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Original Research Paper

Mapping the spread of dengue fever with geographic information system in Magelang City in 2020-2024

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Abstract
Dengue Hemorrhagic Fever (DHF) cases are rising in Magelang City, yet current reporting lacks distribution maps, hindering identification of high-risk areas. This quantitative descriptive study, therefore, aimed to analyze DHF distribution in Magelang City (2020-2024) using a Geographic Information System (GIS) and identify dominant influencing factors. Employing a cross-sectional design, secondary data on DHF cases, rainfall, temperature, humidity, population density, and Larvae Free Rate (LFR) were collected. Data analysis involved spatial methods with QGIS and statistical methods (Geographically Weighted Regression/GWR) via RStudio. Results showed climate factors (rainfall, temperature, humidity) and population density exhibited homogeneous patterns, not significantly explaining DHF case variations. While LFR was generally high (>90%), a positive anomaly in 2023 saw high LFR followed by increased cases. The DHF distribution pattern fluctuated, peaking in 2022. In conclusion, none of the studied factors (climate, population density, LFR) were identified as significant dominant influences on DHF distribution. LFR anomalies suggest program interventions responding to high caseloads. DHF distribution is likely due to complex interactions of other unstudied factors (e.g., PSN effectiveness, behavior, sanitation, community knowledge). GIS remains valuable for data driven DHF prevention planning.

Keywords: dengue hemorrhagic fever; distribution map; geographic information system

1. Introduction

Dengue hemorrhagic fever (DHF) is a severe condition resulting from the dengue virus, with four serotypes known as DEN-1, DEN-2, DEN-3, and DEN-4 (Kanan et al., 2024). Dengue fever has emerged as a serious public health problem in recent years (Safaei et al., 2025). Historically, the incidence of arboviruses, particularly dengue, has been concentrated throughout the tropics (de Castro Poncio et al., 2023). Based on data from the World Health Organization (WHO), Indonesia is among the 30 countries with the highest dengue fever endemic rates in the world. In 2023, Indonesia recorded 114,720 cases of dengue fever with 894 deaths, and this figure increased significantly in the 43rd week of 2024 to 210,644 cases with 1,239 deaths in 259 districts/cities (Kemenkes, 2024).

The incidence rate (IR) of dengue fever in Central Java has almost tripled from 12.80/100,000 population in 2021 to 33.69/100,000 population in 2022. Specifically, Magelang City recorded the highest IR in the work area of the Magelang Public Health Center in 2022, reaching 50.96 per 100,000 population (Dinkes Kota Magelang, 2023). Host-, vector-, and viral agent-dependent factors, along with socio-ecological and epidemiological conditions, are involved in dengue epidemics (Guzman et al., 2025). Dengue fever disease is influenced by temperature, humidity, and rainfall (Zhu et al., 2024). Several factors may influence this outbreak, including the presence of dengue virus, mosquito population density, and the presence of susceptible human populations (Kanan et al., 2024).

DHF mapping using GIS has been shown to help predict disease occurrence and identify high-risk areas in various studies (Crispin et al., 2023), and to facilitate the identification of vulnerable areas through spatial analysis such as overlay (Fariz, 2017). Furthermore, GIS technology holds the potential to evaluate the impact of the geographic distribution of health services (Al-Naabi et al., 2025). Despite these capabilities, its robust implementation in the context of routine reporting and policymaking in Magelang City is still limited, relying heavily on descriptive spatial visualization. This study strengthens its novelty by systematically extending conventional GIS models through a dual approach integrating spatial and statistical methods. We utilize QGIS for spatial visualization and employ Multiple Linear Regression (via RStudio) to objectively determine the causal relationship and identify the most dominant contributing factors among variables (population density, rainfall, larvae free rate, temperature, and humidity). This integrated approach moves beyond simple descriptive mapping, providing an enhanced, evidence-based tool for the Magelang City Health Office to implement more targeted and effective prevention strategies.

2. Research Methods

This study applies a quantitative descriptive design using a cross-sectional approach, relying on a Geographic Information System (GIS) to analyze secondary data collected for DHF cases in Magelang City from 2020 to 2024. Data were systematically sourced for integration: DHF case numbers and the larvae free rate (LFR) were acquired from the Magelang City Health Office; population density data were obtained from the Central Statistics Agency (BPS); and climate variables (rainfall, temperature, humidity) were sourced from NASA POWER. To establish a unified unit of analysis, all data were aligned to the administrative kelurahan level, representing a single cumulative observation across the entire study period.

This alignment was finalized using a Recapitulation Form instrument. Climate data, initially acquired monthly, were averaged annually and then cumulatively to match the single cumulative observation of DHF cases and population density at the kelurahan level. Data analysis involved QGIS for the spatial mapping of disease distribution and risk factors, and RStudio for statistical analysis, including multiple linear regression to identify relationships and dominant factors. It should be noted that due to the non-availability of LFR data for 2020, the corresponding data points were excluded from the regression model. Furthermore, the homogeneity of climate data limits the temporal and spatial correlation analysis for climate factors. The study was conducted at the Magelang City Health Office between March–June 2025.

3. Result and Discussion

3.1.Results

3.1.1.Distribution of Dengue Hemorrhagic Fever in Magelang City in 2020-2024 based on Rainfall, Temperature, and Humidity factors.

Magelang City has 3 sub-districts and 17 villages. The climate data sourced from NASA POWER utilized monthly observations for rainfall, temperature, and humidity spanning the 5-year study period (2020–2024). Based on data from NASA Power, the average annual rainfall, temperature, and humidity in each sub-district of Magelang City shows a uniform value.

Table 1. The Average Rainfall, Temperature, and Humidity Data for Magelang City from 2020 to 2024

Year	Variable		
	Rainfall	Temperature	Humidity
2020	9.27	23.38°C	88.92
2021	8.22	23.08°C	89.3
2022	8.15	23.09°C	89.8
2023	4.94	23.27°C	86.59
2024	7.57	23.68°C	88.65

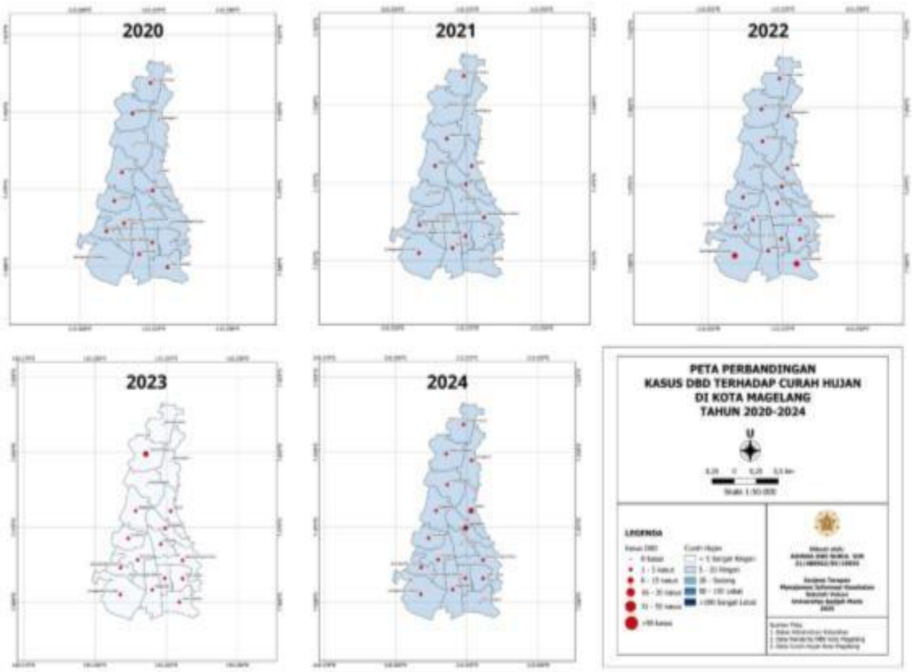

Figure 1. Comparison Map of Dengue Fever Cases to Rainfall 2020-2024

This Figure 1 can be seen from the homogeneous color of the sub-district area in each annual map. Therefore, this map cannot be used to analyze the spatial relationship between rainfall and the distribution of dengue cases because there is no spatial variation in the rainfall data. The red circles representing the number of cases vary in size and location across the annual maps, indicating differences in the distribution and intensity of dengue cases in sub-districts in Magelang City during the period 2020-2024.

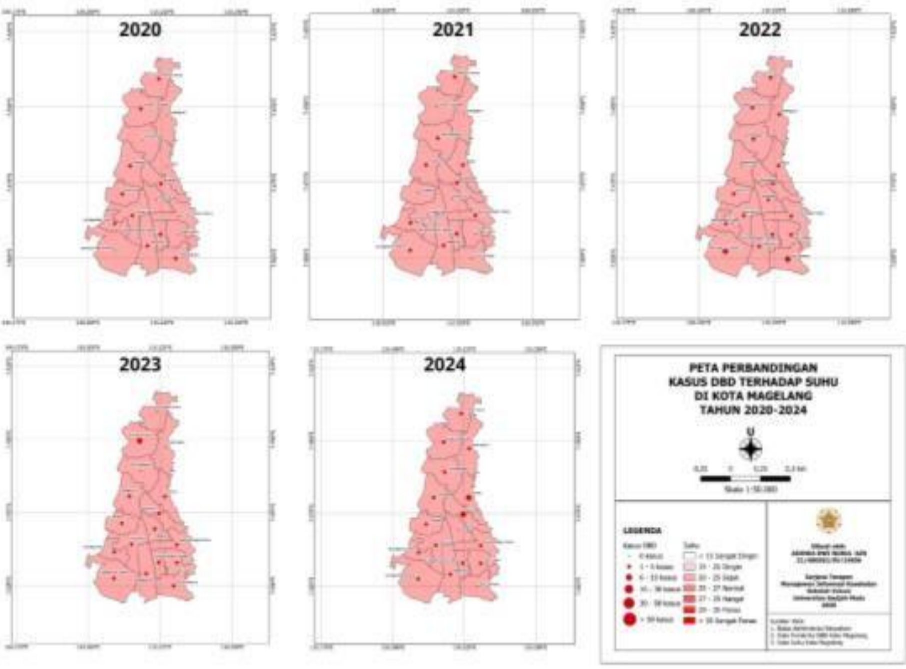

Figure 2. Comparison Map of Dengue Fever Cases to Temperature 2020-2024

All sub-districts show uniform average temperatures (category Cool) each year, indicating no significant spatial variation in temperature data for analysis of the relationship with dengue fever distribution. However, these maps still show spatial and temporal variation in the number of dengue cases between sub-districts, indicated by differences in the size and location of the red circles from year to year.

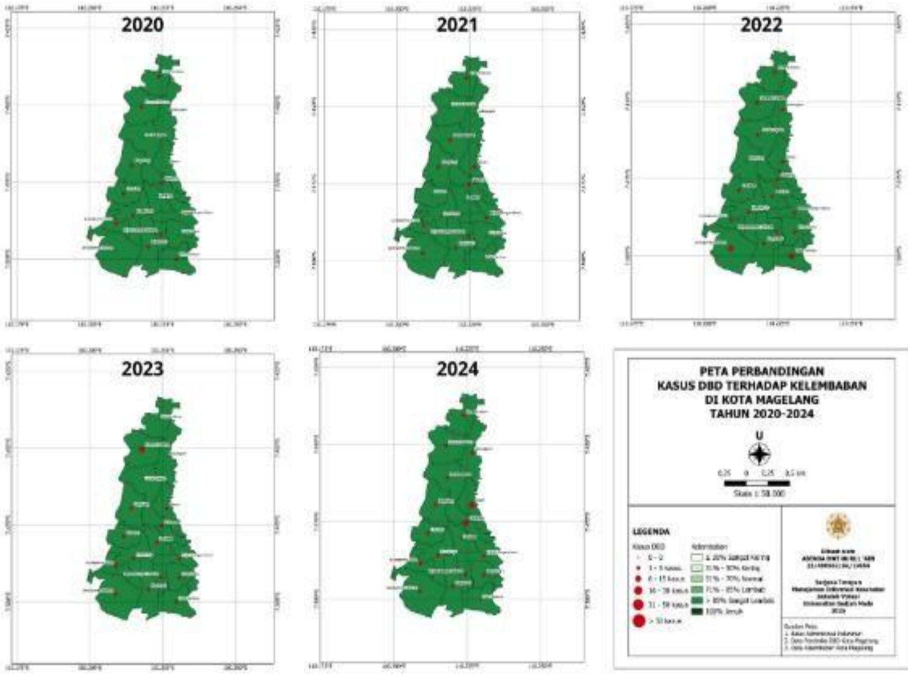

Figure 3. Comparison Map of Dengue Fever Cases to Humidity 2020-2024

The Figure 3 shows a comparison of dengue cases to humidity in Magelang City (2020-2024). All sub-districts consistently display dark green, indicating uniform humidity in the "Very Humid" category (>80%) throughout the region each year. The map still shows significant spatial and temporal variations in the number of dengue cases between sub-districts, as indicated by the size and location of the red circles that change from year to year.

3.1.2. Distribution of Dengue Hemorrhagic Fever in Magelang City in 2020-2024 based on Population Density Factors

To further understand the distribution of dengue fever in Magelang City (2020-2024), an analysis will be conducted by integrating dengue fever case data with population density. Population density data in 17 sub-districts of Magelang City in 2020-2024 are presented in the following table.

Table 2. Population Density Data for Magelang City 2020-2024

No	Ward	Population Density				
		2020	2021	2022	2023	2024
1.	Potrobangsan	6.039	6.291	6.344	6.385	6.395
2.	Wates	7.569	7.552	7.429	7.497	7.425
3.	Kedungsari	5.596	5.540	5.548	5.598	5.569
4.	Kramat Selatan	5.582	5.579	5.551	5.602	5.640
5.	Kramat Utara	4.774	4.870	4.840	4.757	4.794
6.	Kemirirejo	6.509	6.525	6.463	6.602	6.659
7.	Cacaban	9.341	9.418	9.369	9.487	9.581

No	Ward	Population Density				
		2020	2021	2022	2023	2024
8.	Magelang	6.299	6.303	6.309	6.374	6.399
9.	Panjang	18.013	17.836	18.189	18.146	18.254
10.	Gelangan	9.188	9.311	10.031	9.603	9.657
11.	Rejowinangun Utara	13.331	13.163	12.756	12.760	12.809
12.	Jurangombo Selatan	3.393	3.385	3.367	3.404	3.432
13.	Jurangombo Utara	6.360	6.450	6.692	6.689	6.813
14.	Magersari	5.490	5.443	5.420	5.528	5.419
15.	Rejowinangun Selatan	22.408	22.259	21.663	21.645	21.513
16.	Tidar Utara	7.486	7.406	7.379	7.418	7.420
17.	Tidar Selatan	4.370	4.341	4.334	4.388	4.430
	Average	**8,338.118**	**8,333.647**	**8,334.353**	**8,346.059**	**8,365.235**

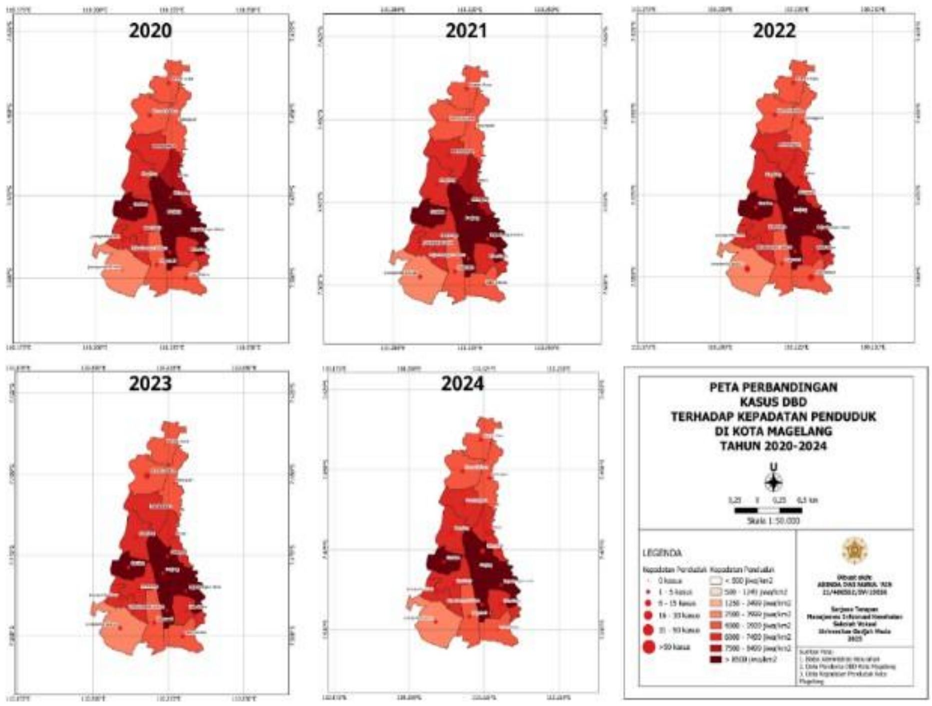

Figure 4. Comparison Map of Dengue Fever Cases to Population Density 2020-2024

The population density distribution pattern shows very stable and consistent characteristics throughout the five-year period, with densely populated areas (marked in dark red, >8500 people/km^2) consistently concentrated in the central part of the city, such as Rejowinangun Selatan, Panjang, Rejowinangun Utara, and Gelangan Sub-districts. Conversely, the areas with the lowest density (light red, 2500-3999 people/km^2) are consistently in Jurangombo Selatan.

Visual analysis of this map overlay does not indicate a clear and consistent spatial correlation between population density and dengue fever case distribution. High dengue cases (indicated by the large red circles) often occur in villages with varying population densities, not just in the most densely populated areas. Some villages with very high densities are not always the locations with the highest number of dengue cases in a given year. This suggests that population density, as a single factor, may not be a direct predictor of high dengue fever cases in an area. However, the pattern of dengue case distribution itself (red circles) still shows dynamic variations both spatially between villages and temporally from year to year.

3.1.3.Distribution of Dengue Hemorrhagic Fever in Magelang City in 2020-2024 based on the Larvae Free Rate Factor

The following is the 2021-2024 Larvae Free Rate of 17 Sub-districts in Magelang City.

Table 3. Data on the Larvae Free Rate of Magelang City Year 2020-2024

No	Ward	LFR			
		2021	2022	2023	2024
1.	Potrobangsan	86.4	89.6	93.5	87.9
2.	Wates	97.9	97.4	95.5	95.0
3.	Kedungsari	92.1	93.5	93.4	93.9
4.	Kramat Selatan	91.3	92.3	88.0	86.1
5.	Kramat Utara	95.5	96.9	94.5	95.9
6.	Kemirirejo	93.3	93.4	95.0	95.4
7.	Cacaban	98.5	98.3	97.6	94.0
8.	Magelang	94.4	91.6	92.6	93.1
9.	Panjang	91.6	89.4	88.1	82.6
10.	Gelangan	94.6	94.4	95.8	95.9
11.	Rejowinangun Utara	92.9	93.9	93.8	92.0
12.	Jurangombo Selatan	95.3	96.8	90.4	89.0
13.	Jurangombo Utara	90.3	91.5	88.9	91.4
14.	Magersari	98.4	97.1	98.0	97.8
15.	Rejowinangun Selatan	73.6	85.8	90.6	93.4
16.	Tidar Utara	96.8	98.1	99.1	99.5
17.	Tidar Selatan	94.5	95.4	95.6	95.9
	Rata-rata	**92.78**	**93.84**	**93.55**	**92.87**

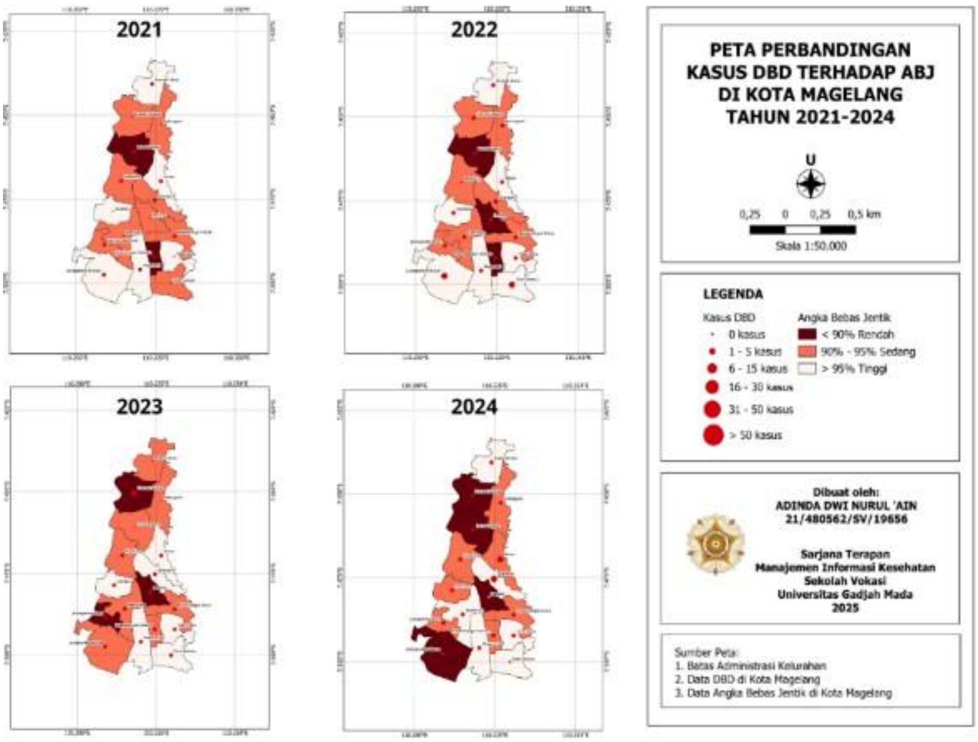

Figure 5. Comparison Map of Dengue Fever Cases to Larvae-Free Rates 2020-2024

The Larvae Free Rate (LFR) shows heterogeneous spatial variation between sub-districts and temporal fluctuations. However, the relationship with dengue fever cases is not always inversely proportional. An anomaly was found where a high LRF was accompanied by significant dengue fever cases. Although the pattern of these factors varies, dengue fever cases themselves consistently show a dynamic distribution pattern, varying spatially between sub-districts and fluctuating temporally from year to year in Magelang City.

3.1.4.Distribution of DHF cases in Magelang City 2020-2024

Magelang City in 2020-2024 had 198 cases of Dengue Fever. The following is the number of DHF cases in Magelang City.

Table 4. DBD data in Magelang City 2020-2024

No	Ward	Cases of Dengue Fever				
		2020	2021	2022	2023	2024
1.	Potrobangsan	0	2	5	0	1
2.	Wates	0	2	4	2	6
3.	Kedungsari	0	0	5	0	2
4.	Kramat Selatan	1	0	3	8	5
5.	Kramau Utara	1	2	2	0	1
6.	Kemirirejo	2	0	2	2	5
7.	Cacaban	1	0	4	5	4
8.	Magelang	4	1	0	1	4
9.	Panjang	0	0	4	4	0
10.	Gelangan	1	3	4	3	7
11.	Rejowinangun Utara	0	4	5	3	5
12.	Jurangombo Selatan	0	2	8	4	2
13.	Jurangombo Utara	3	1	4	1	3
14.	Magersari Rejowinangun	2	1	2	4	1
15.	Selatan	5	2	2	3	1
16.	Tidar Utara	0	0	3	2	3
17.	Tidar Selatan	1	0	6	2	0
	Jumlah	**21**	**20**	**63**	**44**	**50**

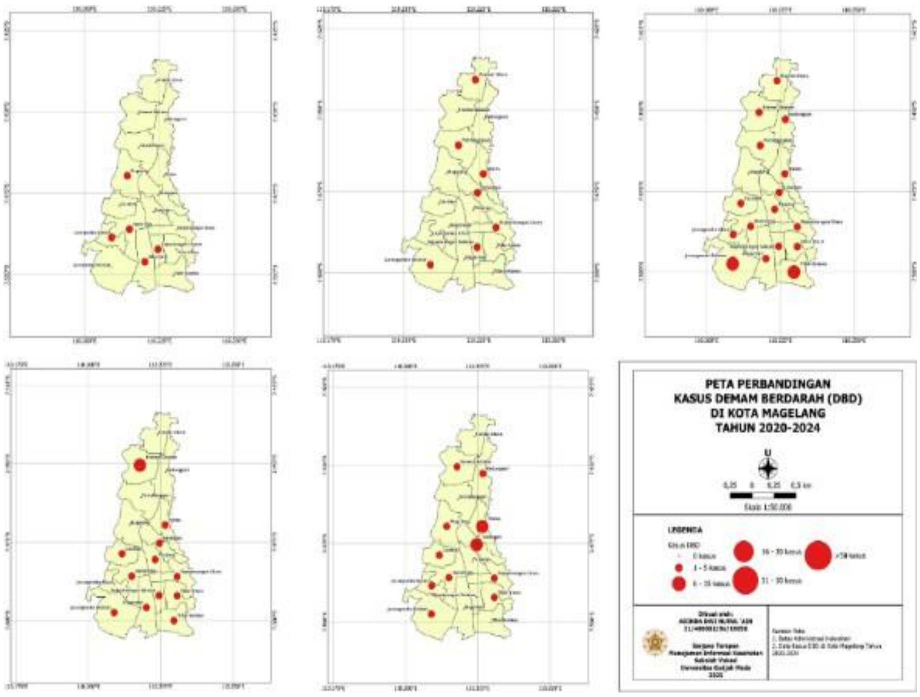

Figure 6. Comparison Map of Dengue Fever Cases 2020-2024

The pattern of dengue fever case distribution in Magelang City showed significant fluctuations from 2020 to 2024. Cases were relatively low and not too widespread in 2020-2021. 2022 was the highest peak with 63 cases, spread more evenly across almost all sub-districts, with South Jurangombo recording 8 cases. Although there was a decrease in 2023 and 2024, cases were still widespread, and several sub-districts such as Kramat Selatan (5 cases) and Gelangan (7 cases) continued to record significant numbers in 2024, indicating a more widespread distribution pattern.

3.1.5. The most dominant factor influencing the spread of dengue fever in Magelang City in 2020-2024

Environmental variables such as rainfall, temperature, and humidity cannot be included in the regression model. This is because the three variables have constant values (do not vary) across the 17 observed sub-districts, so they do not meet the statistical requirements to be tested for their influence as predictors in the regression model. The following is a correlation test of the relationship between the dependent variable and the independent variable in 2020 to 2024.

Table 5. Annual Regression Test (2020-2024)

Year	F-Statistic	P-Value (F-Statistic)	Adjust R- Squared	Moran's I (Residual)	P-Value (Moran's I)
2020	0.845	0.3725	-0.009783	-0.0143	0.3696
2021	1.411	0.2766	0.04882	-0.276	0.917
2022	0.261	0.7736	-0.1017	0.1335	0.09587
2023	2.133	0.1554	0.124	-0.17199	0.7645
2024	0.6017	0.5615	-0.0524	-0.14992	0.71

Based on the Annual Regression Test Table (2020-2024), the independent variables (Population Density and LFR) as a whole do not have a significant spatial influence on DHF cases, indicated by the p-value (F-Statistic) which is always greater than 0.05. The model's ability to explain variations in DHF cases is also very limited, the Adjusted R-Squared value is negative in 2020, 2022, and 2024, indicating the model is ineffective, while in 2021 and 2023 the value is positive but very low (0.04882 and 0.124). However, the Moran's I spatial autocorrelation test on the model residuals shows a p-value> 0.05 for all years, indicating the absence of significant spatial autocorrelation in the residuals, indicating the model is quite good at handling spatial patterns.

Table 6. Test Results Variable

Year	Variable	Koefisien	Std. Error	t-value	p-value
2020	(Intercept) Population	0.65807	0.72931	0.902	0.381
	Density 2020	0.06923	0.07531	0.919	0.373
2021	(Intercept) Population	-2.38246	6.70241	-0.355	0.728
	Density 2021	-0.06019	0.07868	-0.765	0.457
	LFR 2021	0.04376	0.06740	0.649	0.527
2022	(Intercept) Population	6.06600	17.19424	0.353	0.729
	Density 2022	-0.07868	0.12521	-0.628	0.540
	LFR 2022	-0.01816	0.17611	-0.103	0.919
2023	(Intercept) Population	-26.33006	14.14803	-1861	0.0839
	Density 2023	0.09947	0.10255	0.970	0.3485
	LFR 2023	0.30024	0.14827	2.025	0.0624
2024	(Intercept) Population	0.9056	12.6707	0.071	0.944

Year	Variable	Koefisien	Std. Error	t-value	p-value
	Density 2024	-0.1130	0.1180	-0.958	0.354
	LFR 2024	0.0321	0.1329	0.241	0.813

Based on the Test Results Table per Variable, most of the independent variables in each year show a p-value > 0.05, indicating no statistically significant effect on DHF cases at a significance level of 5%. However, in 2023, the LFR 2023 variable has a p-value of 0.0624 which is close to 5% significance, indicating an indication of influence at a confidence level of 90%. The positive coefficient of LFR 2023 (0.30024) indicates a positive relationship, where an increase in LFR tends to be followed by an increase in DHF cases in that year.

3.2.Discussion

3.2.1.Distribution of Dengue Hemorrhagic Fever in Magelang City in 2020-2024 based on Rainfall, Temperature, and Humidity factors

The results of the analysis show that climate factors (rainfall, temperature, and humidity) in Magelang City in the 2020-2024 period are spatially homogeneous. The comparison map consistently shows uniform values across all sub-districts each year, such as the average temperature which is always in the cool category (20°C - 25°C) and very humid relative humidity (>85%). The homogeneity of this data hinders statistical testing of the spatial relationship between climate variables and the distribution of dengue cases in the regression model, because the predictor variables must have variation. Environmental conditions tend to be stable and uniform, data on the distribution of dengue cases shows significant temporal fluctuations. Dengue cases were relatively low and their distribution was limited in 2020-2021, but increased drastically to reach the peak of the epidemic in 2022 with a total of 63 cases. The spread of cases has spread to many sub-districts, followed by a decrease in the number of cases in 2023 and 2024. Research conducted in Iran states that climate change plays a crucial role in the growth of mosquito populations and the transmission of diseases (Abbasi, 2025).

The insignificance of environmental factors in explaining the variation in the number of DHF cases between sub-districts in this study does not necessarily deny the scientific theory that states the importance of rainfall, temperature, and humidity in the mosquito life cycle and virus transmission. This result is more due to the limited data that is not detailed enough to capture possible micro variations. This finding is in line with other studies (Lukman, N. H., 2023) which also found that climate factors may not be the only major determinant of DHF incidence, especially in relatively homogeneous environments. Therefore, in conditions like this, other factors such as vector density, human behavior, environmental sanitation, or the effectiveness of public health interventions could be stronger drivers in the dynamics of DHF transmission.

3.2.2.Distribution of Dengue Hemorrhagic Fever in Magelang City in 2020-2024 based on Population Density factors

Based on the overlay map, the distribution of DHF cases (marked by the size of the dots) against population density (red color gradation) in Magelang City shows that the population density pattern tends to be stable from 2020-2024. The highest density (>8500 people/km^2) is concentrated in the city center sub-districts such as South Rejowinangun, Panjang, North Rejowinangun, and Gelangan, while the lowest (2500-3999 people/km^2) is in South Jurangombo. Visually, there is a tendency for high concentration of DHF cases in densely populated sub-districts (for example, South Rejowinangun, North Rejowinangun, Cacaban, and Gelangan which have recorded the highest cases several times). For example, South Rejowinangun in 2020 and Gelangan in 2024 had the highest cases and very high density.

Population density is indeed recognized as a risk factor for DHF (Ayuningtyas, 2023). Population density accelerates the spread of mosquitoes in dense environments (Lestari, 2017). However, findings in Jurangombo Selatan Village in 2022, which recorded the highest dengue cases despite its moderate population density (3,367 people/km^2), indicate that population density is not the only dominant factor. Other factors, such as the success of the Mosquito Nest Eradication program (Kemenkes, 2017), may play a bigger role. In general, although there is a tendency for more dengue cases in densely populated areas, this relationship is not always linear and complex. Inconsistencies such as in Jurangombo Selatan could be due to the use of less detailed annual data per village to capture the spread in smaller areas (hotspots).

3.2.3. Distribution of Dengue Hemorrhagic Fever in Magelang City in 2020-2024 based on the Larvae Free Rate factor

Based on data analysis, the LFR in Magelang City from 2021 to 2024 shows a trend that tends to be high and stable in most sub-districts (average above 90%), indicating consistent efforts to control larvae. Although some sub-districts such as Rejowinangun Selatan experienced a significant increase in LFR, while Kramat Selatan and Panjang tended to fluctuate lower.

The overlay map of the distribution of dengue cases with LFR provides a visual depiction of the relationship between these two variables, which shows consistent tendencies but also anomalies. The density of Aedes aegypti larvae is indeed a risk factor for dengue transmission (Rahmah et al., 2022). However, the results of visual observations show that although sub-districts with low LFR tend to have dengue cases (seen in 2021, 2022, 2023, 2024), dengue cases are also consistently recorded in sub-districts with medium and even high LFR (>95%). This anomaly is very visible in 2021 and 2022 (the peak of dengue cases), where high LFR does not necessarily guarantee the absence of cases.

Overall, although there is a visual trend of low LFR correlating with DHF cases, the presence of cases in areas with medium and high LFR indicates that DHF control efforts cannot only rely on achieving high LFR. This is in line with other studies (Yuliasari et al., 2019) which show that high larval density does not always have a direct effect on high DHF cases. Other factors such as virus strains, community immunity, mosquito behavior, and socio-economic factors (Sutriyawan et al., 2022) may have a more complex and dominant role in influencing the distribution of DHF cases. Routine health education activities as a supporting strategy in the health system need to be strengthened (Narendran et al., 2024).

3.2.4. Distribution of DHF cases in Magelang City 2020-2024

Map analysis shows the dynamics of the distribution of Dengue Hemorrhagic Fever (DHF) cases in Magelang City from 2020 to 2024, confirming the endemic nature of DHF in tropical areas. In 2020-2021, DHF cases were relatively low and the distribution was limited, possibly due to vector control or less supportive climate (Siyam et al., 2022).

The year 2022 was the peak of the epidemic with 63 cases, marked by a significant spike in the number and geographical scope, spreading evenly to almost all sub-districts, creating new hotspots such as South Jurangombo. This increase could be triggered by optimal climate change, driving extensive community transmission (Ernyasih et al., 2021). Although there was a decrease in cases in 2023 and 2024 compared to 2022, the distribution of cases remains widespread in various points, with several sub-districts still recording significant numbers (eg, Kramat Selatan 5 cases, Gelangan 7 cases in 2024). This decrease may be due to intensive public health interventions, the formation of natural immunity, or changes in environmental conditions (Arum, 2023). The insights gained also contribute to global efforts to combat dengue fever, by emphasizing a collaborative and holistic approach in public health initiatives (Feng et al., 2024). However, the presence of cases that are still widespread, although the number is smaller, indicates that dengue fever remains an endemic threat that requires vigilance and ongoing control programs. The dynamics of dengue fever cases as a whole are very complex, involving low periods, peak epidemics, and declines with continued widespread distribution.

3.2.5. The most dominant factor influencing the spread of dengue fever in Magelang City in 2020-2024

Based on regression analysis of rainfall, temperature, humidity, population density, and LFR, none of the five factors were significantly identified as dominant factors influencing the distribution of DHF in Magelang City during 2020-2024. Population density consistently had no significant effect, in contrast to several other studies (Sholihah et al., 2020). Environmental variables (rainfall, temperature, humidity) were also not significant in explaining variations in DHF cases between sub-districts. The results of this study are inconsistent with several previous studies, such as research conducted in Kendari, which found a relationship between humidity and dengue fever incidence (Arsin et al., 2020). A study in Manado (Monintja et al., 2021) found a significant relationship between temperature, humidity, and dengue fever prevalence. Research in South Asia (Wang et al., 2024) emphasized the importance of considering a combination of climatic factors such as temperature, humidity, and rainfall in efforts to prevent and control dengue fever infections.

Although LFR approached significance in 2023, the relationship was positive and contrary to theory, indicating that high LFR may be an intervention response to high cases, not a deterrent (Yuliasari et al., 2019). This shows the complexity of dengue fever transmission which is influenced by factors other than the presence of vectors, such as virus strains, mosquito behavior, community immunity, education, and knowledge of PSN (Sutriyawan et al., 2022).

The absence of a dominant factor in this study implies that the distribution of DHF in Magelang City is likely the result of a complex interaction of various unmeasured factors (e.g. the effectiveness of the PSN program, behavior, environmental sanitation, community knowledge about DHF) (Respati et al., 2017). Therefore, a comprehensive understanding requires a broader multi-factor approach with higher spatial and temporal resolution of data.

4. Conclusion

This study shows that the distribution of Dengue Hemorrhagic Fever (DHF) cases in Magelang City fluctuates with an epidemic peak in 2022, followed by a decline in 2023 and 2024, although the distribution remains wide in sub-districts. Environmental variables such as rainfall, temperature, humidity, and population density do not show a significant effect on differences in cases between sub-districts, mainly due to limited data that tends to be spatially homogeneous. In addition, the LFR variable shows an inconsistent, even paradoxical relationship in 2023 where high LFR is positively correlated with high cases, indicating a reactive bias from the post-outbreak Mosquito Nest Eradication (PSN) program intervention. Based on the model analysis, none of the variables measured in this study were identified as dominant factors determining the distribution of DHF cases. This implies that the distribution of DHF in Magelang City is a complex phenomenon influenced by multi-factor interactions, including the possibility of other factors not studied such as the effectiveness of intervention programs in the field and population mobility.

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