

# Laura Wihanto

## FEVER DURATION, HEPATOMEGALY, AND OVERWEIGHT WITH THE DENGUE SHOCK SYNDROME IN KUPANG, EAST NU...



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## FEVER DURATION, HEPATOMEGALY, AND OVERWEIGHT WITH THE DENGUE SHOCK SYNDROME IN KUPANG, EAST NUSA TENGGARA

Robertus S Cundawan <sup>1)</sup>, Laura Wihanto <sup>2)</sup>, Steven Wijono <sup>3)</sup>

### ABSTRACT

**Introduction:** Dengue infection is an infection caused by the dengue virus. Community-widespread cases of morbidity and mortality are often found in Extraordinary Events (KLB) in Indonesia, especially in children.

**Purpose:** The purpose of this study was to prove the correlation between the duration of fever, hepatomegaly, and overweight with dengue shock syndrome in Kupang, East Nusa Tenggara.

**Methods:** This research is an observational analytic study with a case-control approach—the subject in this study was data of dengue infection patients aged 5-14 years. The research instrument used was the patient's medical record data for the period June 2018-June 2019. Bivariate analysis was done using chi-square statistical test.

**Results:** The results showed that there was a significant correlation ( $p < 0.05$ ) between the duration of fever ( $OR = 0,35; p = 0,04$ ), hepatomegaly ( $OR = 3,34; p = 0,022$ ), and overweight ( $OR = 2,88; p = 0,033$ ) with dengue shock syndrome in Kupang, East Nusa Tenggara.

**Conclusion:** There is a significant relationship between the duration of fever, hepatomegaly, overweight with dengue shock syndrome.

**Keywords:** Dengue infection, fever duration, hepatomegaly, overweight, dengue shock syndrome.

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## INTRODUCTION

Dengue infection is an infection caused by the dengue virus. The disease caused by dengue infection is a problem that is still very serious in the world today. Cases of morbidity and mortality are still very much happening in the community and also often found cases of Extraordinary Events (Kejadian Luar Biasa in Indonesian or KLB), which are caused by a dengue infection. This infection occurs in rural and urban areas, especially in the tropics area. Indonesian people need to be vigilant throughout the year due to erratic rainfall patterns to avoid dengue infection.<sup>1</sup>

Clinical manifestations of dengue infection can be mild, which is commonly called Dengue Fever (DF) and severe, commonly called Dengue Hemorrhagic Fever (DHF), which is characterized by leaking capillaries and can lead to hypovolemic shock, bleeding complications, organ damage, and even death. Other symptoms that manifest in this disease are fever, headaches, muscle and joint pain, and rashes.<sup>2,3</sup>

Dengue infection is still a global health problem, endemic, and epidemic in the tropics and subtropics regions. Death rates and dengue infection sufferers in various countries vary and depend on various factors, such as the population's immune status, vector density and

frequency of transmission, and the prevalence of dengue serotypes and weather conditions. In this era of globalization, as many as 2.5 billion people or around 40% of the world's population live in dengue infection areas.<sup>4</sup>

WHO (2016) estimates that around 50-100 million people are reported to be infected with dengue virus, including around 500,000 cases of Dengue Hemorrhagic Fever (DHF) grade III and IV / Dengue Shock Syndrome (DSS) per year with a percentage of 2.5% mortality (Case Fatality Rate) caused by Dengue Hemorrhagic Fever (DHF) degrees III and IV or Dengue Shock Syndrome (DSS). Shock in DHF, known as Dengue Shock Syndrome (DSS), is a hypovolemic shock that can cause circulation disorders and make the patient unconscious because of the loss of plasma fluid. The morbidity and mortality rates of severe dengue cases are common in children.<sup>4,5</sup>

Asia has the highest number of sufferers of dengue infection as a cause of illness, especially in Southeast Asia and the Pacific region. The four serotypes of DHF can be found in Southeast Asia. Starting in 2012, all provinces in Indonesia have experienced dengue virus outbreaks. In 2014, until mid-December, there were 71,668 people with dengue infection in 34 provinces in Indonesia, and 641 deaths.<sup>6</sup>

6 The decline in dengue infection in Indonesia was recorded between 2016 to 2017 from 204,171 cases to 68,407 cases. However, at the end of 2018 until early 2019, there were many cases of dengue infection, and most cases were in East Java, Central Java, and East Nusa Tenggara. The number of national cases of dengue infection as of February 3, 2019, is 16,692 cases, with 169 deaths. The cases continue to increase compared to the previous month recorded on January 29, 2019, which number of cases reached 13,683 with the number of deaths 133 people. The number of patients with dengue infection in East Nusa Tenggara as of February 1, 2019, was 1,337. Most cases were in West Manggarai Regency 321 cases, followed by Kupang as many as 245 cases. The death toll recorded was as many as 15 people (NTT Provincial Health Office, 2019). This case number caused the Government, especially in the Kupang city, to determine dengue infection as the KLB.<sup>7,8</sup>

The influence of overweight on the incidence of DSS is still controversial. A study conducted by Tantracheewathorn and Tantracheewathorn S. regarding DSS cases found that this case was more common in children of normal weight. There is also research conducted by Elmy S., together with colleagues, saying that obesity is a risk factor for DSS. In addition

to overweight, some studies say the duration of fever and hepatomegaly are other risk factors that influence the incidence of DSS.<sup>8,9,10</sup>

## METHOD

This research is a qualitative study with observational design because in conducting this research, no intervention was carried out. We used the case-control approach in this study. The population in this study were all patients with dengue infection aged 5-15 years who were treated at the Siloam Hospital, Kupang, East Nusa Tenggara. This place was taken as a place of research because Kupang had the second-highest number in East Nusa Tenggara who experienced an outbreak of dengue infection, which was as many as 245 cases as of February 1, 2019, based on information obtained from the provincial health office serving in the relevant work area.

The sample in this study were patients with dengue infection who were hospitalized in the Siloam Hospital, Kupang, East Nusa Tenggara, from the period of June 2018 to June 2019. The minimum number of samples that have been determined using the Case-Control formula is for a minimum sample case group of 20 people. For a control group, a minimum sample of 40 people is needed.

The control sampling technique used a probability sampling technique, which is simple random sampling, whose sampling was done randomly without regard to strata in the population members. In comparison, the case sampling used a total sampling technique, the population was considered the research sample.

data was taken from the medical records of patients from Siloam Hospital Kupang, East Nusa Tenggara.

overweight data, duration of fever, and hepatomegaly were obtained from medical records of dengue infection patients aged 5-15 years at Siloam Hospital, Kupang, East Nusa Tenggara. Retrieval of data was assisted by hospital medical records management staff on duty during the study period.

## RESULTS

Based on the research data, the characteristics of the medical record data in the form of each distribution will be explained, namely age, sex, overweight, duration of fever, and hepatomegaly. Furthermore, the translation of the research analysis test is the Relationship between Overweight, Duration of Fever, and Hepatomegaly with Dengue Shock Syndrome.

**Table 1. Research Characteristics of Dengue Infection Patients Data by Age**

Variable (Age)	Total Sample (n=84)	Percentage
5 y/o	11	13,1%
6 y/o	8	9,5%
7 y/o	8	9,5%
8 y/o	11	13,1%
9 y/o	11	13,1%
10 y/o	7	8,3%
11 y/o	9	10,7%
12 y/o	10	11,9%
13 y/o	3	3,6%
14 y/o	6	7,2%
<b>Total</b>	<b>84</b>	<b>100%</b>

Table 1 shows the characteristics of research data on dengue-infected patients according to age at Siloam Hospital, Kupang.

**Table 2. Research Characteristics of**

Variable	Total Sample (n=84)	Percentage
Men	51	60,7%
Women	33	39,3%
<b>Total</b>	<b>84</b>	<b>100%</b>

## Dengue-infected Patients Data by Gender

Table 2 shows the Research Characteristics of Dengue Infection Patient Data by Gender at Siloam Hospital Kupang.

**Table 3. Research Characteristics of Dengue Infection Patients Data Based on Overweight**

Variable (Weight)	Total Sample (n=84)	Percentage
Overweight	32	38,1%
Normal	52	61,9%
Total	84	100%

Table 3 shows the Research Characteristics of Dengue-infected Patients Data Based on Overweight data in Siloam Hospital, Kupang.

**Table 4. Research Characteristics of Dengue Infection Patient Data Based on Fever Duration**

Variable	Total Sample (n=84)	Percentage
> 3 Days	58	69,05%
< 3 Days	26	30,95%
Total	84	100%

Table 4 shows the Research Characteristics of Dengue-infected Patient Data by Duration of Fever in Siloam Hospital, Kupang.

**Table 5. Research Characteristics of Dengue Infection Patients Data Based on Hepatomegaly**

Table 5 Research Characteristics of Dengue Infection Patients Data Based

Variable (hepatomegaly)	Total Sample (n=84)	Percentage
Positive	45	53,5%
Negative	39	46,5%
Total	84	100%

on Hepatomegaly at Siloam Hospital Kupang

**Table 6. Analysis of the Relationship between Overweight and Dengue Shock Syndrome**

Var	DSS		Non DSS		Total		p-value
	n	%	n	%	n	%	
1	13	15,5	19	22,6	32	38,1	0,033
2	10	11,9	42	50	52	61,9	
Tot.	23	27,4	61	72,	84	100	

Table 6. Analysis of the Relationship between Overweight and Dengue Shock Syndrome in Siloam Hospital Kupang, with each (1) and (2) variables respectively represents overweight and not overweight variables.

Based on the analysis of the relationship between hepatomegaly and dengue shock syndrome using the Chi Square statistical test, the value of  $p = 0.033$  or  $p < 0.05$  which indicates a significant correlation between overweight with dengue shock syndrome and  $OR = 2.88$ , which shows the overweight patient with dengue infection has a risk of 2.88 times to experience dengue shock syndrome.



**Table 7. Correlation Analysis of Fever Duration and Dengue Shock Syndrome**

Var	DSS		Non DSS		Total	
	n	%	n	%	n	%
1	12	14,3	46	54,7	58	69,1
2	11	13,1	15	17,9	26	30,9
<b>Tot.</b>	23	27,4	61	72,6	84	100

Table 7 Analysis of the Relationship between Fever Duration and Dengue Shock Syndrome in Siloam Hospital Kupang, with each (1) and (2) variables respectively represents less than 3 days of fever and more than 3 days of fever variables.

Based on the analysis of the relationship between the duration of fever with dengue shock syndrome using the Chi Square statistical test, the value of  $p = 0.04$  or  $p < 0.05$  which indicates a significant correlation between the duration of fever with dengue shock syndrome and  $OR = 0.357$  which shows patients with dengue infection have a risk of 0.357 times to experience dengue shock syndrome.

**Tabel 8. Analysis of the Correlation of Hepatomegaly with Dengue Shock Syndrome**

Var	DSS		Non DSS		Total		p-value
	n	%	n	%	n	%	
1							0,022

	17	20,2	28	33,4	45	53,6
2	6	7,1	33	39,3	39	46,4

Table 8 Analysis of the Relationship of Hepatomegaly with Dengue Shock Syndrome in Siloam Hospital, Kupang, , with each (1) and (2) variables respectively represents hepatomegaly and non-hepatomegaly variables.

Based on the analysis of the correlation between hepatomegaly with dengue shock syndrome using the Chi-Square statistical test, we obtained  $p\text{-value} = 0.022$  or  $p < 0.05$ , which indicates a significant correlation between hepatomegaly with dengue shock syndrome. Meanwhile,  $OR$  showed a result of 3.34, which shows patients with dengue infection who have experienced hepatomegaly symptoms, have a risk of 3.34 times to experience dengue shock syndrome.

These results are consistent with the hypothesis which states that there is a correlation between overweight, fever duration, and Hepatomegaly with Dengue Shock Syndrome.

## DISCUSSION

From the results of the study, the results of statistical tests with case control showed the results showed a significant

correlation ( $p < 0.05$ ) between the duration of fever ( $OR = 0.35$ ;  $p = 0.04$ ), hepatomegaly ( $OR = 3.34$ ;  $p = 0.022$ ), overweight ( $OR = 2.88$ ;  $p = 0.033$ ) with dengue shock syndrome in Kupang, East Nusa Tenggara.

The link between overweight factors with dengue shock syndrome can be seen from the theory of Kalayanarooj and Nimmannitya (2005), in the incidence of dengue infection, patients who have overweight (excess body weight) have a strong immunological reaction, this strong immunological reaction is expected to exacerbate the inflammatory reaction, and can increase capillary permeability so that extravasation of fluid can cause shock. According to Peta (2015), Children with excessive fat tissue secretes and releases pro-inflammatory cytokines  $TNF\alpha$  and some interleukins such as  $IL-1\beta$ ,  $IL-6$ , and  $IL-8$ . Increased  $CD4 / CD8$  and excessive production of cytokines in dengue infection will affect vascular permeability. Body fat also has less water content (as much as 10%). Lack of water content in people with overweight causes dehydration. If the bleeding occurs, then the body will quickly experience shock, according to Lauralee (2001).<sup>11,12</sup>

The correlation between the duration of fever and dengue shock syndrome can be seen from the nature of

fever, which is one of the clinical symptoms of dengue infection that peaks before the fever cools down. However, the reverse can indicate the condition to the more severe phase, the critical phase. During this critical phase, a new person comes to the hospital for medical treatment.<sup>(13)</sup>

Dengue infection also has an unspecified course of the disease; patients often come to the hospital with a severity degree that cannot be helped. The factor that often happens to make dengue shock syndrome is the delay in coming to the health facility due to the fever's transition to the critical phase (days 4 or 5) when plasma permeation will occur, which must be treated as quickly and as well as possible. Patients with dengue infection should be treated quickly and properly.<sup>(10)(13)</sup>

The correlation of hepatomegaly factors with known dengue shock syndrome regarding the theory of hepatomegaly, which is a response to dengue infection (DHF degrees I, II, III, and IV). Hepatomegaly occurs due to liver overwork and damage, especially Kupffer cells as a result of dengue virus infection. Liver damage is also characterized by liver dysfunction which disrupts the liver to synthesize proteins related to blood coagulation (fibrinogen, prothrombin,

factors V, VII, IX, X) so that the blood becomes difficult to clot which aggravates bleeding which can cause shock.<sup>10,11,12</sup>

## CONCLUSION

The results of research conducted at Siloam Hospital Kupang and East Nusa Tenggara show a significant and robust correlation between overweight, duration of fever, and hepatomegaly with dengue shock syndrome. These results are consistent with previous research theory, which states that there is a relationship between overweight, duration of fever, and hepatomegaly with dengue shock syndrome.

Overweight factor in dengue infection is a factor that affects the immune system reaction, which can cause shock in patients. The duration factor of fever influences the patient's handling to limit the severity of the dengue infection phase. Hepatomegaly factors can trigger shock due to the disruption of liver function in the process of blood clotting.

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2. Friends of the Faculty of Medicine, Widya Mandala Catholic University of Surabaya, class of 2016.

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