# The Relation Between Rainfall With Prevalence Of Dengue Hemorrhagic Fever (DHF) In Children Ages 5-14 Years

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**Abstract**: Dengue Hemorragic Fever (DHF) is one of health problems in Indonesia. DHF is often associated with climate change, because it usually occurs at the beginning and at the end of the rainy season. it is shown by the high rates of morbidity and mortality. the case of DHF tends to reach its peak on January each year, on wich the rainfall tends to fall. This research is observational analytic study using a case report. Samples of this study are all DHF cases in children aged 5-14 years during 2010-2012 in Haji hospital Surabaya. The result of spearman analysis showed r =0.383 (p=0.011) with the result obtained by linear regression=0.356, with R square = 0.025. There is significant relation between rainfall and DHF case. This proves that the amount of rainfall is not directly proportional to the case of DHF. The correlation of both variables shows that DHF case reaches its peak when the rainfall is in the mid-level (<400 mm3). Because rainfall is not proved to affect the case of DHF, future researchers are recommended to identify other variables, namely temperature.

**Keyword**: rainfall, Dengue Hemorrhagic Fever (Dengue), Children aged 5-14 years.

## 1 INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is one of public health problem in Indonesia. Incidence of dengue is often associated with climate change, because the peak of dengue cases usually occur at the beginning and end of the rainy season (Sungkar S, 2011). The mortality rate of dengue cases is in high category, especially DHF patients who were late with stage IV. Aedes mosquito vectors of dengue disease aegypty and aedes albopictus still prevalent in parts of Indonesia. Technological advances in the field of transport be accompanied rapid population mobility facilitates the spread of the source of contagion from one city to another (Soegijanto, 2004). In Indonesia, the number cases of DHF occurs mostly in the age group of 5-14 years is 60% (U. Hadi, 2007). Based on data from the Provincial Health Office of East Java there is an increased incidence of DHF are significantly from year to year. In 2008, there were 16 291 cases, then in 2009 increased to 18 631 cases in 2010 increased rapidly to 26 059 cases. In addition, the death rate from dengue also increased. In 2008 found 163 people died from dengue fever, and in 2009 increased to 185 people died, in 2010 increased to 234 people died. In fact, in Surabaya at 2010, the number of dengue fever patients reached 3,379 people with morbidity rate (IR) of 116.03 / 100,000 population. Patients with DHF otherwise receive adequate care can experience heavy bleeding, shock, and can lead to death. therefore, all dengue cases according to WHO criteria should seek care at health centers or hospitals. Infectious diseases is the combination of various factors that influence each other: environment (environtment), agent and host (host). The third important factor is called triangle of epidemiology. Environment includes physical and non-physical environment. The physical environment consists of geographical conditions, humidity, temperature and neighborhoods (Widoyono, 2011). Transmission of communicable diseases is strongly influenced by climatic factors. Parasites and vectors of disease are extremely sensitive to climatic factors, especially temperature, rainfall, humidity, water and wind. DHF spread of vector-borne transmission of the disease needs to watch out for this increase with climate change. In many tropical countries this disease is the leading cause of death (AMV Dini, 2010) Climate can affect ecosystems, habitats animal-borne diseases, even the growth of colonies of germs naturally. Thus, directly or indirectly affect the emergence of a disease. The Appearance of dengue and malaria are often associated with humidity and rainfall. Therefore, early awareness needs to be improved before the rainy season climate and incidence of the disease has a very close relationship, especially in infectious diseases. Climate can be used as predictors of incidence of various infectious diseases that should be used as a guide to health management, in particular based disease management area (UF Achmadi, 2005). The incidence of dengue fever tend to reach the peak in January in each year at East Java, at which time precipitation tends to fall (East Java Health Office, 2012). Surabaya is one of the endemic regions in Indonesia with the highest dengue cases in East Java. Number of patients with DHF during February-March 2011 based on data from Surabaya Health Department is quite high at around 289 people (Rini USA, 2012). This research want to identify the relationship between rainfall with the prevalence of dengue in children 5-14 years in RSU Haji Surabaya, it do hope the prevention measures and anticipated form the mosquito eradication before the rising cases of dengue and preparation in the hospital when a spike in dengue cases.

## 2 METHOD

This research is observational analytic study using case report design to study the relationship between rainfall with dengue prevalence in children aged 5-14 years in RSU Haji Surabaya in 2010-2012. The research population includes all cases of dengue hemorrhagic fever in children at 2010-2012 year. The sampling technique usieng total sampling. With the Inclusion criteria: Patients with dengue hemorrhagic fever (DHF), aged 5-14 years, hospitalized in RSU Haji Surabaya 2010-2012 The exclusion criteria: Patients with a diagnosis of dengue with HIV / AIDS. The independent variables are rainfall. The dependent variable is the prevalence of dengue hemorrhagic fever. Rainfall Data obtained by recording the results of measurements carried out by the Agency for Meteorology, Climatology and Geophysics years 2010 to 2012. The prevalence of dengue disease were obtained through monthly recapitulation level of morbidity patient in 2010 - 2012. The bivariate analysis performed using simple linear regression.

The results of simple regression was used to determine the relationship of independent variables with the dependent variable. If the results show the value of p <0.05, with alpha = 0, 05; means the independent variables have a relationship with the dependent variable (Purwanto, 2007). Then proceed with the analysis spearman rank correlation test. Odds ratio is not implemented because the incidence of pain can not be divided between the diseased groups and groups who are not sick.

## 3 RESULT

### Rainfall Data

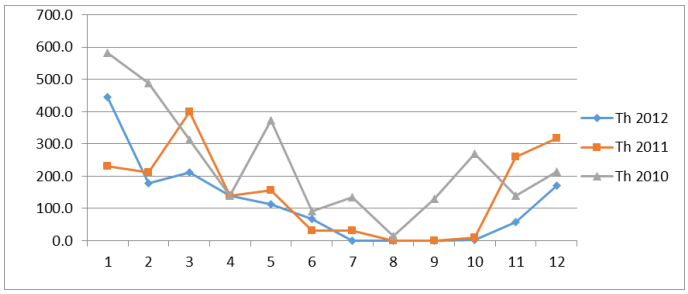



***Figure 3.1*** *The Rainfall At Surabaya 2010-2012 years*

The X-axis numbers indicate the month, and the Y axis shows the rainfall figures with the unit: mm3; Source: Meteorology and Geophysics Meteorological Station Juanda From the graph above shows that the highest rainfall occurred in January 2010, which amounted to 581.7 mm. The lowest rainfall occurred in October 2012 in the amount of 2.1 mm, and there are five months did not experience at all that rain in August and September 2011 and in August, September and October 2012.

DHF Case

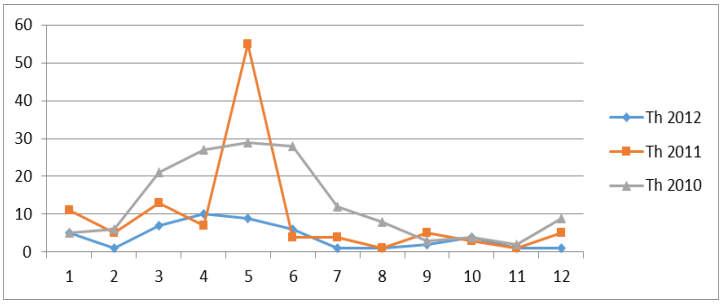



***Figure 3.2*** *The children 5-14 years old with DHF diagnosis at 2010-2012 years*

The X-axis represents the month, and the Y axis shows dengue cases with units: frequency of occurrence per month; Source: Sub-Division of Medical Record RSU Haji Surabaya From the graph above it appears that there is no month without dengue cases in children aged 5- 14 years who were treated at the Hospital Haji Surabaya. Lowest cases one child was in August and November 2011, February, July, August and November 2012. Most cases were 55 children, occurred in May 2011.

### Relationship between rainfall and DHF patient.

The analyze of relationship between rainfall with incidence of DHF in patients aged 5-14 years show that the data of two variable do not meet the normality of the data. So the correlation test using Spearman rank correlation test by the result obtained significant correlation with r - Spearman = 0.11.

***Table 3.1*** *The results of Spearman Rank Correlation Test between variable rainfall with variable prevalence of dengue*

Correlations

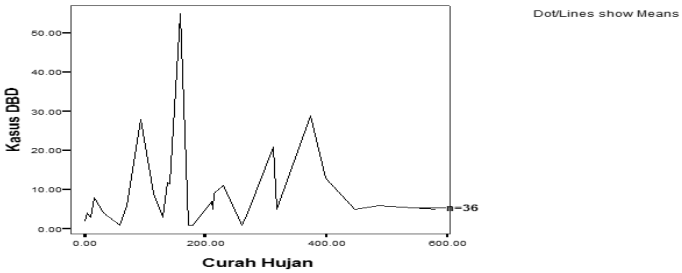
| | | | Rainfall | Incidence of dengue |
|---|---|---|---|---|
| Spearman's rho | Rainfall | Correlations Coeficient<br>Sig. (10 tailed)<br>N | 1.000<br>.<br>36 | .383*<br>.011<br>36 |
| | Incidence of dengue | Correlations Coeficient<br>Sig. (10 tailed)<br>N | .383*<br>.011<br>36 | 1.000<br>.<br>36 |

This implies that the correlation between rainfall with a significant incidence of dengue, but not necessarily at the level of rainfall causalitas not give a strong influence on the incidence of dengue. Odds Ratio Analysis and Risk Ratio as the initial plan was not possible because the research groups of data dependent can not be categorized into two parts; considering the analysis Odds Ratio and Risk Ratio requires data categories of the two variables they will be two or table 2 times 2.

## 4 DISCUSSION

Results of research on dengue fever cases occur in children aged 5- 14 years who were treated in RSU Haji Surabaya in 2010- 2012, proved to be no relationship between rainfall with dengue prevalence in children age 5- 14 years in RSU Haji Surabaya. The results of correlation test Spearman rank test with an alpha of 0.05, the result of 0.16. The correlation proved significant at the 0.05 level where rainfall is less than 200 mm3. During 2010 to 2012 almost every month of rain, only five months did not experience at all that rain in August and September 2011 and in August, September and October 2012. The highest rainfall occurs in January 2010, amounting to 581, 7 mm. The lowest rainfall occurred in October 2012 that is equal to 2.1 mm. Meanwhile during the years 2010- 2012 there was no moon that no dengue cases in children aged 5- 14 years who were treated at the Hospital Haji Surabaya. Lowest cases one child was in August and November 2011, February, July, August and November 2012. Most cases were 55 children, took place in May 2011. At the time of highest rainfall, January 2010 (581.7 mm) turned out to be not the highest dengue cases (5 cases). Conversely when the lowest rainfall occurred in October 2012 in the amount of 2.1 mm, dengue cases are not the lowest (4 cases). Even when there is no rainfall is in August and September 2011 and in August, September and October 2012, there are still cases of DHF, namely: in August 2011, 1kasus, September 2011, 5 cases, in August 2012, 1 case, September 2012, 1 case and October 2012, 2 cases. Highest prevalence was occurred in May 2011 (55 cases), at that time the highest rainfall (156.8 mm).

Rainfall




By looking at the graph, the correlation between rainfall incidence of dengue indicates that rainfall is not directly proportional to the incidence of dengue, but it appears that the rainfall moderate (less than 200 mm3) showing the incidence of dengue highs. This is consistent with the results of Sungkar S (2011) research which states that the incidence of dengue is often associated with climate change, because the peak of dengue cases usually occur at the beginning and end of the rainy season. Climate can affect ecosystems, habitats animal-borne diseases, even the growth of colonies of germs naturally. Thus, directly or indirectly affect the emergence of a disease. The prevalence of DHF and malaria are often associated with humidity and rainfall. Therefore, early awareness needs to be improved before the rainy season climate and incidence of the disease has a very close relationship, especially in infectious diseases. Climate can be used as predictors of incidence of various infectious diseases that should be used as a guide to health management, in particular based disease management area (UF Achmadi, 2005). There are several different terms relating to the climate, the weather and the season. The weather is more variable conditions describe multiple variations on a daily basis, such as temperature and humidity daily. Example that illustrates the daily conditions such as the weather is sunny, cloudy, hot and others. Weather Refers to the day-to-day state of the atmosphere, Characterized by meteorological factors such as temperature, humidity, precipitation, and winds. (US National Research Council, 2001). The world is undergoing climate change. This is due to human activities, particularly in the selection of energy use that tends not renewable and emit gases or toxins that affect climate change. It is estimated, the earth's temperature rise between 1.4 and 5.8 ° C by the end of the 21st century. Experts are conducting efforts predictive of the development of diseases caused by rising global temperatures. One of them that is the emergence of a new infectious disease events. Environmental factors that affect the lives of the vector is the abiotic and biotic factors. Biotic factors such as climate (rainfall, temperature, humidity and wind speed) can influence the failure of egg, larva, pupa, mosquitoes become imago. Likewise, biotic factors such as predators, parasites and foods that interact in a container as aquatic habitat pradewasa also affects the success becomes imago (Barrera et al., 2006). Climate change causes changes in rainfall, temperature, humidity, wind direction, so that the effect on land and sea ecosystems that affect health, especially to the proliferation of mosquitoes such as Aedes vectors and others. Surabaya is one of the endemic regions in Indonesia which is endemic regions with the highest dengue cases in East Java. Number of patients with DHF during February-March 2011 based on data from Surabaya city health department is quite high, reaching 289 people (Rini U.S., 2012). The pattern of increased transmission cycle coincided with the rainy season has been observed in several countries. The interaction between temperature and rainfall are important determinants of transmission of dengue, because the colder temperatures affect the survival of adult mosquitoes, so it affects the rate of transmission. So furthermore, rain and temperature can affect the diet and reproduction of mosquitoes that result in increased density of vector populations (WHO, 1998). To watch with climate change, the rains became erratic and prolonged. The cases of dengue fever occurred be spread throughout the year, is no longer in certain months. Besides, the prevalence of dengue disease is also increasing. With the climate change an increase the temperature of the earth. Rainfall is one of the elements of the climate that affect the increased prevalence of dengue. May need to be further investigated the effect of changes in the earth's temperature to the increased prevalence of dengue.

## 5 Conclusions And Suggestions:

**Conclusions:**

During the years 2010- 2012 most of the year it rains in Surabaya. Only 5 months of the 36 months of no rain. There are cases of dengue in children aged 5-14 years in RSU Haji Surabaya and there is a relationship between rainfall and the prevalence of dengue cases in children aged 5-14 years in RSU Haji Surabaya

**Suggestion:**

For the community need to increase vigilance against dengue disease, because it can happen at any time, by increasing mosquito eradication efforts by 3M. For hospital need to set up facilities and infrastructure in order to face the surge in dengue fever cases occur every month and for further research is necessary to study the relationship between the temperature change with an increase in dengue cases.

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