IDENTIFICATION OF POTENTIAL CONTAINERS FOR *AEDES* LARVAE BREEDING IN *DENGUE* FEVER CONTROL AT PALANGKA RAYA UNIVERSITY

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ABSTRAK

Wabah Demam Berdarah *Dengue* (DBD) masih menjadi masalah kesehatan masyarakat di Indonesia khususnya di Palangka Raya karena hingga saat ini masih di temukan kasus DBD. DBD ditularkan melalu gigitan nyamuk betina, sehingga mengidentifikasi tempat perindukan nyamuk sangatlah penting untuk menekan penularan penyakit ini. Habitat nyamuk memegang peranan penting dalam menentukan kepadatan larva, hingga perkembangan nyamuk dewasa. Penelitian ini bertujuan mengidentifikasi tempat perindukan larva nyamuk yang sering terabaikan. Penelitian ini bersifat observasional dan survei jentik dilakukan pada tujuh titik lokasi di area Universitas Palangka Raya pada tahun 2024. Hasil pengamatan menunjukkan bahwa beberapa tempat perindukan larva nyamuk yang sering diabaikan yaitu vas bunga, genangan air dan sampah wadah plastik. Jenis larva nyamuk yang di temukan yaitu *Aedes aegypti* dan *Aedes albopictus*, kedua nyamuk ini berperan pada penularan DBD. Wadah perkembangbiakan potensial yang ditemukan di lokasi penelitian menekankan bahwa pentingnya kepedulian dari setiap individu di permukiman dalam pengendalian vektor ini.

Kata kunci : aedes, demam berdarah *dengue*, habitat nyamuk, kontrol, vektor nyamuk

ABSTRACT

Dengue Hemorrhagic Fever (DHF) Outbreaks remain a public health issue in Indonesia, particularly in Palangka Raya, as DHF cases continue to be reported. DHF is transmitted through the bites of female mosquitoes, making the identification of mosquito breeding sites crucial in reducing disease transmission. Mosquito habitats play a significant role in determining larval density and the development of adult mosquitoes. This study aims to identify neglected mosquito breeding sites. This observational study included a larval survey conducted at seven locations within the Palangka Raya University area in 2024. Observations revealed several overlooked breeding sites, including flower vases, water puddles, and plastic waste containers. The mosquito larvae found belonged to the species Aedes aegypti and Aedes albopictus, both of which are known vectors of DHF. The identification of potential breeding containers in the study area highlights the importance of individual awareness in residential areas for effective vector control.

***Keywords** : aedes, dengue hemorrhagic fever, inhabiting mosquito, mosquito vector, control*

INTRODUCTION

The Aedes genus of mosquitoes is a concerning presence in residential areas. *Aedes aegypti* and *Aedes albopictus* are of particular concern due to their association with recurring infectious diseases, posing serious public health threats (Diallo *et al*., 2022; Lwande *et al*., 2020). These two mosquito species are competent vectors of four major arboviruses, including the *dengue* virus, chikungunya virus, yellow fever virus, and Zika virus, all of which impose a significant health burden and economic losses globally (Lwande *et al*., 2020). Over the years, these vectors and viruses were endemic and limited to specific regions, but they have now spread across tropical, subtropical, and temperate zones, increasing their global reach and the potential for large-scale epidemics (Kraemer *et al*., 2019; Lwande *et al*., 2020; Wen *et al*., 2015). These mosquitoes commonly inhabit residential areas. *Dengue* is the most prevalent arboviral disease worldwide. It is caused by four distinct but closely related *dengue* virus

serotypes (DENV-1, -2, -3, and -4). DENV is transmitted through the bites of infected female *Aedes* mosquitoes. Infection with a single DENV serotype generally provides lifelong immunity against that specific serotype but only offers short-term cross-protection against other DENV serotypes, lasting from several months to a few years (Nugraheni *et al*., 2023).

DENV transmission is complex, though well-documented in the literature, indicating that the virus is spread to humans primarily through the bites of *Ae. aegypti* and *Ae. albopictus* mosquitoes (Dhar-Chowdhury *et al*., 2016). Conventional methods for determining *dengue* outbreak risk have focused on inspecting mosquito breeding sites, particularly larval habitats (Morales-Pérez *et al*., 2017; Ferdousi *et al*., 2015). However, in recent years, surveillance of larval and pupal populations has been used to assess the risk of *dengue* outbreaks (Islam et al., 2019; Joannides *et al*., 2021; Lippi *et al*., 2019; Ngugi *et al*., 2017), as the abundance of *Aedes* pupae serves as an accurate proxy for estimating the number of female mosquitoes (Jacob *et al*., 2014; Lema *et al*., 2021; Tomé *et al*., 2014).

Recent studies also emphasize the importance of measuring container conditions and types when estimating larval counts. Additionally, pupal productivity is influenced by ecological factors and container location—whether it is exposed to sunlight or in a shaded area. The "most productive containers" are identified by assessing the contribution of each specific container type to the overall number of *Aedes* larvae and/or pupae found (Ferdousi *et al*., 2015; Islam *et al*., 2019). Various container types can serve as breeding grounds for mosquito larvae, but certain containers may yield significantly higher numbers, making them highly efficient sources of immature mosquitoes (Paul *et al*., 2018a). Therefore, from an epidemiological and public health policy perspective, obtaining a clear and comprehensive understanding of the location and distribution of potential breeding containers is crucial (Ferdousi *et al*., 2015; Paul *et al*., 2018b).

Eliminating the most productive breeding sites for *Aedes* species has been implemented globally to keep vector densities below critical thresholds. Primary breeding containers play a vital role in determining the most appropriate and effective vector control strategies. This study aims to identify container types that support the development of *Aedes* spp. larvae as baseline data to propose suitable prevention and control measures based on integrated vector management strategies. Additionally, raising public awareness about neglected mosquito habitats is crucial in efforts to curb disease transmission.

METHOD

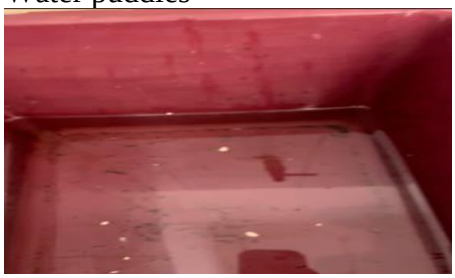
This study was conducted in seven locations within the Palangka Raya University area, covering seven faculties. It was an exploratory study carried out from September to October 2024. The survey of mosquito larvae presence was conducted manually through direct observation at potential breeding sites. Larval samples collected from each location were then stored in containers and brought to the laboratory for identification.

RESULT

Based on the direct survey conducted at the seven locations, several overlooked mosquito larval breeding sites were identified. The breeding of *Aedes* mosquito larvae was detected in various types of water-holding containers that are often neglected outside faculty buildings, as figure 1.




Used Plastic waste containers Water puddles

Used Flower vases Toilet tanks

Figure 1. Mosquito Larval Breeding Sites Frequently Overlooked During the Survey

DISCUSSION

This study identified several overlooked breeding sites for *Aedes* mosquito larvae in all surveyed locations, including plastic waste containers, water puddles, used flower vases, and toilet tanks. The breeding sites found in the study area were artificial containers, aligning with the findings of Akollo (2024). The study also revealed that *Aedes* mosquitoes predominantly breed in containers located outside buildings rather than inside, consistent with previous research (Ferede *et al*., 2018; Irayanti *et al*., 2021; Ngugi *et al*., 2017; Nordin *et al*., 2017; Tasya Febrial, 2022; Wikurendra, 2020). However, contrasting findings were reported by other studies (Freitas *et al*., 2019; Massaid *et al*., 2021), which found that *Ae. aegypti* prefers to lay eggs and rest indoors. These differences may be attributed to ecological variations and human activities. Different habitat preferences are influenced by local climate factors (Schwarz *et al*., 2020). In the study area, no open water containers were found indoors, and human activity was more concentrated outside buildings. As a result, the neglected outdoor containers were found to be positive for *Aedes* mosquito larvae. These findings provide a basis for initial vector control strategies, enabling a more targeted approach that focuses on specific types of water-holding containers. The presence of these containers allows *Aedes* mosquitoes to lay eggs and complete their life cycle.

The dominant mosquito species found in this study was *Ae. aegypti*. This aligns with findings from other studies (Bouzid *et al*., 2014) and supports references indicating that *Ae. aegypti* females lay eggs in domestic containers (Cao *et al*., 2017). Furthermore, *Ae. aegypti* larvae are more commonly found outdoors than indoors (Massaid *et al*., 2021; Ngugi *et al*., 2017). Other studies, however, have identified *Ae. albopictus* as the dominant species (Dom *et al*., 2016; Uddin *et al*., 2023). The presence of *Ae. aegypti* in this study may be due to the abundance of suitable breeding containers and the availability of organic matter for larval development (Chandrasiri *et al*., 2020; Lippi *et al*., 2019). The presence of organic and inorganic materials also influences vector size, behavior, and disease transmission potential (Bevins, 2007). This mosquito species is typically found near human settlements and prefers human blood meals (Jeyaprakasam *et al*., 2024).

This study represents an initial effort to characterize the presence of *Aedes* mosquitoes and their preferred breeding habitats within the campus area. However, there are several limitations. The research was conducted during the rainy season, which may have contributed to a higher

risk index. Additionally, all collected larvae and pupae were assumed to belong to the *Aedes* genus, meaning specific mosquito species could not be definitively identified. Biotic and abiotic factors, as well as water quality—which may influence mosquito oviposition preferences—should be examined in future studies. Despite these limitations, this preliminary research provides the first baseline data on the presence of *Aedes*arbovirus vectors in the study area. Identifying and eliminating the most productive breeding sites in an area has the potential to reduce mosquito density to levels that can halt *dengue* virus transmission (Ferdousi *et al*., 2015). Artificial containers serve as the primary breeding habitats in *dengue* outbreaks. Therefore, community mobilization to eliminate artificial containers, both indoors and outdoors, is crucial for *dengue* control programs (Mahmud *et al*., 2018).

Understanding the distribution and seasonal patterns of *Aedes* breeding sites aids in resource planning and raising public awareness to reduce *dengue* transmission (Jeyaprakasam et al., 2024). The number of potential breeding containers found in the study area highlights the importance of developing targeted vector control strategies, with an emphasis on sites such as water puddles, flower vases, and used plastic containers (Rodrigues *et al*., 2023). This investigation identified used plastic containers as a common breeding site, frequently harboring *Ae. aegypti* larvae and pupae. These containers are often discarded carelessly, contributing to a large population of adult female *Aedes* mosquitoes (Paul et al., 2018b). Behavioral changes in waste disposal and recycling are necessary, especially in urban areas, to ensure proper use, disposal, and recycling of containers (Medeiros-Sousa *et al*., 2020; Ngugi *et al*., 2017). In this study, used plastic containers were the most commonly found breeding sites for *Aedes* larvae, emphasizing the need for focused monitoring and intervention. Since these containers are prevalent and currently identified as major breeding sites, they should be prioritized for vector control interventions outside homes and buildings.

Increasing widespread and focused public awareness through health education is essential. Efforts should emphasize the role of *Aedes* mosquitoes in *dengue* transmission, the need to use covered containers, the importance of regularly cleaning or emptying water-holding containers, and behavioral changes in residential areas. Further research on vector biology, behavior, and control strategies is recommended (Diallo *et al*., 2022). These findings will assist relevant authorities in formulating programs to change community behaviors by targeting the most productive breeding containers for *Aedes*habitat management and vector control in Palangka Raya.

CONCLUSION

Used plastic containers are often neglected and serve as potential breeding sites for *Aedes* larvae. The *Aedes* larvae found in this study included *Ae. aegypti* and *Ae. albopictus*.

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