

Mapping the prevalence of dengue fever in sragen reGENCY Indonesia



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ABSTRACT

Introduction: Dengue fever is a disease that is transmitted by vectors. The intermediary vector for dengue fever transmission is the *Aedes Aegypti* mosquito. Dengue fever cases occur in almost all districts in Indonesia, including the Sragen reGENCY. From 2016 to 2019, the incidence of dengue fever was higher than the previous year. This unusual condition needs to be further monitored and studied. This study's purpose was to map the prevalence of dengue fever in the Sragen reGENCY.

Methods: A retrospective research design was performed using secondary data provided by the reGENCY health office and the Central Bureau of statistics from the government of Sragen reGENCY. A free and open-source software, namely Quantum Geographic Information System (QGIS), was utilized to produce maps and spatial figures. The results of this study are presented by map and prevalence.

Results: The incidence of dengue fever in the Sragen reGENCY in 2017-2019 fluctuated between 15.83 per 100,000 population and 33.54 per 100,000 population. The dengue fever case in Gemolong district is the highest in 2018 and 2019.

Conclusion: The conclusion for this research is mapping the dengue fever prevalence helping to figure up the spatial pattern of the disease in Sragen reGENCY.

Keywords: dengue fever, information system, mapping, spatial, surveillance.

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INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by the dengue virus; the virus is transmitted through the bite of the *Aedes aegypti* mosquito that enters the blood vessels.^{1,2} Dengue fever is increasing significantly in the tropics and sub-tropics, which can cause illness and death in patients.³ Environmental conditions also cause the spread of DHF, community behavior, infections in landfills, and the control carried out. Dengue fever most often occurs in the rainy season.⁴ DHF increases the number of sufferers; this is closely related to the increasing population in each region. Dengue fever is a problem that causes burdens in various sectors, not only in the health sector.⁵

Based on the 2018 Central Java province health profile data, it was stated that DHF was a serious problem in the Central Java region, especially in the Sragen reGENCY.⁵ The Sragen Health Office noted that there were 140 patients in 2017, where there were 93 male patients, 47 female patients, and no dead patients. Meanwhile, in 2018,

in Sragen reGENCY, there were 345 patients, 207 male patients, 138 female patients and three patients who died. The increase of dengue cases in the Sragen reGENCY has been reported only through writing and then inputted into Microsoft Office.⁵

It is important to make it easier to see the distribution of dengue cases using an epidemiological approach to the Geographic Information System (GIS) which is expected to show the distribution of dengue cases.⁶ The GIS can help analyze the spreading and distribution of areas against DHF. Then after knowing the distribution of DHF cases, it can be used to determine the actions taken in handling DHF cases.⁷

The information system is a computer-based system that stores, collects, and combines spatial data.⁸ Applying the GIS takes data on DHF patients in Sragen reGENCY from 2017 to 2019 and administrative maps presented via google maps. Google maps can show the patient's location displayed on the map.⁹ In using this system, a database is needed, namely the quantum GIS

application for program development and google earth as the database integration. Some previous researchers used QGIS in mapping DHF.^{10,11} GIS research to determine the distribution of DHF, to provide a proportional intervention in an area with a large distribution, such as DHF in Sragen reGENCY. GIS needs to be developed to explain the spreading of infectious diseases that have not been handled completely and increasing non-communicable diseases. This study aims to explore the distribution of cases of DHF in the Sragen reGENCY from 2017 to 2019 based on population and gender.

METHODS

This research design uses a retrospective approach to a research object by looking at and taking data on DHF cases in 2017-2019. The study was carried out at the Sragen district and the infectious disease control division of the health office. Using a Geographical Information System (GIS), the study was presented as a map. The technique is used in spatial analysis as well as comparative analysis.

RESULTS

Figures 1 and 2 show the incidence of DHF in 2017 and 2018. The population affected by DHF in 2017 was 140 patients; in 2018, there were 340 sufferers. The vector layer used is Ruster. in the Sragen district, it can be seen that two sub-districts have the highest number of cases, namely in the Masaran sub-district and Gemolong sub-district. In Mascara district, there were 18 cases of DHE, and in Gemolong district, there were also 18 cases of DHF. While the highest case values after Gemolong and Masaran were the Sidoharjo sub-district with 13 patients, Karangmalang with 11 patients, and Kalijambe sub-district with 11 patients. In 2017 the points were divided into 3, namely, the area with observations showing the highest risk, namely Gemolong regency, with a value of 34.61 per 100,000 surrounded by Kalijambe district. Category II shows areas with a moderate risk assessment apart from Kalijambe and Gemolong are Tangen, Jenar, Ngrampal, Sidoarjo and Masaran sub-districts. While in category III with low risk of DHF, namely Gesi and Sukodono districts. Based on the results of this study, it turns out that the DHF cases in the Sragen regency, which experienced a high number of issues, were not located in areas with a high population density. The incidence of DHF in Sragen regency in 2017 showed more man DHF cases than women. The highest male gender is in Gemolong District, with eight female patients and ten male points. DHF can be suffered by anyone, young, old, and children and female and male.⁵ The study obtained from the 2017 and 2018 DHF distribution map results in the Sragen regency, which experienced more DHF incidence in males than females.

The incidence of DHF cases in the Sragen regency in 2018 is based on Figure 2. mapping the number of DHF cases in 2018 in the Sragen regency, it can be seen that Gemolong sub-district still occupies one of the sub-districts with the highest cases, after Sumberlawang and Tanon sub-districts. The sub-districts with the highest case values are Sumberlawang, Gemolong, Miri, and Tanon sub-districts. The four sub-districts are located in adjacent areas so that they affect other sites. The number of Gemolong has 33 cases. Then there

was an increase in cases in 2 sub-districts, namely Sumberlawang sub-district with 38 instances and Tanon sub-district with 35 patients. Sumberlawang shows that the highest incidence rate is 75.6 per 100,000 (38 patients).

Furthermore, the highest value is in the Tangen district, with a value of 72.79 per 100,000. The third highest score is in the Gesi district, with a total score of 69.50 per 100,000. The number of DHF cases tends to increase both in number and the area of the affected area; there are always extraordinary events (outbreaks) every year. Population variables and environmental variables essentially influence the incidence of DHF. Population factors such as population density affect the transmission or transfer of disease from one person to another. The pattern of DHF incidence in the Sragen regency area in 2017-2018 tends to increase, it is known from the number of occurrences, and the incidence of DHF can be seen from the DHF incidence rate Sragen regency.

This study showed that the DHF cases in the Sragen regency, which experienced many issues, were not located in areas with a high population density. The district in Sragen regency it is known that the highest case in 2017 was Gemolong District, in 2018 DHF with the highest point was Sumberlawang district. Gemolong has a population of 25,765 people/km², and Sumberlawang with a population of 24,783 people/km², both of which have a small population compared to the Masaran sub-district, but the cases of dengue tend to be high.⁵

This result shows the evidence of males being most dominantly affected by DHF compared with females. Figure 3, showing the evidence of gender in the occurrence of DHF in Sragen regency. In almost every region or district, the DHF case is higher in males than females.

The distribution of cases of DHF patients in 2019 is shown by a location map using google maps, as illustrated by figure 4.

According to Figure 4, it can be seen that a dot can symbolize the incidence of DHF on the map; that point is the address of the dengue patient in 2019. Based on the figure, it can be seen that the sub-districts are a sub-district that has the

highest cases every year is Sumberlawang district. The lowest point occurred in the Gesi sub-district, Kedawung and Masaran, with 1 number of patients. However, some communities do not experience DHF being located in the district Jenar. Yang district

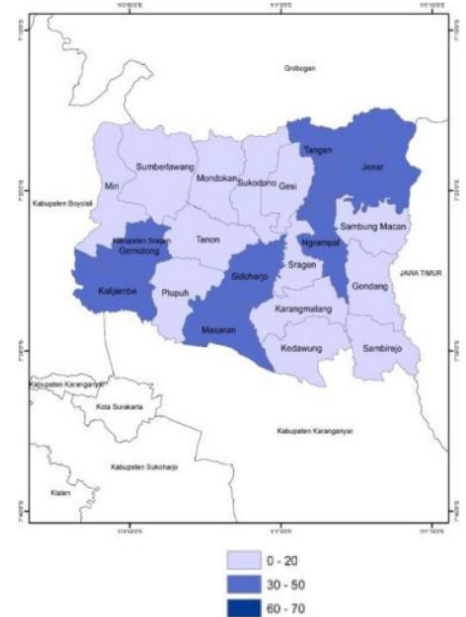


Figure 1. The incidence of dengue hemorrhagic fever case in sragen regencies 2017.

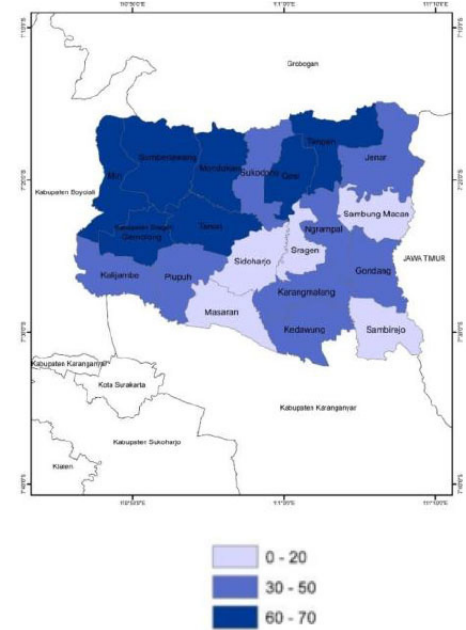


Figure 2. The incidence of dengue hemorrhagic fever case in sragen regency 2018.



Figure 3. Gender distribution of dengue hemorrhagic fever case in sragen regency 2018.



Figure 4. Spatial distribution of dengue hemorrhagic fever case in sragen regencies 2019.

has the highest case distribution after Sumberlawang is Gemolong and Plupuh district, the three sub-districts are situated in different areas close together. Based on the analysis of the quantum GIS software, the distribution pattern. The incidence of DHF in the Sragen regency is clustered and DDisperse/spread. In Sragen Regency, those 3 clusters are in Sumberlawang, Gemolong, and Miri districts, the second is Tanon, Mondokan, and Sukodono, the third is Sragen, Karangmalang, and Ngrampal

DISCUSSION

The results of this study are in line with the previous research results that every region or place has a different pattern in several cases at other times.^{12,7} The spatial distribution of DHF shows a way of clustering. It can be endemic of dengue location that high population of *Aedes aegypti* mosquito.¹³ The spatial distribution pattern of DHF cases tends to group or cluster.¹⁴ Research was obtained from the results of the DHF distribution map in 2017 and 2018 in Sragen regency, which experienced the incidence of DHF is more in men than women. According to Andrea et al., DHF is more common in males.¹⁵

DHF is still a big problem in health with high morbidity and mortality and an outbreak.¹⁶ Without any preventive measures sufficient, the virus will develop more conducive to cause an increase in cases. Therefore, the government needs special attention related to the feasibility of human life, especially the health center role to provide counseling on the importance of implementing 3M plus (the 3M concept, namely: closing, draining, and recycling).^{16,17} Low temperatures and high rainfall can add puddles of water used as mosquito breeding places and increase humidity. Evi and Susi's research in Bogor City also showed that most *Aedes* larvae were found in containers outside the house. Strategies that can be done by maintaining larvae-eating fish¹⁷, sowing larvicides, using mosquito nets at bedtime, and are expected to carry out periodic larval checks according to site conditions, increase disease monitoring by looking at the trend of cases and their spatial distribution.¹⁸

In general, the clustering of DHF events with a tendency to follow population density is high, and the larva-free rate is low. It is in line with other studies which state that the high incidence of DHF in Indonesia in the working area of the Banjarnegara II Health Centre is estimated to have a relationship with the community in eradicating bad dengue mosquito nests.⁵ Permenkes Number 50 of 2017 concerning quality standards health environment and health requirements for vectors and animals.⁵ Disease carriers and their control, so dengue transmission does not occur, the larva-free rate in an area is at least 95%.⁵ DHF management using GIS is inforatic, very effective because GIS is a technology application remote sensing and information systems that can be utilized to countermeasure spatial modeling and early warning systems for fever outbreaks dengue blood. By using map overlap between location conditions. With the distribution of patients, it is also possible to predict potentially endemic locations infectious diseases. The local and city governments can do case management by using this geographic information system to monitor DHF.

CONCLUSION

There is a different spatial distribution of dengue in the Sragen regency in 2017-2019. Male-dominated cases of dengue fever in Sragen.

CONFLICT OF INTEREST

We declare no conflict of interest.

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ETHICS APPROVAL

This research has been approved with registration number: KEKP/PKPO/09/XX/2020.

AUTHOR CONTRIBUTION

All authors had contributed to this research by participating in collecting data, analyzing the results, writing the draft and approving the final manuscript.

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