit & Training Centre,Chetla.
All India Institute of Hygiene & Public Health, Kolkata
**** Retired Senior Scientist, CRME, Madurai**
NCDC, Coonoor.
***** Veterinary Specialist.**
Pasteur Institute of Coonoor
Corresponding author: Dr Pranab Jyoti Bhuyan
Mail id-pranabjyoti333@rediffmail.com

Conclusion: Low density of Aedes mosquito population was observed due to prolongd life cycle of Aedes mosquito.

Key words: Aedes, Nilgiri hills. Ovi trap index, Mean egg density

Introduction

Dengue is an arboviral disease prevalent in the tropical and subtropical regions of the world transmitted to human by the bites of vectors *Aedes aegypti* and *Aedes albopictus* .The incidence of dengue is largely dependent on vector populations and the frequency of contact between the vectors and susceptible human hosts, reflected by a positive correlation of *Aedes* abundance and prevalence with dengue.[1-3]

Though dengue outbreaks had previously been reported from urban areas, in the recent past outbreaks had also been reported from semi-urban and rural areas of North India,[4] South India,[5]Western India,[6]and West Bengal.[7]

The Nilgiri hills of Tamil Nadu bordering Kerala and Karnataka states in the Western Ghats lie between Latitude 11^0 10^1 N and Longitude 76^0 5^1 E and situated at altitude ranging from 200 to 2600 Meters above mean sea level (MSL). As of 2011, the Nilgiri district had a population of 735,394 with a sex-ratio of 1,042 females for every 1,000 males. It comprised six taluks; viz., Ootacamund, Kundah, Coonoor, Kotagiri, Gudalur and Pandalur. The district regularly received rain during both the Southwest Monsoon and the Northeast Monsoon. The entire Gudalur and Pandalur, Kundah taluks and parts of Udhagamandalam taluk got rain from the southwest monsoon while part of Udhagamandalam taluk and the entire Coonoor and Kotagiri taluks got rains of the northeast monsoon. The prevailing temperature was 5-28^0 C.

The Nilgiris in Western Ghats having the richest mosquito fauna but almost free from mosquito borne diseases. After the DDT era, malaria incidence was declined and the vector mosquito (*An. fluviatilis*) is considered extinct species from Nilgiris.[8] But the surrounding areas of Nilgiris, particularly some parts of Kerala state are often experiencing the dengue incidence and *Aedes alboptictus* is considered as the lone epidemic vector of dengue infection in these areas.[9] There were few imported cases of dengue have been reported in recent time in surrounding area of Coonoor taluk of Nilgiris. Being a tourist place, a lot of floating population visits this place throughout the year. The tourist influx and the change of climatic condition may be considered as the risk factor for dengue transmission. Hence a study on Aedes mosquito

was carried out in Coonoor, Ooty, Kotagiri and Gudalur taluks of Nilgiri district during May 2010 – November 2012 with the objectives: i) To find out the density and distribution (time, place) of Aedes mosquito . ii) To study the different stages of the Aedes mosquito life cycle.

Materials and Methods

During May 2010 to November 2012, a study on dengue vector was carried out in six urban, eighteen semi-urban and three rural areas of Coonoor, Ooty, Kotagiri and Gudalur taluks of Nilgiri hills as per convenience. This preliminary study was conducted in the above areas which were considered to be potential source of dengue vector breeding. All the probable breeding habitats around the human habitations were examined every month and the larvae were collected by the Conventional Survey Method10 (in which several larvae were collected from each pot). The collected larvae were brought to the entomological laboratory of NCDC,Coonoor. The larvae were reared to adult for identification of the species. This type of survey had been used to find out predominantly the types of Aedes mosquito breeding in different containers. The number of mosquitoes collected other than Aedes were not considered in details in this study.

The types of habitats were categorized in three groups - i) Group I - Natural habitats (Tree hole,Bamboo stump,Rock pool,Mud pool,Spring pool) ii) Group II - Artificial containers in use (Cement container/tank, Plastic drum, Iron drum, Sintex tank) and iii) Group III- Discarded containers (Plastic container,Tin container,Coconut shell,Grinding stone,Abandoned boat,Waste tyre,Bamboo fence,Cemetery vase,Bottle, Mud pot,Flower pot, Cement cavity).

In addition, ovi traps (i.e.traps collect the eggs laid by the mosquito which develop into larva, pupa and adult which may be used as a sensitive surveillance tool) were placed monthly around residential areas for more than 48 hrs for ovi positional to monitor the seasonal density by the ovi trap index (No.of ovitrap positive /Total No. of ovitrap subjected for surveillance X 100) and the mean egg density(Average No. of eggs for positive traps). The oviposition technique (i.e Collection of eggs from artificial oviposition sites) has frequently been used in surveillance of Aedes aegypti and Aedes albopictus.[10]

The ovi trap samples were brought to the laboratory and the eggs in the ovi trap paddle were counted. After 3 days of conditioning, the eggs were allowed to hatch by flooding the paddle,

reared to adult and the species was identified following the principal keys of Christopherrs and Barraud [11].

Results

Altogether 19 species of mosquito belonging to six genera namely *Aedes* (92.05%), *Anopheles* (0.83%), *Armigeres* (3.44%), *Culex* (3.08%), *Hezmania* (0.55%) and *Toxorhynchites* (0.04%)were recorded..*Aedes albopictus* was found to be the dominant species(70.4%) with minimal evidence of *Ae.aegypti* 2.8% (Table-I).

It had been observed that group III habitats ie. discarded containers were the major breeding site for *Aedes* (71.4%) followed by group II(18.2%) and group I (10.4%)habitats (Fig.1). Breeding preference rates were high in cemetery vases (74.5%) and waste tyres (61.5%) (Fig.2).

The results showed that both the ovi trap index and the mean egg density were comparatively higher during June to August(Fig.3). The different stages of Aedes mosquito cycle were a) low egg hatchability (25%) b) prolonged period of larval development (25-30 days) c) poor survival in larval stage (60%).

Discussion

As per previous reports, Ae.albopictus was predominantly prevalent in the wooded area in Nilgiris.[12] While *Aedes aegypti* was commonly found inside houses, *Aedes albopictus* was more common in outside areas, in open spaces with shaded vegetation and suitable breeding sites such as car tyres and garbage dumps.[13].*Ae. albopictus* was more likely to be found in natural containers or outdoor man-made habitats containing a greater amount of organic debris.[14]

In this study, *Ae.albopictus* (70.4%) was the dominant species but *Aedes aegypti* (2.8%) was recorded minimally and were mostly found in waste tyres.

This was the first time *Ae.albopictus* has been recorded in urban situation in the Nilgiris. *Aedes albopictus* propagated from forest fringe to semi urban areas & urban areas through cemetery vases (74.5%) and waste tyres (61.5%.) respectively. It had been understood that *Ae.albopictus*, a sylvatic species was fast approaching its establishment nearer to human habitations. The

mean egg density and ovitrap indices were comparatively higher in monsoon/postmonsoon season (i.e June to August).

.Under favourable conditions of temperature and food supply the life cycle from the egg to adult is completed in 7-10 days.[15]

In this study, poor survival of larvae and prolonged mosquito cycle of Aedes mosquito in the Nilgiris had been observed . There had not been any indigenous dengue cases in the Nilgiris during the study period.

Conclusion

Dengue cases had not been reported so far in the Nilgiris for the least abundance of Aedes mosquito population due to prolonged life cycle. The probable reason for prolonged life cycle could be that the Nilgiris is a high altitude area. But there would be a risk of emergence of dengue fever at higher altitudes in the global warming scenarios. So fever and vector surveillance through Primary Health Care network should be continued in the Nilgiris.

References

1. Tewari SC, Thenmozhi V, Katholi CR, Manavalan R, Munirathinam A, Gajanana A. Dengue vector prevalence and virus infection in a rural area in south India. Trop Med Int Health 2004; 9 : 499-507.

2. Mahadev PVM, Fulmali PV, Mishra AC. A preliminary study of multilevel geographic distribution and prevalence of Aedes aegypti (Diptera: Culicidae) in the state of Goa, India. Indian J Med Res 2004; 120 : 173-82.

3. Chadee DD. Dengue cases and Aedes aegypti indices in Trinidad, West Indies. Acta Trop 2009; 112 : 174-80.

4. Kumar A, Sharma SK, Padbidri VS, Thakare JP, Jain DC, Datta KK. An outbreak of dengue fever in rural areas of northern India. J Commun Dis. 2001;33(4):274–81.

5. Paramasivan R, Dhananjeyan KJ, Leo SV, Muniara M, Thenmozhi V, Rajendran R et al. Dengue fever caused by dengue virus serotype – 3 (subtype-III) in a rural area of Madurai district, Tamil Nadu. Indian J Med Res. 2010;132:339–342

6. Joshi PT, Pandya AP, Anjan JK. Epidemiological and entomological investigation dengue outbreak area of Ahmedabad district. J Commun Dis. 2000;32 (1):22–27.

7. Hati AK. Studies on dengue and dengue haemorrhagic fever (DHF) in West Bengal State, India. J. Commun. Dis. 2006;38 (2):124–129.

8. Tewari SC, Joghee H, Reuben R.: Survey of the Anophelene fauna of the western ghats in Tamil Nadu, India. Ind J Malariol.1987, 24: 21-28.

9. Tyagi BK, Joghee H, Samuel P,Tewari SC, Paramasivan R. Dengue in Kerala: A critical review. Ind Coun Med Res Bull. 2006, 36:13 – 22.

10. Service MW. Mosquito Ecology. Field Sampling Method", 2nd edition, Vol 1,1995.

11. Barraud PJ. The Fauna of British India: Diptera, vol. V, Taylor and Francis, London, 1934.

12. Tewari SC, Joghee H , Ayanar K, A. Munirathinam , Venkatesh A., Reuben R. .An annotated checklist of Indian mosquito species. CRME Mosquito Museum.2007, 1: 1 – 124.

13. Saleeza SNR, Norma-Rashid Y, Sofian-Azirun M. Mosquitoes Larval Breeding Habitat in Urban and Suburban Areas,Peninsular Malaysia. International Journal of Biology,Biomolecular,Agricultural,Food and Biotechnological Engineering.2011,5(10)599-603.

14. Rattanarithikul R, Panthusiri P. Illustrated keys to the medically important mosquitoes of Thailand.Southeast Asian J Trop Med PublicHealth 1994;25(suppl1): 1-66.

15. Park K, Park's Textbook of Preventive & Social Medicine, Environment and Health, 23rd edition, Banarashi Das Bhanot Publishers, 2015.

Figure 1: Habitat wise positivity rate of Aedes mosquito.

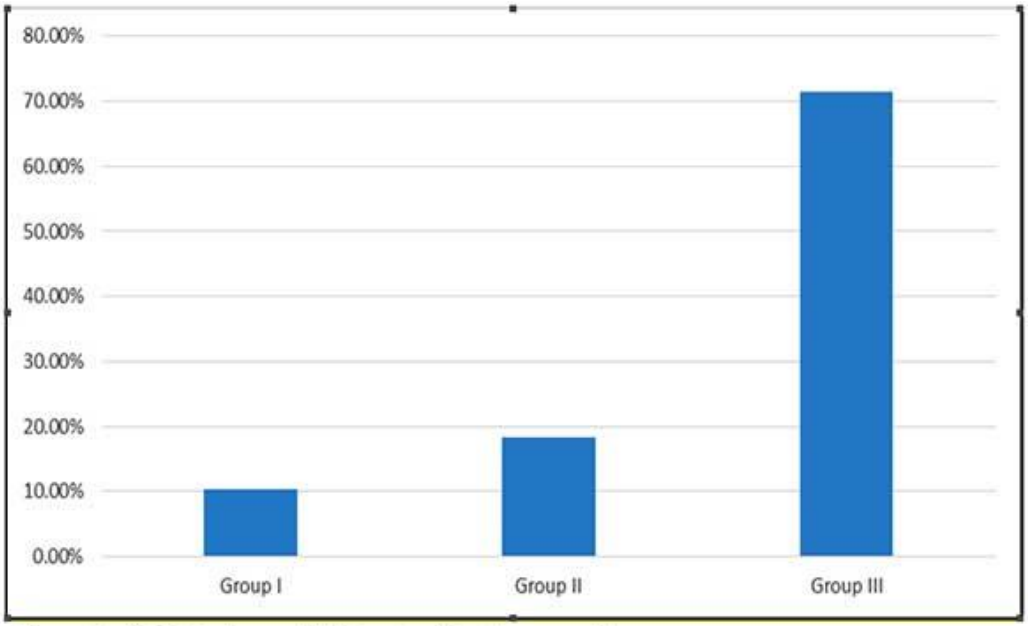

Figure 1: Habitat wise positivity rate of Aedes mosquito.

Table 1: List of mosquito species recorded.

Species recorded	Larval collection.	Egg collection.	Total.	Percentage. (%).
Aedes aegypti (Linnaeus)	71	-	71	2.81
Aedes albolateralis (Theobald)	15	-	15	0.59
Aedes albopictus (Skuse)	960	820	1780	70.40
Aedes harveyi (Barraud)	75	227	302	11.90
Aedes pseudotaeniatus (Giles)	160	-	160	6.33
Anopheles anularis (Van der Wulp)	5	-	5	0.20
Anopheles culicifacis (Giles)	2	-	2	0.08
Anopheles jamesii (Doenitz)	1	-	1	0.04
Anopheles stephensi (Liston)	3	-	3	0.12
Anopheles subpictus (Grassi)	3	-	3	0.12
Anopheles vagus (Doenitz)	7	-	7	0.28
Armegeres subalbatus (Coquillett)	75	-	75	2.97
Armigeres kutchingensis (Edwards)	12	-	12	0.48
Culex mimulus (Edwards)	6	-	6	0.24
Culex pallidothorax (Theobald)	20	-	20	0.79
Culex quinquefasciatus (Say)	50	-	50	1.98
Culex raptor (Edwards)	2	-	2	0.08
Heizmannia indica (Theobald)	14	-	14	0.55
Toxorhynchitis spp new	1	-	1	0.04

Fig. 2. Breeding preference rate of Aedes mosquito.

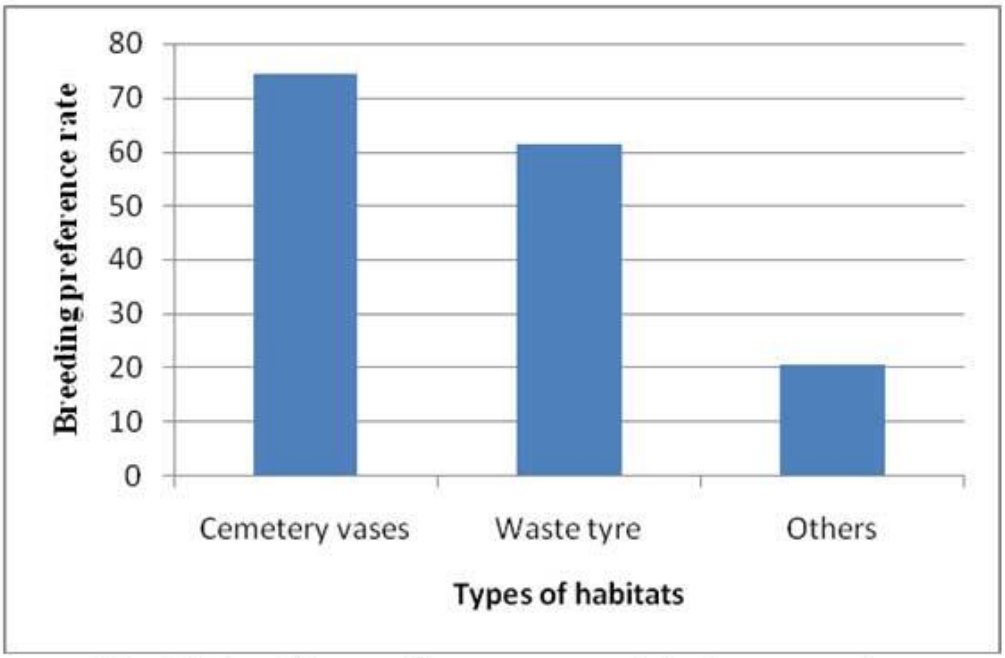

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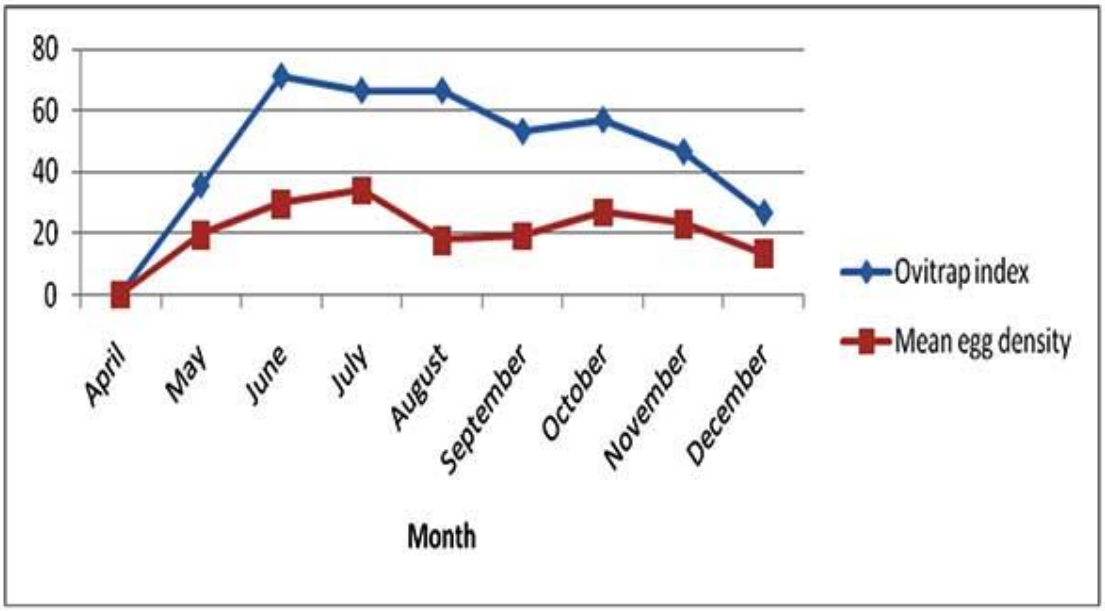
Fig. 3. Seasonal density of Aedes mosquito.



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