RELATIONSHIP BETWEEN VENTILATION, LIGHT INTENSITY AND CONDITIONS FOR WATER RESERVOIRS IN THE HOUSE WITH THE OCCURRENCE OF DENGUE HEMORRHAGIC FEVER

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ABSTRACT

Background: Dengue hemorrhagic fever is an infectious disease caused by dengue virus and is transmitted through the bite of the Aedes aegypti or Aedes albopictus mosquito. Ventilation, light intensity and conditions for water resevoirs are physical controls to reduce the risk of outbreaks of DHF. Medan is one of the cities that is endemic for DHF, so that DHF cases continue to occur and even increase every year. In 2018 cases of dengue hemorrhagic fever have increased as many as 1490 cases with a death rate of 13 people.

Materials and Methods: This study aims to analyze the relationship between ventilation, light intensity and water storage conditions with the incidence of DHF. This type of research is descriptive, with case control design. The study population was 98 households, the study sample consisted of 49 cases and 49 controls. Data collection through observation and measurement. Data analysis methods include univariate analysis, bivariate analysis using chi square.

Result: The univariate analysis results demonstrated that the dengue hemorrhagic fever cases had higher prevalence rate in August (41%) and had dominant attack on 3-14 year old people (39%) as well as on females (59%). The bivariate analysis results indicated that lighting (OR= 9.474), ventilation (OR= 5.949) and condition of water reservoirs (OR= 4.769) were correlated with prevalence of dengue hemorrhagic fever.

Conclusion: The conclusion is there is a relationship between ventilation, light intensity and water storage conditions and the incidence of DHF. The community must pay more attention to this to reduce the risk of contracting dengue.

Keywords: Ventilation, light intensity, water reservoirs, DHF

1.0 Introduction

Dengue hemorrhagic fever (DHF) is a vector-based infectious disease caused by dengue virus and is transmitted through the Aedes aegypti and Aedes albopictus mosquitoes. This type of virus often appears in tropical countries like Indonesia.

Dengue virus is a virus that causes DHF from the genus Flavivirus, family Flaviviridae. Transmission of dengue to humans through the bite of an Aedes aegypti mosquito infected with dengue virus. Dengue virus has four types of serotypes, namely DEN-1, DEN-2, DEN-3, DEN-4 which can cause dengue fever or DD which can cause fluid transfer from blood vessels to external blood vessels which causes rupture of blood vessels and can cause death if not treated immediately.

WHO data in 2004 and 2010 stated that 75% of the burden of dengue was Asia Pacific which ranked first in the world and Indonesia was ranked second in the world with the highest DHF cases among 30 endemic countries, after Thailand from 1968 to 2009 (MOH RI, 2010).

North Sumatra ranks fourth with the highest incidence of DHF in Indonesia with 5327 cases with 29 deaths.

Based on the 2016 North Sumatra Health Profile data, there were 8,715 cases of DHF in North Sumatra with IR, out of 100,000 population there were 63.3 cases and CFR 0.69 percent. In 2016, IR figures increased from the previous year, out of 100,000 population there were 21.9 cases. However, there was a decrease in mortality (CFR) in 2016 to 0.69% from 2015 which was 0.79%. The highest number of cases occurred in Medan with 1,784 cases with CFR 0.62%, Deli Serdang Regency with 1,144 cases with CFR 0.17% and Simalungun with 1,071 cases with CFR 0%.

There was a decrease in the number of dengue cases in Medan in 2017 which were 1,214 cases with 11 deaths, but in 2018 there was an increase in 1,490 cases with 13 deaths.

The incidence of DHF is influenced by several factors, the host (human) is a factor of vulnerability or the human immune system, the agent (mosquito) is influenced by the population density of Aedes aegypti larvae and the environment (environment) such as ventilation using wire netting or not and the light intensity that meets the requirements.

Installation of wire netting in each hole can reduce the number of mosquitoes or the spread of disease by mosquitoes in the house because ventilation serves as a way out and into the house for mosquitoes.

Light can affect the flight distance of mosquitoes, mosquito resting places, where mosquitoes prefer to be in a dark place (<60 lux) coupled with high humidity and larvae are more commonly found in dark vessels than large or bright vessels.

According to the Ministry of Health of the Republic of Indonesia in 2016, an effective and efficient way to deal with dengue is to conduct a program to eradicate mosquito nests (PSN), namely 3M (draining covers, burying water reservoirs) and 3M plus which include installing wire netting on ventilate and maintain the light intensity at home to meet the requirements, so

researchers are interested in knowing whether ventilation and light intensity is one of the factors that causes the high incidence of DHF in Medan. because based on the observation of researchers there are many houses in Medan that do not install wire netting in ventilation, low light intensity enters the house and there are still many open water reservoirs both inside and outside the house.

2.0 Materials and Methods

This research is an observational analytic study using case control design. The study population was 98 houses, the study sample consisted of 49 cases and 49 controls, taken using matching techniques. The number of cases was taken from June to August 2019. Data collection was through observation to see the presence or absence of wire netting in ventilation, water reservoir conditions (open or closed) and measurement of light intensity using a lux meter. Data analysis methods include univariate analysis and bivariate analysis using chi square. This research was conducted in September 2019.

3.0 Result

The research results obtained are: Univariate Analysis

DHF Events	Cases		Control	
	n	%	n	%
Bulan				
Juny	20	41	20	41
July	15	31	15	31
August	14	29	14	29
Total	49	100	49	100
Age				
3-14 years old	19	39	19	39
15-26 years old	10	18	10	18
27-38 years old	11	24	11	24
39-50 years old	4	8	4	8
51-62 years old	3	6	3	6
63-74 years old	1	2	1	2
> 74 years old	1	2	1	2
Total	49	100	49	100
Gender				
Boy	20	41	20	41
Girl	29	59	29	59
Total	49	100	49	100

Table 1: Frequency Distribution of DHF Events by Month.

Based on table 1 above, it is known that the incidence of DHF in June was 20 people (41%), on July 15 (31%) and on August 14 (29%), where this number increased from 2018 in 25 cases. DHF cases are more common in the age group 3-14 years, as many as 19 people (39%) and in the age group 63-74 years and in the age group > 74 years, DHF cases do not occur very much or as much as 1 person (2%). The majority of respondents who contracted dengue fever are female as many as 29 people (59%), while the male sex as many as 20 people (41%).

Ventilation	Cases		Control	
	n	%	n	%
There is not wire	40	82	18	37
netting There is wire netting	9	18	31	63
Total	49	100	49	100

Table 2: Ventilation Frequency Distribution

Based on table 2, it is known that the installation of gauze in ventilation is mostly done by the case group, with 31 houses (63%) compared to the control group with only 9 houses (18%).

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Light Intensity	Cases		Control	
	n	%	n	%
Not Qualifiy	40	82	21	43
Qualifiy	9	18	28	57
Total	49	100	49	100

Table 3: Frequency Distribution of Light Intensity

Based on table 3 above, it is known that the light intensity that meets the requirements (≥ 60 Lux) is found in the control group houses, which is 28 houses (57%) than in the case group that only 9 houses (18%).

Light Intensity	Cases		Control	
	n	%	Ν	%
Closed	18	36,7	36	73,5
Open	31	63,3	13	26,5
Total	49	100	49	100

Table 4: Frequency Distribution of Conditions for Water Reservoirs

Based on table 4 above, is it known that the condition of water reservoirs in the control group was more closed, as many as 36 households (73,5%), while the water reservoirs in the case group were more open, as many as 31 households (63.3%).

Bivariate Analysis

3.1 Relationship between Ventilation with DHF Events.

Ventilation	Р	OR (95% CI)
There is not wire netting There is wire netting	0,001	5,949 (2,449- 14,452)

The results of ventilation measurements in this study are there is a relationship between ventilation and the incidence of DHF p = 0.001 and the OR value is 5.949 (95% CI 2.449 - 14.452) which means that the ventilation variable has a risk of 5.949 times the occurrence of DHF to respondents whose ventilation does not use a wire gauze.

3.2 Relationship between Light Intensity with DHF Events.

Tab	able 6: Relationship of Light Intensity with DHF Events.				
-	Light Intensity	Р	OR (95% CI)		
-	Not Qualifiy Qualifiy	0,001	9,474 (3,357 - 25,372)		

Based on table 6 above, it is known that there is a relationship between lighting with DHF events p = 0.001 and the OR value is 9,474 (95% CI (3,357 - 25,372) which means that the lighting variable has a risk of 9,474 times for DHF events for respondents whose home lighting temperature does not meet condition.

3.3 Relationship between Conditions for Water Reservoirs with DHF Events.

Conditions for Water Reservoirs	Р	OR (95% CI)
Closed Open	0,001	4,769 (2,018 – 11,270)

Based on table 6 above, it is known that there is a relationship between the conditions of open water reservoirs with the incidence of DHF p = 0.001 and the OR value is 9,474 (95% CI (3,357 - 25,372) which means that the conditions of water reservoirs have a risk of 9,474 times for events DHF for respondents whose water reservoirs in their homes are open.

4.0 Discussion

Table 5 shows that there is a relationship between ventilation and the incidence of DHF. This research is in line with the research of Wahvono et al. year 2010 in the city of Depok regarding the factors associated with the incidence of DHF and efforts to overcome them shows that there is a relationship between ventilation and DHF events. according to respondents the amount of costs to be incurred and has a greater benefit from installing iron in each ventilation than installing wire mesh. Lack of interest of respondents in the case group to install wire mesh can cause frequent contact between the occupants of the house with Aedes aegypti mosquitoes, because physical control through the installation of mosquito nets is done to reduce the density of Aedes aegypti mosquitoes and the rate of increase in dengue cases (WHO, 2001).

Aedes aegypti mosquitoes like dark places or light intensity < 60 lux to rest, fly looking for prey and light can affect the distance of flying mosquitoes, where to place larvae. Lighting at home comes from two sources namely natural sources such as sunlight and artificial sources such as lights. Low lighting in this study was found in case groups, where low lighting was due to the respondents' habit of rarely opening windows in the morning or evening both in the living room and bedroom that could prevent natural lighting sources from entering the house and artificial lighting sources were only used or turned on when twilight or night to night. This low lighting causes many larvae or mosquitoes to breed in the respondent's home. Many people also don't know how light intensity can reduce the risk of contracting dengue fever. This is in line with Purba's research (2012) in East Binjai Subdistrict, where there is a relationship of lighting to the incidence of DHF obtained p = 0.041 and OR = 2.33 (95% CI 1.027-5.3300).

A water reservoir is a medium for breeding Aedes aegypti mosquitoes.Based on field observations, water reservoirs are more commonly found in the case group than in the control group and more are found outside the house which are left open or reversed and are rare and some have never even cleaned it because the function they say is only to water the plants, become trash cans and not used for daily purposes, such as bathing. This causes the number of larvae found in the water reservoir. This study is in line with Zulfikar's research (2014) in the Work Area of Kebayaan Public Health Center in Central Aceh District in 2017 that there is a relationship between the conditions of closed and uncovered water reservoirs on the incidence of DHF with p value = 0.004 and OR value of 3.328.

5.0 Conclusion and recommendation

From the above results it can be concluded that there is a relationship between ventilation, light intensity at home and the condition of the water reservoir with DHF events in Medan City in 2019. The case group in this study is more dominant for the occurrence of these three variables with DHF events, so it appears that there was no difference in situation or behavior change to prevent dengue in the case group.

Ventilation and light intensity have a contribution in preventing DHF as a physical control, so the community must also be able to pay attention to ventilation conditions that have the potential to be a pathway for mosquitoes to enter and enter the house as well as the intensity of the light inside. their home. Health workers must also provide knowledge about the contribution of ventilation and light intensity has a contribution in preventing DHF as a physical control, so the community must also pay attention to ventilation conditions that have the potential to be a pathway for mosquitoes to enter and enter the house and the light intensity in their homes and close the water reservoir. which is used mainly outside the home. Health workers must also provide knowledge about the contribution of the presence or absence of screen wire and light intensity in reducing mosquito density inside their homes and closing water reservoirs outside the home.

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Declaration

The authors declare that no conflicts of interest exist.

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