



## Mapping of Flood-Prone and Dengue Fever-Prone Areas in Tahtul Yaman Village, Pelayangan District, Jambi City

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### ABSTRACT

Floods are natural events that come suddenly with an uncertain periodicity, except for areas that often experience annual flooding, such as in Tahtul Yemen Village. This flood disaster can cause health problems that threaten society, one of which is the Danguge Hemorrhagic Fever (DHF) outbreak. This activity aims to carry out mapping of flood-prone areas and dengue-prone areas in Tahtul Yemen Village to provide education about the management and prevention of dengue fever in order to improve the health status of the community, especially those in vulnerable areas. This research is exploratory research with an ecological study research design using Geographic Information Systems (GIS). Based on data on flood-prone areas obtained from 12 RTs in Tahtul Yaman Village, 5 RTs had a high percentage of being affected by flooding, 4 RTs had a moderate percentage of being affected by flooding, and 3 RTs had a low percentage of being affected by flooding. Meanwhile, for dengue-prone areas, there are 7 RTs with a low percentage, 3 RTs with a medium percentage, and 2 RTs with a high percentage. In conclusion, it was found that in Tahtul Yaman Subdistrict areas prone to flooding with the highest dominance are in RT 11,12,5,9, and 7 and areas prone to Dengue Hemorrhagic Fever (DHF) are dominant in RT 7 and 9. It is recommended that the areas that have been mapped be included in prone to flooding and Dengue Hemorrhagic Fever (DHF) strengthen drainage systems, green infrastructure, and increase public awareness about disease prevention

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## INTRODUCTION

Disaster is an event or incident that causes great losses to society, which is destructive, detrimental and takes a long time to recover (Aminudin, 2013). One of the natural disasters that often occurs in Indonesia is flooding.

Flooding is a natural event that is difficult to predict because it comes suddenly with an uncertain periodicity, except for areas that are already prone to annual flooding. In general, flooding is an event where land that is usually dry becomes inundated by water. This is caused by high rainfall and low to depression topographic conditions of the area. Flooding is also caused by low soil infiltration capacity, causing the soil to no longer be able to absorb water. In addition, flooding can be caused by surface water runoff that overflows and its volume exceeds the irrigation capacity of the drainage system or river flow system. Thus, information related to flood vulnerability in an area is important and meaningful as an initial step in efforts to overcome it.

From the presence of flooding, other problems can arise that can threaten and disrupt people's lives, one of which is the DHF (Dengue Hemorrhagic Fever) outbreak. Dengue Hemorrhagic Fever (DHF) is one of the endemic diseases throughout the tropics and some subtropics. The mosquito that transmits dengue is found in almost all corners of Indonesia, except in places that have an altitude of more than 1000 meters above sea level.

The disease transmitted by the *Aedes aegypti* mosquito is a frightening specter because its transmission can occur quickly in an area. Even in one month, the number of DHF cases in endemic areas can reach dozens of people infected with the dengue virus.

The climate change conditions that occur throughout the world cause various negative impacts in various aspects including in Indonesia. Climate change that continues to occur results in decreased immunity in the human body, coupled with population density factors that make it easy for the dengue virus to spread and the transmission of the dengue virus transmitted by mosquitoes (vectors). There are several factors that influence the spread of DHF in humans, factors such as population density have a role where a denser population can facilitate the transmission of DHF.

According to the Indonesian Ministry of Health, Dengue Hemorrhagic Fever (DHF) is a disease caused by a virus from the Arbovirus group which is characterized by sudden high fever without a clear cause, lasting continuously for 2 to 7 days, manifestations of bleeding (petechiae, purpura, conjunctival bleeding, epistaxis, mucosal bleeding, gum bleeding, hematemesis, melena, hematuria) including a positive tourniquet test (Rumple Leede), thrombocytopenia (platelet count  $\leq 100,000/l$ , hemoconcentration (increased hematocrit  $\geq 20\%$ ) with or without liver enlargement (hepatomegaly).

Dengue hemorrhagic fever (DHF) is a disease caused by dengue virus infection. DHF is still one of the main public health problems in Indonesia because it can cause death in a short time and often causes outbreaks. The main vector of DHF is the *Aedes aegypti* mosquito. *Aedes* mosquitoes have a habit of biting repeatedly (multiple bitters) which is biting several people alternately in a short time. This is because the *Aedes aegypti* mosquito is very sensitive and

easily disturbed. This condition greatly helps *Aedes aegypti* in transmitting the Dengue virus to several people at once so that it was reported that there were several DHF sufferers in one house.

DHF was first discovered in Surabaya in 1958 where at that time 58 people were infected and 24 of them died. Since then, this disease has spread widely throughout Indonesia. The development of the life of the *Aedes Aegypti* mosquito from egg to adult takes about 10-12 days and the lifespan of the female *Aedes Aegypti* mosquito is around 1.5 months, depending on the temperature and humidity of the surrounding air. This disease mostly attacks children <15 years old but it is also possible that it can also attack adults.

*Aedes aegypti* mosquitoes are found in almost all corners of Indonesia, except in places that have an altitude of more than 1000 meters above sea level. DHF is often found especially in tropical areas and often causes extraordinary events (KLB). Several factors that influence the emergence of DHF include the low status of community group immunity and the density of the mosquito population that transmits the disease due to the large number of mosquito breeding sites that usually occur during the rainy season. According to the Indonesian Ministry of Health (2010), mosquito breeding sites are not only in water reservoirs but also in containers (used goods) that allow rainwater to stagnate and are not based on soil, such as used cans, used tires, bottles, coconut shells, plastic and others that are thrown away carelessly.

Infectious diseases, especially DHF, are closely related to geographic/spatial aspects because one of the sources of disease is inseparable from environmental factors. Therefore, these environmental factors can be mapped. Decision making in the health sector can be supported by information in spatial form. Advances in geographic information systems have contributed greatly to more effective analysis of various aspects of the health system. GIS is a spatial technology that is very useful in the field of processing and planning the eradication of infectious diseases at this time, including the analysis of epidemic diseases such as dengue fever. With GIS devices, a spatial picture of the spread of dengue fever on the earth's surface can be displayed in the form of digital graphics and can be visualized in the form of maps.

Controlling DHF using Geographic Information Systems is a very effective mitigation because GIS is an application of remote sensing technology and information systems that can be used to compile spatial modeling and early warning systems for extraordinary dengue fever events. By using map overlays between location conditions and the distribution of sufferers, locations that have the potential to be endemic for infectious diseases can also be predicted. Regional and city governments can carry out case management using this geographic information system to monitor DHF.

The Tahtul Yaman environment, Jambi Province is one of the residential areas that has data on dengue fever. In general, most residents use water reservoirs, the environment looks less clean, there are TPS around the residential area, piles of garbage in front of and beside the house and there are still puddles and water reservoirs in the homes of several residents. In addition, according to residents' explanations, there is still a habit of hanging dirty clothes, which is a

place for mosquitoes to perch. These habits and environmental conditions are factors that play a role in the development of mosquitoes that cause dengue fever.<sup>11</sup> Based on an initial survey of interviews with the village head, flood-prone areas in Tahtul Yaman Village are in several RTs, with a high percentage of 5 RTs, namely RT 005, RT 008, RT 009, RT 011 and RT 012. There are 4 RTs Yakini RT 003, RT 004, RT 010. RTs that are prone to flooding with a low percentage are 3 RTs, namely RT 001, RT 002, RT 007. Given the dangers of this DHF disease, Jambi University as one of the Universities engaged in the field of Public Health Sciences considers it necessary to take action in an effort to overcome and prevent the spread of DHF as a promotive and preventive action in order to improve the health status of the community. One of the efforts that can be done is to provide counseling through community service activities that aim to provide education to the community about DHF and how to overcome it as an effort to prevent dengue fever through the eradication of *Aedes aegypti* mosquitoes. This counseling is specifically for residents in the Tahtul Yaman Environment.

## **LITERATURE REVIEW**

Dengue Hemorrhagic Fever (DHF) is an infectious disease caused by a virus and spread by vectors. The virus that causes this disease is Dengue. The first case of DHF in Indonesia was reported in Surabaya in 1968. Since it was first discovered, this case has continued to increase every year. In Indonesia itself in 2021 there were 73,518 cases of DHF with 705 deaths. Cases and deaths due to DHF decreased compared to 2020, which was 108,303 cases and 747 deaths. In 2022 in Jambi province there were 1,381 cases of DHF with 9 deaths. Cases and deaths due to DHF increased significantly compared to 2021, which was 357 cases and 5 deaths.

## **METHODOLOGY**

This research is a quantitative research with an exploratory research type, which uses an ecological study design based on Geographic Information Systems (GIS). H. J. Mukono (2002: 25), an ecological study is an empirical discovery study of a group that applies the unit of analysis. The study includes geographical studies, including studies on the conditions of provinces, districts or cities, sub-districts, and so on.

The research location is located in Tahtul Yaman Village, Pelayangan District, Jambi City, which was conducted in September 2024. The data collected in this study were in the form of coordinate points of the research objects, which were then analyzed using GIS technology to map and identify spatial patterns that were relevant to the research objectives.

The data collected were in the form of graphs and maps produced from mapping research objects using GIS. This approach allows for geographic data visualization, thus facilitating understanding of the spatial dynamics of the variables being studied

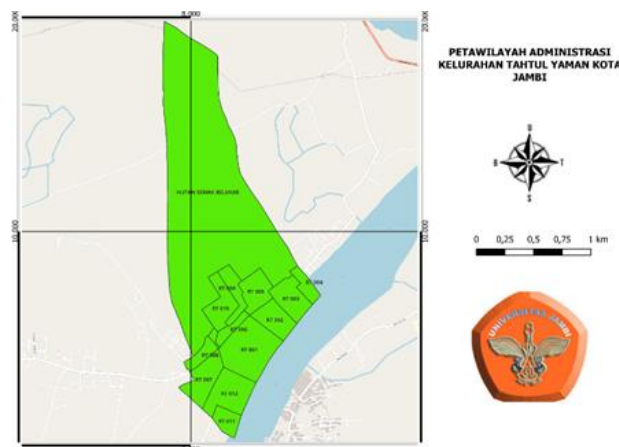
## RESULTS AND DISCUSSION

The following are the results of the discovery of Dengue Hemorrhagic Fever cases with data collection in 12 RTs in Tahtul Yaman Village.

Based on the Dengue Fever Case Graph in Tahtul Yaman Village above, it can be seen that family members who have been affected by dengue fever cases are as follows: RT 03 has 1 case, RT 04 has 1 case, RT 05 has 1 case, RT 06 has 3 cases, RT 08 has 2 cases, RT 09 has 2 cases, RT 10 has 2 cases, RT 11 has 4 cases and RT 12 has 5 cases, and RT 1,2,7 have no cases.



Figure 1. Discovery of Dengue Hemorrhagic Fever Cases with Data Collection In 12 Rts In Tahtul Yaman Village



Larvae can live and breed in damp areas such as bathtubs, stagnant pots, puddles around the house, and other dirty and stagnant environments. Humidity has an influence on the breeding of *Aedes aegypti* mosquito larvae but does not have a direct influence on the incidence of Dengue Hemorrhagic Fever (DHF). As in the research of Novitasari and Sugiyanto<sup>16</sup> that humidity ranging from 70%-90% is the optimal humidity for the breeding of mosquito larvae.<sup>17</sup>

On the map of Dengue Fever (DBD) Prone Areas in Tahtul Yaman Village, Jambi City, it can be seen that areas with low percentages of mosquito larvae are 7 RT Yakini, RT 001, RT 002, RT 003, RT 004, RT 005, RT 008, RT 012. Areas with moderate percentages of mosquito larvae are 3 RT Yakini, RT 006, RT 010, RT 011. Areas with high percentages of mosquito larvae are 2 RT Yakini, RT 007, and RT 009.

There has been a related study conducted by Arif Roziqin and Fitri Hasdiyanti (2017), namely mapping areas prone to Dengue Fever (DBD) with Using the parameters of rainfall, air humidity, and population density, it produces areas that are at risk of being affected by (Dengue Hemorrhagic Fever) DHF.18 Supported by research by Ardhya Meilya Rizky Arivadany (2024), the results of her research state that climate change affects the dynamics of DHF epidemiology through changes in temperature, rainfall, and other weather patterns that can

## **CONCLUSIONS**

Based on the graphic data of dengue fever (DBD) cases that occurred in Tahtul Yaman sub-district, it can be concluded that the cases of dengue fever that occurred in the sub-district are said to be quite small, namely with a total of 21 cases of Dengue Hemorrhagic Fever (DBD) that have occurred in the sub-district. Where, the most cases are in RT 11 & 12. Furthermore, in the flood-prone mapping, RT 11 & 12 are also included in the areas that have a high percentage of experiencing flooding along with RT 05, RT 08, and RT 09, this shows that flooding can be the main cause of the spread of Dengue Hemorrhagic Fever (DBD) cases if not immediately prevented or addressed. In addition, monitoring of mosquito larvae needs to be carried out to determine whether or not there are mosquito larvae in the area around the house or around the house, based on the data that has been carried out, the highest percentage with the number of mosquito larvae around 5-7 houses is in RT 007 and RT 9, therefore prevention and education counseling are needed to the surrounding community so that the number of mosquito larvae and cases of Dengue Fever (DBD) are getting smaller so that the community is safe from Dengue Fever (DBD).

## **RECOMMENDATIONS**

For areas that have been mapped as flood-prone areas and Dengue Fever (DBD), the main suggestions are to strengthen the drainage system, develop green infrastructure, and increase public awareness about preventing Dengue Fever (DBD). In addition, carry out routine monitoring and collaboration with authorities for more effective handling.

## **FURTHER STUDY**

This research still has limitations, so it is necessary to carry out further research related to the topic of Mapping of Flood-Prone and Dengue Fever-Prone Areas in Tahtul Yaman Village, Pelayangan District in order to improve this research and add insight to readers.

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