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Factors Associated with the Incidence of Dengue Hemorrhagic Fever in the Warung Jambu Community Health Center Area, West Java

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ABSTRACT

Dengue Hemorrhagic Fever (DHF) is an escalating public health problem in Bogor City, with 3,094 cases reported in 2024 and 176 cases recorded at Bogor Utara Public Health Center, indicating persistent and difficult-to-control transmission. This study analyzed the association between selected risk factors and DHF incidence in the working area of Warung Jambu Public Health Center from 2024 to June 2025. An analytic quantitative study with a cross-sectional design was conducted, using accidental sampling to recruit 50 respondents. Data were analyzed using the Chi-Square test. The findings showed that education level, water storage container draining practices, types of water storage containers, and the habit of hanging clothes were significantly associated with DHF incidence ($p < 0.05$), while age and sex were not significantly associated ($p > 0.05$). The study concludes that improving community education and strengthening household water storage management and clothing storage behaviors are essential for DHF prevention, supported by coordinated government actions and active community participation to reduce transmission.

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) remains a major public health problem in tropical countries, including Indonesia, and continues to challenge disease prevention programs despite ongoing control efforts. DHF is an acute infectious disease caused by the dengue virus and transmitted primarily by *Aedes aegypti*, a mosquito that breeds in water-holding containers commonly found around households such as bathtubs, buckets, used containers, and other stagnant-water sites. Persistent transmission reflects the complex interaction between vector ecology, environmental conditions, and human behavior, making community-based prevention crucial (Asri, Y., et al, 2024).

Globally, the World Health Organization (WHO) estimates that around 2.5 billion people live in areas at high risk of dengue infection, with approximately 390 million infections occurring annually, most of which are reported in Southeast Asia and the Western Pacific. In the Americas, surveillance up to epidemiological week 19 of 2025 reported approximately 2.7 million suspected dengue cases, indicating an ongoing upward trend. International reports also show that dengue has expanded in magnitude and geographic distribution, with very high global case counts reported in 2023 and 2024. Asia consistently contributes the largest proportion of dengue burden—commonly estimated at around 70% of global cases—due to climatic and environmental conditions that support mosquito development and human–vector contact (Joyodiningrat, M. H., et al, 2024).

In Indonesia, dengue remains a recurring and widespread threat. National surveillance has shown substantial morbidity and mortality across provinces and districts, with notable fluctuations but persistently high case numbers in recent years. West Java is among the provinces reporting high dengue incidence, and within this province, Bogor Regency and Bogor City show concerning trends. Bogor City recorded 3,094 dengue cases between 1 January and 20 December 2024, including 16 deaths, with the highest case distribution observed among children aged 5–14 years. In Bogor Utara area, the Public Health Center documented 176 dengue cases in 2024, while Warung Jambu Public Health Center recorded 155 cases in the same year, underscoring the local urgency for targeted prevention strategies (Kulsum, A. U., et al, 2024).

Evidence suggests that dengue occurrence is strongly influenced by behavioral and household environmental factors. According to Lawrence Green's behavioral theory, health-related behaviors are shaped by predisposing factors such as demographic characteristics (age, sex, education) and daily practices that may increase exposure to vectors. In the context of dengue, behaviors and conditions such as water storage management (availability of covers, type of containers, and frequency of draining/cleaning), household density, and the habit of hanging clothes indoors may create favorable resting or breeding environments for Aedes mosquitoes. However, local evidence that quantifies and prioritizes these factors within specific service areas is often limited, even though local context is essential for designing effective interventions (Liang, Y., et al, 2024).

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Therefore, this study was conducted to analyze factors associated with dengue incidence in the working area of Warung Jambu Public Health Center in 2025. Specifically, the study examines demographic characteristics and community practices related to water storage and household habits to identify priority risk factors that can inform more focused prevention, community education, and vector control programs at the primary health care level (Maulidah, L. R., et al, 2024).

LITERATURE REVIEW

Dengue Hemorrhagic Fever (DHF)

Dengue, or Dengue Hemorrhagic Fever (DHF), is a disease transmitted through the bite of *Ae. aegypti* mosquitoes and caused by infection with the dengue virus. Signs of the disease include bleeding from the nose, gums, and mouth, persistent pain in the upper abdominal (epigastric) area, and the appearance of bruises on the skin. *Ae. aegypti* mosquitoes are known to breed very rapidly, contributing to an estimated 390 million dengue infections each year. In Indonesia, DHF remains a major public health problem because the number of cases continues to increase annually and the spread occurs quickly. Dengue is found in tropical and subtropical regions worldwide, particularly during the rainy season when humidity levels are high. or rejects your proposed hypothesis (Nadeak, B., et al, 2025).

Etiology

Dengue Hemorrhagic Fever (DHF) is a viral disease that is widely distributed worldwide, particularly in tropical regions. The condition mainly affects children under 15 years of age; however, an increasing number of adults are also being infected. The primary reservoirs are humans and primates, while transmission occurs through Aedes mosquitoes (Nugraha, G. R, 2024).

There are four dengue virus serotypes: DEN-1, DEN-2, DEN-3, and DEN-4. Among these, DEN-3 is often associated with more severe cases. Infection with one serotype provides immunity to that serotype, but not to the others. All four serotypes are known to circulate in Indonesia. In endemic areas, an individual may even be infected with more than one serotype at the same time. Dengue virus transmission primarily occurs through *Ae. aegypti*, which is commonly found in urban areas, and *Aedes albopictus* in rural areas. Mosquitoes become vectors when they bite individuals who are currently infected, as the virus is present in the patient's blood. Transmission can also occur transovarially, from an infected female mosquito to her eggs (Nugraheni, E., et al, 2023).

The dengue virus develops inside the mosquito for approximately 8–10 days, mainly in the salivary glands. After this incubation period, an infected mosquito transmits the virus to humans through its saliva during a bite. In humans, the incubation period is about 4–6 days before symptoms appear. The virus replicates and circulates in the bloodstream for around one week. However, not all infected individuals develop DHF symptoms; some experience mild illness, and others remain asymptomatic, yet they can still contribute to transmission during the infectious period (Putri, L. A., et al, 2022).

Once infected, a mosquito can transmit the virus for the rest of its life. DHF is caused by the dengue virus, which affects capillary blood vessels and the blood clotting system, leading to bleeding that may progress to shock and even death. In Indonesia, DHF remains a major public health issue, influenced by increased population mobility and high population density in many areas, which accelerates the spread of the disease (Rojali, R., et al, 2020).

Transmission Cycle

Dengue Hemorrhagic Fever (DHF) is a disease transmitted through the bite of an *Ae. aegypti* female mosquito that has been infected with the dengue virus. In addition to *Aedes aegypti*, several other mosquito species can also serve as potential vectors, such as *Aedes polynesiensis* and *Ae. albopictus*, although they are less commonly found. Transmission occurs when an infected mosquito bites a human and injects the virus into the bloodstream through its saliva (Santi, N. E., Anwar, C., et al, 2023).

The dengue virus has four serotypes (DEN-1 to DEN-4). A person infected with one serotype develops lifelong immunity to that serotype, but not to the others. Secondary infection with a different serotype increases the risk of severe dengue or dengue shock due to a phenomenon known as Antibody-Dependent Enhancement (ADE). *Ae. aegypti* typically bites during the morning and late afternoon. It breeds in clean water containers such as bathtubs, gutters, flower pots, and discarded items. Its life cycle from egg to adult takes only 7–10 days, allowing rapid spread, especially in tropical countries like Indonesia (Sari, R. K., et al, 2022).

DHF was first recorded in 1953 in the Philippines. In Indonesia, the disease was first detected in 1968 in Surabaya City, where 58 DHF cases were identified among children, and 24 of them died, resulting in a Case Fatality Rate (CFR) of 41.3%. Since then, DHF has shown a significant increasing trend in both the number of cases and geographic spread. The disease subsequently expanded across many provinces in Indonesia and became a serious public health problem (Sri, T., Rahman, Q. A., et al, 2024).

DHF transmission is strongly influenced by environmental factors such as high rainfall, humidity, and air temperature, which support mosquito breeding. In addition, high population density and low community awareness regarding mosquito breeding-site elimination further accelerate transmission. Therefore, prevention and control efforts must be implemented continuously through health promotion, environmental management, and periodic fogging and larviciding programs (Thamrin, H. Y., et al, 2024).

Signs and Symptoms of Dengue Hemorrhagic Fever (DHF)

The clinical symptoms of Dengue Hemorrhagic Fever (DHF) generally appear after dengue virus infection and may present with a range of manifestations. These range from nonspecific fever (viral febrile syndrome) and dengue fever to the most severe form, dengue shock syndrome. In patients with DHF, a combination of clinical signs and laboratory findings is commonly observed, as described by (Risnawati, et al, 2021)

Epidemiological Triangle of Dengue Hemorrhagic Fever (DHF)

The epidemiological triangle theory, or epidemiological triad, was introduced by (Aguiar, M., et al, 2022)This theory explains the causes of infectious diseases. Disease occurs due to an imbalance among the host (humans), the agent (causative factor), and the environment (Trisnawati, E., et al, 2021).

Factors Contributing to Dengue Hemorrhagic Fever (DHF)

Age is one factor that may influence a person's vulnerability to dengue virus infection. Although dengue can infect anyone regardless of age, several studies report differences in the age groups most frequently affected. A study by (Anas, A. S., et al, 2025) found that children—particularly those aged 6–12 years—were the group most commonly infected. In contrast, research by (Antoro, B., et al, 2021) and surveillance data from (Asri, Y., Zakaria, et al, 2024) indicate that dengue cases are more frequently found among individuals over 15 years of age (adults). This difference may be related to higher levels of outdoor activity and greater mobility among adults, which can increase the likelihood of exposure to the dengue virus (Ulva, F., et al, 2024).

Sex is generally not a determinant of dengue infection because the dengue virus does not selectively infect hosts based on specific individuals or locations. However, in terms of prevalence, males tend to have a higher risk of infection. This increased vulnerability among males is often associated with occupational activities that involve more time outdoors and higher mobility, which may elevate the risk of contact with infected Aedes mosquitoes.

Behavior (Brief and Cohesive)

Education plays an important role in dengue prevention because it influences a person's knowledge and awareness in practicing clean and healthy behaviors, including the 3M actions (draining, covering, and recycling). In addition, daily household habits such as hanging clothes indoors can unintentionally provide dark and humid resting places for *Ae. aegypti*, thereby increasing the likelihood of mosquito–human contact, especially during peak biting times in the morning and afternoon. To reduce this risk, personal protection measures such as using bed nets during daytime naps and applying mosquito repellent can help prevent bites, provided that bed nets are intact and used properly. Environmental control is also essential; disposing of or burying used items like cans, bottles, and old tires helps prevent rainwater accumulation that can become mosquito breeding sites. For water containers that are difficult to drain regularly, applying larvicide such as abate can be an additional strategy to kill larvae. Overall, consistent water container cleaning—ideally once a week—combined with improved household practices and personal protection can effectively interrupt the mosquito life cycle and reduce dengue transmission.

Environment

Environmental conditions strongly influence dengue transmission. High population and housing density, limited living space, and short distances between houses make it easier for *Ae. aegypti* to move from one home to another and bite more people in a short time. In addition, poor house design—such as

ventilation without mesh screens—can allow mosquitoes to enter and rest indoors, increasing human exposure. Environmental risk is also heightened by unmanaged waste, because discarded containers can collect rainwater and become breeding sites. Likewise, water storage practices are critical: certain container materials (e.g., cement or ceramic) tend to be darker and prone to algae, making them more suitable for larvae, especially when containers are not cleaned regularly. Finally, the absence of tightly fitted covers on water containers enables mosquitoes to lay eggs easily, so using lids and maintaining containers are essential steps to interrupt the mosquito life cycle and reduce dengue risk.

METHODOLOGY

This study employed an analytic quantitative, cross-sectional design to assess associations between risk factors and Dengue Hemorrhagic Fever (DHF) incidence in the working area of Warung Jambu Public Health Center. The population included all DHF patients treated from 2024 to June 2025 (N = 100). A total of 50 respondents were selected using non-random accidental sampling, with sample size determined by the Slovin formula (e = 0.1). Data were collected in July–August 2025 using a structured questionnaire as the research instrument.

Independent variables were age, sex, education level, habit of hanging clothes, presence of water storage containers and container covers, and frequency of draining water containers. The dependent variable was DHF incidence. Inclusion criteria were diagnosed DHF patients willing to sign informed consent; exclusion criteria included inability to communicate/read/write properly and mental disorders.

Data were analyzed using univariate statistics for distributions and bivariate analysis using the Chi-Square test ($p < 0.05$). Findings were displayed in tables and brief descriptive narratives.

RESULTS

Sample Distribution by Age

Table 1. Sample Distribution by Age

Age Group	Frequency (n)	Percentage (%)
Children and Adolescents (6–19 years)	16	32.0
Adults (20–59 years)	29	58.0
Older Adults (≥60 years)	5	10.0
Total	50	100

Based on Table 1. the largest proportion of the sample was aged 20–59 years, totaling 29 respondents (58%), followed by those aged 6–19 years with 16 respondents (32%), and those aged ≥60 years with five respondents (10%).

Sample Distribution by Sex

Table 2. Sample Distribution by Sex

Gender	Frekuensi (n)	Persentase (%)
Female	28	56,0
Male	22	44,0
Total	50	100

Based on Table 2. the majority of respondents were female, totaling 28 people (56.0%), while males accounted for 22 people (44.0%).

Sample Distribution by Education Level

Table 3. Sample Distribution by Education Level

Education Level	Frequency (n)	Percentage (%)
Low (< Senior High School/Equivalent)	21	42.0
High (≥ Senior High School/Equivalent)	29	58.0
Total	50	100

Based on Table 3. the sample distribution by education level showed that 21 respondents (42%) had a low education level, while 29 respondents (58%) had a high education level.

Sample Distribution by Frequency of Draining Water Storage Containers

Table 4. Sample Distribution by Frequency of Draining Water Storage Containers

Frequency of Draining Water Storage Containers	Frequency (n)	Percentage (%)
< 2 times/week	24	48.0
≥ 2 times/week	26	52.0
Total	50	100

Based on Table 4. the sample distribution by the frequency of draining water storage containers showed that the largest proportion was ≥2 times per week, totaling 26 respondents (52.0%), while 24 respondents (48.0%) reported draining <2 times per week.

Sample Distribution by Water Storage Containers and Availability of Container Covers

Table 5. Sample Distribution by Water Storage Containers and Availability of Container Covers

Water Storage Containers and Availability of Container Covers	Frequency (n)	Percentage (%)
Available	26	52.0
Not Available	24	48.0
Total	50	100

Based on Table 5. the sample distribution by water storage containers and the availability of container covers showed that 26 respondents (52.0%) had water storage containers with covers, while 24 respondents (48.0%) did not have water storage containers and covers.

Sample Distribution by the Habit of Hanging Clothes

Table 6. Sample Distribution by the Habit of Hanging Clothes

Habit of Hanging Clothes	Frequency (n)	Percentage (%)
Yes	24	48.0
No	26	52.0
Total	50	100

Based on Table 6. the sample distribution by the habit of hanging clothes showed that 26 respondents (52.0%) did not have the habit, while 24 respondents (48.0%) reported hanging clothes indoors.

Association between Age and Dengue Hemorrhagic Fever (DHF) Incidence at Warung Jambu Public Health Center

Table 7. Association between Age and Dengue Hemorrhagic Fever (DHF) Incidence at Warung Jambu Public Health Center

Age Group	DHF Incidence: Yes n (%)	DHF Incidence: No n (%)	Total n (%)	p-value
Children and Adolescents (6–19 years)	10 (20.0)	6 (12.0)	16 (32.0)	0.889
Adults (20–59 years)	16 (32.0)	13 (26.0)	29 (58.0)	
Older Adults (≥60 years)	3 (6.0)	2 (4.0)	5 (10.0)	

Based on Table 7. most DHF patients were aged 20–59 years (32%), followed by those aged 6–19 years (20%) and ≥60 years (6%). This study found no association between age and DHF incidence at Warung Jambu Public Health Center ($p > 0.05$).

Association between Sex and Dengue Hemorrhagic Fever (DHF) Incidence at Warung Jambu Public Health Center

Table 8. Association between Sex and Dengue Hemorrhagic Fever (DHF) Incidence at Warung Jambu Public Health Center

Sex	**DHF Incidence: Yes n (%)**	**DHF Incidence: No n (%)**	**Total n (%)**	**p-value**
Female	17 (34.0)	11 (22.0)	28 (56.0)	0.661
Male	12 (24.0)	10 (20.0)	22 (44.0)	

Based on Table 8. 17 female respondents in this study experienced DHF, while 12 male respondents experienced DHF. This study found no association between sex and DHF incidence at Warung Jambu Public Health Center ($p > 0.05$).

Association between Education Level and Dengue Hemorrhagic Fever (DHF) Incidence at Warung Jambu Public Health Center

Table 9. Association between Education Level and Dengue Hemorrhagic Fever (DHF) Incidence at Warung Jambu Public Health Center

Education Level	DHF Incidence: Yes n (%)	DHF Incidence: No n (%)	Total n (%)	p-value
Low (< Senior High School/Equivalent)	19 (38.0)	2 (4.0)	21 (42.0)	0.000
High (≥ Senior High School/Equivalent)	10 (20.0)	19 (38.0)	29 (58.0)	

Based on Table 9. most DHF patients had a low education level (38%). This study found an association between education level and DHF incidence at Warung Jambu Public Health Center ($p < 0.05$).

Association between the Frequency of Draining Water Storage Containers and DHF Incidence at Warung Jambu Public Health Center

Table 10. Association between the Frequency of Draining Water Storage Containers and DHF Incidence at Warung Jambu Public Health Center

Frequency of Draining Water Storage Containers	DHF Incidence: Yes n (%)	DHF Incidence: No n (%)	Total n (%)	p-value
< 2 times/week	20 (40.0)	4 (8.0)	24 (48.0)	0.000
≥ 2 times/week	9 (18.0)	17 (34.0)	26 (52.0)	

Based on Table 10. this study found that 20 respondents who drained water storage containers less than twice per week experienced DHF, whereas 9 respondents who drained water storage containers at least twice per week experienced DHF. This study found an association between the frequency of draining water storage containers and DHF incidence at Warung Jambu Public Health Center ($p < 0.05$).

Association between Water Storage Containers and the Availability of Container Covers and DHF Incidence at Warung Jambu Public Health Center

Table 11. Association between Water Storage Containers and the Availability of Container Covers and DHF Incidence at Warung Jambu Public Health Center

Water Storage Containers and Availability of Container Covers	DHF Incidence: Yes n (%)	DHF Incidence: No n (%)	Total n (%)	p-value
Available	11 (22.0)	15 (30.0)	26 (52.0)	0.019
Not Available	18 (36.0)	6 (12.0)	24 (48.0)	

Based on Table 11. DHF cases were most frequently found among respondents who did not cover their water storage containers (36%). This study found an association between water storage containers and the availability of container covers and DHF incidence ($p < 0.05$).

Association between the Habit of Hanging Clothes and DHF Incidence at Warung Jambu Public Health Center

Table 12. Association between the Habit of Hanging Clothes and DHF Incidence at Warung Jambu Public Health Center

Habit of Hanging Clothes	DHF Incidence: Yes n (%)	DHF Incidence: No n (%)	Total n (%)	p-value
Yes	22 (44.0)	2 (23.9)	24 (48.0)	0.000
No	7 (14.0)	19 (38.0)	26 (52.0)	

Based on Table 12. 22 respondents who had the habit of hanging clothes experienced DHF, while 7 respondents who did not have the habit experienced DHF. This study found an association between the habit of hanging clothes and DHF incidence ($p < 0.05$).

DISCUSSION

This study showed that age was not associated with dengue incidence in the Warung Jambu Public Health Center area, indicating that dengue can affect all age groups in endemic settings where exposure may occur at home, school, or workplaces. Although adults often appear more frequently in case reports, this may be driven by daily mobility and activity patterns rather than age as an independent risk factor. Likewise, sex was not associated with dengue incidence, suggesting that males and females have similar opportunities to be bitten by infected Aedes mosquitoes, and that transmission in this area is more strongly shaped by household and environmental conditions than by biological sex differences.

In contrast, education level was associated with dengue incidence. Higher education is generally linked to better health literacy and stronger adoption of preventive behaviors, while lower education may limit understanding and consistent practice of dengue control measures. Key household behaviors and environmental factors were also associated with dengue incidence, particularly the frequency of draining water containers, the availability of water storage container covers, and the habit of hanging clothes indoors. These factors are biologically plausible because *Ae. aegypti* breeds in clean, stagnant water and commonly rests indoors in dark, humid areas. Overall, the findings highlight the importance of community education and practical household interventions—regular container cleaning, covering water storage, and reducing indoor mosquito resting sites—to support dengue prevention in the study area.

CONCLUSIONS

Based on the study conducted in the working area of Warung Jambu Public Health Center in 2025, most respondents were aged 20–59 years (58%), female (56%), and had a high education level (58%). The majority also did not have the habit of hanging clothes indoors (52%), had water storage containers with covers (52%), and drained/cleaned water storage containers at least twice per week (52%). The analysis showed that age and sex were not associated with dengue incidence, whereas education level, the habit of hanging clothes, the frequency of draining water containers, and the presence of water storage containers with available covers were associated with dengue incidence in this area.

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RECOMMENDATIONS

This study recommends strengthening dengue prevention efforts through coordinated actions by the government, community, and future researchers. For the government, community-based education programs should be enhanced to improve public understanding of dengue causes, impacts, and practical prevention measures, with messages delivered in a simple way and adapted to local culture. For the community, families are encouraged to build consistent preventive habits, such as regularly draining bathroom water containers, keeping water storage tightly covered, and avoiding hanging clothes indoors to reduce mosquito resting sites. Finally, future studies are advised to explore additional determinants of dengue, including socioeconomic conditions, access to health services, and other daily practices that may contribute to transmission risk.

FURTHER STUDY

This study has limitations. The cross-sectional design cannot confirm cause–effect relationships, and the use of accidental sampling with a small sample may limit generalizability. Data were collected using questionnaires, which may introduce recall or response bias, and several potential factors (e.g., socioeconomic status, sanitation, household density, climate variation, and access to health services) were not examined.

Future studies should use larger, more representative samples and consider probability sampling. Case–control or longitudinal designs are recommended to better assess causality, and additional variables such as socioeconomic and environmental indicators, larval indices, and health service access should be included to strengthen dengue prevention planning.

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