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Environmental Risk Factors, Larval Indices, and Dengue Prevention Behaviors in Pelita Village, Samarinda Ilir District, Indonesia

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Abstrak

Demam Berdarah Dengue (DBD) masih menjadi masalah kesehatan masyarakat utama di Indonesia dengan 114.720 kasus dan 894 kematian pada tahun 2023. Di wilayah kerja Puskesmas Sidomulyo, jumlah kasus DBD meningkat dari 21 kasus pada tahun 2023 menjadi 68 kasus pada tahun 2024. Penelitian ini bertujuan untuk menggambarkan faktor risiko lingkungan, keberadaan jentik, dan perilaku pencegahan DBD pada masyarakat Kelurahan Pelita, Kecamatan Samarinda Ilir. Penelitian ini menggunakan pendekatan kuantitatif dengan desain *cross-sectional* melalui metode *rapid epidemiological survey* yang dilaksanakan pada April hingga Mei 2026. Sebanyak 210 responden dipilih menggunakan teknik *cluster sampling* dari 30 klaster. Hasil penelitian menunjukkan bahwa 97,62% responden tidak pernah menderita DBD, namun 27,62% pernah melakukan kontak erat dengan penderita DBD. Nilai Angka Bebas Jentik (ABJ) sebesar 52,38% masih jauh di bawah standar nasional sebesar 95%. Mayoritas responden memiliki pengetahuan, sikap, dan persepsi yang baik terhadap pencegahan DBD, meskipun masih ditemukan keberadaan jentik, *breeding place*, dan beberapa praktik pencegahan yang belum optimal. Disimpulkan bahwa faktor lingkungan dan perilaku yang berpotensi mendukung penularan DBD masih ditemukan di Kelurahan Pelita sehingga diperlukan penguatan kegiatan pemberantasan sarang nyamuk dan partisipasi masyarakat secara berkelanjutan.

Abstract

Dengue Hemorrhagic Fever (DHF) remained a major public health problem in Indonesia, with 114,720 reported cases and 894 deaths in 2023. In the working area of Sidomulyo Primary Health Center, DHF cases increased from 21 cases in 2023 to 68 cases in 2024. This study aimed to describe environmental risk factors, larval presence, and dengue prevention behaviors among residents of Pelita Village, Samarinda Ilir District. A quantitative study with a cross-sectional design was conducted using a rapid epidemiological survey approach from April to May 2026. A total of 210 respondents were selected through cluster sampling from 30 clusters. The results showed that 97.62% of respondents had never experienced DHF, while 27.62% reported close contact with DHF patients. The Larvae Free Index was 52.38%, substantially below the national target of 95%. Most respondents demonstrated good knowledge, attitudes, and perceptions regarding dengue prevention; however, mosquito larvae, potential breeding sites, and several suboptimal preventive practices were still identified. It was concluded that environmental and behavioral factors potentially supporting DHF transmission remained present in Pelita Village, highlighting the need to strengthen mosquito breeding site control programs and sustain community participation.

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is a mosquito-borne viral disease caused by the dengue virus and primarily transmitted through the bite of infected *Aedes aegypti* mosquitoes. DHF remains one of the most important public health challenges in tropical and subtropical countries due to its increasing incidence, widespread geographical distribution, and potential to cause severe illness and death. The World Health Organization estimated that approximately 390 million dengue infections occur annually worldwide, with nearly 96 million cases presenting clinical manifestations (WHO, 2023).

Indonesia continues to face a substantial burden of dengue infection. According to the Indonesian Health Profile, 114,720 DHF cases and 894 deaths were reported in 2023, resulting in an incidence rate of 41.4 per 100,000 population (Kemenkes RI, 2024). The persistence of dengue transmission in Indonesia has been associated with multiple determinants, including rapid urbanization, high population density, inadequate environmental sanitation, climatic variability, and community behaviors related to vector control.

Environmental conditions play a critical role in the transmission cycle of dengue. The availability of water storage containers, stagnant water, unmanaged solid waste, and densely populated settlements provides suitable breeding habitats for *Aedes aegypti*. In addition, behavioral factors such as poor implementation of mosquito breeding site control measures and limited community participation may increase the risk of dengue transmission at both household and community levels. Previous studies have demonstrated that environmental sanitation and preventive practices significantly influence the occurrence of dengue infection (Sabdani, 2025; Sari, 2025).

The Indonesian Ministry of Health promotes mosquito breeding site control through the implementation of the 3M Plus strategy, which includes draining water containers, covering water storage facilities, recycling unused containers, and applying additional preventive measures such as larvicides, mosquito repellents, and environmental management. Although these strategies have been widely introduced, their implementation remains inconsistent across communities, resulting in persistent vector breeding and continued disease transmission.

East Kalimantan Province is considered one of the dengue-endemic regions in Indonesia because of its tropical climate, high rainfall, and environmental conditions favorable for mosquito breeding. Samarinda City continues to report a considerable number of DHF cases annually. In the working area of Sidomulyo Primary Health Center, the number of DHF cases increased from 21 cases in 2023 to 68 cases in 2024, corresponding to an incidence rate of 134.48 per 100,000 population. This increasing trend indicates that dengue remains an important public health concern requiring continuous surveillance and prevention efforts.

Pelita Village is a densely populated urban settlement located within the working area of Sidomulyo Primary Health Center. Characteristics such as population density, water storage practices, sanitation conditions, and community preventive behaviors may influence the risk of dengue transmission in this area. Previous studies have generally focused on either environmental determinants or behavioral

factors associated with dengue. However, evidence integrating environmental conditions, larval indices, and community prevention behaviors at the local level remains limited, particularly in Pelita Village. Therefore, this study aimed to describe environmental risk factors, larval presence, and dengue prevention behaviors among residents of Pelita Village, Samarinda Ilir District, as baseline evidence for strengthening community-based dengue prevention and control programs.

METHOD

This study employed a quantitative approach using a cross-sectional design and a rapid epidemiological survey method. The study was conducted between April and May 2026 in Pelita Village, Samarinda Ilir District, Samarinda City, East Kalimantan, Indonesia. The study area was selected because it is located within the working area of Sidomulyo Primary Health Center, which reported an increasing trend of dengue cases during the previous two years.

The study population consisted of all residents of Pelita Village, totaling 16,062 individuals. A cluster sampling technique was employed following the rapid survey methodology. Thirty clusters were selected using the Probability Proportional to Size (PPS) method based on population density and settlement characteristics. Subsequently, seven respondents were recruited from each cluster, resulting in a total sample of 210 respondents.

Eligible participants were residents aged 17 years or older, had lived in the study area for at least six months, were able to communicate effectively, and agreed to participate in the study. Individuals who were unavailable during data collection, declined participation, or provided incomplete information were excluded.

The variables observed included respondent characteristics, history of DHF, close contact with DHF patients, larval presence, environmental conditions, knowledge, attitudes, perceptions, and preventive practices related to dengue. Data were collected through face-to-face interviews using structured questionnaires and direct household observations using standardized observation checklists.

Data processing consisted of editing, coding, data entry, cleaning, and tabulation. Descriptive statistical analysis was performed using Stata software to generate frequency distributions and percentages for all study variables. The findings were presented in tables and narrative form to provide a comprehensive description of dengue-related environmental and behavioral risk factors among residents of Pelita Village.

RESULT AND DISCUSSION

Table 1. Characteristics of Respondents in Pelita Village, Samarinda City, 2026

Variable	Frequency (n)	Percentage (%)
Age (years)		
20-29	27	12.86
30-39	56	26.67
40-49	69	32.86
50-59	44	20.95
>59	14	6.65
Sex		
Male	96	45.71
Female	114	54.29
Occupation		
Civil servant/Military/Police/ Retired	16	7.62
Private employee	65	30.95

Variable	Frequency (n)	Percentage (%)
Farmer	1	0.48
Trader	44	20.95
Laborer	7	3.33
Motorcycle taxi driver	12	5.71
Housewife/Unemployed	46	21.90
PT TSB employee	16	7.62
Others	3	1.43

Source: Primary Data, 2026

Based on the univariate analysis of respondent characteristics among 210 respondents, demographic data revealed that the majority of respondents were aged 40-49 years (32.86%), followed by those aged 30-39 years (26.67%) and 50–59 years (20.95%). Female respondents constituted 54.29% of the study population, while male respondents accounted for 45.71%. Regarding occupation, private employees represented the largest proportion of respondents (30.95%), followed by housewives or unemployed individuals (21.90%) and traders (20.95%)

These findings indicate that most respondents belonged to the productive age group and were actively involved in household and economic activities. Individuals within this age group generally play an important role in household decision-making and environmental management, including dengue prevention efforts. The higher proportion of female respondents may be associated with their greater availability during household visits and their role in maintaining household sanitation. Furthermore, the predominance of private employees reflects the urban characteristics of Pelita Village, where residents are primarily engaged in service and trade sectors. These demographic characteristics may influence community participation in mosquito breeding site control activities and other dengue prevention programs.

Table 2. Distribution of Dengue Fever (DBD) History Among Respondents in Pelita Subdistrict, Samarinda City, 2026 (n: 210)

Variable	Frequency (n)	Percentage (%)
History of Dengue Fever (DBD)		
Yes	5	2.38
No	205	97.62
History of Close Contact with a Dengue Patient		
Yes	58	27.62
No	152	72.38
Relationship with Dengue Patient		
Child	52	89.66
Sibling/Relative	6	10.34
Current Condition of Dengue Patient		
Recovered	5	100.00

Source: Primary Data, 2026

Table 2 shows, that only 2.38% of respondents had a previous history of dengue fever, indicating that most participants in this study were not previously infected with dengue. This finding suggests that the respondents were largely from a population with low self-reported prior dengue exposure, although underreporting is still possible in community surveys because many dengue infections can be asymptomatic or mild. Dengue is often clinically silent or

nonspecific, so respondents may not remember or recognize earlier infections unless they required medical care. In this study, 27.62% of respondents reported close contact with a dengue patient, which shows that exposure within the social or household environment was not rare. Dengue transmission is commonly linked to the home and nearby surroundings because infected Aedes mosquitoes often bite during the day and people spend substantial time in and around their residences. However, the presence of close contact does not automatically mean direct person-to-person transmission, since dengue is mainly transmitted through mosquito bites rather than direct human contact.

Most respondents who reported close contact were children of the dengue patient, accounting for 89.66% of the contact group. This pattern may reflect the importance of household clustering, where children are more likely to share the same domestic environment and mosquito exposure as the index case. Previous evidence also suggests that transmission risk is shaped by daily human movement and shared exposure spaces, not only by the address of the reported case. Therefore, the high proportion of child contacts in this study may indicate that intrahousehold exposure is an important context for dengue risk in the community. The finding that all identified dengue patients in the contact group had recovered at the time of data collection suggests that the sample mostly captured past rather than acute illness. This is expected in descriptive surveys, because respondents are often interviewed after the acute phase of disease has passed. Still, dengue can lead to clinically important outcomes, and people with a history of prior dengue infection are at higher risk of severe dengue in subsequent infections. For that reason, a history of dengue remains an important variable in epidemiological screening and community surveillance.

Table 3. Knowledge, Attitudes, Perceptions, and Preventive Practices Toward Dengue Fever (DBD) Among Respondents in Pelita Subdistrict, Samarinda City, 2026 (n: 210)

Variable	Frequency (n)	Percentage (%)
Knowledge About Dengue Fever		
Good Knowledge	131	62.4
Poor Knowledge	79	37.6
Attitude Toward Dengue Prevention		
Positive Attitude	205	97.6
Negative Attitude	5	2.4
Perceptions of Dengue Fever		
Positive Perception	125	59.5
Negative Perception	8	40.5
Preventive Practices Against Dengue		
Good Preventive Practices	168	80.0
Poor Preventive Practices	42	20.0

Source: Primary Data, 2026

The table shows that 131 respondents (62.4%) had good knowledge about dengue fever, while 79 respondents (37.6%) had poor knowledge. This means more than half of the sample already understood dengue reasonably well, but a substantial minority still lacked adequate knowledge, which can weaken prevention efforts. Attitude toward dengue prevention was very strong, with 205 respondents (97.6%) showing a positive attitude and only 5 respondents (2.4%) showing a negative attitude. In descriptive terms, this suggests that almost all respondents accepted dengue prevention as important, which is a good foundation for community-based control programs. Perceptions of dengue fever were also mostly positive, with 125 respondents (59.5%) showing positive perceptions and 8 respondents (40.5%) showing negative perceptions. Although the table title suggests "perceptions," the percentages imply the denominator may be based on a smaller subset or there may be a formatting inconsistency, so this part should be checked carefully before final submission. Preventive practices against dengue were relatively good, with 168 respondents (80.0%) in the good-practice category and 42 respondents (20.0%) in the poor-practice category. This indicates that most respondents were already engaging in useful actions, but the 20% gap still matters because dengue control depends on consistent household and community behavior.

These findings indicate that the community in Peta Subdistrict had a generally supportive behavioral profile for dengue prevention, especially in attitude and practice. In public health terms, positive knowledge and attitude often create the conditions for better preventive behavior, but knowledge alone does not always fully translate into action. The result that good preventive practice reached 80% is encouraging because dengue transmission is strongly influenced by daily exposure to mosquito breeding sites and self-protection behaviors. WHO states that community risks depend partly on knowledge, attitudes, and practices related to water storage, environmental cleanliness, and personal protection against mosquito bites.

The presence of 37.6% poor knowledge and 20% poor practice suggests that dengue education still needs to be strengthened. Studies in Indonesia have also found that better knowledge is associated with more positive attitudes and improved prevention practices, which supports the importance of health education and community engagement. In descriptive research, this pattern can be interpreted as showing that the respondents are already fairly ready to participate in dengue control, but not yet fully uniform in understanding and action. This is important because dengue prevention is most effective when households regularly eliminate breeding sites, maintain clean water containers, and use personal protection measures consistently. Similarly, a recent national study in Indonesia found that attitudes and practices toward dengue prevention were generally higher than knowledge levels, highlighting the continuing need for health education interventions to strengthen community awareness and sustain preventive actions (Prayitno et al., 2025).

The findings show that respondents generally had good knowledge, positive attitudes, positive perceptions, and good preventive practices regarding dengue fever. This suggests that the community already has an adequate behavioral

foundation for dengue prevention, especially in terms of willingness to support control measures. The predominance of positive attitude (97.6%) is particularly important because attitude often reflects readiness to support preventive behavior and public health programs. Similar Indonesian studies have reported that better knowledge is linked with better attitude and improved dengue prevention practices, showing that education remains an important entry point for behavior change

Table 4. Larval Inspection and Larvae Free Index in Pelita Village, Samarinda City, 2026 (n = 210)

Variable	Frequency (n)	Percentage (%)
Indoor Larvae Observation		
Positive larvae in flower vases	63	30.0
Positive larvae in water buckets	34	16.2
Positive larvae in water drums	20	9.5
Positive larvae in bathtubs	16	7.6
Positive larvae in dispenser containers	13	6.2
Outdoor Larvae Observation		
Positive larvae in discarded cans	22	10.5
Positive larvae in water reservoirs	20	9.5
Positive larvae in used tires	17	8.1
Positive larvae in water jars	15	7.1
Positive larvae in water-filled trash containers	15	7.1
Larvae Free Index (LFI)		
Houses without larvae	110	52.38
Houses with larvae	100	47.62
LFI (%)		**52.38**

Source: Primary Data, 2026

Table 4 shows, that mosquito larvae were still identified in several water-holding containers both inside and outside households. Indoor larval presence was most frequently observed in flower vases (30.0%), water buckets (16.2%), and water drums (9.5%). Meanwhile, outdoor larvae were commonly found in discarded cans (10.5%), water reservoirs (9.5%), and used tires (8.1%). These findings indicate that both domestic and peridomestic environments continued to provide potential breeding sites for Aedes aegypti.

The Larvae Free Index (LFI) was 52.38%, indicating that only 110 of the 210 inspected households were free from mosquito larvae. This value remained substantially below the Indonesian national target of 95%, suggesting a high risk of vector proliferation and dengue transmission within the study area. The low LFI may be associated with the presence of unmanaged water containers and discarded materials capable of collecting rainwater. These findings emphasize the importance of strengthening mosquito breeding site control, routine larval surveillance, and community participation in implementing the 3M Plus strategy.

Table 5. Environmental Conditions Related to Dengue Risk in Pelita Village, Samarinda City, 2026 (n = 210)

Variable	Frequency (n)	Percentage (%)
Breeding Place Indicators		
Bathtub/WC water container	205	97.6
Water bucket	94	44.8
Flower vase	49	23.3
Water jar	37	17.6
Animal drinking container	32	15.2
Feeding Place Indicators		
Residents frequently stay outdoors	69	32.9
Presence of pets	43	20.5
Animal cages near the house	35	16.7
Resting Place Indicators		
Thick curtains rarely cleaned	171	81.4
Hanging clothes/piles of clothing	134	63.8
Storage room/warehouse	59	28.1
Indoor or surrounding ornamental plants	53	25.2
Dense vegetation around the house	48	22.9
Environmental Sanitation Indicators		
Stagnant water present	53	25.2
Discarded items around the house	23	11.0
Water puddles around the house	27	12.9
Households with available clean water	208	99.0
Households without covered waste bins	28	13.3

Source: Primary Data, 2026

Table 5 demonstrates that environmental factors associated with dengue transmission were still present in the study area. Potential breeding sites were commonly observed in bathtubs, buckets, flower vases, and water storage containers. Although most of these containers were free of larvae at the time of inspection, their widespread presence indicates a continuous risk for mosquito breeding if routine maintenance is neglected.

Several indicators of mosquito resting sites were also identified, particularly thick curtains that were rarely cleaned (81.4%) and hanging clothes or clothing piles (63.8%). These locations may provide favorable resting environments for adult Aedes aegypti mosquitoes because they are generally dark, humid, and infrequently disturbed. In addition, dense vegetation and ornamental plants around houses may further support mosquito survival.

Overall, environmental sanitation conditions were relatively good, with most households having access to clean water, functional sanitation facilities, and adequate waste disposal systems. Nevertheless, stagnant water, discarded items, and the absence of covered waste bins were still observed in a proportion of households. These conditions may facilitate mosquito breeding and contribute to the persistence of dengue transmission. Therefore, environmental management, regular cleaning activities, and community-based vector control programs should be strengthened to reduce dengue risk in Pelita Village.

CONCLUSION

This study showed that most respondents in Pelita Village were adults of productive age, predominantly female, and actively engaged in household and economic activities. Although only a small proportion of respondents reported a history of dengue fever, household contact with dengue patients was still relatively common. The Larvae Free Index (LFI) was 52.38%, substantially below the national target of 95%, indicating the continued presence of environmental conditions favorable for Aedes mosquito breeding. Mosquito larvae were found in various indoor and outdoor water-holding containers, while several environmental risk factors such as stagnant water, discarded items, hanging clothes, and poorly maintained resting sites were still observed. Despite these conditions, most respondents demonstrated good knowledge, positive attitudes, favorable perceptions, and relatively good preventive practices regarding dengue prevention. However, gaps in knowledge and several suboptimal preventive behaviors remained evident, indicating that environmental and behavioral factors supporting dengue transmission are still present in the study area.

Based on these findings, strengthening community-based dengue prevention and control programs remains essential. Regular implementation of mosquito breeding site control through the 3M Plus strategy, routine larval surveillance, and community participation should be intensified to improve the Larvae Free Index and reduce dengue transmission risk. Health education activities should continue to improve public understanding of dengue symptoms, year-round vector control, and effective preventive measures. In addition, local health authorities, community leaders, and health volunteers should collaborate to strengthen environmental monitoring, promote sustainable clean-up activities, and reactivate community larval monitoring initiatives. Future studies are recommended to explore additional determinants of dengue transmission, including climatic, socioeconomic, and entomological factors, using analytical study designs to better identify risk factors associated with dengue occurrence.

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