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Deli Serdang Regency Government Policy in Efforts to Prevent the Increase in the Incidence of Dengue Hemorrhagic Fever

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Abstract

The purpose of this study is to determine and analysis Deli Serdang Regency Government policy in efforts to prevent the increase in the incidence of dengue hemorrhagic fever from the relationship of rainfall and air temperature to the incidence of dengue hemorrhagic fever in Deli Serdang Regency. This type of research is ecological study research according to time. The object of this research is all climate data of Deli Serdang Regency recorded in the Meteorology, Climatology, and Geophysics Agency in 2016-2020 and data on the number of cases of dengue hemorrhagic fever in Deli Serdang Regency in 2016-2020. The method of data analysis in this study used bivariate analysis. The results show that rainfall has no correlation with the incidence of dengue hemorrhagic fever in Deli Serdang Regency. Air temperature has a moderate correlation with the incidence of dengue hemorrhagic fever in Deli Serdang Regency. Suggestions in this study are that Local Governments can take advantage of the results of this study in making policy in an effort to prevent increasing the incidence of dengue hemorrhagic fever in Deli Serdang Regency and be able to provide appropriate solutions in solving public health problems, especially the incidence of dengue hemorrhagic fever in Deli Serdang Regency.

Keywords
rainfall; air temperature; dengue hemorrhagic fever

I. Introduction

Dengue hemorrhagic fever is an infectious disease caused by a virus carried by the Aedes aegypti mosquito. Dengue hemorrhagic fever remains a major public health problem throughout the tropics and sub-tropics with a 30-fold increase in global incidence over the last 50 years. The World Health Organization estimates that 2.5 billion or 40% of the world's population is at risk of dengue hemorrhagic fever, especially those living in urban areas in tropical and subtropical countries.

The World Health Organization estimates that 390 million dengue infections occur worldwide each year. Of these, about 500,000 cases progress to severe dengue or dengue hemorrhagic fever, a more severe form of the disease that results in 25,000 deaths annually worldwide.

Dengue hemorrhagic fever is an acute febrile disease that is often found in areas with tropical climates. Dengue hemorrhagic fever is caused by the dengue virus which is transmitted through the bite of the Aedes aegypti mosquito. Since it was discovered in 1986 until now, the number of reported cases of dengue hemorrhagic fever has increased and the spread of this disease is increasingly widespread in Indonesia (Kementerian Kesehatan, 2011).

Infectious diseases in tropical countries are still happening today, one of them is a vector-based disease. Indonesia is located on the equator and is therefore a tropical country. This causes the risk of transmission of vector-based diseases such as dengue hemorrhagic fever.

The virus that causes dengue hemorrhagic fever is a dengue virus of the flavivirus genus, which belongs to group B arbovirus (arthropoda borne virus). There are four types of dengue virus, namely type 1, type 2, type 3, and type 4. Tissue cultures, such as mammalian baby hamster kidney cells and arthropod cells, for example are Aedes albopictus cells. In the Southeast Asian region, the epidemic of dengue hemorrhagic fever is a perennial problem and a leading cause of morbidity and mortality in children. The results of the study showed that dengue hemorrhagic fever was found mainly in children under the age of 15 years, but in the last decade there was an increasing trend of dengue hemorrhagic fever in adults and no significant difference was noted in the susceptibility to dengue hemorrhagic fever between genders.

Dengue hemorrhagic fever is still one of the main health problems in Indonesia. Based on data from the Ministry of Health of the Republic of Indonesia, the number of extraordinary cases of dengue hemorrhagic fever reported to have increased from 1,081 cases in 2014 to 8,030 cases in 2015. Likewise, the number of provinces and districts reporting dengue hemorrhagic fever outbreaks has increased, namely from five provinces and 21 districts in 2014 to seven provinces and 69 districts in 2015.

During the rainy season in some areas, there are usually extraordinary occurrences of dengue hemorrhagic fever almost every year, however, from the beginning of 2011 to August 2015 there were relatively increased cases. For 43 years the prevention and eradication program for dengue hemorrhagic fever has been ongoing and has succeeded in reducing the mortality rate from 41.3% in 1968 to 0.87% in 2010, but the program has not succeeded in reducing morbidity. The number of dengue hemorrhagic fever sufferers is increasing, the spread is increasingly widespread, not only attacking children but also to older people.

Deli Serdang Regency is one of the endemic areas for dengue hemorrhagic fever in North Sumatra Province. Based on data obtained from the Deli Serdang District Health Office, cases of dengue hemorrhagic fever in 2016 the number of patients recorded was 960 cases, in 2017 it increased by 988 cases, in 2018 it became 1,328 people with in 2019 it decreased to 974 cases and in 2020 again decreased to 802 cases. Fluctuations in the trend of dengue hemorrhagic fever cases in Deli Serdang Regency are allegedly due to weather anomalies.

Climate change causes changes in rainfall, air temperature, humidity, rainy days so that it has an effect on land and ocean ecosystems as well as on health, especially the proliferation of disease vectors such as the Aedes mosquito, malaria, and others. The main factors that influence the occurrence of infectious diseases are climate and season. Climate and seasons affect the life of disease agents, vectors and reservoirs (Chandra, 2007).

According to Achmadi (2011) there are direct and indirect impacts of temperature changes on disease incidence. The direct impacts are climate change, heat waves, and winter. Indirect impacts are changes in vector-borne diseases. Temperatures that increase with certain humidity can change the nature of mosquitoes, such as producing mosquito eggs requires protein in human or animal blood, so that it can spread transmission to subtropical countries.

The purpose of this study is to determine and analysis Deli Serdang Regency Government policy in efforts to prevent the increase in the incidence of dengue hemorrhagic fever from the relationship of rainfall and air temperature to the incidence of dengue hemorrhagic fever in Deli Serdang Regency.

II. Research Method

This type of research is ecological study research according to time. Study research is research carried out focused on a particular case to be observed and analyzed carefully to completion (Asyraini et al., 2022, Octiva, 2018; Pandiangan et al., 2022). Ecological studies according to time are observations from time to time about the correlation of the frequency of morbidity and mortality due to a certain disease that occurs in the community with health efforts or risk factors in the community (Chandra, 2007).

The object of research is the object of research and the set of elements that can be people, organizations, or goods to be studied (Octiva et al., 2018; Pandia et al., 2018; Pandiangan, 2015). The object of this research is all climate data of Deli Serdang Regency recorded in the Meteorology, Climatology, and Geophysics Agency in 2016-2020 and data on the number of cases of dengue hemorrhagic fever in Deli Serdang Regency in 2016-2020.

The data collection method is an activity carried out to obtain information that is treated in order to achieve the objectives of a study (Pandiangan, 2018; Pandiangan et al., 2021). The data collection method used is secondary data, namely data from climate measurements from the Meteorology, Climatology, and Geophysics Agency in 2016-2020 and data on the number of cases of dengue hemorrhagic fever in Deli Serdang Regency in 2016-2020.

The method of data analysis in this study used bivariate analysis. This analysis is used to test and see the relationship between the dependent variable and the independent variable (Octiva et al., 2021; Pandiangan et al., 2018). The relationship between two variables or bivariate analysis must pay attention to the strength of the relationship and the significance of a relationship that occurs. If you want to see and know more precisely the magnitude or degree of the relationship between two variables, the Pearson correlation coefficient is used (Pandiangan, 2022; Tobing et al., 2018).

III. Results and Discussion

3.1 Correlation Test

Table 1. Correlation Test of Rainfall and Air Temperature to the Incidence of Dengue Hemorrhagic Fever in Deli Serdang Regency

Variable	P Value	R	Information
Rainfall	0.941	-0.047	No Correlation
Air Temperature	0.301	0.584	Moderate Correlation

Based on Table 1, the results show that rainfall has no correlation with the incidence of dengue hemorrhagic fever in Deli Serdang Regency. Air temperature has a moderate correlation with the incidence of dengue hemorrhagic fever in Deli Serdang Regency.

3.2 Relationship between Rainfall and Dengue Hemorrhagic Fever in Deli Serdang Regency

The average rainfall in 2016-2020 is 185 mm per month. This data shows that rainfall in Deli Serdang Regency in 2016-2020 belongs to the category of medium/moderate rainfall, which is in the range of 100 mm to 300 mm (Badan Metereologi Klimatologi dan Geofisika Sampali, 2010). The ideal rainfall for dengue hemorrhagic fever is in the range of 100-300 mm per month, which is a potential factor for

the Aedes aegypty mosquito to breed.

Based on the results of statistical tests, it shows that there is no relationship between rainfall and the incidence of dengue hemorrhagic fever in Deli Serdang Regency in 2016-2020, the value of p=0.941, R=-0.047. Rainfall is one of the climatic factors that can affect the occurrence of dengue hemorrhagic fever, but rainfall cannot be said to be the single factor that affects the incidence of dengue hemorrhagic fever in Deli Serdang Regency in 2016-2020. This can be seen from the graph that shows that high rainfall is not followed by an increase in the number of cases of dengue hemorrhagic fever and vice versa.

The data shows that the peak of dengue hemorrhagic fever in 2016 was 130 cases with rainfall of 70 mm/month, after which cases decreased to 93 cases with increased rainfall of 319 mm/month. Meanwhile, the peak of dengue hemorrhagic fever during 2018 which was the highest peak of dengue hemorrhagic fever with the number of cases of 141 cases which rose to 146 cases occurred at intervals of rainfall ranging from 170 mm/month to 260 mm/month.

Based on data during 2016-2020, the highest rainfall figures occurred in September and October which were in the rainfall interval of 322-417 mm but this was not followed by the number of cases of dengue hemorrhagic fever in September and October with the lowest number of cases being 57 cases and the highest was 111 cases.

An increase in high rainfall will have an impact on increasing the vector population where the vector size becomes larger and there is an increase in vector survival because rainfall increases along with increasing rainfall.

The researcher's assumption that there is no relationship between rainfall and the incidence of dengue hemorrhagic fever is influenced by other factors besides rainfall, namely community behavior factors that anticipate before the rainy season by eradicating mosquito nests.

This is supported by research conducted by Priesley et al. (2018) that there is a relationship between the behavior of eradicating mosquito nests p=0.001 by closing, draining, and recycling plus (PSN M Plus) on the incidence of dengue hemorrhagic fever.

High rainfall can result in the emergence of puddles naturally and the existence of rainwater reservoirs such as containers, cans or used bottles that are left open so that they have the potential to become a place to live for mosquito development, but if the rainfall is too high it occurs in a sufficient period of time. Long and long periods of time can cause flooding so that it can eliminate mosquito breeding sites and result in a decrease in mosquito populations.

On the other hand, if the rainfall is small for a long time, there will be additional mosquito breeding sites and an increase in population. The rainfall index does not directly affect the mosquito breeding process, but it does affect the ideal rainfall.

Increased rainfall can increase the presence of disease vectors by expanding the size of existing larval habitats and creating new mosquito breeding sites. A fairly high rainfall index will provide enough shelters filled with rainwater and thus will be a good place for the Aedes aegypti mosquito to lay eggs. Rain affects the relative rainfall in the air and the breeding places for mosquitoes also increase.

The rainfall index that continues to be high from year to year causes more places to lay eggs, more eggs will hatch into larvae or larvae as well as the growth rate of adult female aedes aegypti vectors will increase. The increasing population of adult female Aedes aegypti mosquitoes will increase the frequency of biting and contact with humans because the Aedes aegypti and Aedes albopictus imago require a protein supply for the production and maturation of their eggs. The protein supply is obtained from the host's blood fluid.

3.3 Relationship between Air Temperature and Dengue Hemorrhagic Fever in Deli Serdang Regency

Based on the results of the statistical test of air temperature, the air temperature with a value of p=0.301, R=0.584, it can be said that air temperature has no relationship with the incidence of dengue hemorrhagic fever. The average air temperature in Deli Serdang Regency is 26.5^0C during the 2016-2020 period. The highest air temperature in April 2016 for the 2016–2020 period was 29.4^0C with 81 cases of dengue hemorrhagic fever and the lowest air temperature in October 2019 for the 2016–2020 period was 21^0C with 43 cases of dengue hemorrhagic fever.

Temperature can affect the life cycle and metabolic processes of mosquitoes. Mosquito development is in the temperature range of 25˚C-27˚C, if the temperature is 40˚C, mosquito growth will stop. In general, dengue virus transmission occurs in the tropics and sub-tropics because cold temperatures can kill the eggs and larvae of the Aedes aegypti mosquito. The high air temperature will increase the evaporation of water so that the air can become moist. The need for high air temperatures affects mosquitoes to look for wet and humid places as a place to rest.

The meaninglessness of air temperature with the incidence of dengue hemorrhagic fever in Deli Serdang Regency in 2016-2020 is possible because of behavioral factors from the community that support clean and healthy lifestyle efforts such as eradicating mosquito nests.

This study is in line with research conducted by Bangkele and Syafrianti (2016) in Palu City which stated that there was no significant relationship between air temperature p=0.270, R=-0.81 with the incidence of dengue hemorrhagic fever.

The interaction between air temperature and temperature reduction is an important determinant in dengue transmission. The lower the temperature (cold conditions) will affect the survival of adult mosquitoes so that it affects the rate of transmission. The decrease in temperature also affects the diet and reproduction of mosquitoes and increases mosquito population density. At the breeding water temperature between 25-32°C, the time required for the growth and development of Aedes aegypti from eggs to mosquitoes ranges from 8-15 days. This temperature is the optimal temperature. With water temperatures below 24°C or lower than the optimal temperature, the growth and development time becomes longer (Kementerian Kesehatan, 2011).

IV. Conclusion

The results show that rainfall has no correlation with the incidence of dengue hemorrhagic fever in Deli Serdang Regency. Air temperature has a moderate correlation with the incidence of dengue hemorrhagic fever in Deli Serdang Regency.

Suggestions in this research are:

1. The Deli Serdang District Health Office for Disease Prevention and Control (P2P) is expected to be able to utilize the results of this study in an effort to eradicate and prevent dengue hemorrhagic fever.
2. Suggestions in this study are that Local Governments can take advantage of the results of this study in making policy in an effort to prevent increasing the incidence of dengue hemorrhagic fever in Deli Serdang Regency and be able to provide appropriate solutions in solving public health problems, especially the incidence of dengue hemorrhagic fever in Deli Serdang Regency.
3. The community is expected to apply a clean and healthy lifestyle such as cleaning the house often, not hanging clothes at home (bedroom), draining the bath at least once a

week, if you have an aquarium (fish pond) then you can also keep fish that eat mosquito larvae, close water reservoirs, sprinkle abate powder on water reservoirs and use spray and burn drugs as additional efforts to eradicate mosquitoes.

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