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CLIMATE FACTORS AND *DENGUE* FEVER INCIDENCE (DHF) IN GOWA

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ABSTRACT

Case Fever *Dengue* Hemorrhagic Fever (DHF) since the year 2019 amounts to 138.127 cases, w hich is increased a year previously in the year 2018 as much as 65,602 cases in Indonesia. In 2020, the number of dengue fever cases in Gowa Regency increased to 387 cases, with six people dying from dengue fever and becoming the city with the highest number of dengue fever cases in South Sulawesi Province. One of the factors causing the increase in DHF is climate. The study aims to know the climate connection factor (Temperature, air, Rainfall, rain, air humidity, air pressure, wind speed, and rainy days) with the occurrence of DHF in the Gowa Regency in 2017-2021. This study used a descriptive design. Ecological survey with a time series approach (*time series analysis).* Samples of study This is all over results observation monthly from incident dengue fever, temperature air,rainfall, air humidity, air pressure, wind speed, and rainy days, in 5 years that is 60 months taken from data secondary/result observation. The results of this study indicate that there is no relationship between air temperature (p=0.199), air humidity (p=0.160), air pressure (p=0.191), and also day Rain (p=0.051) with incident dengue fever. There is a connection between rainfall (p=0.024) and wind speed (p=0.043) with incident dengue fever. This research suggests the need for public awareness and participation in efforts to prevent and eradicate dengue fever.

Keywords: Dengue fever; ecology, climate; mosquitoes

1. INTRODUCTION

Virus Dengue, member genus flavivirus as well as the family Flaviviridae, is an infectious agent that triggers dengue fever, which has a high morbidity rate and the highest mortality rate globally (Indonesian Ministry of Health, 2011; Monintja et al., 2021). The bite of the Aedes aegypti mosquito is the primary method of spreading the Dengue virus to the human body. Most of the Dengue virus's spread occurs in tropical and subtropical areas, often in the rainy season. Based on WHO data, 2.5 billion people are at risk of being attacked with dengue fever, as well as 50 million number pain consequence virus Dengue happens each year all over the

world. Not only That, 500,000 suffer from dengue fever, and most children still need inpatient (Widoyono, 2011).

Dengue fever is most prevalent in Southeast Asia. There is in Indonesia, where in all districts and cities in Indonesia, fever is a disease That most Likely causes health risks (Ministry of Health Republic of Indonesia, 2015). Of people who attacked consequences as well as coverage of geographical disease. This increase often brings up incidents outside normal (KLB) and even impacts others, such as social and economic impacts. Loss of society due to DHF, namely deaths and lower life expectancy. Short. In 2019, there were 138,127 cases of DHF (51.48), an increase compared to the previous year, when there were 65,602 cases (24.75). The number of deaths due to DHF also increased. In 2018, that is as many as 467 cases, and in 2019, there were 919 cases due to dengue fever (Monthly et al., 2021).

Province Sulawesi South is a diverse region that reflects different weather conditions in each region. The number of dengue cases is the highest in the 8-year final recorded in 2015, as much as 4.818 cases, followed by 7,568 cases in 2016 and 1,895 cases in 2017 (Muhammad Reza Dear Sir, 2022). Humidity, air, rainfall, rain, and temperature are only some variables that can influence the prevalence of DHF. The number of DHF cases in Gowa Regency 2014 was 96 cases and experienced an increase in 2015 by 103 cases of DHF. Then, in 2016, the cases of dengue fever increased by 453 cases, where the number of cases was taller than that of City Makassar, with as many as 402 cases (BPS South Sulawesi Province, 2017).

Weather elements are the most important factors in the occurrence of DHF. A study by Xu et al. (2014) found that high air humidity can affect mosquitoes' lives, including distance flight, age, and developer culture, which can affect the incidence of DHF. In addition, research by Arsin et al. (2020) has shown that the air temperature and air humidity of dengue fever cases own substantial positive correlation with the mean value ($p = 0.048$; $r = 0.257$) and relative air humidity ($p = 0.001$; $r = 0.413$). Based on this research, It is important to investigate the effects of temperature, humidity and climate on the prevalence of DHF. Other studies have also found that over the past two decades, there has been a correlation between dengue fever incidence in Port Sudan between 2008 and 2010, with ideal air humidity and relative temperature (Noureldin & Shaffer, 2019). DHF incidence was measured by cross-wavelet analysis conducted by Santos et al. (2019), who found a correlation between rainfall and DHF incidence in the last 3 years. The results of cross wavelet measurements show a result of 45°, which means that the rainfall in that year will cause an improvement in case of dengue fever next year.

In 2020, the number of DHF cases in Gowa Regency increased to 387 cases, with six people dying as a consequence of dengue fever, and it became the city/district with the highest DHF rate in Sulawesi Province South (Antaranews, 2020). The global problem currently being faced is the increasing number of cases. DHF constantly. One of the factors that contribute to the occurrence of DHF is wind speed. Research using secondary data from the Department City Makassar And BMKG City Makassar, as well as analysis data using the use of General Estimating Equation (GEE), find that The wind speed variable correlates $p = 0.001$ and CI 95% = -13.50 (-3.4800) which significant with the incident Dengue Fever in the City Makassar (Susilawaty et al., 2021).

2. METHODS

This study uses ecology as the approach. Analysis series time (time series analysis) is the method used to analyze data collected sequentially throughout time. Studies ecology is observation where the unit being examined is the population within a region and geographical or statistical data on incidence, prevalence, and mortality. Ecological studies were conducted as an observational study to evaluate the relationship between the temporal occurrence of a disease in the community and its risk variables. In this study, the population used was the observation or observation of all the results from the variable study (dependent and independent) every month from January 2017 until December 2021 in the Regency Gowa. All monthly observation results of DHF incidents, air temperature, rainfall Rain, humidity air, pressure air, speed wind, day Rain in 5 years counted month January 2017 until month December 2021 is 12 months multiplied by 5 years, which is 60 months, which is made a sample in this study. Determination of sample size was carried out by exhausting sampling (all population is used as samples).

3. RESULTS AND DISCUSSION

a. The Correllation between Air Temperature with Incident *Dengue* Hemorrhagic Fever (DHF)

The correlation between Air Temperature with Incident *Dengue* Hemorrhagic Fever (DHF) are shown in Table 3.1.

Table 1. Results of Correlation Analysis of Air Temperature with *Dengue* Hemorrhagic Fever (DHF) Incident in the RegencyGowa 2017-2021

Variable	DHF Incident		
	r	p	n
Temperature	0.168	0.199	60

Pearson correlation test between DHF incidence data and temperature air show No There is a significant correlation between air temperature and DHF case data in Gowa Regency in 2018 2017–2021, which shows a p-value = 0.199 (more significant than α namely 0.05). However, the analysis results obtained an r-value of 0.168, Which means positive or one-way with a strong correlation, Whichis weak. However, mark r (direction connection). There is no meaning because mark p is more significant than 0.05.

b. The Correllation between Rainfall with Incident Dengue Hemorrhagic Fever (DHF)

The correlation analysis of rainfall with incident *Dengue* Hemorrhagic Fever (DHF) shown in Table 3.2 below:

Table 2. Results of the Correlation Analysis of Rainfall with *Dengue* Hemorrhagic Fever (DHF) Incident in the RegencyGowa 2017-2021

Variable	DHF Incident		
	r	p	n
Rainfall	0.291	0.024	60

The results of the analysis of the relationship between rainfall and dengue fever incidents using the Pearson correlation test obtained a significance value of 0.024, which means that the p value is smaller than α (0.05), so that it can be interpreted that there is a meaningful relationship between rainfall and dengue fever incidents in Gowa Regency in 2017-2021. The results of the statistical test obtained a correlation coefficient value (r) of 0.291, which indicates a positive correlation or a unidirectional relationship with a weak correlation strength, meaning that the higher the rainfall, the higher the dengue fever incident will be**.**

Rainfall is one of the many variables that affect the increase in dengue cases. However, puddles of water due to rainwater falling on media/places can be a means for mosquito breeding (Ariati & Musadad, 2012). Ideal rainfall indirectly affects the mosquito breeding process. Mosquito eggs will develop into larvae after 2 days in the water, and after 6 to 8 days they will mature into pupae. Before developing into Aedes aegypti mosquitoes, pupae will live for 1-2 days (Sembel, 2009 (in Angelina, C.R, 2018).

c. The Correllation between Air Temperature with Incident Dengue Hemorrhagic Fever (DHF)

The correlation between humidity with Incident *Dengue* Hemorrhagic Fever (DHF) are shown in Table 3.3.

Table 3. Results of Air Humidity Correlation Analysis with the Incidence of *Dengue Hemorrhagic Fever* (DHF) in Regency Gowa 2017-2021

Variable	DHF Incident		
	r	p	n
Humidity	0.184	0.160	60

The results of the analysis of the relationship between DHF frequency and air humidity in Gowa Regency from 2017 to 2021 using the Pearson correlation test showed that there was no significant relationship between air humidity and DHF case data in Gowa Regency from 2017–2021 because the p value = 0.160 is greater than α (0.05). The results of the statistical test showed an r value of 0.184 indicating positive or in the same direction with a very weak correlation strength, but the r value (direction of the relationship) has no meaning because the p value is greater than α (0.05). Research in Batam City produced a p value of 0.111 and showed no significant relationship between air humidity and the incidence of dengue fever, although the average air humidity in Batam City was 83.2% or was at the optimum air humidity for mosquitoes to live and become disease vectors, but air humidity was not the only causative factor, many other factors had a greater influence on the increase in the incidence of dengue fever, so that the study was in line with this study (Ariati & Musadad, 2012). In addition, Tomia et

al., (2016) obtained research results with a p value of 0.543 which showed that there was no correlation between the frequency of dengue fever and humidity because air humidity fluctuated in the area. Research by Komaling et al. (2020) obtained a p value of 0.273, and research by Putri et al. (2020) with a p-value of 0.201, the study also obtained an average optimum humidity (70%-80%) even though the statistical test results showed no correlation, so the researcher explained that there were other factors that had a greater influence on the increase in DHF cases.

d. The Correllation between Air Temperature with Incident Dengue Hemorrhagic Fever (DHF)

The correlation between Air Pressure with Incident *Dengue* Hemorrhagic Fever (DHF) are shown in Table 3.4.

Table 4. Results Analysis Correlation Pressure Air with*Dengue* Hemorrhagic Fever (DHF) Incident in the Regency Gowa 2017-2021

Variable	DHF Incident		
	r	p	n
Air Pressure	0.171	0.191	60

Pearson correlation test between air pressure and data DHF shows a p-value = 0.191 or more significant than α (0.05), so it can be concluded that there is no meaningful relationship between pressure air and the amount of case of dengue fever in Gowa Regency 2017-2021. Based on the results of the statistical tests, the r-value is 0.171, which indicates that it is positive or in the same direction as the strength correlation. Weak. However, mark r (direction relationship) has no meaning because the p-value is more significant than 0.05.

The results of this study are not in line with the research conducted by Faruk et al. (2022) where the results of the study showed a p value <0.01 and had a significant negative relationship with the incidence or spread of dengue fever, this was due to the northeast monsoon season which was marked by high rainfall which affected the increase in the incidence of dengue fever. In addition, dengue fever incidents were also found in areas with high humidity, which encouraged the development of mosquitoes in Sri Lanka in 2017.

e. The Correllation between Wind Speed with Incident Dengue Hemorrhagic Fever (DHF)

The correlation between Wind Speed with Incident *Dengue* Hemorrhagic Fever (DHF) are shown in Table 3.5.

Table 5. Results of Wind Speed Correlation Analysis with the incidence of *Dengue Hemorrhagic Fever* (DHF) inRegency Gowa 2017-2021

Variable	DHF Incident		
	r	p	n
Wind Speed	-0.262	0.043	60

Results test correlation *Pearson* between speed wind with data DHF shows a p-value = 0.043 (smaller than α (0.05)), then there is a strong correlation between wind speed and data DHF cases in Gowa Regency in 2017-2021. The results of the statistical test were that the r value was -0.262, which indicated strength correlation weak And connection negative or No one way,

This study is the same as the study conducted in Tanah Datar by Mangguang MD (2016), as well as the study conducted in Makassar by Rasyid A. et al. (2016), each obtained a p value of 0.001, where the results of their studies both explained that there was a relationship between the incidence of DHF and wind speed because the wind speed in the area was ideal for mosquitoes to be able to transmit the disease from one human to another. However, there are studies that contradict this study, including research by Bambang et al. (2010) with a p value of 0.384, and research conducted by Gandawari et al. (2018) with a p value of 0.722, where both studies found that there was no relationship between wind speed and the incidence of DHF because each region had a high population density, making it easier for mosquitoes to become vectors of the disease.

In addition, Ritawati & Supranelfy (2019) also conducted a study that obtained a p value of 0.203 which showed that there was no relationship between wind speed and the incidence of Dengue Hemorrhagic Fever (DHF) because the researchers explained that the incidence of DHF was caused by many factors such as the environment, behavior, and established policies. Theoretically, wind speed can have an impact on the spread and range of mosquito flight because it can prevent mosquitoes from flying at speeds of 11–14 m/s or 21–27 knots. The wind speed that occurs at sunrise and sunset makes mosquitoes fly in or out of the house more freely so that it can affect the amount of contact between humans and mosquitoes (Wirayoga, 2013). The range of mosquitoes can also be influenced by wind speed, and the greater the range, the more likely they are to come into contact with humans. As a result, their lifespan and reproductive cycle become longer (Yanti S., 2004).

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