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Preliminary studies on the density of mosquito and trends of larval indices besides area of Mul Talav, Ta. Mul, Maharashtra District Chandrapur

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Abstract
Maharashtra is highly infested by one of the most important arboviral disease i.e. dengue. Bionomics of the mosquitoes play a vital role in the development of their control measures. Outbreak of mosquito Borne diseases can be predicted by using entomological surveillance method and larval indices. Creating mosquito free and safe residential area needs creating management strategies and people cooperation. Hence the present investigation was carried to calculate the standardized larval indices tendency and the density of mosquito to determine the major breeding sources besides area of Mul talav, Tahsil Mul, District Chandrapur, Maharashtra.
The study sites were personally visited both for indoor and outdoor water holding containers to identify the presence of mosquito's larvae over a period of five months. The survey was conducted using health education and Waste prevention method. The most common species of the mosquitoes found during the study were *Aedes egypti* and *Aedes albopictus.* The larval indices like House index (HI), Container index (CI) Breteau index (BI) were calculated. Outcome of the study indicate that all the entomological indices were found to be above critical level during these months i.e. from August (CI=28.18%, HI= 31.58% and BI= 107.86%) to September (CI=26.12%, HI= 28.57% and BI=90.91%) but there is gradual decrease in mosquito density during the month of December (CI=18%, HI=7.89% BI=11.84%).

Keywords: Aedes, Dengue, house index**,** breteau index, Mul

Introduction
Mosquitoes are small, midge-like flies that are included in the family Culicidae. Females of most species are ecto-parasites feeding on blood of vertebrates through piercing and sucking mouth parts on the host's skin to suck the blood. As per recent reports, there is a total of 3541 recorded number of mosquito species found all over the world belonging to two sub families-*Anophelinae and Culicinae*, 11 tribes and 11 Genera. In India 404 species of mosquitoes are recorded out of them *Aedes* mosquito belongs to tribe *Aedini* which contains 34 genera and 175 species (Tyagi, *et al.*, 2015).
In general, Mosquitoes stand out most among the numerous species of blood sucking arthropods that co-exist with humans. Most of these species act as vectors of different pathogens which cause dengue fever, yellow fever, malaria, lymphatics, filariasis, Japanese encephalitis and other serious diseases to human beings. The warmer climates in tropical areas allow these insects to be active all year round since their ideal conditions for proliferation in an environment which is hot and humid with moderate rainfall a typical tropical condition. In hot climate they are able to be more active and the rainfall gives them aquatic sites for larval and pupal stages (Gillett, 1972). Because of their medical importance, it is essential to make an inventory of the diversity of mosquitoes in different places periodically, which forms the baseline to study bionomics of vector species as well as correlations with the abiotic factors of the environment and to make strategy for the control over mosquito born diseases (Pandian, 1998).
The incidences of vector-borne diseases are increasing alarming due to many factors including uncontrolled urban developments that support breeding of vector mosquitoes. World Health Organization (WHO) in 2010 stratified the current situation of dengue/DHF in India under category A, which means a major public health problem, leading cause of hospitalization and death among children. Occurrence of dengue fever in India was first reported in 1946 (Karamchandani, 1946). It is endemic in most of the states of India, and after the nationwide outbreak in 1996, many frequent outbreaks occurred in different parts of the country with manifestations of haemorrhagic symptoms in varying intensities (Kalra and Kaul, 1997); (Gupta and Ballani, 2014; NVBDCP, 2016). More than 50 outbreaks of dengue have been reported in different parts of the country (Yadav and Narasimham,1992; WHO, 2003). In India, National Vector Borne Disease Control Programme (NVBDCP) reported 28,055 dengue cases in 2010 from 31 out of 35 states in India (highest ever in a year) (NVBDCP, 2012).
In state of Maharashtra, sporadic cases of dengue were reported in 1973, 1983, and 2000. Recently the cases of Chikungunya are reported from villages Mungi, Balamtakli, and Madhi (district Ahamadnagar), Malegaon city (district Nashik), and all 8 districts of Marathwada region and in Vidarbha regions 7 districts: Akola, Washim, Buldhana, Yeotmal, Nagpur, Wardha, and Chandrapur (The Public Health Department, Government of Maharashtra, 2012). Information on the mosquito fauna with particular reference to vector of dengue in Chandrapur district had not been reported earlier. Thus, an attempt is made to study the investigations of dengue vectors besides area Mul talav, Th. Mul, Chandrapur district.

Objectives
- To find the major breeding sources of the mosquitoes in the study area.

- To find the standardize larval index i.e. House index (HI), Container index (CI), Breteau index (BI).
- To analyze the patterns of the larval indices.

Materials and Methods

The survey was conducted personally besides area of Mul talav, Tahsil Mul, District Chandrapur, Maharashtra for five months i. e. from August to December, where 382 houses were inspected. During the survey, houses were visited for indoor and outdoor containers to inspect the presence of larvae and adult mosquitoes. For identification of larvae and mosquito the sample was collected in small plastic and glass bottles with the help of pipette and eye dropper. The samples for larvae were brought to the laboratory for preservation identification of the species with the help of pertinent literature.

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.

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

- Priority I: Death due to dengue confirmed.
- Priority II: HI >5, BI >20.
- Priority III: HI>5, BI >20

Results

From the month of August to December 2025, 382 houses were surveyed, yielding 1,205 potential breeding containers of these 1,019 contained water(wet) and 186 were dry. Overall, 237 wet containers were positive for mosquito larvae.

Positive containers declined from 82 in August to 70 in September, 58 in October, 18 in November, and 9 in December. The Container Index was highest in August (28.18%), followed by September (26.12%) and October (24.17%), declining to (10.59%) in November before rising to (18.00%) in December. Other plastic containers were the most common wet containers (33.85%), followed by plastic water bottles (12.86%) and plastic buckets (8.44%). Other breeding habitats included glass bottles, mud pots, concrete tanks, tyres, flower pots, tarpaulins, paint tins, broken pipes, steel utensils, oil tins and plastic cans. Larvae were found in several container types, indicating widespread *Aedes* breeding in household and discarded water-holding materials.

On monthly basis 76, 77, 76, 77 and 76 houses were surveyed in the months of August, September, October, November and December respectively out of which 24, 22, 18,10 and 6 houses were found to be infested with mosquitoes larvae respectively in above month. The house index for these months decreased from 31.58% in month of August to 7.89% in month of December.

Breteau index also showed marked decrease during the study period i.e. 107.89% per 100 houses inspected in month of August, to 90.91% in September, 76.32% in October, 23.38% in November and down to 11.84% in month of December. Hence all the indices were seen to high in month of August and fall by December. Table 2 shows that all the adult mosquitoes capture from indoor and outdoor containers were found to be mostly *Aedes albopictus* followed by *Aedes aegypti*

Table 1: Monthly Distribution of Inspection Findinds And Larval Indices.

Particular	August	September	October	November	December
Total number of house surveyed	76	77	76	77	76
Number of potential containers	330	310	285	210	70
Number of wet containers	291	268	240	170	50
Number of infested houses	24	22	18	10	6
Number of positive containers	82	70	58	18	9
House index	31.58	28.57	23.68	12.99	7.89
Container index	28.18	26.12	24.17	10.59	18.00
Breteau index	107.89	90.91	76.32	23.38	11.84

Table 2: Number and type of containers with presence of larvae from August to December 2025

Container	August		September		October		November		December	
	Wet	Positive	Wet	Positive	Wet	Positive	Wet	Positive	Wet	Positive
Plastic bucket	20	5	16	8	15	7	25	6	10	2
Other plastic	50	8	100	27	105	20	70	10	20	0
Rubber tyre	8	6	5	2	10	5	4	2	3	1
Flower pot	11	1	18	3	10	1	15	0	0	0
Tarpaulin sheet	20	10	10	5	3	1	0	0	0	0
Paint tin	10	2	9	2	13	1	0	0	0	0
Broken pipe	7	3	10	1	7	1	6	0	0	0
Tile pieces	0	0	0	0	0	0	0	0	0	0
Glass bottle	70	10	2	1	10	4	3	0	0	0
Steel utensils	0	0	12	4	16	5	7	0	0	0
Concrete tank	10	8	15	7	19	2	10	0	4	0
Mud pot	20	5	16	2	10	3	17	0	1	0
Oil tin can	8	2	4	1	2	1	1	0	1	0

Plastic tin can	7	4	6	2	4	2	2	0	1	0
Plastic water bottle	50	9	46	5	16	5	10	0	10	6
Total	291	82	268	70	240	58	170	18	50	9

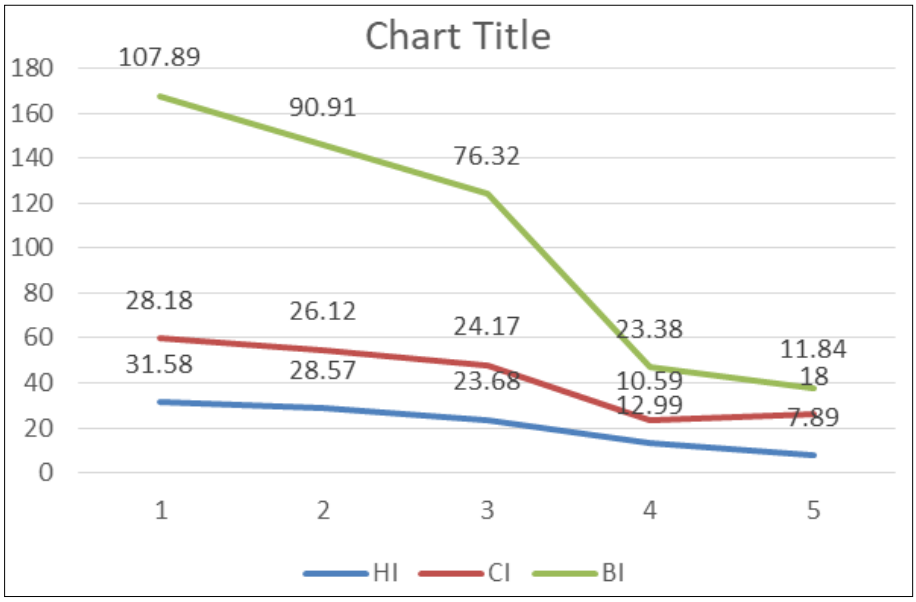


Fig 1: Time-trend of larval indices.

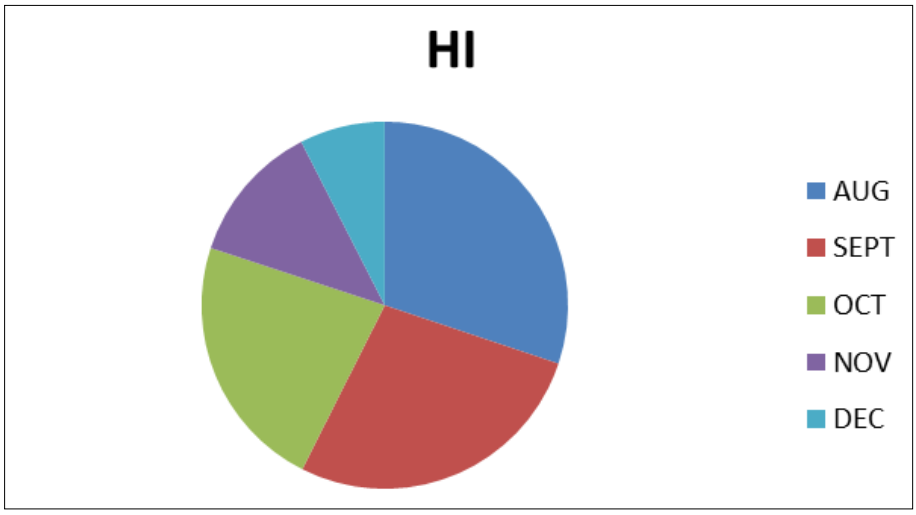


Fig 2: Graphical presentation of house index.

Discussion

Aedes mosquitoes are abundant in Maharashtra, which makes Maharashtra a hotspot for vector-borne diseases, this warrants routine entomological surveillance. The larval survey is most widely used method for entomological surveillance, for practical reason, when compared to egg, pupal and adult surveys (WHO, 2011). This technique was applied in study. There was a notable decrease in number of infested houses and number of positive containers in month of August to December and is reflected by a similar trend in HI, CI and BI during these months. High indices in the months of August and September are attributed to monsoon season in Maharashtra. In our present study, in the month of August BI (107.89%), CI (28.18%) and HI (31.58%). The high larval indices may also be due to water lodged area and over grown vegetation in lake which is attached to the area of study.

In our study, 382 houses were surveyed, yielding 1,205 potential breeding containers of these, 1,019 contained water(wet) and 186 were dry. The high values in number of infested houses and number of positive containers were recorded in month of August and September which gradually decreased up to month of December and it reciprocates very high HI, CI and BI during these months. Surveys carried out in month of October, November showed relatively lower indices when compared to August and September.

The study recorded 1,019 wet containers from August to December 2025, including 237 with mosquito larvae, highlighting the need to regularly inspect and manage water-holding containers. Containers were positivity declined from 28.18% in August to 10.59% in November, then raised to 18.00% in December. This variation may reflect differences in rainfall, environmental conditions and household practices. Miscellaneous plastic containers were most common (33.85%), followed by bottles, buckets, glass bottles, mud pots and concrete tanks. Positive containers included tyres, flower pots, tarpaulins, paint tins, broken

pipes and other artificial habitats, many of which can be managed through source reduction.

The area selected for study is mainly the slum area population comprises mainly of labour class. Lower education rates and misbelief about diseases has affected the disease understanding and prevention protocols. The different larval indices of area near Mul Talav were found to be above critical level (HI>1, CI>1 and BI>1) predicting high risk of outbreak (Jesha *et al.*,2015). Generally, 10% and 5% are taken as critical level for BI and HI. Jesha *et al*.,2015 during study in Kerala calculated HI= 25.15%, CI=10.36% and BI=73.05% suggesting urgent need of vector control measures in these areas. Samuel *et al.,* 2014, showed an overall HI= 62.8%, CI=31.8% and BI=129.8% during the study at Kottapuram Panchayat, Thiruvananthapuram district to study the trend of Dengue vector prevalence from 2007 to 2010 which is similar to our findings.

Conclusion

The study identified numerous potential *Aedes* mosquito breeding habitats from August to December. Out of 1,019 wet containers, 237 contained mosquito larvae. The Container Index was highest in August (28.18%), declined through November, and increased moderately in December. Miscellaneous plastic containers (33.85%) were the most common breeding sites, followed by bottles, buckets, glass containers, mud pots, concrete tanks, tires and flower pots. Control efforts should focus on water-retaining domestic and discarded containers through regular inspections, proper disposal, prevention of water accumulation and community participation. Accurate House and Breteau Indices require monthly data on larva-positive houses. Continued surveillance is recommended to monitor seasonal changes and guide timely interventions.

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