Container survey of Aedes breeding sites in a Rural Health Training Centre campus in South West of Delhi

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Abstract

Introduction: Aedes mosquito is one of the mosquito species that are most studied because of their potential as vector of dengue and such information can be used to design an effective control measures for campuses.

Objective: To study the Aedes breeding sites using the container survey method and to recommend control measures in controlling the Aedes breeding sites.

Methodology: The container survey study was carried out in the campus of a Rural health training centre campus which spreads over 30 acres with rich plantation and trees all around. All natural and artificial containers in the vicinity of the campus and reachable tree holes were examined during the survey. The number, type and water condition of containers that may serve as potential breeding sites were examined and recorded. Larvae collection was carried out indoors (interior of the building) and outdoors (outside of the building but confined to its immediate vicinity within the campus limits) by using pre-designed questionnaire. Larva identification was done by motility Pattern.

Result: The survey included study of 359 common breeding sites such as cooler, Plastic storage containers, unused plastic waste, cement tanks, syntax tanks, earthen pots, plant pots, solid waste and others in 13 sites and 3 out of the 359 containers contained Aedes larvae.

Conclusion: The RHTC management should Practise Integrated Vector Management (IVM) recommended by WHO in the campus. An IVM approach takes into account the available health infrastructure and resources, and integrates all available and effective measures, whether chemical, biological or environmental.

Keywords: Aedes, Larva, Potential breeding site, Integrated vector management, Larval survey

Introduction

Dengue is a viral disease caused by RNA virus of Flaviviridae family. The global incidence of dengue is reportedly increasing with >2.5 billion people living at risk mostly in urban and sub-urban areas of tropical and sub-tropical countries with estimated 50–100 million cases annually (WHO, 2014). In India, the burden of Dengue was 1,11,896 cases and 227 deaths in 2016¹. The total number of cases has almost doubled since 2012¹. The disease is transmitted

mainly by the infective bite of *Aedes aegypti* mosquito and another important vector involved is *Aedes albopictus*. Disease develops 5-6 days after being bitten by an infective mosquito. The favoured breeding places of the vector include-desert coolers, drums, jars, pots, buckets, flower vases, plant saucers, tanks, cisterns, bottles, tins, tyres, roof gutters, refrigerator drip pans, cement blocks, cemetery urns, bamboo stumps, coconut shells, tree holes and many more places where rainwater collects or is stored².

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Disease is prevalent throughout India in most of the metropolitan cities and towns³. Containers are probably the most important factor determining the breeding of *Aedes* spp. since artificial containers are the major larval habitats in and near human habitation⁴. The life cycle of mosquito is completed by 7-10 days⁵. The vector can fly only upto a limited range of 400m, but can spread over vast distances mechanically in various types of vehicles used by man⁶. There are many factors that have contributed to this emergence of dengue, but the principal drivers are urbanization, globalization and lack of effective mosquito control. Mosquito larvae go through four developmental stages called instars, usually referred to as 1st to 4th instar larvae, which eventually turn into pupae. In *Aedes* breeding, when the larval and pupal count combined value exceeds >5/dip and if >25% of all samples are positive for immature mosquitoes, that is the threshold for control action⁷.

Larval sampling should be systematic. It should take into account temporal and spatial coverage. Larval sampling sites should include either fixed or random sampling (or both) depending upon whether the habitats are permanent or temporary in nature^{8,9,10}. However when located near human inhabitation, larval counts of >2 larvae/dip in manmade containers or natural habitats might warrant control. For *Aedes*, a House Index of >5% and Breteau Index of >20% should alarm and warrant immediate control action at PoE. Various threshold levels have been suggested for native mosquitoes based on different levels of incidence and types of traps. In Delhi, *Aedes* mosquito is one of the mosquito species that are most studied because of their potential as vector of dengue and the present survey was therefore conducted to determine the container breeding preferences of mosquitoes by larval survey in the campus of the RHTC, Najafgarh, Delhi. Such information can be used to design an effective control measures for campuses. With this background our objective was to study the *Aedes*

breeding sites using the container survey method and to recommend control measures in controlling the *Aedes* breeding sites.

Methodology

The container survey study was carried out from 19 October 2017 to 25 October 2017, in the campus of Rural health training centre campus in south west Delhi at Najafgarh, which spreads over 30 acres with rich plantation and trees all around.

All natural and artificial containers in the vicinity of the campus and reachable tree holes were examined during the survey. The number, type and water condition of containers that may serve as potential breeding sites were examined and recorded. Larvae collection was carried out indoors (interior of the building) and outdoors (outside of the building but confined to its immediate vicinity within the campus limits) by using pre-designed questionnaire. Larva identification was done by motility Pattern.

The survey areas included Coolers, plastic storage containers, unused plastic waste, cement and syntax tanks, earthen pots, solid waste and others was examined.

Results

The survey included study of 359 common breeding sites such as cooler, Plastic storage containers, unused plastic waste, cement tanks, syntax tanks, earthen pots, plant pots, solid waste and others in 13 sites such as the New Director office, Cold chain storage building, MCD Malaria office, Old Director office, Staff Quarters 1, Staff Quarters 2, ANM Hostel, ANM School, Auditorium, ANC OPD, DOTS Centre, OPD Building, Metro construction site within the campus premises and 3 out of the 359 containers contained *Aedes* larvae as shown in Table 1.

Table 1. Premises wise distribution of searched & Larval positive containers

Premises	Cooler		Plastic storage		Plastic unused		Cement tanks		Syntax tanks		Earthen (MP/BP)		Planted Pot (C/E/P)		Solid Waste		Others	
	Search	+ve	Search	+ve	Search	+ve	Search	+ve	Search	+ve	Search	+ve	Search	+ve	Search	+ve	Search	+ve
New Director office	0	0	3	1	2	0	0	0	0	0	0	0	0	0	4	0	4	0
Cold chain storage building	4	0	2	0	12	0	0	0	0	0	0	0	4	0	10	0	4	0
MCD Malaria office	2	0	2	0	2	0	0	0	0	0	2	0	4	0	3	0	1	0
Director office	6	0	0	0	10	0	0	0	2	0	1	0	13	0	0	0	2	0
Staff Quarters 1	4	0	3	0	42	0	1	0	2	0	10	0	14	0	22	0	12	0
Staff Quarters 2	2	0	12	1	8	0	0	0	2	0	3	0	4	0	22	0	10	1
ANM Hostel	12	1	6	0	5	0	0	0	8	0	0	0	0	0	2	0	2	0
ANM School	0	0	4	0	0	0	0	0	0	0	0	0	19	0	0	0	1	0
Auditorium	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANC OPD	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
DOTS Centre	1	0	0	0	2	0	0	0	0	0	0	0	4	0	0	0	1	1
OPD Building	1	0	0	0	6	0	0	0	0	0	0	0	0	0	1	0	1	0
Metro construction site	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

* Mud Plot, BP = Bird Pot, C = Cement pot, E = Earthen pot, P = Plastic pot; Solid waste includes tyres, unused cup, broken glasses

Figure 1.Larvae Positive containers

Figure 2.Some Potential breeding sites

Conclusion

The study has clearly shown again that artificial man-made containers are the potential breeding site for *Aedes* larvae when water collects in them. These containers as already said are man-made and each individual must take up the responsibility by avoiding the same. Hence, Integrated vector management along with Health education of the masses will help in eliminating vector borne diseases. The elimination of artificial and natural containers or alteration of breeding sites in and around living/working areas of RHTC campuses, should be taken into consideration since the presence of water in containers is probably the most important factor in determining the breeding of mosquitoes, especially *Aedes*. Container management should be taken up as a priority by the campus community.

The RHTC management should Practise Integrated Vector Management (IVM) recommended by WHO in the campus. An IVM approach takes into account the available health infrastructure and resources, and integrates all available and effective measures, whether chemical, biological or environmental. IVM also encourages effective coordination of the control activities of all sectors that have an impact on vector-borne diseases, including health, water, and solid waste and sewage disposal. An IVM approach is evidence-based and its essential feature is the development of capacity to generate local data on disease epidemiology and vector ecology. IVM integrates all available resources to achieve maximum impact on vector-borne diseases. However, integration of IVM at the recommended by WHO in the campus. An IVM approach takes into account the available health infrastructure and resources, and integrates all available and effective measures, whether chemical, biological or environmental. IVM also encourages effective coordination of the control activities of all sectors that have an impact on vector-borne diseases, including health, water, and solid waste and sewage disposal. An IVM approach is evidence-based and its essential feature is the development of capacity to generate local data on disease epidemiology and vector ecology. IVM integrates all available resources to achieve maximum impact on vector-borne diseases. However, integration of IVM at the level required is not a simple task. Commitment is needed from

the RHTC management to integrate IVM within the campus and local health authorities to coordinate their efforts.

Conflict of Interest: None

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