

Research Article

Prevalence of *Aedes* Mosquito Larvae in Various Hospitals of Delhi in 2024

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A B S T R A C T

Introduction: Dengue Virus (DENV) accounts for significant morbidity and mortality in its complications. It has become a major health concern for the public. *Aedes aegypti* is the principal vector responsible for DENV transmission in Delhi. DENV has four serotypes (DENV 1–4). There is no approved vaccine or licensed therapeutics against dengue. Therefore, it causes a high disease burden, especially in areas like Delhi, which is densely populated. Vector surveillance with identification and destruction of potential mosquito breeding sites, is the only mainstay for the prevention of transmission of dengue. This study focuses on the prevalence of *Aedes* mosquito larvae among various hospitals across Delhi.

Method: In the study, *Aedes* larval surveillance has been performed in 13 government hospitals in Delhi. The study period for conducting the survey was from April 2024 to August 2024. To determine the container positivity, different mosquito breeding sites were searched and checked.

Result: A total of 3,471 containers were checked for *Aedes aegypti* larvae. out of which 144 containers were found positive. The total Container Index (CI) was found to be 4.1 where the maximum container index (CI) was 5.2 and the minimum was 2.2. The most preferred container for *Aedes* breeding was found in plastic containers (40.28%), earthen pots (23.61%), and iron containers (10.62%).

Conclusion: This study emphasises sustainable entomological surveillance so that DENV transmission can be prevented timely and proper preventive measures can be taken as patients in hospitals are the most vulnerable sites to DENV infection.

Keywords: *Aedes Aegypti*, Larval Surveillance, Dengue, Serotype, Denv Outbreak

Introduction

Half of the global population is at risk of dengue, with annual estimates suggesting 100 to 400 million infections,¹ around 96 million people developing clinical symptoms, and approximately 40,000 deaths.² Despite a 30–50-fold increase in dengue cases in tropical and subtropical regions over the past 50 years, and its status as the fastest-growing viral threat, an estimated 3.97 billion people across 129 countries remain at risk.^{2,3} The steady rise in dengue cases over the last half-century has been driven by factors such as global trade and travel, urbanisation, population growth, and shifts in climate, all of which create favourable conditions for dengue-carrying mosquitoes and the spread of the virus.^{3,4} Climate change, rising temperatures, urbanisation, vector adaptability, and increased population vulnerability all contribute to enhanced transmission of dengue from vectors to humans.^{3,4} *Aedes* mosquito is a major health problem in India, especially in cities like Delhi where diseases like dengue, chikungunya, and Zika are common. During monsoon or post-monsoon season, DENV cases increase manifolds.

Dengue now causes annual outbreaks in many parts of Southeast Asia, and its threat is exacerbated by ongoing environmental changes. India reported 110,473 dengue cases in 2022 as compared to 101,192 cases recorded in 2018. Significantly higher numbers were observed in previous years, with 188,401 cases in 2017, 157,315 in 2019, 193,245 in 2021 and 254,739 in 2023.⁵ Infection with a heterologous serotype may cause more complications like Dengue Haemorrhagic Fever (DHF). It has been found that Delhi is hyperendemic to dengue infection and multiple DENV serotypes are circulating. Delhi has also experienced numerous DENV outbreaks from time to time. There is no approved vaccine or licensed therapeutics, so there is a high disease burden, especially in areas like Delhi, which is densely populated. Vector surveillance with identification and destruction of potential mosquito breeding sites, is the mainstay for the prevention of transmission of this arboviral infection. Because of this, vector surveillance has been performed in the study.

Materials and Methods

The study consisted of data from 13 government hospitals in Delhi which was collected during regular larval surveillance. No permission was required for this study. It was done in public interest. These hospitals were chosen based on their size, number of patients, and location. The names of the hospitals have been kept confidential. The study period covered was from April 2024 to August 2024, which includes the months before and during the monsoon season. Data collection involved *Aedes* mosquito larvae identification and counting at each hospital weekly. Different mosquito breeding sites were searched like water containers, plastic containers, earthen pots, flower pots, air coolers, iron

containers, tyres, and other areas with stagnant water within the hospital premises.^{6–8}

The Container Index (CI %) of *Aedes aegypti* larvae was calculated by using published formulae.⁹

- **Study Design:** This is a descriptive study based on the analysis of entomological data generated during vector surveillance of various hospitals in Delhi.
- **Data Analysis:** Container indices were calculated manually and Microsoft Excel was used for plotting the graphs.

Results

The current study showed the prevalence of *Aedes aegypti* larvae in all thirteen (13) hospitals. In order to determine *Aedes aegypti* larvae positivity, 3471 containers were checked and a total of 144 containers were found positive. The total Container Index was estimated to be 4.1%. The findings showed that the Container Index (CI) varied in different hospitals in Delhi. It was relatively high (5.2%) in big hospitals and low (2.2%) in small hospitals. Wet containers such as plastic containers, earthen pots, flower pots, air coolers, iron containers, tyres, and others were found positive for *Aedes* mosquito larvae. The maximum larval breeding was found in plastic containers (40.28%) followed by earthen pots (23.61%) and iron containers (10.62%). Other containers include flower pots (9.02%) and coolers (9.02%), others (6.25%), and tyres (0.69%) (Figure 1). Various categories of hospitals like Central Govt, Delhi Government, and MCD hospitals of Central, South and North region of Delhi have been included in the study. The northern part of Delhi had higher numbers of larvae when it was compared to those with the southern and central parts. Month-wise total container positivity of clusters of hospitals surveyed from April 2024 to August 2024 was determined and it was relatively high in monsoon season (July and August 2024) (Figure 2). It was 6.4 and 6.8 in July and August respectively. Container positivity was relatively low during pre-monsoon season. It was 1.4, 2.02, and 2.3 in April, May and June, 2024 respectively (Figure 2).

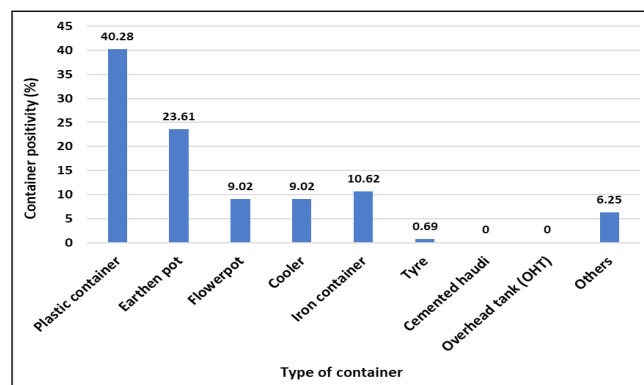


Figure 1. Container Positivity in Various Hospitals of Delhi between April 2024 and August 2024

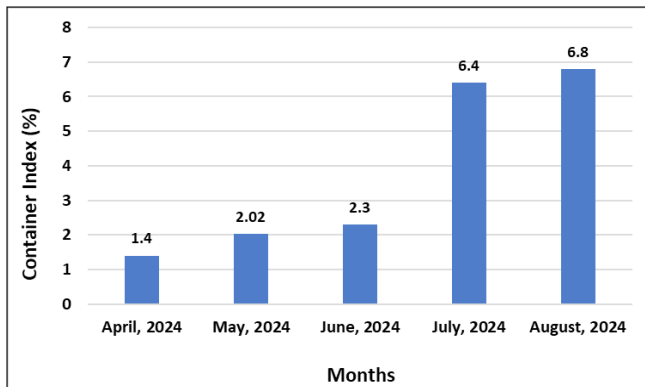


Figure 2. Month-Wise Total Container Positivity of Clusters of Hospitals Surveyed from April 2024 to August 2024

Discussion

The study highlights the importance of managing environmental sanitation to control the spread of *Aedes* mosquitoes in hospitals. The high number of larvae during the monsoon season shows the need for regular surveillance and timely interventions in hospitals. The study also points out the need for public health initiatives to educate hospital staff and patients about the risks of mosquito breeding and how to reduce these risks. The differences in larval prevalence among hospitals suggest that interventions should be tailored to the specific conditions of each hospital rather than using a single approach for all. Hospitals in high-risk areas should prioritise mosquito control measures, such as regular cleaning of potential breeding sites, proper waste management, and the use of larvicides when necessary.

Breeding data of *Aedes aegypti* in different hospitals revealed that the container index varied from 2.2% to 5.2% during 2024. Previous report on Delhi also showed container index varied from 1.9% to 11.6% except in one hospital where it was 45.1%.⁸ Another report on the hospital-based survey to know the prevalence of *Aedes aegypti* larvae in Delhi-NCR hospitals during 2017 revealed that the container index varied from 5.5 to 21 except in two hospitals where it was exceptionally high.¹⁰ Another study from NCT-Delhi also supports our finding and the container index reported by the study varied from 2.9 to 9.5% except one hospital where it was 20%.¹¹ In India, it was observed that all dengue infections/ outbreak is associated with a high container index of *Aedes aegypti* mosquito which was more than 20%.¹² Although in hospitals, the container index should be much lower than what is observed in the study, such a high index requires regular preventive measures based on surveillance. However, different changing environmental conditions like rainfall, humidity, and temperature that affect the vector breeding sites cannot be ignored.

The northern part of Delhi had a higher number of larvae as compared to the southern and central parts. This difference

could be due to variations in hospital infrastructure, water management, and proximity to residential areas. The number of *Aedes* larvae increased from April to August 2024, with the highest numbers recorded in July and August. This increase corresponds with the monsoon season, which creates ideal breeding conditions due to more rainfall and higher humidity. Fewer larvae were found in the pre-monsoon months (April to June 2024). Hospitals that have more water-filled containers with poor water management had more larvae, highlighting the importance of managing the environment to control mosquito breeding. During the entomological surveillance in different hospitals, it was also observed that dengue vectors showed high breeding in plastic containers and earthen pots. This is consistent with other reports from Delhi where plastic containers were the preferable breeding sites for dengue vectors.¹³

Conclusion

The study found that *Aedes* mosquito larvae were more common in Delhi hospitals from April to August 2024, particularly during the monsoon season. Plastic containers, particularly when wet, are prime breeding sites for *Aedes* mosquitoes, which could be vectors for diseases like dengue, chikungunya, and Zika. To mitigate this risk, it is critical to securely cover water storage containers, especially in areas with frequent water storage. In regions facing long water shortages, vector control efforts combined with behaviour change communication (BCC) initiatives should be emphasised. Targeted interventions on high-risk containers, such as plastic containers, earthen pots, and coolers, can help prevent the seasonal surge in mosquito-borne illnesses. Hospitals should make dedicated efforts on a priority basis to protect patients and healthcare workers by implementing integrated vector control measures.

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