

Mosquito-Borne Risk in Residential Areas of Hapur: A Survey of Breeding Sites and Findings

Dr. Mamta Verma¹, Rashi Dhaka² and Zahida³

¹Assistant Professor, Department of Zoology, SSV P.G. College, Hapur, Uttar Pradesh, INDIA

^{2,3}PG Student, Department of Zoology, SSV P.G. College, Hapur, Uttar Pradesh, INDIA

¹Corresponding Author: drmamtaverma73@gmail.com



www.jrasb.com || Vol. 5 No. 2 (2026): April Issue

Received: 11-04-2026

Revised: 18-04-2026

Accepted: 26-04-2026

ABSTRACT

Mosquito-borne diseases represent a major public health concern in urban and semi-urban residential environments, particularly in regions characterized by poor drainage systems, stagnant water accumulation, rapid urbanization, and changing climatic conditions. Mosquitoes act as vectors for several infectious diseases including dengue, malaria, chikungunya, Japanese encephalitis, and filariasis, thereby posing significant health risks to human populations. The present study investigates mosquito-borne risk in residential areas of Hapur through a systematic survey of mosquito breeding sites and ecological conditions influencing vector proliferation. The study focuses on identifying major breeding habitats, mosquito density patterns, environmental risk factors, and public health implications associated with mosquito infestation in residential zones. Data were collected through field observations, environmental assessment, entomological surveys, and review of scientific literature related to vector ecology and mosquito-borne disease transmission. The findings indicate that stagnant water in household containers, drainage channels, discarded tires, rooftop water tanks, construction sites, and poorly maintained sewage systems serve as major mosquito breeding habitats in residential areas. Increased mosquito density was observed during monsoon and post-monsoon periods due to favorable humidity and water accumulation conditions. The study further reveals that inadequate sanitation, improper waste disposal, and lack of public awareness significantly contribute to mosquito breeding and disease risk. The findings highlight the urgent need for integrated vector management strategies, environmental sanitation programs, and community-based awareness initiatives for effective mosquito control and prevention of mosquito-borne diseases in Hapur.

Keywords- Mosquito-Borne Diseases; Breeding Sites; Vector Ecology; Residential Areas.

I. INTRODUCTION

Mosquito-borne diseases continue to pose a major challenge to global public health, particularly in tropical and subtropical regions where environmental and climatic conditions favor mosquito survival and reproduction. Mosquitoes are among the most medically significant insect vectors because they transmit a wide range of pathogens including viruses, protozoa, and nematodes responsible for diseases such as dengue fever, malaria, chikungunya, yellow fever, filariasis, and Japanese encephalitis. Rapid urbanization, population growth, inadequate sanitation, climate change, and unplanned residential development have significantly increased mosquito breeding opportunities and disease

transmission risk in many urban and semi-urban environments [1][2].

Mosquitoes require stagnant or slow-moving water for the completion of their life cycle. The egg, larval, and pupal stages of mosquitoes occur entirely in water before adult emergence. Common breeding habitats include water storage containers, discarded plastic items, clogged drains, rooftop tanks, construction sites, sewage channels, ponds, puddles, flower pots, and household waste materials capable of retaining rainwater. Environmental conditions such as humidity, temperature, rainfall, and water availability strongly influence mosquito abundance and breeding activity.

Residential areas are particularly vulnerable to mosquito infestation because human settlements provide

abundant artificial breeding sites and continuous blood meal sources for adult female mosquitoes. Species such as *Aedes aegypti*, *Aedes albopictus*, *Anopheles*, and *Culex* commonly adapt to urban environments and thrive in domestic and peri-domestic habitats. *Aedes* mosquitoes, responsible for dengue and chikungunya transmission, frequently breed in clean stagnant water accumulated in containers and household surroundings, whereas *Culex* mosquitoes often breed in polluted water bodies and drainage systems [3].

The district of Hapur has experienced rapid urban expansion and increasing residential development in recent years. Seasonal rainfall, inadequate drainage infrastructure, accumulation of solid waste, and irregular sanitation practices create favorable ecological conditions for mosquito breeding. During monsoon and post-monsoon seasons, waterlogging and stagnant water accumulation become common in residential colonies, increasing the risk of vector-borne disease outbreaks. Similar conditions in urban residential regions across India have been associated with increased dengue and malaria incidence.

Mosquito breeding not only affects human health but also imposes significant social and economic burdens on communities. Frequent outbreaks of dengue and malaria increase healthcare expenditure, reduce workforce productivity, and create psychological stress among residents. Children, elderly individuals, and immunocompromised populations are particularly vulnerable to mosquito-borne infections. In densely populated residential areas, vector proliferation can rapidly lead to localized disease transmission and public health emergencies [4].

Environmental sanitation and vector control play a crucial role in reducing mosquito-borne disease risk. Integrated vector management strategies including source reduction, biological control, larvicidal treatment, fogging, public awareness campaigns, and environmental monitoring have been widely recommended for effective mosquito control. Removal of stagnant water and elimination of artificial breeding habitats are considered among the most effective preventive approaches.

Recent technological developments including GIS-based surveillance, smart mosquito monitoring systems, and AI-assisted vector detection have further improved mosquito control strategies. Autonomous systems capable of detecting and eliminating breeding habitats are being explored for efficient vector management.

Despite increasing awareness regarding mosquito-borne diseases, many residential communities continue to face challenges related to poor environmental hygiene, inadequate waste management, and limited public participation in vector control programs. Therefore, understanding the distribution of mosquito breeding sites and associated environmental

factors is essential for developing effective public health interventions.

The present study aims to investigate mosquito-borne risk in residential areas of Hapur by conducting a survey of mosquito breeding habitats and analyzing environmental conditions contributing to mosquito proliferation. The study also evaluates public health implications and highlights preventive strategies for sustainable vector control and disease prevention.

II. MATERIALS AND METHODS

The present study adopts a comprehensive analytical and field survey-based methodology to investigate mosquito breeding habitats and mosquito-borne risk in residential areas of Hapur. The research integrates concepts from entomology, environmental science, public health, vector ecology, and epidemiology to provide a multidisciplinary understanding of mosquito proliferation and disease transmission risk within urban and semi-urban residential environments.

Data collection involved both primary and secondary sources. Primary field surveys were conducted across selected residential colonies, drainage zones, waterlogged areas, construction sites, parks, household surroundings, and waste disposal regions. Survey locations were selected based on population density, sanitation conditions, water accumulation patterns, and previous reports of mosquito nuisance or vector-borne disease occurrence. Field observations were carried out during pre-monsoon, monsoon, and post-monsoon periods to assess seasonal variations in mosquito breeding activity.

Potential breeding habitats were systematically inspected for the presence of mosquito larvae and pupae. Common breeding sites examined included rooftop water tanks, discarded containers, plastic waste materials, tires, flower pots, overhead tanks, clogged drainage channels, open sewage systems, stagnant puddles, construction site reservoirs, air cooler trays, and household water storage units. Water-holding containers and stagnant water bodies were visually examined and categorized according to breeding intensity and environmental condition.

Environmental parameters including water stagnation duration, humidity, rainfall pattern, temperature, waste accumulation, vegetation cover, and sanitation condition were recorded during field observations. Residential hygiene practices, waste disposal systems, and drainage maintenance conditions were also assessed to understand environmental factors influencing mosquito proliferation.

Secondary data were collected from peer-reviewed scientific literature, public health reports, vector control guidelines, municipal sanitation reports, and epidemiological studies related to mosquito ecology and vector-borne diseases. Scientific databases including ScienceDirect, SpringerLink, PubMed, Google Scholar,

and WHO vector control reports were systematically reviewed using keywords such as “mosquito breeding habitats,” “urban mosquito ecology,” “vector-borne diseases,” “Aedes breeding sites,” and “residential mosquito survey.”

A mixed-method analytical approach combining qualitative and quantitative interpretation was employed. Quantitative analysis involved estimating breeding site frequency, larval density, habitat distribution, and seasonal variation patterns. Qualitative analysis focused on environmental sanitation, ecological suitability of breeding habitats, and public health implications associated with mosquito infestation.

Comparative analysis was conducted between residential areas with proper sanitation infrastructure and areas exhibiting poor waste management and drainage conditions. The study additionally evaluated the effectiveness of existing mosquito control measures such as fogging, larvicidal treatment, and source reduction activities implemented in residential areas.

To ensure scientific reliability and validity, observations from multiple survey locations were cross-verified and supported with findings from previous vector ecology studies. Tables and graphical representations were used to summarize breeding site distribution, environmental risk factors, and mosquito density patterns.

III. RESULTS

The findings of the study reveal that residential areas of Hapur contain multiple environmental conditions favorable for mosquito breeding and vector proliferation. One of the most significant observations is the widespread occurrence of stagnant water accumulation within domestic and peri-domestic environments. Household water storage containers, rooftop tanks, discarded tires, plastic containers, construction sites, and clogged drainage systems were identified as major mosquito breeding habitats. These breeding sites provided suitable aquatic environments for larval development and contributed significantly to increased mosquito density.

The survey indicates that mosquito breeding activity increased substantially during monsoon and post-monsoon seasons due to increased rainfall, humidity, and waterlogging conditions. Areas with poor drainage infrastructure and irregular waste disposal exhibited higher larval density and greater mosquito abundance compared to well-maintained residential zones. Residential colonies with open sewage channels and stagnant wastewater accumulation showed particularly high prevalence of *Culex* mosquito breeding.

Aedes mosquito breeding was commonly observed in artificial water-holding containers containing relatively clean stagnant water, including air coolers, flower pots, rooftop tanks, and discarded household items. These breeding conditions increase the

potential risk of dengue and chikungunya transmission in densely populated residential environments. Similar observations regarding urban breeding habitats have been reported in multiple Indian cities experiencing vector-borne disease outbreaks.

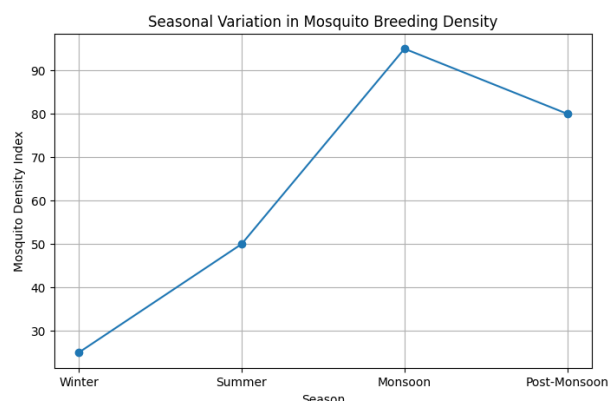
The study also found that inadequate sanitation and improper waste management significantly contribute to mosquito proliferation. Accumulation of solid waste materials capable of retaining rainwater created numerous microhabitats for mosquito breeding. Construction sites and vacant plots containing water-filled debris exhibited high mosquito larval density. Residential areas with limited public awareness regarding mosquito control practices showed greater abundance of unmanaged breeding sites.

Environmental factors such as temperature, humidity, vegetation cover, and stagnant water duration strongly influenced mosquito density patterns. Areas with shaded vegetation and prolonged water stagnation demonstrated increased larval survival and adult mosquito activity. Mosquito abundance was highest during warm and humid conditions favorable for rapid larval development and adult survival.

The results further indicate that existing mosquito control measures such as fogging and insecticide spraying provide only temporary reduction in adult mosquito populations without addressing underlying breeding habitats. Source reduction through elimination of stagnant water and improved environmental sanitation was found to be more effective for long-term vector control.

Table : Major Mosquito Breeding Sites Identified in Residential Areas of Hapur

Breeding Habitat	Mosquito Type Commonly Observed	Associated Risk
Rooftop Water Tanks	<i>Aedes</i>	Dengue & Chikungunya
Open Drains & Sewage	<i>Culex</i>	Filariasis & Nuisance Biting
Discarded Tires & Containers	<i>Aedes</i>	Vector Proliferation
Construction Sites	Mixed Species	Increased Larval Density
Stagnant Puddles	<i>Anopheles</i>	Malaria Risk



Graph : Seasonal Variation in Mosquito Breeding Density

IV. DISCUSSION

The findings of the present study highlight the strong relationship between environmental sanitation, stagnant water accumulation, and mosquito-borne disease risk in residential areas of Hapur. Artificial water-holding containers and poorly maintained drainage systems create highly suitable breeding habitats for mosquitoes, particularly *Aedes* and *Culex* species responsible for transmitting dengue, chikungunya, and filariasis.

One of the most important observations is the role of urbanization and poor waste management in increasing mosquito proliferation. Rapid residential expansion without adequate drainage infrastructure contributes to water stagnation and vector breeding. Similar urban ecological conditions have been associated with increased vector-borne disease outbreaks in multiple Indian cities.

The study also emphasizes the importance of community participation and environmental awareness in mosquito control programs. Many breeding habitats identified during the survey were directly associated with domestic negligence, including uncovered water containers, discarded plastic waste, and stagnant rooftop water storage systems. Public awareness regarding source reduction and sanitation practices is therefore essential for sustainable vector management.

Another important finding is that chemical fogging alone is insufficient for long-term mosquito control because it primarily targets adult mosquitoes while leaving larval habitats unaffected. Integrated vector management involving source reduction, biological control, environmental sanitation, and regular surveillance provides a more sustainable approach for reducing mosquito populations and disease transmission risk.

Climate and seasonal variation also play a major role in determining mosquito abundance and disease risk. Warm temperatures, increased humidity, and rainfall create ideal conditions for mosquito breeding and rapid population growth. Therefore,

preventive vector control measures should be intensified before and during monsoon seasons to minimize outbreak potential.

V. CONCLUSION

The present study demonstrates that residential areas of Hapur provide multiple ecological conditions favorable for mosquito breeding and vector-borne disease transmission. Stagnant water accumulation, poor sanitation, inadequate drainage systems, and improper waste management significantly contribute to increased mosquito density and public health risk.

The study reveals that rooftop tanks, open drains, discarded containers, construction sites, and stagnant water bodies serve as major mosquito breeding habitats in residential environments. Seasonal climatic variation further intensifies mosquito proliferation, particularly during monsoon and post-monsoon periods.

Effective mosquito control requires integrated vector management strategies combining environmental sanitation, source reduction, public awareness campaigns, biological control, and regular monitoring of breeding habitats. Community participation and improved urban sanitation infrastructure are essential for sustainable prevention of mosquito-borne diseases.

Future research should focus on GIS-based mosquito surveillance, smart vector monitoring systems, and ecological modeling approaches for predicting mosquito outbreak risk and improving public health preparedness in rapidly urbanizing residential regions.

REFERENCES

- [1] Centers for Disease Control and Prevention (CDC). (2025). *About Mosquitoes and Mosquito-Borne Diseases*.
- [2] United States Environmental Protection Agency (EPA). (2024). *Mosquito Life Cycle and Control Methods*.
- [3] World Health Organization (WHO). (2025). *Vector Control and Mosquito-Borne Disease Prevention Guidelines*.
- [4] Encyclopaedia Britannica. (2024). *Mosquito Ecology and Disease Transmission*.
- [5] National Center for Biotechnology Information (NCBI). (2023). *Mosquito Biology, Ecology, and Public Health Importance*.
- [6] American Mosquito Control Association (AMCA). (2024). *Integrated Mosquito Management and Urban Vector Control*.
- [7] Nature Reviews Microbiology. (2024). *Urban Mosquito Ecology and Vector-Borne Disease Risk*.
- [8] ScienceDirect. (2023). *Mosquito Breeding Habitats in Urban Residential Environments*.
- [9] Springer Nature. (2024). *Environmental Factors Influencing Mosquito Proliferation*.

[10] Journal of Medical Entomology. (2025).
Residential Mosquito Surveys and Vector Ecology.

[11] Environmental Health Perspectives. (2024).
*Climate Change and Mosquito-Borne Disease
Expansion.*