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Research Article

PREVALENCE OF *AEDES AEGYPTI* BASED ON SEASONAL DISTRIBUTION IN ANNAMALAI NAGAR, CHIDAMBARAM, TAMIL NADU, INDIA

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ABSTRACT

The aim of this present study is to evaluate the seasonal variation of *Aedes aegypti*, the primary vector for Dengue virus, in two different localities. They are Kothankudikuppam and Tiruvetkalam in Annamalai Nagar (Town Panchayt) Chidambaram (Taluk), Cuddalore (District) Tamil Nadu, India. In this experiment, the prevalence of *Ae. aegypti* was detected by three types entomological indices such as house index (HI), breteau index (BI) and container index (CI). Results revealed that the highest HI and BI were recorded in Kothankudikuppam, during the pre-monsoon season (July-September, 2016) whereas highest CI was notices in pre monsoon of Tiruvetkalam. The maximum rainfall for the year 2016 also occurs during the same pre monsoon of our results when comparing to other seasons. The results obtained shows that necessary control measure can be implemented in these selected localities during the prevalence season either by individuals or the government to curb the population of *Ae. aegypti* and in turn reduce the dengue incidences in the same localities.

Keywords: *Aedes aegypti*, Dengue, Seasonal prevalence, Entomological indices.

INTRODUCTION

Dengue is a mosquito-borne viral disease that has rapidly spread in all over the world. Dengue virus is transmitted by female mosquitoes *Aedes aegypti* and, to a lesser extent, *Aedes albopictus*. According to the World Health Organization, worldwide there are about 390 million people suffering from dengue fever (Dengue and severe dengue, 2017). In India, around 1,29,166 people are suffering from dengue, and in Tamil Nadu, 2531 people are suffering from dengue (NVBDCP, 2017).

The abundance of mosquitoes is strongly influenced by density-dependent patterns on seasonal and climatic variations. Changes in climate may accelerate (or) delay in the development, availability of breeding sites and food resources of mosquitoes (Franklin and Whelan, 2009). The environment around our house has a great impact on vector entry and its prevalence. The changes inhuman ecology and its interaction with environment had led to an increase in a wide number of new infectious diseases. The changes in temperature and rainfall along with other parameter have a direct influence on breeding and feeding behaviour of many pathogens. Thus vector-mediated transmission of pathogens is directly influenced by seasonality (Dar and Wani, 2010).

Ae. aegypti is a principal vector for dengue fever, showing endophilic and endophagic behaviour, which can be found throughout the residential environment, that is directly implicated in the successful transmission of the virus (Lambrechtsand Failloux, 2012), Previously Senthamarai Selvan and Jebanesan (2014) reported the abundance of *Ae. aegypti* in Chidambaram and their surrounding areas (Senthamarai Selvan and Jebanesan, 2014). Hence, the aim of the present study was to

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determine the seasonal prevalence of *Ae. aegypti* during 2016 for major four seasons of the year such as post monsoon, summer, pre monsoon and monsoon at Tiruvetkalam, Kothankudikuppam, Annamalai Nagar and Chidambaram (Tamil Nadu, India).

MATERIALS AND METHODS

Study sites

This study was conducted from January 2016 to December 2016 at Tiruvetkalamand Kothankudikuppam, Annamali Nagar, Chidambaram, Tamil Nadu and India. These study places, Tiruvetkalamand Kothankudikuppam are located at LAT: N 11°23'35.9 & LONG: E 79°43'10.7 and LAT: N 11°23'38.8 & LONG: E 79°42'26.4, respectively. In these study areas, four distinct seasons are observed and the field survey was made during these seasons. The seasons are (i) Post monsoon season (January-March), (ii) Summer season (April-June), (iii) Pre monsoon season (July-September) and (iv) Monsoon season (October December). The rainfall data of Chidambaram station was collected from Indian Meteorological Department, Government of India.

Criteria for Selection

In 2014, a high number of *Ae. aegypti* was observed in Chidambaram and their surrounding places (Senthamarai Selvan and Jebanesan, 2014). Hence, this study aimed to investigate the prevalence of *Ae. aegypti* in four different seasons in the selected areas, i.e., Tiurvetkalam and Kothankudikuppam.

Entomological Surveillance and Data Analysis

Entomological Surveillance for dengue vector *Ae. aegypti* was carried out in the study areas (a door-to-door survey) for the year 2016. Three entomological indices: House Index (HI), Container Index (CI), and Breteau Index (BI) were analysed as per standard WHO guidelines.

$$\text{House Index (HI)} = \frac{\text{Number of house infected}}{\text{number of house inspected}} \times 100$$

$$\text{Breteau Index } ((\text{BI})) = \frac{\text{Number of positive containers}}{\text{number of house inspected}} \times 100$$

$$\text{Container Index } ((\text{CI})) = \frac{\text{Number of positive containers}}{\text{number of house inspected}} \times 100$$

Result and Discussion

In Tiruvetkalam, a total number of 966 houses were presented as the breeding sites of *Ae. Aegypti* among the 212 houses visited in the entire study period (Table 1). A total number of 4,562 containers were observed in Tiruvetkalam, among them 524 containers were positive containers. The number of positive houses was higher in pre monsoon compare to other seasons and also it shows the highest HI (35.72), CI (15.98) and BI (78.38) when compared to other seasons.

In Kothankudikuppam, a total number of 805 houses were presented as the breeding sites of *Ae. Aegypti* among the 186 house visited in the entire study period (Table 2). During the January to December 2016, a total number of 4,828 containers were searched in Kothankudikuppam, in which 481 containers observed as positive containers. In the pre monsoon, an abundance of positive houses was observed and also it shows the highest HI (36.99), CI (13.58) and BI (84.31) were noticed in pre monsoon when compared to other seasons. As per the obtained results, the highest positive houses for *Ae. aegypti*, HI, and BI were recorded in Kothankudikuppam but the highest CI was observed in Tiruvetkalam during the pre-monsoon season (July-September, 2016), followed by monsoon, summer and post-monsoon.

Figure 1 shows the rainfall data during 2016 (January to December). Among the four seasons, pre monsoon was showing more rainfall, followed by monsoon, summer and post-monsoon.

Ae. Aegypti larvae maybe found in both natural and artificial containers in and around the house (Katyal *et al*., 1997). Commonly, water containers kept open that were rarely cleaned, and containers that remain undisturbed for most of the time, result in the high breeding of *Ae. aegypti* (Wilson and Sevarkodiyone, 2013).Usually during the high rainfall season, the breeding population of *Ae. aegypti* may increase. BI is more when compared to all other indices. BI is considered to be the best risk indicator of dengue outbreaks, as it combines information on containers and houses (Wilson and Sevarkodiyone, 2013). In the present study, during the pre monsoon, the highest level of the HI and BI in Kothankudikuppam was observed whereas CI index abundance in Tiruvetkalam compared to Kothankudikuppam. Among all the index parameters, BI was found to be higher compared to other indexes, which might be the reasons for sudden spurt of dengue and chikungunya cases in the study areas. In the present study, the prevalence of mosquito was also found to be higher in Kothankudikuppam when compared to Tiruvetkalam due to improper maintaining of environment in Kothankudikuppam. These above observed results may be due to higher rainfall and higher number of opened containers in Kothankudikuppam study area. Previously Singh *et al.* (2008) reported that density of vector was low during the dry season and found highest during the wet season. The prevalence of the mosquito population obtained in the present study was found to be in compliance with the findings of Singh *et al.* (2008).

Table 1. Prevalence of *Ae. aegypti* mosquito in the different seasons in Tiruvetkalam from the month of January to December 2016.

Season	Months	Number of house hold	Number of positive house hold	Number of containers	Number of positive containers	House Index (Hl)	Breteau Index (BI)	Container Index (CI)
Post monsoon	January	87	9	386	48	10.34	55.17	12.44
	February	83	7	370	24	8.43	28.92	6.49
	March	81	5	381	17	6.17	20.99	4.46
	Sub-Total	251	21	1137	89	8.32	35.03	7.79
Summer	April	86	6	393	13	6.98	15.12	3.31
	May	78	16	398	46	20.51	58.97	11.56
	June	79	20	394	53	25.32	67.09	13.45
	Sub-Total	243	42	1185	112	17.60	47.06	9.44
Pre monsoon	July	84	24	387	62	28.57	73.81	16.02
	August	81	33	405	65	40.74	80.25	16.05
	September	74	28	378	60	37.84	81.08	15.87
	Sub-Total	239	85	1170	187	35.72	78.38	15.98
Monsoon	October	75	21	300	56	28.00	74.67	18.67
	November	76	25	391	43	32.89	56.58	11.00
	December	82	18	379	37	21.95	45.12	9.76
	Sub-Total	233	64	1070	136	27.62	58.79	13.14
	Total	966	212	4562	524	22.31	54.81	11.59

Table 2. Prevalence of *Ae. aegypti* mosquito in the different seasons in Kothankudikuppam from the month of January to December 2016.

Season	Months	Number of house hold	Number of positive house hold	Number of containers	Number of positive containers	House Index (Hl)	Breteau Index (BI)	Container Index (CI)
Post monsoon	January	75	11	405	36	14.67	48.00	8.89
	February	60	5	410	30	8.33	50.00	7.32
	March	66	4	381	17	6.06	25.76	4.46
	Sub-Total	201	20	1196	83	9.69	41.25	6.89
Summer	April	68	5	411	12	7.35	17.65	2.92
	May	65	12	406	39	18.46	60.00	9.61
	June	72	17	399	48	23.61	66.67	12.03
	Sub-Total	205	34	1216	99	16.48	48.10	8.19
Pre monsoon	July	69	21	430	58	30.43	84.06	13.49
	August	71	25	415	60	35.21	84.51	14.46
	September	64	29	422	54	45.31	84.38	12.80
	Sub-Total	204	75	1267	172	36.99	84.31	13.58
Monsoon	October	62	23	335	44	37.10	70.97	13.13
	November	66	19	402	41	28.79	62.12	10.20
	December	67	15	412	42	22.39	62.69	10.19
	Sub-Total	195	57	1149	127	29.42	65.26	11.18
	Total	805	186	4828	481	23.14	59.73	9.96

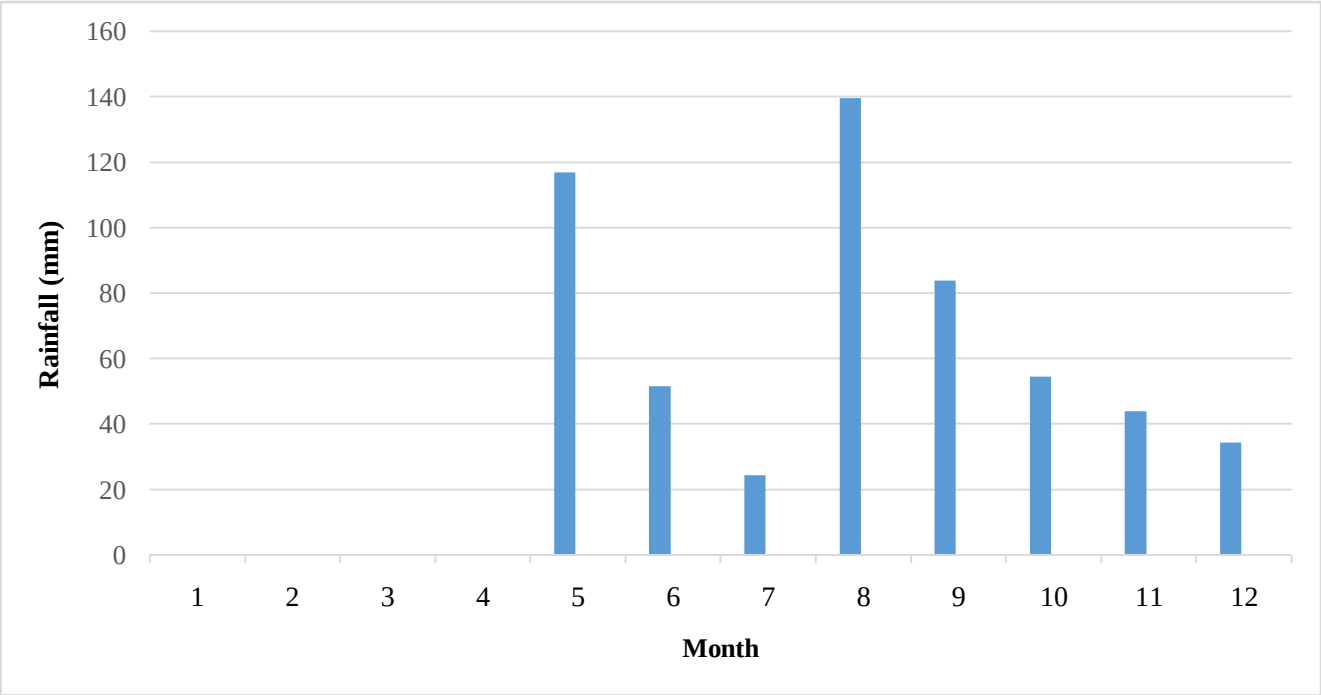

Figure 1. Annual rainfall data during the month of January to December 2016, Chidambaram Station.

CONCLUSION

The present findings provide an insight on the distribution of *Ae. aegypti* in urban areas, i.e., Kothankudikuppam and Tiruvetkalam. The urban settings could benefit from vector control strategies, which can be implemented based on the data availed from the one-year study (January 2016-December 2016). The urban areas are the targeted area for mosquito breeding. One or two-day bottom-up programme for every week, and awareness regarding proper water management practices to the members of the urban community are given to minimize the breeding potential of *Ae. aegypti*. These initiatives would not only help in reducing the incidences of dengue and other vector-borne diseases but also uplift the overall health status of urban community.

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