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ENTOMOLOGICAL SURVEILLANCE OF *Aedes* MOSQUITOES AND DENGUE RISK IN LAKHIMPUR DISTRICT, ASSAM

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ABSTRACT

An entomological survey was carried out between September 2024 to February 2025 across several urban and semi-urban localities of Lakhimpur district, Assam, to assess the population density of *Aedes* mosquitoes. The study involved larval sampling techniques commonly used in public health entomology. The data revealed unusually high values for key vector indices: the House Index was recorded at 55.78, the Container Index at 27.22 and the Breteau index at 121.82 during the study period. These figures suggest a significantly heightened risk for a dengue outbreak in the region. As per the breeding preference, discarded tyres were found to be mostly preferred as breeding site (35% positive) as compared to other solid wastes. With the huge population of *Aedes* and poor fever supervision activities, there is a chance that the people here may have acquired the infection while visiting other high risk cities or some intruder had brought the virus and the high *Aedes* population have triggered a local transmission.

Keywords: *Aedes*, House Index, Container Index, Breteau Index, Lakhimpur, Assam

INTRODUCTION

The dengue virus, which is mostly transmitted by infected *Aedes* mosquitoes, causes dengue fever and its more severe form, dengue hemorrhagic fever (DHF).

Aedes aegypti, *Aedes albopictus*, *Aedes scutellaris*, and *Aedes polynesiensis* are the main vector species implicated (Wiwanitkit, 2014). Millions of people worldwide are

afflicted by these diseases, which are among the most common mosquito-borne illnesses today. They also put a great deal of strain on public health systems, particularly in tropical and subtropical areas.

In the North Eastern Region, Assam and Arunachal Pradesh showed a significant positive cases of dengue every year [2, 3, 4]. Usually, the dengue positive cases are reported from largest metropolitan areas of the country but past reports indicate that a significant dengue outbreak has occurred in Pasighat, in the East Siang region of Arunachal Pradesh [2, 3]. Furthermore, Itanagar, the state capital of Arunachal Pradesh, has reported a significant number of dengue positive cases [2, 3]. Approximately 70–80% of dengue-positive cases in Assam are reported from the capital city of Kamrup district [4]. Apart from Kamrup district, there were also notable positive dengue cases in Lakhimpur district [5]. There was also a long interstate barrier between the district and Arunachal Pradesh. As a result, people living in border areas are more likely to get the dengue virus, which raises the possibility that the infection may spread throughout the district.

104 positive dengue cases were reported in a sociodemographic and epidemiological investigation conducted between 2012 and 2015 [5]. The actual disease burden is estimated to be much higher, with many cases undiagnosed, unreported and additional cases reported in public/private sectors. Consequent upon the reporting of the positive cases of dengue/DHF from the district each year and several dengue deaths in the state, a rapid entomological survey for *Aedes aegypti* and *Aedes albopictus* was carried out in the Lakhimpur district to find out whether the cases were imported or it was an indigenous transmission.

MATERIALS AND METHODS

Study Area

The study was conducted in Lakhimpur district, located in the northeastern state of Assam. The region features a subtropical monsoon climate with high humidity and significant rainfall, particularly between June and September. These environmental conditions, along with rapid urbanization and insufficient waste management, create ideal breeding sites for *Aedes* mosquitoes. The study focused on both urban and semi-urban areas of the district, where artificial water containers were commonly found.



Figure 1: Water containing Discarded Household Containers

Study Design and Data Collection

A cross-sectional survey was conducted over a span of six months, from September 2024 to February 2025. The study combined both field observations and household surveys. Larval surveillance was carried out by inspecting common water-

holding containers such as flower pots, discarded tires, plastic buckets, and any kind of water storage containers and tanks in selected neighbourhoods.

The survey for *Aedes* mosquito breeding was carried out in the urban and suburban areas using single larva technique

during September 2024 to February 2025. The larvae were collected, reared till adult emergence and species identification was confirmed using adult dichotomous keys of Darsie and Morris [6]. Each sampled container was emptied completely to destroy the site of breeding.

Data Analysis:

The density of the larvae of vector mosquitoes was expressed in House Index (HI), Breteau Index (BI) and Container Index (CI). The present study used the following formulae to calculate BI, CI and HI.

Container Index (CI): Percentage of wet containers infested with larvae and/or pupae

$$CI = \frac{\text{Number of positive containers}^*}{\text{Number of wet container inspected}} \times 100$$

House Index (HI): Percentage of houses infested with larvae and/or pupae

$$HI = \frac{\text{Number of houses infested}^*}{\text{Number of houses inspected}} \times 100$$

Breteau Index (BI): Number of positive containers per 100 houses inspected

$$BI = \frac{\text{Number of positive containers}^*}{\text{Number of houses inspected}} \times 100$$

*Positive for *Aedes aegypti* and *Aedes albopictus* only

RESULTS AND DISCUSSION

The entomological survey revealed a high presence of *Aedes* larvae in various types of man-made containers, particularly during the peak post monsoon months as included in the study. The Breteau Index was found to exceed the threshold level of 20 in several wards, indicating a high risk of dengue transmission. Discarded tires and

uncovered water containers were the most common breeding habitats observed.

During the study the *Aedes* were found to prefer discarded tyres mostly as breeding grounds (35%) followed by uncovered water containers and empty flower pots. The preferences for breeding site are shown in **Figure 2**.

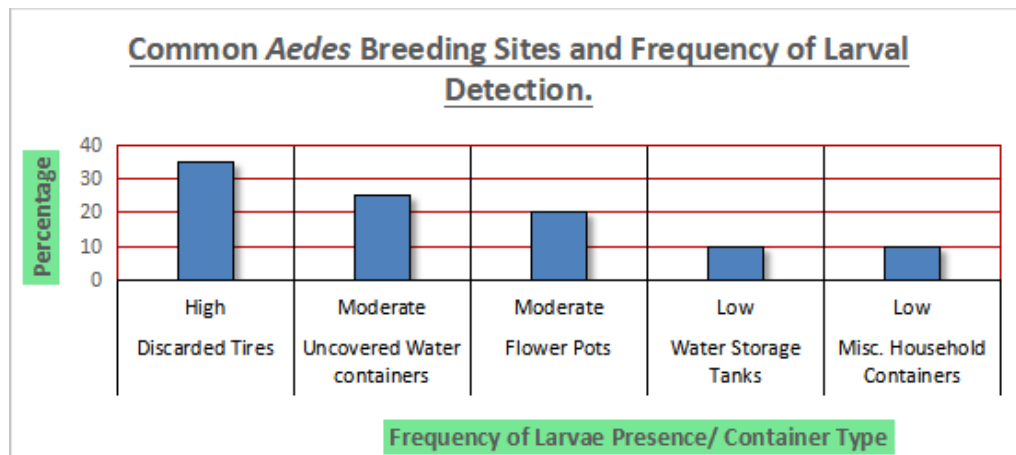


Figure 2: Common *Aedes* Breeding Sites and Frequency of Larval Detection

Between September 2024 and February 2025, larval surveys were conducted in a total of 678 households across different urban and semi-urban areas in Lakhimpur district, Assam. During the course of the survey, 3034 water-holding containers were examined for the presence of *Aedes* larvae. The data collected showed clear month-to-month variations in the mosquito indices used to assess dengue transmission risk—namely, the House Index (HI), Container Index (CI), and Breteau Index (BI).

In September 2024, where every house inspected tested positive for *Aedes* breeding, leading to a House Index of 100%. The Container Index for that month was 38.08%, and the Breteau Index reached 270.11—well beyond the threshold considered safe by health authorities.

High values continued into October and November, with the House Index at 86.46% and 78.20% respectively. The Container Index peaked in October at 58.47%, while

the Breteau Index remained elevated in both months (190.63 in October and 166.67 in November), signalling a strong and persistent presence of the mosquito.

From December onward, the indices began to decline, likely due to cooler weather and reduced rainfall. In December, the Breteau Index dropped to 107.97. The trend continued into the new year, with January showing a Breteau Index of 66.67, and by February 2025, it had decreased further to 35.13. The House Index also fell sharply to just 11.48 by the end of the survey period, and the Container Index declined to 13.27.

A detailed breakdown of the monthly findings is provided in Table 1 and figure 3. The overall pattern suggests a seasonal peak in *Aedes* mosquito activity during the post-monsoon months, followed by a steady reduction during the winter. These findings emphasize the need for timely mosquito control efforts, especially in the

months leading up to and following the monsoon season.

inspected tested positive for *Aedes* breeding.

The situation was most alarming in September 2024, where every house

Table 2: Monthly entomological indices for *Aedes* mosquitoes in Lakhimpur District (September 2024 to February 2025)

Month/Duration	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25	Feb-25	Sep24-Feb25
No. of Houses searched	87	96	78	113	156	148	678
Houses found +ve	87	83	61	35	43	17	326
House Index	100	86.46	78.2	30.97	27.56	11.48	55.78
No. of container searched	617	313	460	374	878	392	3034
Containers +ve	235	183	130	122	104	52	826
Container Index	38.08	58.47	28.26	32.62	11.84	13.27	27.22
Breteau Index	270.11	190.63	166.67	107.97	66.67	25.13	121.82

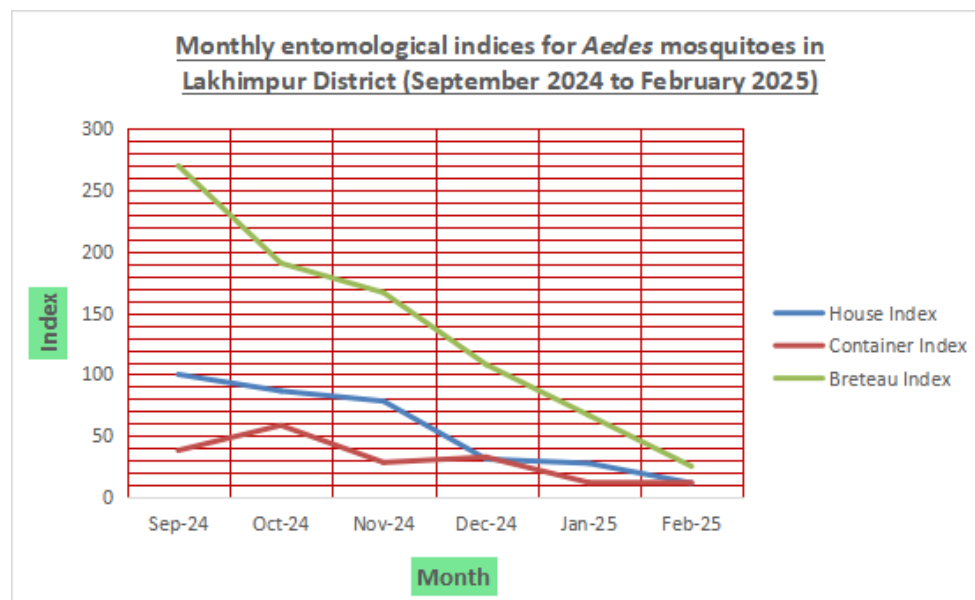


Figure 3: Monthly entomological indices for *Aedes* mosquitoes in Lakhimpur District (September 2024 to February 2025)

The study reveals the persistent challenge posed by *Aedes* mosquitoes in Lakhimpur district. Despite some level of public awareness, the widespread presence of breeding sites highlights a gap between knowledge and effective practice. The high entomological indices reflect both environmental and behavioural factors contributing to the proliferation of vectors.

Unplanned urban growth and inadequate sanitation infrastructure has been intensifying the issue, creating microhabitats that are difficult to manage through conventional vector control strategies alone. Moreover, the seasonal pattern of increased breeding during the monsoon months in the district coincides with results of Baruah, S. and Dutta, P. [7]

and this points to the need for pre-emptive interventions before the onset of rains each year.

Earlier studies in Assam [7, 8] have highlighted the presence of *Aedes* mosquitoes and their link to dengue outbreaks, mainly focusing on broader regions like Dibrugarh. Sharma (2017) also documented clinical profiles of dengue in Lakhimpur but vector breeding in details in the district is lacking.

Present study provides a focused entomological assessment specific to Lakhimpur district, identifying breeding sites, calculating vector indices, and highlighting local risk factors. By combining field observations with analysis of breeding patterns, it offers practical insights for targeted *Aedes* control.

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