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Cross Sectional Study: the Relationship Between Comorbidities and Hematocrit with the Hospitalization of Patients of Dengue Hemorrhagic Fever (DHF)

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Dengue hemorrhagic fever (DHF) is a public health problem in Indonesia because of the number of sufficient patients is likely to increase and spread more widely. Long hospitalization of patients in the hospital costs a lot. This study aims to determine the relationship between comorbidities and hematocrit with the dengue patients hospitalized with cross sectional design. The study population was collected from medical records for 1 January - 31 December 2016. 72 samples with simple random sampling technique. Analysis of data using Product Moment Pearson test and linear regression with $\alpha = 0.05$. The results showed there was a positive correlation between comorbidities with hospitalization ($p = 0.006$), and there is a negative correlation between hematocrit values with hospitalization ($p = 0.044$). This research is expected to direct public health interventions to minimize mortality.

Keywords: Hematocrit, Comorbidities, Hospitalization, Dengue

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1. INTRODUCTION

Dengue hemorrhagic fever (DHF) to international attention because of incidents every year is increasing in some countries. DHF is spread through the bite of mosquitoes that carry the virus. The virus cannot spread from person to person through casual contact. People who have dengue fever should be protected from mosquito bites. If a mosquito bites an infected person, the mosquito becomes infected with the virus and can pass it to other people. WHO report show more than 40 years, dengue endemic countries have reported cases and deaths treated in the hospital reached 4,975,807 cases of dengue fever with cases of death of 68,977 (1.4%). DHF is a major problem in Southeast Asia, because over the period of 40 years there was 67,295 deaths from total deaths worldwide of 68,977. This means an average mortality of 1682 / year due to DHF. Currently an estimated 70-500 million people are infected with dengue virus every year in more than 100 countries around the world. The results predict that DHF will continue to spread especially in the tropics due to the effects of rainfall, temperature and urbanization rates. Using a cartographic approach, an estimated 390 million / year of infections occur because DHF and 96 million indicate clinical or sub-clinical severity. The disease is now endemic in more than 100 cities in Africa, America and Asia Pacific.¹ Indonesia is one

country with Incidence Rate (IR) DHF disease from year to year tend to fluctuate. Data show that the year 2013 incidence rate of dengue per 100,000 population in Indonesia is 41,25, year 2014 is 38,9, year 2015 equal to 49,5. DHF in Banyumas is still a serious health problem, because of the high incidence and mortality annually.²

Table 1. Number of Cases, Case Fatality Rate and Mortality Patients with DHF in Banyumas district year 2012-2016

Year	Number of cases	CFR	Mortality
2012	199	2,01	4
2013	539	0,74	4
2014	209	0,91	4
2015	296	0,33	1
2016	115	8,69	10

Table 1 shows cases of fatality and mortality that increase from year to year. Treatment of DHF patients requires a large cost. therefore the longer the hospitalization, the greater the burden of the family for medical expenses, in addition to the burden of increasing due to the family can not work because waiting for patients.

Dengue hemorrhagic fever is an acute infectious disease that often leads to death for the sufferer, therefore, to monitor the clinical progress of the disease, laboratory examination is necessary to support such levels of platelets, hematocrit and others. Results showed death due to the condition of DHF include age > 55 years, and their gastrointestinal bleeding (OR 10.26), hematuria (OR 5.07), thrombocytopenia (OR 2.55). A low hematocrit level is a sign of a low red blood cell count. One way to increase the ability of oxygen transport in red blood cells is through blood transfusion, which is carried out typically when the red blood cell count is low. Prior to the blood transfusion, hematocrit levels are measured to help ensure the transfusion is necessary and safe.⁶ Hematocrit value is the parameter most objective and simple to assess the degree of patient hemoconcentration. Investigation Complete Blood Count (CBC) became one of the permanent procedures performed in the hospital to confirm the diagnosis of dengue. Hematocrit as one of the CBC is an important indicator for the note. Number of hematocrit can describe vascular permeability. With the increasing amount of hematocrit (blood viscosity) the proper care in hospitals in observing patients and handling further enhanced fluid to pass through the critical phase of dengue fever. Decreased hematocrit¹⁰ could indicate life-threatening diseases such as leukemia. When the bone marrow no longer produces normal red blood cells, hematocrit levels deviate from normal as well and thus can possibly be used in detecting acute myeloid leukemia. It can also be related to other conditions, such as malnutrition, water intoxication, anemia, and bleeding.⁷ The hematocrit value is also a parameter to determine the severity of the disease, as well as the initial shock events, the results of this study found a hematocrit value of the minimum and maximum to be aware to detect the possibility of DSS (Dengue Shock Syndrome).⁸

A study using medical records recorded in hospitalized patients who died for ten years showed a significant relationship between comorbidities, especially hypertension and diabetes with hospitalization days. Both of these diseases increase the incidence of death due to DHF.⁹ However, research shows presence of diabetes mellitus, hypertension, ischemic heart disease and bronchial asthma among patients contracted dengue

Table 2. Hospitalization, comorbidities, hematocrit (N=72)

Variable	Mean Std. Deviasi	Minimum Value	Maksimum Value
Hospitalization	4,33 ± 1,163	2	8
Comorbidities	0,71 ± 0,830	0	4
Hematocrit	38,96 ± 4,652	29	56

b. The relationship between comorbidities and hematocrit with hospitalization

The results of the bivariate analysis showed significant relationship between comorbidities (p = 0.006) and hematocrit (p = 0.044) with hospitalization. The relationship between comorbidities with the hospitalization showed a positive relationship means more diagnoses of comorbidities then the longer the hospitalization of dengue patients in hospitals Prof. Dr. Margono Soekarjo Purwokerto. Hematocrit relationship with the hospitalization showed a negative correlation means that the lower the hematocrit value the longer the hospitalization of dengue patients in hospitals (Table 3)

fever will not increase the risk of dengue hemorrhagic fever dengue shock syndrome.¹⁰ This study aims to determine the relationship between comorbidities and hematocrit with the hospitalization of patients of dengue hemorrhagic fever (DHF).

2. METHODS

a. Subjects

The current study was approved by the committee for medical ethics in research, Margono Soekardjo Hospital before starting the project. However, this study did not use patients or specimens collected from patient and only used data from medical record and laboratory. The study population consisted of all persons with severe dengue registered in the medical record during January 1, 2016–December 31, 2016 In Prof. Dr. Margono Soekardjo Hospital.

b. Sampling and Epidemiological data collection

From 1 January to 31 December 2016, there were more than 429 patients with the diagnosis of dengue hemorrhagic fever. 72 samples with the criteria of age young adults to adults. Data from laboratory of Prof. Dr. Margono Soekardjo hospital contained laboratorium results hematocrit value and the presence of comorbidities, which were selected by simple random sampling.

c. Statistical Methods

Data were analyzed using SPSS software (version). Hematocrit value is the result of the examination of hematocrit during in-patient at a hospital in units per cent. Comorbidities is their diagnosis of diseases other than dengue fever and hospitalization is defined by the number of days of care during the patient in the hospital. Bivariate analysis using pearson product moment with p < 0.05 and prediction of hospitalization with linear regression.

3. RESULTS AND DISCUSSION

a. Hospitalization, comorbidities and hematocrit

The table below is a description of comorbidities, hematocrit and hospitalization. The results showed an average of hematocrit values above normal.

Table 3. The relationship between comorbidities and hematocrit with hospitalization

Variable	r Pearson Correlation	p Value (Sig)
Comorbidities	0,321	0,006*
Hematocrit	-0,238	0,044*

* are mean significant at α=0,05, n=72

c. Prediction of Hospitalization

Prediction of hospitalization, by looking at the number of comorbidities obtained equation y = 4.014 + 0,450x positively

correlated with $x = 0$ comorbidities, the number of hospitalizations by 4 days. If the patient has a number of diagnoses of comorbidities $x = 5$ then found the number of hospitalizations as much as 6.2 days. (Table 4).

Table 4. The regression equation prediction of hospitalization indicators morbidities and hematocrit

Independen variable	Equation	P Value (Sig)	Conclusion
Comorbidities	$y=4,014+0,450x$	0,006	Positif correlation
Hematocrit	$y=6,667-0,060x$	0,044	Negatif correlation

Figure 1, the correlation upward direction (+), it can be concluded that the more the diagnosis of concomitant disease then the longer the hospitalization of dengue patients in hospitals Prof. Dr. Margono Soekarjo Purwokerto.

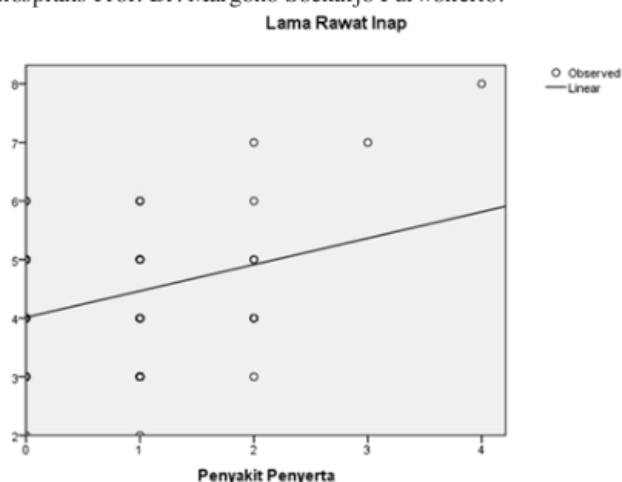


Figure 1. Relationship comorbidities and hospitalization

Prediction hospitalization, with a view hematocrit obtained the following equation, $Y = 6,667-0,060x$ negatively correlated with $x = 45\%$ hematocrit, the length of stay amounted to four days, if the patient has a number of diagnostic $x = 60\%$, then found the number of hospitalization as many as 3,067 inpatient days (table 4)

Figure 2 shows the negative correlation, can be concluded that the higher the hematocrit value, the less days hospitalized dengue patients in hospitals Prof. Dr. Margono Soekarjo Purwokerto.

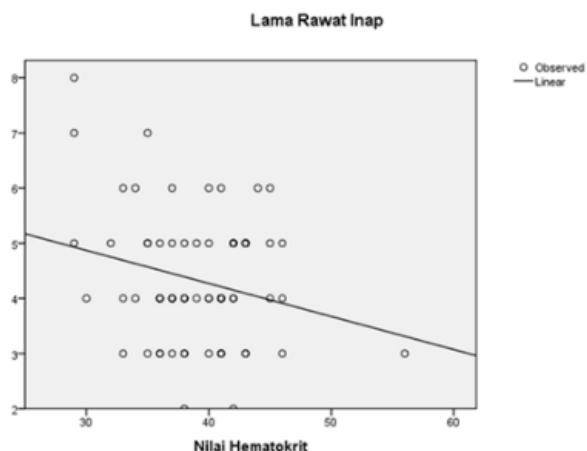


Figure 2. Relationship hematocrit and hospitalization

The results showed there was a positive relationship between comorbidities and hospitalization, meaning that the more coexisting disease will be the longer the patient is treated in the hospital. this suggests that in the presence of comorbidities, immunity decreases so that it takes in penganannya which will increase the length of hospitalization. In this study obtained predominant morbidities suffered by patients with DHF are febris 25%, ischemia 5.5%, bronchitis and typhoid 2.7%, and other diagnoses such as dyspepsia, melena, hepatitis, pulmonary tuberculosis and hypokalemia 1.38%. This study found the equation $y = 4,014 + 0,450x$ positively correlated with significant value $p = 0,006$ so that H_0 refused meaning there is a long-morbidities with hospitalization of dengue patients in which the greater number of diagnoses of comorbidities then the longer the hospitalization of dengue patients in hospitals Prof. Dr. Margono Soekarjo Purwokerto. Previous research concluded with the longer stay in hospital, it will increase the risk of death DHF.¹¹This study is in line with research that states that there is a relationship between comorbidities of patients with dengue incidence of cardiovascular death, according to the study results were also obtained with respondents who have a history of comorbidities had 3.9 times the risk of experiencing dengue incidence of cardiovascular death compared with respondents who do not have history of comorbidities.¹² This study is consistent with research that concludes that severe hospitalized dengue occurred at any age but the majority of cases were in pre-adolescents and adults and than at any age, risk of dying from hospitalized dengue was even higher with common comorbidities such as pulmonary disease, renal disease, diabetes, ischaemic heart disease, obesity and HIV and than CFR and hospital duration incrementally increased in dengue patients with more comorbidities.¹³

The results showed there was a negative relationship between hematocrit and hospitalization, that means the lower the hematocrit value the longer the hospitalization of dengue patients in hospitals. Hematocrit value is an indication on DHF patients to be hospitalized. Increased hematocrit portrait hemoconcentration and is an indicator that is sensitive to the occurrence of plasma leakage. High hematocrit value associated with plasma leakage. The greater the leakage higher hematocrit value. This is due to the blood becomes concentrated by the cell components for the liquid component of blood, the plasma was leaking into the room extravascular (outside the blood vessels, could be in between cells; interstitial or inside cells; intracellular) so that remains in the blood vessels is primarily a component blood cells. This plasma leakage reaches its peak at the time of shock. Hemokonsentrasi characterized by increased hematocrit 20% ataulebih reflect increased capillary

permeability, plasma leakage, and related to the length of hospitalization however, also influenced ³ the hematocrit value of the replacement fluid or bleeding. Hematocrit levels also serve as an indicator of health conditions. Thus, tests on hematocrit levels are often carried out in the process of diagnosis of such conditions and may be conducted prior to surgery. Additionally, the health conditions associated with certain hematocrit levels are the same as ones associated with certain hemoglobin levels.¹⁴

Previous research titled Survival Analysis And faktor Factors Influencing Healing Dengue Patients Using Bayesian Mixture Survival shows that each additional unit hematocrit levels, patients with dengue fever will have a longer healing rate of 1.0622 times (1/0, 9414).¹⁵ Another study showed the effect of hematocrit with the dengue shock syndrome (DSS) with OR of 4.46 (95% CI = 1.85 to 3.28).¹¹ Other research results concluded that closed monitoring of dengue hemorrhagic patients is necessary. The general practitioner cannot rely on the admission hematology laboratory data to predict shock in these patients. Additionally, it might confirm that, although dengue infection can be fatal, with proper supportive treatment, especially hospitalization and hydration for severe cases, the outcome is very good.¹⁶ Other research results show factors associated with dengue mortality were age >40 ⁶ years (p=0.004), secondary infection (p=0.040), comorbidities (p<0.05), acute kidney injury (p<0.001), pr⁶onged PT (p=0.022), multiple-organ dysfunctions (p<0.001), haematocrit >20% (p=0.001), rhabdomyolosis (p<0.001) and respiratory failure (p=0.007). Approximately half of the fatal cases in this study had prolonged hospital stay of greater than three days. The results underscore the high proportion of dengue patients with prolonged hospital stay. Early identification of factors relating to prolonged hospitalisation and death will have obvious advantages in terms

of appropriate decisions about treatment and management in high dependency units.¹⁷

4. CONCLUSIONS

There was a positive relationship with comorbidities length of stay of patients DHF with the equation $y = 4.014 + 0.450x$. and there is a negative correlation between hematocrit with a length of stay of patients DHF with the equation $y = 6.667 - 0.060x$. More research is needed to see the cure rate of patients of different variables to reduce hospitalizations.

Conflict of Interests: The authors declare no competing interests. There was no external funding involved for any part of this study.

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