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The relationship between healthy hygiene behavior and dengue haemorrhagic fever (DHF) incidence in Semarang

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Abstract. Dengue Haemorrhagic Fever (DHF) is an infectious disease caused by one of 4 different Dengue viruses and transmitted by *Aedes aegypti* and *Aedes albopictus*. Incidence Rate (IR) of DHF in Semarang District from 2006 to 2016 are always much higher than IR DHF of Central Java and IR DHF of National Indonesia. Human sweat contains components that plays an important role in the attractiveness of anthropophilic mosquito species. Human need to reduce their sweat components by applying healthy hygiene behavior. This study aims to analyze the relationship between healthy hygiene behavior through the habit of taking bath and the habit of hanging clothes with the incidence of DHF in Semarang. We used a case control study with DHF sample cases from three hospitals in Semarang city (n=48) from the period of March to May 2017 and the control groups from healthy respondents with matched age, sex, and district location (n=48). The data was processed by Chi-Square test and calculation of Odds Ratio with 95% confidence interval. The result of the research shows that there was relationship between the habit of taking bath with DHF (p=0.038 and OR=2.391) and the habit of hanging clothes with DHF (p=0.009 and OR=3.839). In conclusion, there were relationship between healthy hygiene behavior through the habit of taking bath and the habit of hanging clothes with Dengue Haemorrhagic Fever cases in Semarang.

Keywords: DHF, Healthy hygiene behavior, Semarang

1. Introduction

Dengue Haemorrhagic Fever (DHF) is an infectious disease caused by one of four different dengue virus. DHF is transmitted by *Aedes aegypti* and *Aedes albopictus*. DHF case found in tropical and subtropical regions, which are Indonesia and the north Australia [1]. Dengue Haemorrhagic Fever transmitted to humans through the bite of *Aedes* that infected by Dengue virus. Dengue virus is included in the B Arthropods Virus (Arbovirosis) group which is known as the genus of *Flavivirus*, family *Flaviviridae*, and have 4 type of serotypes, namely: Den -1, Den-2, Den-3, Den-4 [4]. While dengue is a global concern, currently close to 75% of the global population exposed to dengue are in the Asia-Pacific region [5]. Moreover, there has been an increase in the proportion of dengue cases, particularly in Thailand, Indonesia, and Myanmar [6].



Semarang city is a DHF endemic area with high number of cases in Central Java Province. From 1994 to 2016, the highest number of cases and deaths in 2010 were 5.556 cases and 47 deaths. The highest DHF Incidence Rate (IR) was also in 2010 that was 368.7 in every 100.000 population and the highest DHF Case Fatality Rate (CFR) was in 2006 with 2.28%. The DHF Incidence Rate of Semarang from 2006 to 2015 are always higher than DHF Incidence Rate of Central Java and DHF Incidence Rate of nationwide of Indonesia. In 2014, the DHF Incidence Rate was 92,4257/100.000 population with the DHF Case Fatality Rate was 1.66%. But then in 2015, the DHF Incidence Rate reached 98, 61/100.000 population and the number of deaths 1.21%. In 2016, there was a decrease of DHF Incidence Rate number to 25,22/100.000 population, while the number of DHF Case Fatality Rate (CFR) has increased to 5.12% ([2], [7]).

Aedes aegypti mosquito is an anthropophilic that likes human blood compared to animal blood [8]. *Aedes aegypti* mosquitoes resting on the clothes hanging that had been used, because there are some substances that can attract mosquitoes such as amino acids, lactic acid, body heat, body odor or sweat and other substances. Furthermore, the clothes hanging will increase the mosquito population ([9],[10]). The results of Suyasa research (2008) suggested a positive relationship between the habit of hanging clothes with the presence of the DHF vector [11]. Likewise with research conducted by T. Widiyanto (2007) who stated that there is a relationship of the habit of hanging clothes with the incidence of DHF (OR=7.851) in the respondents in Purwokerto [12]. However, the smell of sweat that appears can be prevented by performing bath activities. The habit of taking bath can reduce the smell of sweat, so the activity of mosquitoes around humans can be reduced. Eiras and Jepson (1994) found that human sweat plays an important role in the attractiveness of *Aedes aegypti*.

The purpose of this study was to analyzed the relationship between healthy hygiene behavior through the habit of taking bath and the habit of hanging clothes behavior with DHF case in Semarang.

2. Method

This research used an observational research with analytic study method. The research design used case control design which aims to find the relation of how far the risk factor can influence the happening of a disease by using retrospective approach. The case group were DHF patients whose hospitalized at three hospitals in Semarang City, which are Wongsonegoro hospital, dr. Kariadi hospital, and dr. Adhiyatma, MPH hospital; in the period March to May 2017. The control group were people who did not suffer from DHF (the DHF's neighbor) at the same time in Semarang City. The samples were collected with consecutive sampling technique which included into non probability sampling.

The samples were 96 subject samples consist of 48 cases and 48 controls. The samples Primary datas were obtained from interviews of respondents using questionnaires, while secondary datas was obtained from the Health Office of Semarang City. The Data was processed using univariate and bivariate analysis. Bivariate analysis using Chi Square (χ^2) test and calculation of 2x2 Odds Ratio (OR) with 95% confidence interval.

3. Result

3.1 The Relationship Between the Habit of Taking Bath with Dengue Haemorrhagic Fever

Table 1. The Relationship Between the Habit of Taking Bath with Dengue Haemorrhagic Fever

The habit of taking bath	Status				OR	95% CI	<i>P Value</i>
	Case group		Control group				
	f	%	f	%			
< 2 times a day	25	52,1	15	31,3	2,391	1,040 - 5,498	0,038
≥ 2 times a day	23	47,9	33	68,8			
Total	48	100,0	48	100,0			

Based on the Table 1, Respondents with the habit of taking bath < 2 times a day were 25 respondents in the case group (52.1%), more than the control group as many as 15 respondents (31.3%). While the remaining 23 respondents in the case group (47.9%) and 33 respondents in the control group (68.8%) had the habit of taking bath ≥ 2 times a day. Based on these results it is known that case groups tend to have higher habit of taking bath < 2 times a day than the control group.

Based on statistical test, the results showed that the p value=0.038 or p value <0.05 , which means there was a significant relationship between the habit of taking bath with the incidence of Dengue Haemorrhagic Fever. The Odds Ratio calculation result showed that the variable of the habit of taking bath as risk factor to DHF case. Odds Ratio value (95% CI=1.04-5.49) is 2.39, indicating that the habit of taking bath <2 times a day has 2.39 times greater risk of DHF than the habit of taking bath ≥ 2 times a day.

3.2 The Relationship Between the Habit of Hanging Clothes with Dengue Haemorrhagic Fever

Table 2. The Relationship Between the Habit of Hanging Clothes with Dengue Haemorrhagic Fever

The Habit of Hanging Clothes	Status				OR	95% CI	<i>P Value</i>
	Case group		Control group				
	f	%	f	%			
Hanging clothes	17	35.4	6	12.5	3,839	1.35-10.86	0.009
No Hanging clothes	31	64.6	42	87.5			
Total	48	100.0	48	100.0			

Based on the Table 2, Respondents with the habit of hanging clothes were 17 respondents in the case group (35.4%), more than the control group as many as 6 respondents (12.5%). While 31 respondents in the case group (64.6%) and 42 respondents in the control group (87.5%) without habit of hanging clothes. Based on these results it is known that case groups tend to have higher habit of hanging clothes than the control group.

Based on statistical test, the results showed that the p value=0.009 or p value <0.05 , which means there was a significant relationship between the habit of hanging clothes with the incidence of Dengue Haemorrhagic Fever. The Odds Ratio calculation result showed that the variable of the habit of hanging clothes as risk factor to DHF case. Odds Ratio value (95% CI=104-5.49) is 3.83, indicating that the habit of hanging clothes has 3.83 times greater risk of DHF than without habit of hanging clothes.

4. Discussion

4.1 The Relationship Between the Habit of Taking Bath with Dengue Haemorrhagic Fever

The result of statistical analysis showed that there was a relationship between the habit of taking bath with the incidence of Dengue Haemorrhagic Fever with $p=0.03$ and $OR=2.39$ (95% CI=1.04-5.49), indicated that the habit of taking bath <2 times a day has 2.39 times greater risk of DHF than the habit of taking bath ≥ 2 times a day. The proportion of the habit of taking bath <2 times a day in the case group was greater than the control group. This result different with earlier study from Riza (2016) found no association between the habit of taking bath with the incidence of DHF with $p=0.17$ [13].

Carbon dioxide, ammonia, lactic acid, and other aliphatic carboxylic acids play a role in the host-seeking process of *Aedes aegypti*. With the exception of CO₂, these compounds are present on the human skin and in human sweat [14]. *Aedes aegypti* mosquitoes are able to detect the host through human body odor due to the lactic acid content in human sweat. The smell coming from the head and hands was significantly more interesting than the odor of the body, arms and legs. Interestingly, only in combination with the hot temperature that makes mosquitoes responded to human smell. The

attractiveness of *Aedes aegypti* can be a determinant of mosquitoes in biting and causing the occurrence of DHF [15].

The effort for a person to remain in good health is to maintain personal hygiene. Maintaining optimal self-hygiene is impossible without any cultivation of a clean life attitude and an exemplary example of the family and surrounding community. Taking bath is to clean the dirt on the body by using clean water and soap. The benefits of taking bath are as follows: remove dirt attached to the surface of the skin, eliminate the smell of sweat, stimulate blood and nerves and restore the freshness of the body [16].

4.2 Healthy Hygiene Behavior Relationship through The Habit of Hanging Clothes with Dengue Haemorrhagic Fever

The result of statistical analysis showed that there was a relationship between the habit of hanging clothes with the incidence of Dengue Haemorrhagic Fever with $p=0.009$ and $OR=3.83$ (95% $CI=1.35-10.86$), indicated that the habit of hanging clothes has 3.83 times greater risk of DHF than without habit of hanging clothes. The proportion of the habit of hanging clothes in the case group was greater than the control group.

This study is consistent with research conducted by Yunita, J et al. (2012), that the habit of hanging clothes is related to the occurrence of DHF, with $OR=6.29$ (95% $CI=3.09-12.81$) [17]. The similar results are also in line with Widiyanto (2007) who stated that the habit of hanging clothes has a statistically significant relationship with DHF incidence in Purwokerto with $p=0.005$ ($OR=7.85$) [12].

Clothes hanging is a favorite place to take a rest for *Aedes aegypti* mosquitoes after sucked human blood. After that, the mosquito will suck human blood again until the blood is enough for maturing their eggs. If the mosquitoes resting on the hanging clothes suck the blood of the people with DHF disease and subsequently move to suck the blood of a healthy person, then there can be transmission of Dengue Haemorrhagic Fever virus [17]. Avoiding the habit of hanging clothes in the house/bedroom is an activity that must be done to control the *Aedes aegypti* mosquito population, so that the transmission of DHF disease can be prevented and reduced.

5. Conclusion

In conclusion, there were relationship between healthy hygiene behavior through the habit of taking bath and the habit of hanging clothes with Dengue Haemorrhagic Fever cases in Semarang.

6. Recommendation

Further studies will be necessary to determine healthy hygiene behavior factors are associated with a particularly high risk of dengue virus infection.

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