LABORATORY FINDING AND CLINICAL MANIFESTATION AFFECTING THE LENGTH OF STAY OF HOSPITALIZATION ON CHILDREN WITH DENGUE HEMORRHAGIC FEVER

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Abstract

Dengue Hemorrhagic Fever (DHF) was a disease caused by dengue virus infection with high morbidity. Most DHF patients required hospitalization care. The length of stay of hospitalization increased the cost and became burden of the patient's family. Length of stay (LOS) was an indicator to assess the quality of health services. The purpose of this research was to analyze the factors related the LOS of pediatric patients with DHF in Tugurejo hospital, Semarang. This was an observational study with cross sectional analytic. Total sample was 137 children with DHF who was hospitalized in Tugurejo hospital, Semarang during the period of September 1st 2015- August 31st 2016. The sample data was obtained from medical records that used purposive-sampling techniques. Data analysis used chi-square test with < 0.05 significance level and 95% confidence intervals. The analysis showed that platelet counts (p = 0.000), hematocrit (p = 0.000), hemoglobin (p = 0.000), complications (p = 0.000), the degree of fever (p = 0.027) and duration of fever before hospitalization (p = 0.000) significantly related to LOS of pediatric patients with DHF and there was no significant related of leukocyte count (p = 0.374) to LOS of pediatric patients with DHF. Prolonged LOS was associated with laboratory finding and clinical manifestation. By knowing these factors, practitioner could provide a more effective and efficient treatment to patients with DHF to shorten the LOS.

Keyword : laboratory finding, clinical manifestation, length of stay, Dengue Hemorrhagic Fever

INTRODUCTION

Dengue Hemorrhagic Fever (DHF) is a viral infection disease with rapid spread over the past decade.[1] WHO notes that Indonesia is the country with the highest frequency of dengue fever cases in Southeast Asia from 1968 to 2009.[2] Semarang ranks at third position in DHF cases after Magelang and Jepara in Central Java with an incidence rate of 98.61 per 100,000 population in 2015.[3]

Dengue virus can infect humans through *Aedes aegypti* and *Aedes albopictus* mosquitoes.[1,4] Symptoms of DHF range from mild to severe with high mortality due to shock and severe haemorrhage.[4] Increased vascular permeability, hypotension, decreased plasma volume, thrombocytopenia and bleeding disorders are factors that distinguish Dengue Hemorrhagic Fever from Dengue Fever.[5] The diagnosis of DHF is based on clinical and laboratory criteria. Clinical criteria of DHF are high fever for 2-7, enlarged liver, at least one sign of bleeding such as positive Rumple Leed test, petechiae, ecchymosis, purpura, gum hemorrhage, epistaxis and gastrointestinal bleeding as well as the presence of shock that is characterized by rapid and weak pulse, decreased pulse pressure, hypotension, cold feet and hands with restlessness. Laboratory criteria are decreased platelet count ≤100.000 / µl (thrombocytopenia) and an increase in the number of hematocrit> 20% with clinical symptoms.[6,7]

Most of DHF patients requires health services in specialized units equipped with intensive unit hospital facilities (ICU).[1,4] Indications of hospitalization for DHF patients are thrombocytopenia, shock, increased hemoglobin, increased hematocrit, prolonged vomiting, seizures, consciousness

reduction, hematemesis and melena. And children becomes the most inpatient patient in the case of DHF.[6,7] The mortality rate of pediatric patients with DHF who undergo hospitalization is 2.5% .[1,4] The length of hospitalization is an indicator to assess the quality of health services. The longer hospitalization shows the declining quality of inpatient care. The shorter the hospitalization time indicates the good quality of the health service, so the patients get their satisfaction. The length of hospitalization represents the time in a treatment period that is calculated by the subtraction of the date of discharge and the date of admission. The longer hospitalization is proportional to the increase in the cost and burden of the patient's family.[8,9,10] The purpose of this research is to analyze the factors related the Length of Stay (LOS) of pediatric patients with DHF in Tugurejo hospital, Semarang.

RESEARCH METHODS

This research was analytic observational study with cross sectional approach. The sample was 137 children with DHF who underwent hospitalization at Tugurejo hospital, Semarang during period of September 1st 2015- August 31th 2016. The sample data was obtained from medical record using purposive-sampling technique. Inclusion criteria were ≤ 14 years of age patients diagnosed with DHF and available complete data on age, sex, platelet count, leukocyte count, hematocrit number, hemoglobin count, complications of bleeding or shock or pleural effusion, degree of fever and duration of fever before hospitalized. Exclusion criteria were DHF which was not the main diagnosis, the patient died and judicial discharge during hospitalization at Tugurejo hospital Semarang. Bivariate statistical analysis used Chi-Square with < 0.05 significance level and 95% confidence intervals.

RESULTS

Based on table 1, the sample that had the most characteristic value was age> 5 years old (73%), male (54,7%) and hospital stay> 4 days (74,5%). The length of stay ranged from 2 days to 11 days with an average of 5.47 days.

Table 1. Characteristics of Age, Sex and Length of stay

No	Variable	Category	N	Percentage
1	Age	≤5 yo	37	27,0%
		>5 yo	100	73,0%
2	Sex	male	75	54,7%
		female	62	45,3%
3	Length of stay	≤ 4 days	35	25,5%
		>4 days	102	74,5%

Table 2. Clinical Characteristic of patients

No	Variable	Category	n	Percentage
1	Thrombocyt	≤ 50.000/ µl	82	59,9%
		> 50.000/ µl	55	40,1%
2	Leukocyte	≤ 5.000/ µl	116	84,7%
		> 5.000/ µl	21	15,3%
3	Hematocrit	< 40,7%	53	38,7%
		≥ 40,7%	84	61,3%
4	Hemoglobin	≤ 14 g/dL	69	50,4%
		>14 g/dL	68	49,6%
5	Complications of bleeding or shock or pleural effusion	Yes	84	61,3%
		No	53	38,7%

6	Fever	≤ 39°C	107	78,1%
		>39°C	30	21,9%
7	Duration of fever before admission	≤3 hari	60	43,8%
		>3 hari	77	56,2%

Patients with platelet counted ≤ 50.000 / µl had a significant relations (p=0,000), with a chance of 0.090 times to have length of hospitalization> 4 days compared with patients with platelet counted > 50.000 / µl (Table 3). Patients with hematocrit was amount ≥ 40.7% had a significant relations (p=0,000), with chance of 20.609 times having hospitalization> 4 days compared with patients with hematocrit counted <40.7%. Patients with hemoglobin> 14 g / dL had a significant relations (p=0,000), with a chance of 30.250 having hospitalization> 4 days compared with patients with hemoglobin ≤ 14 g / dL. The number of leukocytes did not significantly affect the length of hospitalization of pediatric patients with DHF in Tugurejo hospital, Semarang (p = 0.374). Complication had significantly affected the length of hospitalization of pediatric patients with DHF in Tugurejo hospital, Semarang (p = 0.000). The OR (Odds Ratio) value of 0.081 meant that patients with a predisposing complication of 0.081 times had hospitalization> 4 days compared with patients who did not have complications.

Based on table 2, most of the sample had clinical characteristic in the form of number of platelets ≤ 50.000 / µl (59,9%), leukocyte count ≤ 5.000 / µl (84,7%), total hematocrit ≥ 40, 7% (61.3%), number of hemoglobin ≤ 14 g / dL (50.4%). Most of patients had complications (61.3%), fever ≤39 ° C (78.1%) and duration of fever > 3 days before admission (56.2%). The degree of fever significantly affected the length of hospitalization of pediatric patients with DHF (p = 0,027). The OR (Odds Ratio) value of 3,840 meant that patients with fever grade ≤39 ° C had a chance of 3,840 times having an inpatient ≤ 4 days compared with patients with fever> 39 ° C. The duration of fever before hospital admission significantly influenced the length of hospitalization of pediatric patients with DHF (p = 0,000). Value of OR (Odds Ratio) 0,184 meant that patient with

fever before hospital admission ≤ 3 days had chance 0,184 times to get hospitalization> 4 days compared to patient who had a long duration of fever before hospital admission. Based on table 4, the results of logistic regression analysis showed that the number of hematocrit was the most influential independent variables on the length of hospitalization with the OR 79.092.

DISCUSSION

Patients with lower platelet counted (≤ 50.000 / µl) had a longer hospital stay of> 4 days. The results of this study were in line with the results of the Ita Perwira study (2011) at Persahabatan Hospital, East Jakarta which showed that patients with lower platelet counted (<100.000 / µl) had longer hospitalization of> 5 days.[11] The results also corresponded with research by Hasri Nopianto, 2012 at Dr. Kariadi Hospital, Semarang that showed patients with lower platelet counted (≤100.000 / µl) had a longer hospitalization time> 4 days.[12]

The immune complex on the platelet surface caused platelet aggregation, then the platelets would be destroyed in the liver. Thrombocytopenia and disruption of trombocyte function were the main factors causing mild to severe hemorrhage. In the condition of shock which was difficult to overcome could be found massive bleeding due to thrombocytopenia and coagulation system disorders. Severe bleeding in vital organs with shock and DIC could risk a death. The condition required a rigorous evaluation in order not to fall on death, thus required longer hospitalization.[5]

The results also showed that the leukocyte count did not significantly affect the length of hospitalization of pediatric patients with DHF in Tugurejo Hospital, Semarang. The results of this study did not in line with the results of Ita Perwira (2011) which indicating that patients with leukocyte counted <3500 / µl had LOS > 5 days.[11] The

different outcome was probably due to the differences in categorization of leukocyte counts. In the study, the number of leukocytes was categorized to be <3500 / µl and ≥3500 / µl. Thus, the categorization of leukocyte counts was likely to affect the differences of outcome. The results of this study did not correspond to Hasri Nopianto study (2012) which showed that patients with higher leukocyte counts (≥5.000 / µl) had a shorter hospitalization time of ≤4 days.[12] The difference in outcome was probably due to the differences in patient characteristics. In the study of Hasri Nopianto (2012), patients with leukocyte <5,000 / µl was 74 patients from 122 samples (60.7%). While in this study patients with leukocyte counted ≤5.000 / µl was 116 patients from out of total 137 children (84.7%). The condition showed that the majority of patients had a leukocyte count of ≤5.000 / µl. Thus, the characteristic of differences had the possibility of influencing outcomes. Leukocyte was one of the laboratory values that played role in the process of host immunity. Leukopenia or decreased number of leukocytes could occur due to the decline in the number of granulocyte cells such as neutrophil cells. [13]

Table 3. Relations Between Laboratory Finding And Clinical Characteristic And Length Of Stay Patient Of DHF

		Lenght Of Stay		p value	OR	95%CI
		≤ 4 days	> 4 days			
Trombocyte	≤ 50.000/ µl	7	75	0,000	0,090	0,035-0,230
	> 50.000/ µl	28	27			
Leukocyte	≤ 5.000/ µl	28	88	0,374	0,636	0,234-1,733
	> 5.000/ µl	7	14			
Hematocrit	< 40,7%	30	23	0,000	20,609	7,179 - 59,159
	≥ 40,7%	5	79			
Hemoglobin	≤ 14 g/dL	33	36	0,000	30,250	6,859-133,41
	>14 g/dL	2	66			
Complications of bleeding or shock or pleural effusion	Yes	7	77	0,000	0,081	0,032-0,208
	No	28	25			
Fever	≤ 39ºC	32	75	0,027	3,840	1,086-13,572
	>39ºC	3	27			
Duration of fever before admission	≤3 days	6	54	0,000	0,184	0,070-0,481
	>3 days	29	48			

Patients with higher hematocrit (≥ 40.7%) had a longer hospital stay of> 4 days. The results of this study were not in accordance with the research of Hasri Nopianto (2012) which showed that the number of hematocrit did not affect the length of hospitalization of patients with dengue infection in Dr Kariadi Hospital, Semarang.[14] The differences results might be caused by the differences in the categorization of hematocrit and sample. In that study, the number of hematocrits was categorized to <35% and ≥ 35% with adult sample. In this study, the number of hematocrits was categorized into <40.7% and ≥ 40.7% with a sample of patients aged ≤ 14 years. Thus, the differences in categorization of variables had the possibility of influencing outcomes. Patients with higher hemoglobin (> 14 g / dL) had a longer hospital stay of> 4 days.

Hematocrit and hemoglobin were the values that could describe the condition of hemo-concentration. Plasma leakage to the extravascular through damaged blood vessels could result in shock. Under these conditions, the hematocrit and hemoglobin values would increase according to the degree of plasma leakage. Patients with shock required a rigorous evaluation to avoid a poor prognosis, so the time taken for hospitalization would be longer. However, hematocrit values were more sensitive in assessing hemo-concentration compared to hemoglobin values. The value of hemoglobin could be used in assessing hemo-concentration if there was no result of hematocrit value.[5]

Patients with complications of bleeding or shock or pleural effusion had a longer hospital stay (> 4 days). The results of this study were in accordance with Ita Perwira study (2011), indicating that patients with complications had a long hospitalization (> 5 days).[11] That complications could occur during hospitalization. Patients with complications required more rigorous evaluation than patients without complications. Management of shock should be done adequately because it could worsen into a severe shock (profound shock). Severe bleeding in vital organs accompanied by shock and DIC caused death. These conditions required intensive supervision to avoid a poor prognosis such as death, so the patients needed longer hospitalization.[5]

Patients with a fever of > 39 ° C had a longer hospital stay (>4 days). Increased body temperature during infection might reflect pathogenic replication. In the Jih-Jin Tsai study (2013) proved that the body temperature was associated with viremia. The higher of body temperature the higher of number of viruses in the body.[14] Based on the research of Annette Fox et al (2011) and Yang Bo Tang et al (2010) showed that the viremia affected the severity of dengue infection.[15,16] Patients with high viremia affected the severity of disease, then requiring adequate management and longer hospitalization time.

Patients with long fever prior to admission Hospital ≤ 3 days had longer hospitalization (> 4 days). The results of this study were in accordance with Ita Perwira study, 2011 at Persahabatan Hospital, East Jakarta which showed that patients with long fever prior to hospital admission had longer hospitalization length which was more than > 5 days.[11] The length of fever before hospital admission was associated with the tendency of parents in seeking treatment to the hospital. The higher body temperature and the duration of fever, parent would be more worried and immediately seek a treatment. The higher temperature indicated the higher amount of virus in the blood or viremia.

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