Jurnal Kesehatan Lingkungan Indonesia
23 (2), 2024, 137 – 145
DOI : 10.14710/ jkli.23.2.137-145
Available at https://ejournal.undip.ac.id/index.php/jkli

DHF Endemicity and *Aedes aegypti* Larvae Density Mapping in West Purwokerto Community Health Center's Working Area in 2023

Ikkas Atha Putri Salsabila, Aris Santjaka*, Nur Utomo

Poltekkes Kemenkes Semarang, Jl. Tirto Agung, Pedalangan, Kec. Banyumanik, Kota Semarang, Jawa Tengah 50268, Indonesia
*Corresponding author: arissantjaka@gmail.com

Info Artikel:Diterima 18 Juli 2023 ; Direvisi 9 Desember 2023 ; Disetujui 11 Januari 2024
Tersedia online : 30 Januari 2024 ; Diterbitkan secara teratur : Juni 2024

Cara sitasi: Salsabila IAP, Santjaka A, Utomo N. DHF Endemicity and Aedes aegypti Larvae Density Mapping in West Purwokerto Community Health Center's Working Area in 2023. Jurnal Kesehatan Lingkungan Indonesia [Online]. 2024 Jun;23(2):137-145. https://doi.org/10.14710/jkli.23.2.137-145.

ABSTRAK

Latar belakang: Kecamatan Purwokerto Barat merupakan wilayah endemis yang memiliki banyak kasus Demam Berdarah (DBD). Faktor yang mempengaruhi kasus DBD adalah kepadatan jentik nyamuk *Aedes aegypti* yang berhubungan dengan kinerja jumantik karena berperan langsung dalam kegiatan Pemberantasan Sarang Nyamuk (PSN). Faktor lain yang berhubungan dengan kepadatan jentik nyamuk *Aedes aegypti* yaitu kondisi lingkungan curah hujan. Analisis spasial menggunakan aplikasi sistem informasi geografis (SIG) dapat digunakan untuk mengetahui model penularan kasus DBD, tingkat kepadatan jentik nyamuk, Angka Bebas Jentik (ABJ) dan kinerja Juru Pemantau Jentik (jumantik) sebagai salah satu upaya pengendalian kasus DBD.
Metode: Jenis penelitian yang digunakan yaitu penelitian kualitatif dengan pendekatan eksploratif. Penelitian ini dilakukan untuk mendapatkan gambaran kasus DBD dan kepadatan jentik nyamuk *Aedes aegypti* melalui pemetaan yang dirancang dengan pemodelan SIG.
Hasil: Terdapat 78 kasus DBD yang tersebar pada 7 kelurahan di wilayah kerja Puskesmas Purwokerto Barat. Model penularan kasus DBD yaitu 15 secara *cluster* dan 15 secara *separated*. Kasus DBD berkaitan dengan fluktuasi curah hujan dimana curah hujan yang sangat tinggi diiringi dengan penurun kasus DBD. Hasil analisis spasial kepadatan jentik yang mempengaruhi kasus DBD yaitu terdapat 6 kelurahan dengan kasus DBD yang memiliki kategori indikator CI, HI dan BI rendah dengan nilai ABJ ≥ 95% dan 1 kelurahan dengan kasus paling sedikit memiliki kategori sedang dengan nilai ABJ < 95%.
Simpulan: Model penularan DBD yaitu secara cluster dan separated. Kasus DBD di wilayah kerja Puskesmas Purwokerto Barat berkaitan dengan curah hujan tetapi tidak berkaitan dengan kepadatan jentik nyamuk Aedes aegypti dan kinerja jumantik.

Kata kunci: Kasus DBD; Kepadatan Jentik; SIG

ABSTRACT
Title: DHF Endemicity and Aedes aegypti Larvae Density Mapping in West Purwokerto Community Health Center's Working Area in 2023
Background: *The West Purwokerto district is an endemic area with a high incidence of Dengue Hemorrhagic Fever (DHF) cases. Factors that influence DHF cases are Aedes aegypti larvae density related to Jumantik performance because has a direct impact on PSN activities. Another factor related to Aedes aegypti larvae density*

is the amount of rainfall in the area. Spatial analysis using Geographic Information System (GIS) applications can determine the transmission model of DHF cases, mosquito larvae density level, ABJ (larvae-free index), and jumantik performance as one of the efforts to control DHF cases.
Methods: *The research method employed was qualitative with an exploratory approach. This research was conducted to get an overview of DHF cases and the density of Aedes aegypti mosquito larvae through mapping designed with GIS modeling.*
Results: *In the working area of the West Purwokerto Community Health Center, there were 78 DHF cases spread across 7 sub-districts. The DHF transmission model consisted of 15 clusters and 15 separated cases. DHF cases are linked to rainfall, with extremely high rainfall leading to decreased DHF cases. The results of the larvae density spatial analysis show that 6 villages with DHF cases have low CI, HI, and BI indicator categories with larvae-free index values of ≥ 95%, and 1 village with at least cases having a medium category with larvae-free index values of < 95%.*
Conclusion: *DHF cases are transmitted in contagious clusters and separated. DHF cases in the West Purwokerto Community Health Center's working area are related to rainfall but not to mosquito larvae density.*

Keywords: DHF Cases; GIS; the Density of Larvae

INTRODUCTION

Indonesia has the highest number of DHF cases in Southeast Asia. In 2022, the Directorate of Infectious Disease Prevention and Control of the Indonesian Ministry of Health recorded a total of 131,265 DHF cases with around 40% of them being children aged 0 to 14 years. Meanwhile, the number of deaths reached 1,135 cases with 73% occurring in children aged 0 to 14 years[1]. According to the gathered data, the Case Fatality Rate (CFR) is evident at 0,86%.

Banyumas Regency is one of the dengue endemic areas in Central Java with high number of annual cases[2]. West Purwokerto District ranked among the 27 subdistricts in Banyumas Regency for the number of DHF cases in 2022. The density of Aedes aegypti mosquitos, which are common in tropical and subtropical areas, influences the spread of dengue disease[3]. The density of mosquito larvae describes the population of *Aedes aegypti* mosquitoes in a region[4]. High mosquito populations have a high risk of dengue transmission[5].

The density of mosquito larvae in an area is related to the performance of the larvae monitor (Wiggler Monitoring Officers)[6]. Wiggler Monitoring Officers interact directly with the community through periodic larvae monitoring activities, Eradication of Mosquito Nest (EMN), and providing communication, information, and education to the community. The larvae-free index indicator can be used to assess the success of EMN activities[7]. A larvae-free index value greater than 95% indicates that it is in the "good" category, while a value less than 95% indicates a high risk of transmitting and spreading DHF[8-9]. The larvae-free index value in the working area of the West Purwokerto Community Health Center is 96.9%, but there are many DHF cases.

Another factor that can be linked to DHF cases is environmental conditions[10]. Physical environmental conditions, such as rainfall, are closely associated with the breeding of *Aedes aegypti*[11]. Rainfall affects where mosquito larvae breed, which explains why DHF cases vary with the rainfall. Previous research conducted by Thessalonika Bone, Wulan P.J. Kaunang, and Fina L.F.G. Langi indicated a significant correlation between rainfall and dengue outbreaks[12].

As part of the effort to identify DHF cases, it is necessary to analyze the factors that influence DHF cases. These factors are linked through the mapping of DHF cases using GIS. The objective of mapping DHF cases is to provide detailed spatial information about the distribution of DHF cases and their transmission models, as well as the factors that affect DHF cases, i.e., the density of *Aedes aegypti* larvae. In addition, an analysis of the relationship between DHF cases and rainfall in the West Purwokerto Community Health Center work area will be conducted using rainfall graph media.

MATERIALS AND METHODS

The research method employed was qualitative with an exploratory approach. This study was conducted to obtain an overview of DHF cases and the density of *Aedes aegypti* mosquito larvae through mapping designed with GIS modeling. The goal of exploratory research is to discover the connection to a problem[13]. Data analysis on two variables, e.g., DHF cases and *Aedes aegypti* mosquito larvae density; including Container Index (CI), House Index (HI), Breteau Index (BI), and larva-free index indicators, as well as DHF cases with Wiggler Monitoring Officers performance, was carried out by looking at the results of mapping performed with GIS applications. Then, using rainfall graph media, the relationship between DHF cases and rainfall in the West Purwokerto Community Health Center work area was examined.

With only 78 DHF cases in the West Purwokerto Community Health Center work area in 2022, the subjects of this study were mapping DHF cases. The density of mosquito larvae was measured in the homes of dengue patients and in homes within 100 meters of the patient's residence. Cadres of Wiggler Monitoring Officers were evaluated for performance in hamlets where DHF cases have been identified.

RESULTS AND DISCUSSION

Result

This research was conducted in dengue-endemic areas located in the working area of the West Purwokerto Community Health Center. DHF cases in the West Purwokerto Community Health Center's working area were 78 cases spread across 7 villages, e.g., Kedungwuluh, Kober, Pasir Muncang, Bantarsoka, Rejasari, Pasir Kidul, and Karanglewas Lor (Table 1).

Table 1. Number of DHF Cases

No.	Village	∑ Case	%
1.	Kedungwuluh	8	10.26
2.	Kober	18	23.07
3.	Pasir Muncang	15	19.23
4.	Bantarsoka	15	19.23
5.	Rejasari	12	15.39
6.	Pasir Kidul	8	10.26
7.	Karanglewas Lor	2	2.56
Total cases		78	100

Rainfall data is derived from secondary data sourced from the Banyumas Regency's Central Bureau of Statistics. Figure 1 shows a graph of the relationship between rainfall and DHF cases.

Rainfall is inversely linked to the number of DHF cases. Rainfall is low in April (265 mm) and May (255 mm), accompanied by an increase in cases. The highest number of DHF cases was in May (14 cases), indicating an increase from April. Light rainfall will, over time, create many puddles as breeding sites for mosquitoes, leading to an increase in the mosquito population and possibly an increase in the number of cases[14-15].

Furthermore, the highest variation in rainfall occurred in October (810 mm), followed by a decrease in DHF cases from September. It can be due to washing away any of the remaining puddles of rainwater in September by rainfall that could be used as a breeding ground for mosquito larvae, causing mosquito larvae to die and fail to breed[16].

Rainfall

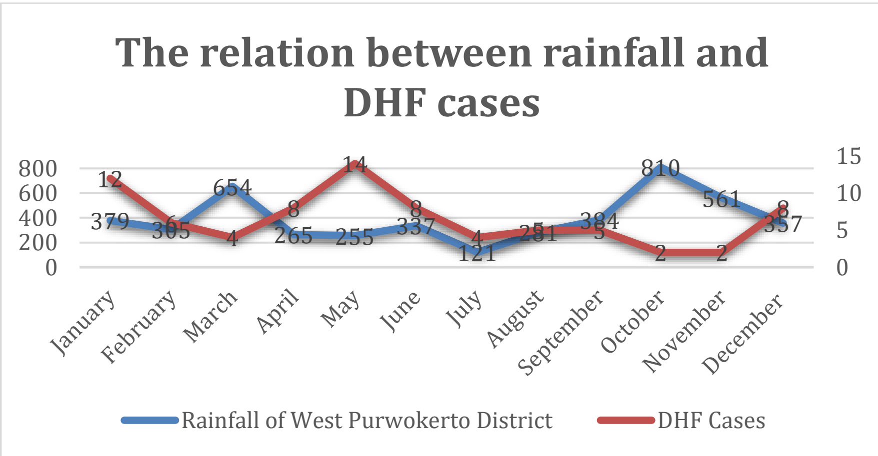

Figure 1. The Relationship Between Rainfall and DHF Cases

The density of *Aedes aegypti* mosquito larvae

Examination of *Aedes aegypti* mosquito larvae was carried out at the home of dengue patients and a radius of 100 meters from the patient's house using visual methods or by seeing and recording the presence or absence of larvae in containers[17]. Container Index (CI), House Index (HI), and Breteau Index (BI) indicators were used to calculate mosquito larvae density. Furthermore, the value of the larvae-free index was measured as an indicator of Wiggler Monitoring Officer performance.

The results of measuring the density indicator of *Aedes aegypti* mosquito larvae in the working area of the West Purwokerto Community Health Center are displayed in Table 2. The measurement results revealed that 6 out of 7 villages had CI, HI, and BI values in the low categories and larvae-free index values more than 95%, e.g., Kedungwuluh, Kober, Pasir Muncang, Bantarsoka, Rejasari, Pasir Kidul, and Karanglewas Lor Villages. Meanwhile, Karanglewas Lor Village had a medium category and a larvae-free index value of less than 95%.

Table 2. Results of measuring the density of *Aedes aegypti* mosquito larvae

No.	Village	CI	HI	BI	Larva-free Index
1.	Kedungwuluh	2.15	3.61	4.81	96.64%
2.	Kober	1.37	3.35	3.35	97%
3.	Pasir Muncang	1.87	3.00	4.50	97.71%
4.	Bantarsoka	1.03	1.55	2.07	96.38%
5.	Rejasari	1.26	2.28	2.85	96.7%
6.	Pasir Kidul	1.93	3.33	4.17	98.4%
7.	Karanglewas Lor	5.06	7.89	10.5	92.10%
	Average	1.73	3.57	3.71	96.42%

Wiggler Monitoring Officers performance

The monitoring performance of Wiggler Monitoring Officers was evaluated through surveys administered during in-person interviews. Respondents included Wiggler Monitoring Officers from each hamlet in the West Purwokerto Community Health Center's service area where dengue fever cases had been reported.

The percentage of Wiggler Monitoring Officers' performance questionnaire responses in each village is shown in Table 3. According to the study's findings, only three of seven urban villages had good Wiggler Monitoring Officers performance. With a questionnaire score of 96.7%, Bantarsoka Village has the best Wiggler Monitoring Officers performance. Meanwhile, Kober Village has the lowest Wiggler Monitoring Officer performance with a questionnaire score of 70%.

Table 3. Percentage of Wiggler Monitoring Officers performance questionnaire results

No.	Village	%	Category
1.	Kedungwuluh	94.2	Bad
2.	Kober	70	Bad
3.	Pasir Muncang	71.2	Bad
4.	Bantarsoka	96.7	Good
5.	Rejasari	75.36	Good
6.	Pasir Kidul	87.5	Good
7.	Karanglewas Lor	75	Bad

Spatial Analysis

The spatial analysis performed is a description of the results of maps produced by spatial data processing software in the form of ArcGIS applications. Secondary data obtained from West Purwokerto Community Health Center data in 2022 was used to collect DHF cases in the working area of the West Purwokerto Community Health Center in 2022. Then, coordinate points were taken at each dengue patient's house in all outputs located in the West Purwokerto Community Health Center work area. The obtained coordinate points were then entered into spatial data processing software in the form of ArcGIS applications. Meanwhile, the DHF cases transmission model is described using the Buffer feature.

The distribution of DHF cases can be seen in Figure 2, while the DHF cases transmission model can be seen in Figure 3. In both maps, DHF cases are represented by red dots, providing a visual depiction of the case distribution. The use of red dots as symbols enhances clarity and facilitates a quick understanding of the prevalence and potential pathways of DHF transmission.

a. Distribution of DHF Cases

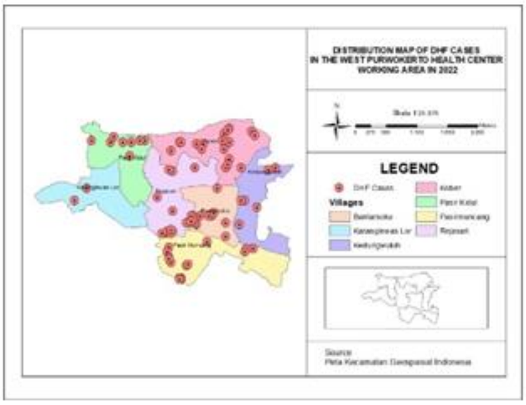

Figure 2. Map of the distribution of DHF cases in 2022

b. DHF Cases Transmission Model

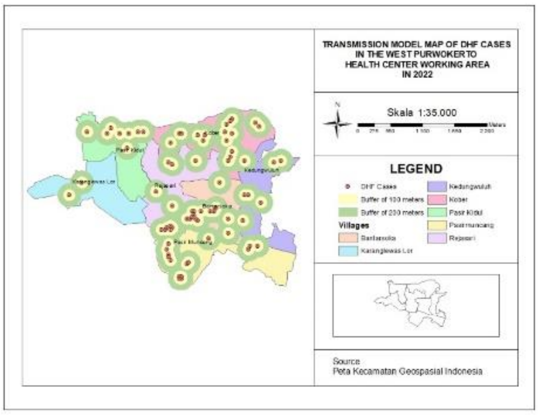

Figure 3. Map of DHF cases transmission model in 2022

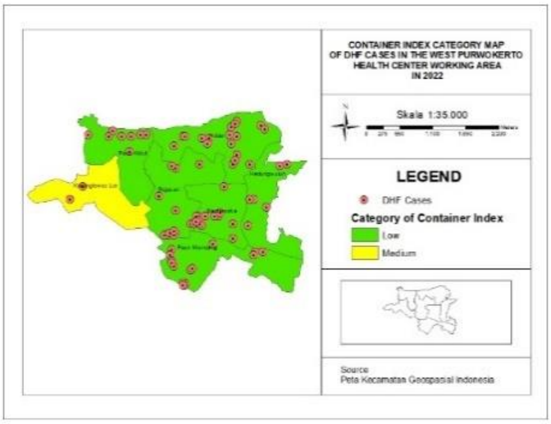

Figure 4. Map of Container Index (CI)

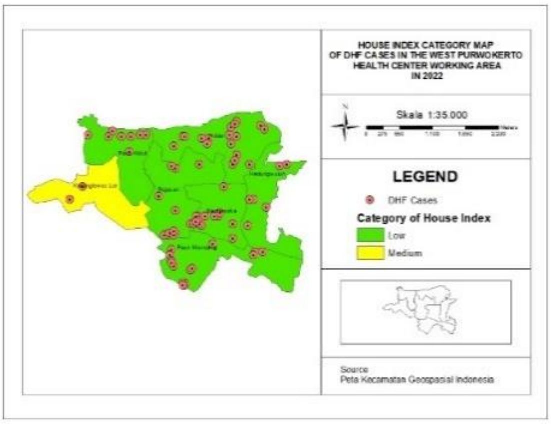

Figure 5. Map of House Index (HI)

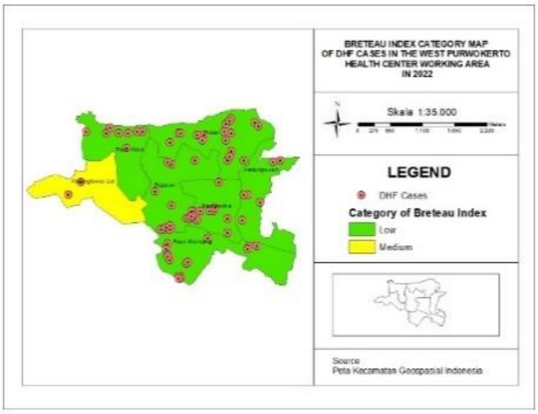

Figure 6. Map of Breteau Index (BI)

c. The density of *Aedes aegypti* mosquito larvae

The measured indicators of the density of *Aedes aegypti* mosquito larvae are container index (CI), house index (HI), and breateau index (BI), which are depicted through maps that can be seen in Figure 4-6. It shows the category of indicators of the density of *Aedes aegypti* mosquito larvae in the working area of the West Purwokerto Community Health Center. The mosquito larvae density indicators category is distinguished by color, i.e., green for the low category and yellow for the medium category. The category of Karanglewas Lor village is medium, whereas six other villages, namely Kedungwuluh, Kober, Pasir Muncang, Bantarsoka, Rejasari, and Pasir Kidul, are low.

d. Larva-free Index

Analysis of larvae-free index on DHF case was carried out by classifying larvae-free index data, which was divided into two, e.g., the value of larvae-free index ≥ 95% and the value of larvae-free index < 95%. The results of mapping larvae-free index values in the working area of the West Purwokerto Community Health Center can be seen in Figure 7.

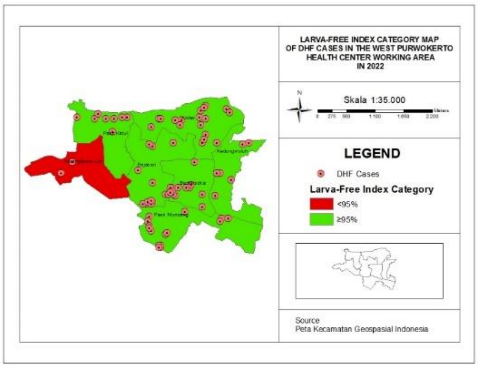

Figure 7. Map of larvae-free index

e. Wiggler Monitoring Officers performance

Wiggler Monitoring Officers cadre respondents' questionnaire scores were used to determine how well they handled DHF cases. Respondents came from every community that had dengue patients. There are two performance categories for Wiggler Monitoring Officers, e.g., good and poor. If the questionnaire score is greater than 80%, the category is good; otherwise, the category is bad. Figure 8 shows the Wiggler Monitoring Officers' performance map.

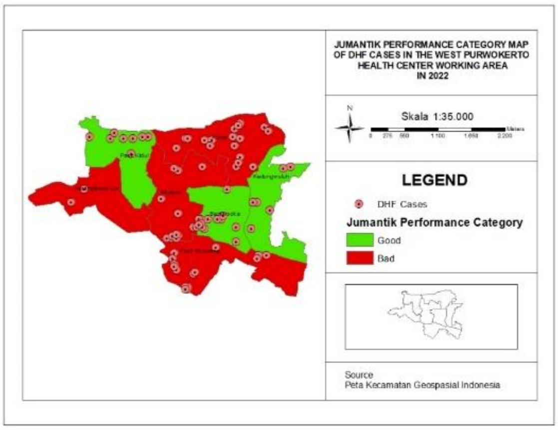

Figure 8. Map of Wiggler Monitoring Officers performance

Discussion

a. Distribution of DHF Cases

Figure 2 shows the distribution of DHF cases in 2022 in the working area of the West Purwokerto Community Health Center. DHF patients are indicated by red dots scattered in each village. It was found that Kober Village had the most dengue patients with 18 cases, while Karanglewas Lor Village had the fewest dengue patients with 2 cases.

b. DHF Cases Transmission Model

Dengue case transmission can be classified into two types, e.g., cluster and separated. Cluster transmission are 100 meters away, while the separated transmission are further away18. The distance is based on the flight range of the Aedes aegypti mosquito, which is limited to 100 meters19.

In the data collected for this study, two transmission models were identified in the data collected for this study, e.g., a cluster model and a separated model (Figure 3). Dengue patients' radius is represented by two colors, i.e., light pink for a radius of 100 meters and light green for a radius of 200 meters. There are 15 distinct separate transmission models and 15 distinct cluster transmission models. A cluster transmission occurs within a specific area, whereas a separated transmission occurs over a distance greater than 100 metersTwo2,20. This is connected to the 100-meter mosquito flight range and the time it takes for dengue fever to develop (incubation period)21.

Based on data obtained from the community health center, the first dengue case was reported in Pasir Muncang village on January 1, 2022; the second case was identified in Bantarsoka village on January 3, 2022; and the third case was reported in Kober village on January 4, 2022. All three cases occurred at distance greater than 100 meters. Thus, it can be concluded that the three cases are the first case index. Based on the mosquito's flight distance of 100 meters, it is possible to conclude that the three cases are exceeded the mosquito's flight ability.

The fourth case experienced symptoms on January 7, 2022. The patient was less than 100 meters away from the first case. As a result, the fourth case was considered as a secondary case or one that was transmitted from the first case. This is based on the DHF incubation period of seven days and the maximum flight distance of mosquitoes of 100 meters. These two cases are cluster transmissions located in Pasir Muncang village.

Furthermore, in the separated transmission model, dengue disease transmission over a distance of more than 100 meters. This relates to the flight distance of mosquitoes at most 100 meters. Transmission separately can come from several types of mosquitoes or other factors such as the patient being exposed outside the home area. According to research, many homes of dengue patients do not contain mosquito larvae and have clean, well-maintained environments, therefore the chance of the patient being bitten by mosquitoes outside the home environment is low.

c. The density of *Aedes aegypti* mosquito larvae

The density of Aedes aegypti mosquito larvae is depicted through maps that can be seen in Figure 4-6. It shows the category of indicators of the density of Aedes aegypti mosquito larvae. The indicators of mosquito larvae density measured are CI, HI, and BI which have direct relevance to the transmission of DHF cases22. Based on the map image, it can be seen that villages with low categories for CI, HI, and BI indicators have a large number of DHF cases, whereas villages with medium categories have the fewest DHF cases.

The results of measurements against CI, HI, and BI indicators can be used to determine the level of mosquito larvae density or density figure (DF), which indicates the level of transmission risk23. The DF level of the village with the green color is low, which means the risk of dengue transmission is low while the DF level of the village with yellow color is medium, which means the risk of dengue transmission is medium.

Karanglewas Lor village has a medium density of larvae because, according to research, people in Karanglewas Lor village do not keep the environment clean. Many used items, such as used bottles, were discovered scattered throughout the village. A dirty environment could potentially be a breeding ground for mosquito larvae24. Karanglewas Lor village is in the medium category, which may be due to calculation factors such as the small number of houses examined in comparison to other villages. Meanwhile, in villages with a high number of cases, the density of larvae is low because only a few containers and houses are positive for larvae, according to research findings. This is related to the fact that researcher discovered that the research was conducted at a time after the simultaneous EMN, therefore the houses of residents used as research subjects were still clean and no mosquito larvae were found.

d. Larva-free Index

The results of mapping larvae-free index values in the working area of the West Purwokerto Community Health Center can be seen in Figure 7. It shows a map of the distribution of DHF cases based on larvae-free index with two categories differentiated by color, green for the larvae-free index category ≥ 95% and red for the larvae-free index category < 95%. The study found that only one village, Karanglewas Lor village, had the larvae-free index category < 95%, and six other villages, Kedungwuluh, Kober, Pasir Muncang, Bantarsoka, Rejasari, and Pasir Kidul villages, had the larvae-free index category > 95%.

The larvae-free index value is high in each village because only a few houses found mosquito larvae out of the total number of houses inspected. Meanwhile, Karanglewas Lor village has a larvae-free index value of < 95% also due to the calculation factor where the houses examined are only neglible compared to other villages. The larvae-free index values below the 95% standard can be risky in accelerating the transmission of DHF cases25. A low larvae-free index value in an area indicates a lack of community participation in eradicating mosquito nests (EMN), allowing mosquito populations to grow and pose a high risk of dengue transmission26.

Before the larvae inspection, the community was informed that larvae inspection activities would be carried out so that residents could clean their homes, including draining the bathtub and cleaning the refrigerator water reservoir and dispenser. As a result, at the time of inspection, the larvae-free index value in six urban villages within the West Purwokerto Community Health Center's service area was greater than 95%.

e. Wiggler Monitoring Officers performance

Figure 8 shows a color-coded Wiggler Monitoring Officers performance map, with green representing good performance and red representing poor performance. From 7 subdistricts, Karanglewas Lor, Kober, Rejasari, and Pasir Muncang villages had poor Wiggler Monitoring Officers performance, while the remaining three had good performance, namely Kedungwuluh, Bantarsoka, and Pasir Kidul.

According to the findings of this research, Wiggler Monitoring Officers in the West Purwokerto Community Health Center's working area conducted EMN activities once a month. However, there were also Wiggler Monitoring Officers who participate in EMN activities once per week. This was due to the fact that some homeowners do not want their homes checked for larvae every week, and others do not want their homes checked for larvae at all. This does not comply with the regulations outlined in the technical guidelines for EMN activities sourced from the Indonesian Ministry of Health in 2016[27]. There were numerous Wiggler Monitoring Officers who failed to record the survey results on the survey result card, resulting in an inadequate report to the community health center.

According to research conducted by Melisa S. Panungkelan, there is a relationship between Wiggler Monitoring Officers and family behavior in EMN efforts. For families to participate in EMN activities, there is a need to increase the role of Wiggler Monitoring Officers in educating families. This is because a good Wiggler Monitoring Officers role influences family behavior in conducting EMN.[28]. The significance of the role of Wiggler Monitoring Officers is highlighted by the study conducted by Saputro (2017), which explained the meaningful connection between the role of Wiggler Monitoring Officers and family behavior in performing EMN[29].

Additionally, according to information obtained from dengue patients, during the EMN activity, Wiggler Monitoring Officers did not conduct a thorough inspection of all houses, and EMN only checked containers that were easily accessible in the house at the time. Furthermore, Wiggler Monitoring Officers performance can be influenced by abilities, motivation, age and personal situations that can affect productivity at work[30]. Based on the research conducted, the average age of Wiggler Monitoring Officers is 50 years while the maximum productive age is 40 years[31].

Subsequently, based on the research conducted, it was discovered that Wiggler Monitoring Officers always provides information to the community prior to EMN so that the community has cleaned the house first, including containers that have the potential to be positive for larvae. As a result, no positive container larvae were discovered during EMN, and the Larvae-Free Index value for the region was greater than 95%.

CONCLUSION

This research concluded: 1) the number of DHF cases in the working area of the West Purwokerto Community Health Center for the period of January to December 2022 was 78 spreads across 7 villages, i.e., Kedungwuluh, Kober, Bantarsoka, Pasir Muncang, Rejasari, Pasir Kidul, and Karanglewas Lor. 2) Rainfall is inversely proportional to DHF cases, with high rainfall resulting in a decrease in DHF cases as mosquito larvae breeding sites are washed away by rainwater. However, moderate rainfall following heavy rainfall can increase the incidence of dengue fever due to the formation of puddles that serve as breeding grounds for mosquito larvae. 3) The results of mapping the density category of *Aedes aegypti* mosquito larvae in the West Purwokerto Community Health Center’s working area show the low category as green and the medium category as yellow. The villages of Kedungwuluh, Kober, Pasir Muncang, Bantarsoka, Rejasari, and Pasir Kidul are considered to be in the low category. The village of Karanglewas Lor is considered to be in the medium category. 4) In the West Purwokerto Community Health Center work area, there are two mapping results of the larvae-free index category, i.e., larvae-free index $\geq$ 95% is shown in green, and larvae-free index < 95% is shown in red. Villages with the larvae-free index category $\geq$ 95% are Kedungwuluh, Kober, Pasir Muncang, Bantarsoka, Rejasari, and Pasir Kidul villages. Village with the larvae-free index category < 95% is Karanglewas Lor Village. 5) Wiggler Monitoring Officers performance mapping in the West Purwokerto Community Health Center work area, with good Wiggler Monitoring Officers performance was highlighted in green and poor Wiggler Monitoring Officers performance was highlighted in red. Kedungwuluh, Bantarsoka, and Pasir Kidul villages have good Wiggler Monitoring Officer performance. Karanglewas Lor, Kober, Rejasari, and Pasir Muncang have poor performance.

The recommendation for further research is the research be carried out within the community association (RW) so the mapping of DHF cases is more detailed. Therefore, the efforts to prevent and control DHF cases will be optimized.

ACKNOWLEDGEMENTS

Ikkas Atha Putri Salsabila of the Environmental Health Department, Poltekkes Kemenkes Semarang, prepared this journal article based on the report DHF Endemicity and *Aedes aegypti* Larvae Density Mapping in West Purwokerto Community Health Center’s Working Area in 2023. This work has been funded by Aris Santjaka and Nur Utomo as the supervisor. The opinions expressed here are those of the authors and do not necessarily reflect the views of those who provide the funding.

REFERENCES

1. Kemenkes RI. Atasi Dengue, Kemenkes Kembangkan Dua Teknologi ini [Internet]. 2023.

Available from: https://sehatnegeriku.kemkes.go.id/baca/umum/20230205/3642353/atasi-dengue-kemenkes-kembangkan-dua-teknologi-ini/

2. Sunaryo B, Ningsih DP. Distribusi spasial demam berdarah dengue di kabupaten banyumas, provinsi jawa tengah spatial distribution of dengue haemorrhagic fever cases in banyumas district, central java province. 2014;10(01):1–8.
3. Aini N, Santjaka A, Gunawan AT. Dinamika Penularan Penyakit Demam Berdarah Dengue (DBD) Di Kecamatan Purwokerto Selatan Kabupaten Banyumas Tahun 2015. Keslingmas. 2015;37(1):20–35. https://doi.org/10.31983/keslingmas.v37i1.3786
4. Sari IP. Karya tulis ilmiah. Karya Tulis Ilm [Internet]. 2022;8–11. Available from: www.smapda-karangmojo.sch.id
5. Ummi K, Wahyuningsih NE, Hapsari. Kepadatan Jentik Nyamuk Aedes Sp. (House Index) Sebagai Indikator Surveilans Vektor Demam Berdarah Dengue Di Kota Semarang. J Kesehat Masy [Internet]. 2017;5(5):906–10. Available from: http://ejournal3.undip.ac.id/index.php/jkm
6. Entomologi P, Masyarakat FK, Diponegoro U. Hubungan faktor perilaku jumantik terhadap kepadatan jentik di wilayah binaan gerakan satu rumah satu jumantik puskesmas candilama kota semarang. 2021;9(September):581–8. https://doi.org/10.14710/jkm.v9i5.30712
7. Putri YD. Upaya Pencegahan DBD oleh Juru Pemantau Jentik (Jumantik) dan Hubungannya dengan Angka Bebas Jentik (ABJ) di Wilayah Krja Puskesmas Rawa Buntu Kota Tangerang Selatan Tahun 2016. 2017;
8. Arsula SY, Cahyati WH. Pembentukan Mawas Demam Berdarah Dengue (DBD) Terhadap Angka Bebas Jentik (ABJ). J Care. 2017;5(1):1–9.
9. Nirmala F, Layaly NS, Ode Azim LL, Sabarudin. Korelasi Faktor Iklim, Kepadatan Penduduk, Dan Angka Bebas Jentik (ABJ) Terhadap Kejadian Demam Berdarah Dengue(DBD) Di Kota Kendari Periode Tahun 2012-2021. Medula. 2022;9(2):134–44. https://doi.org/10.46496/medula.v9i2.25471
10. Kemenkes RI. Profil Kesehatan Kemenkes RI [Internet]. Profil Kesehatan Kemenkes RI. 2018. 173–180 p. Available from: file:///C:/Users/HP/Downloads/PROFIL_KESEHATAN_2018.pdf
11. Nisaa A. Korelasi antara Faktor Curah Hujan dengan Kejadian DBD Tahun 2010-2014 di Kabupaten Karanganyar. 2014.
12. Bone T, Kaunang WPJ, Langi F. Hubungan Antara Curah Hujan, Suhu Udara Dan Kelembaban Dengan Kejadian Demam Berdarah Dengue Di Kota Manado Tahun 2015. Kesmas [Internet]. 2021;10(5):36–45. Available from: https://ejournal.unsrat.ac.id/index.php/kesmas/article/view/35109
13. Samsu. Metode Penelitian Metode Penelitian. Metod Penelit Kualitatif [Internet]. 2017;(17):43. Available from: http://repository.unpas.ac.id/30547/5/BAB III.pdf
14. Lahdji A, Putra BB. Association of Rainfall, Temperature, and Humidity with Dengue Hemorrhagic Fever Cases in Semarang. Syifa Med. 2017;8(1):46–53. https://doi.org/10.32502/sm.v8i1.1359
15. Koesnayani AS, Hidayat AK. Hubungan Antara Pola Curah Hujan dengan Kejadian DBD di Kota Tasikmalaya Tahun 2006-2015 (Kajian Jumlah Curah Hujan dan Hari Hujan). J Siliwangi. 2018;4(1):14–9.
16. Biis NA, Sukesi TW. Hubungan Antara Curah Hujan dan Kepadatan Penduduk dengan Kejadian Demam Berdarah Dengue (DBD) di Wilayah Kerja Puskesmas Gamping I (Desa Balecatur) Kabupaten Sleman Tahun 2015-2017. Naskah Publ. 2017;1–10.
17. Lutfiana M, Winarni T, Zulmiati Z, Novarizqi L. Survei Jentik Sebagai Deteksi Dini Penyebaran Demam Berdarah Dengue (Dbd) Berbasis Masyarakat Dan Berkelanjutan. J Ilm Mhs Fak Kesehat Masy Univ Diponegoro. 2012;2(1):96982.
18. Baiti N, Santjaka A. Analisis Dinamika Penularan Penyakit Demam Berdarah Dengue (DBD) Di Desa Endemis Kabupaten Pekalongan Tahun. Dewi Nugraheni RM / Pena Med. 2018;8(1):64–75. https://doi.org/10.31983/keslingmas.v37i1.3786
19. Purnomo CA. Di Kecamatan Duren Sawit Kotamadya Jakarta Timur Tahun 2010 Di Kecamatan Duren Sawit Kotamadya Jakarta Timur Tahun 2010. 2010;137308.
20. Sayono, Nurulita U. Situasi Terkini Vektor Dengue (*Aedes aegypti*) di Jawa Tengah. Kesmas. 2016;11(18):96–105.
21. Ningrum KM. Analisis Sebaran Spasial Tingkat Kejadian Penyakit Demam Berdarah Dengue dengan Metode Kernel Density di Kecamatan Depok Tahun 2019. file:///C:/Users/VERA/Downloads/ASKEP_AGREGAT_ANAK_and_REMAJA_PRINT.docx. 2020;21(1):1–9.
22. Kinansi RR, Widjajanti W, Ayuningrum FD. Kepadatan Jentik Vektor Demam Berdarah Dengue Di Daerah Endemis Di Indonesia (Sumatera Selatan, Jawa Tengah, Sulawesi Tengah Dan Papua). J Ekol Kesehat. 2017;16(1):1–9.
23. Suharno Zen, M.Sc DR. Kepadatan Jentik Nyamuk Aedes Spp Ditinjau dari Nilai Breteu Index (BI), Container Index (CI), dan Human Index (HI) di Kelurahan Metro Kecamatan Metro Pusat Kota Metro Lampung Tahun 2015. Pros Semin Nasional-ISBN. 2015;(Ci).
24. Prasetyo. Pencegahan dan Penanggulangan Penyakit Demam Berdarah Dengue dan Demam

Berdarah. 2014;

25. Yosepha W. Survey Tempat Perkembangbiakan dan Kepadatan Jentik Nyamuk Aedes Sp di Kelurahan Kampung dalam Kecamatan Kabanjahe Kabupaten Karo Tahun 2018. [Kti] Politek Kesehat Kemenkes Medan [Internet]. 2018;1–49. Available from: http://ecampus.poltekkes-medan.ac.id/jspui/bitstream/123456789/1213/1/Winda KTI.pdf
26. Nasifah SL, Sukendra DM. Kondisi Lingkungan dan Perilaku dengan Kejadian DBD di Wilayah Kerja Puskesmas Kedungmundu. Indones J Public Heal Nutr. 2021;1(1):62–72.
27. Kemenkes RI. Petunjuk teknis implementasi PSN 3M Plus Dengan Gerakan 1 Rumah 1 Jumantik. petunjuk Tek implementasi PSN 3M-PLUS Dengan Gerak 1 Rumah 1 Jumantik. 2016.
28. Panungkelan MS, Pinontoan OR, Joseph WBS, Kesehatan F, Universitas M, Ratulangi S. Hubungan Antara Peran Kader Jumantik Dengan Perilaku Keluarga Dalam Pemberantasan Sarang Nyamuk Dbd Di Kelurahan Tingkulu Kecamatan Wanea Kota Manado. Kesmas. 2020;9(4):1–6.
29. Saputro P., K I. Hubungan Peran Jumantik dengan Perilaku Keluarga dalam PSN Penyebab DBD. Universitas Muhammadiyah Yogyakarta; 2017.
30. Ma'rifah S. Hubungan Antara Pengetahuan Jumantik Tentang Demam Berdarah Dengue (DBD) Dengan Kinerja Jumantik. J Keperawatan Komunitas. 2014;2(1):39–45.
31. Darmayanti JR, Handayani PA, Supriyono M. Hubungan Usia , Jam , dan Sikap Kerja terhadap Kelelahan Kerja Pekerja Kantor Dinas Koperasi Usaha Kecil dan Menengah Provinsi Jawa Tengah. Prosidang Semin Nas UNIMUS. 2021;4:1318–30.