

Study of Factors Caused Dengue Haemorrhagic Fever Case Study: Pasuruan, Jawa Timur-Indonesia

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Abstract—Dengue Haemorrhagic Fever is one of the international health problem which a half of the world's population is now at risk. The aim of this study is to describe the DHF situation in Pasuruan and factors affecting DHF cases. This study is using descriptive method. Samples were taken from the 10 sub-districts which accumulated of the highest DHF cases from 2009-2013. This study has showed DHF trend factors in 2013 showed the number of population density low categories correlated 0% with the high category of DHF cases, the high household with PHBS categories correlated 0% with the high category of DHF cases, and the number of population mobility low categories correlated 71,43% with the low category of DHF cases. The conclusion of this study show up that Population Density, Household with PHBS And population mobility are fit up with the DHF transmission theory.

Index Terms—Dengue Haemorrhagic Fever, population density, PHBS, population mobility

I. INTRODUCTION

Dengue Haemorrhagic Fever is one of international health problem which a half of the world's population is now at risk and severe dengue is a leading cause by serious illness and death among children [1]. Dengue Haemorrhagic Fever is communicable disease caused by dengue virus and transmitted by aedes aegypti [2]. Dengue viruses are arbovirus that are transmitted primarily to humans through the bite of an infected aedes species mosquito and also occur through transfusion of infected blood or transplantation of infected organs or tissue [3].

Agoes [4] describes that about 2 per 5 from peoples (2500 million peoples) is risk population of Dengue Haemorrhagic Fever infection, It is more than 100 countries especially tropical and sub-tropical area has been reported of Dengue Haemorrhagic Fever cases

which 95% is child and the mortality of DHF cases about 1000 cases per year.

Hundreds of thousands of cases of dengue and DHF are reported each year in tropical regions of Americas, Africa, Asia and Oceania which 879.632 cases of dengue were reported in 1980 through 1987 from countries in the American region [5]. Today about 2.5 billion people, or 40% of the world's population, live in areas where there is a risk of dengue transmission [6]. And then, WHO clarifies that Dengue and dengue haemorrhagic fever are present in urban and suburban areas in the Americas, South-East Asia, the Eastern Mediterranean and the Western Pacific [7].

Most of the regions in Indonesia have tropical climate and sub-tropics. These circumstances make Indonesia as one of the Dengue Haemorrhagic Fever endemic countries in South East Asia [8]. Furthermore, Dengue Haemorrhagic Fever has been known in Indonesia since 1968 were reported in the Surabaya and Jakarta [9]. The number of Dengue Haemorrhagic Fever cases since January until October in 2009 is 121.423 cases, with the number of died patients are 1.013 and it has been increasing then DHF cases in 2008 [10]. Meanwhile, the number of dengue haemorrhagic fever case in 2012 is 90.245 cases which 816 patient died and 8.177 cases of Dengue Haemorrhagic Fever were reported in East Java during 2012 and that cases became the highest rank in Indonesia after West Java with 19.663 cases [11]. Based on data of Health Office from Pasuruan Dengue Haemorrhagic Fever cases in Pasuruan has been increasing in 2012 through 2013, which the number of DHF case in 2013 is 388 cases. The number of Dengue Haemorrhagic Fever cases during 2009 until 2013 in the Pasuruan is 1453 cases. Based on that data, Dengue Haemorrhagic Fever is serious disease which needed to get attention to prevent the negative impact of Dengue Haemorrhagic Fever.

There are many factors related with Dengue Haemorrhagic Fever outbreaks, such as population density, population mobility, transportation access,

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season and world climate exchange, and environment sanitary and healthy living behavior (PHBS) [9]. Moreover, Agoes [4] describes that global warming and Dengue Haemorrhagic Fever has corellation, if global warming is gradually increases, it affects the mosquito growth spurt. The high growth of mosquitoes especially *Aedes aegypti* sp. has a consequences such as populations of aedes which ready to transmit are high.

The aim of this study is to describe the Dengue Haemorrhagic Fever situation of Dengue Haemorrhagic Fever incident in Pasuruan and factors affecting DHF cases include population density, population mobility and healthy living behavior (PHBS). The author's expectation of this research is the result of this research to be a reference for development of policy and management control of DHF in Pasuruan, East Java. According to the trends and patterns of Dengue Haemorrhagic Fever development.

II. MATERIAL AND METHOD

A. Study Area

The researcher was conducted in the Pasuruan Regency, East Java, Indonesia. Pasuruan has 24 sub-districts, which ranging area about 1488, 5 km².

B. Population and Sampling

The population of this study is all of the sub-districts in Pasuruan. Samples have taken from 10 sub-districts with the highest Dengue Haemorrhagic Fever cases. The DHF cases where in the data were accumulated from 2009-2013.

C. Method Design and Procedure

This study uses descriptive method which uses secondary data by health office and population office of Pasuruan. The procedure of this study is correlation with study of Sholehudin [8], which the procedure begin with accumulating the research across Dengue Haemorrhagic Fever case during 2009-2013 based on the sub-districts. Then, the data are being ranked highest to get the sub 10 Dengue Haemorrhagic Fever cases. The 10 sub-districts data which being the sample be mapped with all of the variables to see the variables change in each sub-districts during 2009-2013. The Variables are including of all variables such as population density, healthy living behaviour (PHBS) and population mobility then being categorized into some categories such as low, medium and high. DHF cases high category > 39, medium 22-39 cases and low <22 cases. Category of high population density >1.881 people/Km², Medium 1.355-1.881 people/Km² and low <1.355 people/Km². Category of high population mobility >1.011 people, medium 643-1.011 people and low <643 people. And then, Category of high PHBS >50%, Medium 28-50% and low <28%. After be categorizes based in the reference, researcher analyze the Dengue Haemorrhagic Fever cases variable with all of the factor causing Dengue Haemorrhagic

Fever by descriptive text analysis in the form of frequencies and crosstabs in SPSS.

III. RESULT AND DISCUSSION

Based on data from Pasuruan's health office concerned Dengue Haemorrhagic Fever incident in the Pasuruan during 2009-2013, total of Dengue Haemorrhagic Fever cases during 2009-2013 is 1.453 case which Bangil become the sub-district with the highest Dengue Haemorrhagic Fever cases as big as 185 cases. In 2011, Dengue Haemorrhagic Fever incident in the Pasuruan has decreased become 96 cases, but the DHF incident increase in 2012 and 2013 as big as 148 and 388 cases. The number of Dengue Haemorrhagic Fever cases in 2010 is the highest during 2009 until 2013, which total case in 2010 is 480 cases. The lowest DHF cases during 2009 until 2013 occur in 2011 with 96 cases.

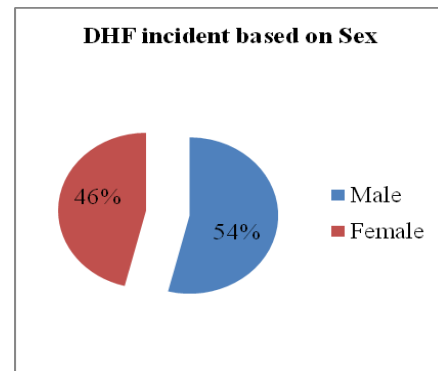


Figure 1. DHF incident based on sex during 2009-2013

Dengue Haemorrhagic Fever incident based on sex in the Pasuruan shows that male DHF patient is more higher than female DHF patient, which 55,15% of DHF patient is male and 44,85% of DHF patient is female in 2013 and then in 2012, 57% of DHF patient is male and 43% of DHF patient is female. Overall, Dengue Haemorrhagic Fever incident in Pasuruan during 2009-2013 based on sex shows that male DHF patients is more higher than female DHF patients with 54%. The trend of Dengue Haemorrhagic Fever in Pasuruan based on sex during 2009-2013 shown in Fig. 1.

These result are similar with the study of DHF in South Palu sub-district which the number of male's DHF patient more higher than female's DHF patient [12].

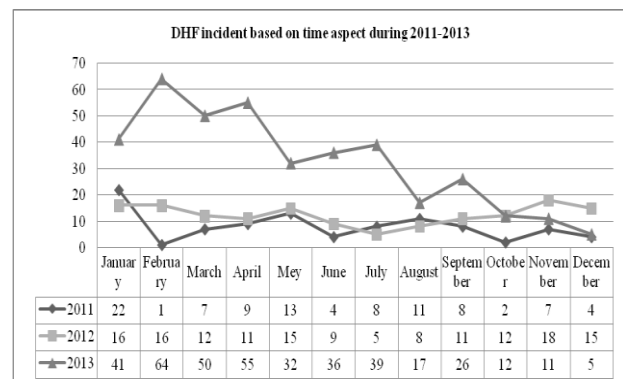


Figure 2. DHF incident based on time aspect during 2011-2013

Total of Dengue Haemorrhagic Fever incident in Pasuruan during 2011 until 2013 is 632 cases, which the number of Dengue Haemorrhagic Fever incident in 2013 is 388 cases, 148 cases in 2012 and last 96 cases in 2011.

The trend of Dengue Haemorrhagic Fever in Pasuruan based on time aspect during 2009-2013 shown in Fig. 2, which the high number of DHF cases in 2013 occur in February with 64 cases whereas the low number of DHF cases occur in December with 5 cases, it is different with DHF cases in 2011 which the low number of DHF cases occur in February with 1 case. In 2012, The high number of DHF cases occur in November with 18 cases whereas the low number of Dengue Haemorrhagic Fever cases occur in July with 5 cases. Furthermore, WHO describes that disease which transmitted by mosquitoes such as Dengue Haemorrhagic Fever has a relations with warm condition [13].

The number of Dengue Haemorrhagic Fever cases during 2009-2013 in the Pasuruan is 1453 cases which Bangil Sub-district is the place with the high DHF cases, and Tutar sub district is the place with the low DHF case. Meanwhile, 10 sub district with the high DHF case during 2009 until 2013 are Bangil, Grati, Pandaan, Kejayan, Gondang Wetan, Winongan, Kraton, Sukorejo, Gempol, and Rejoso.

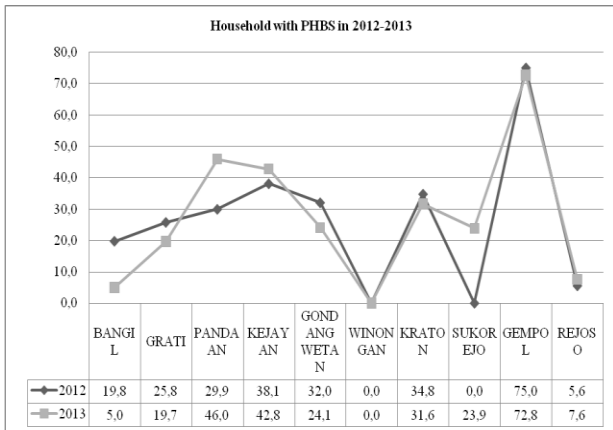


Figure 3. Development Chart of Healthy Living Behavior (PHBS) (%)

Based on data from Pasuruan's Health office, the trends of healthy living behavior (PHBS) in Pasuruan during 2012-2013 shown in Fig. 3 which Gempol is the highest sub-district of healthy living behaviour (PHBS) level during 2012-2013 with 75% and 72.8%. In 2012, There is no healthy living behaviour level (PHBS) data from Sukorejo. Therefore, Winongan is the lowest sub-district of healthy living behaviour (PHBS) level in 2012 with 0%. Meanwhile, In 2013, there is no healthy living behaviour (PHBS) data from Winongan and Bangil sub-district. Bangil sub-district has 2 primarily medical health care (puskesmas), there are Puskesmas Raci and Puskesmas Bangil. However, only puskesmas Raci extend the data of PHBS level to Pasuruan's health office with the result that Rejoso sub-district is the lowest sub-district of healthy living behaviour (PHBS) level in 2013

with 7,6% and Gempol sub-district is the highest sub-district of healthy living behaviour (PHBS).

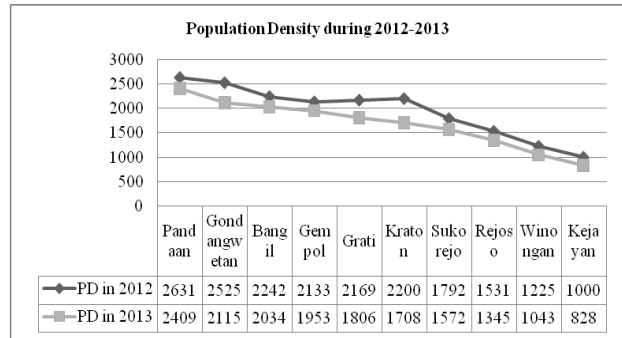


Figure 4. Development chart of population density (people/km²)

Based on data from population office of Pasuruan, the trends of population density in Pasuruan during 2012-2013 shown in Fig. 4 which sub-district with the highest population density in 2012 and 2013 is pandaan with 2.631 people/Km² and 2.409 people/Km². Kejayan is the lowest sub-district of population density in 2012 and 2013 with 1.000 people/Km² and 828 people/Km².

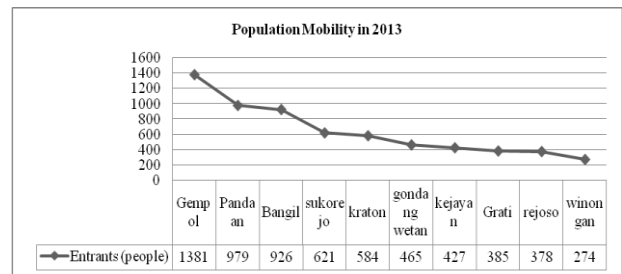


Figure 5. Development chart of population mobility in 2013

The trends of population mobility in Pasuruan during 2013 shown in Fig. 5, which population mobility is the number of individuals who went to settle in a sub-district in Pasuruan, both individuals were from one of the sub-district located in Pasuruan or derived from other district. Mantra [14] describes that mobility is process of population movement from a region to the other region within a certain period and according to intention for settle in the destination area, population mobility divided became 2, there are permanent population mobility or migration and non permanent population mobility. Based on data, Gempol is sub-district with the highest number of new comers or entrants in 2013 with 1.381 peoples, whereas Winongan is sub-district with the lowest number of entrants as big as 274 peoples.

TABLE I. CROSSTABS BETWEEN POPULATION DENSITY WITH DHF CASES IN 2013

Population Density	Cases			Total
	Low	Medium	High	
Low	2 (66,67%)	1(33,3%)	0 (0%)	3(100%)
Medium	2 (66,67%)	0 (0%)	1 (33,33)	3(100%)
High	1 (25%)	2 (50%)	1(25%)	4 (100%)
Total	5 (50%)	3 (30%)	2(20%)	10(100%)

In Table I shows that population density are correlated with DHF cases. Number of population density with low category had a correlation of 0% in the high category of DHF cases, and then number of population density with low category had a correlation of 66,67% in the low category of DHF cases. Furthermore, that value is the highest of the other categories. It means that population density have value to DHF cases. It is correspond to the research result of Kusbudiono and Widodo [15], state that population growth rate affects the incidence of DHF, if the rate of population growth enlarges, the opportunities of peoples infected DHF also large. And then, the other research concerned relations between sociodemographic and environment toward DHF incident in the Pekanbaru city describes there is a significant relationship between the distances of home to the DHF incident [16]. However, there is small discrepancy at high density correlated 25% of cases with high DHF category.

TABLE II. CROSSTABS BETWEEN PHBS WITH DHF CASES IN 2013

PHBS	Cases			Total
	Low	Medium	High	
Low	3 (75 %)	0(0%)	1 (25%)	4(100%)
Medium	2 (66,67%)	1(33,33%)	0 (0%)	3(100%)
High	0 (0%)	1(100%)	0(0%)	1 (100%)
Total	5 (50%)	2 (30%)	1(10%)	8(100%)

Based on Table II, has known that there is a correlation between household within PHBS and DHF cases. Number of household within PHBS with high category had a correlation of 0% in the high category of DHF cases. Meanwhile, there are 4 sub-district from 8 sub-district in PHBS low category. It shows that trend of low PHBS category of DHF cases in Pasuruan has more higher DHF cases than the other categories. It is correspond with Mahardika [17] describes that there are correlation between healthy behavior such as burying container, use repellent, etc. with DHF incident. And then, household sanitary environment condition has correlation with the presence of larvae Mosquito (Jentik Vektor) in the risk area [18]. Sholehudin [8] describes that one of the components which in a healthy house must exist is the prevention of vector, one of which is *Aedes aegypti* sp. if the percentage is low, mosquitoes should be in that house and DHF cases be increasing.

TABLE III. CROSSTABS BETWEEN POPULATION MOBILITY WITH DHF CASES IN 2013

Population Mobility	Cases			Total
	Low	Medium	High	
Low	5 (71,43 %)	1(14,28%)	1 (14,28%)	7 (100%)
Medium	0 (0%)	1(50%)	1 (0%)	2 (100%)
High	0 (0%)	1(100%)	0(0%)	1 (100%)
Total	5 (50%)	3 (30%)	2(20%)	10 (100%)

In Table III shown, that population mobility is correlated with DHF cases. Number of population mobility with low category had a correlation of 71, 43% in the low category of DHF cases. And then, number of

population mobility with low category had a correlation of 14,28% in the high category of DHF. It is correspond to the research result of Roose [16] describes that dominant variable in DHF incident is mobility variable.

IV. CONCLUSION

Based on data, it can be concluded that the Dengue Haemorrhagic Fever incident that occurred in Pasuruan has increased in 2012 and 2013, Bangil is the highest number of Dengue Haemorrhagic Fever cases during 2009-2013. There is factors related with DHF cases in Bangil such as populaiton density. Futhermore, the number of male DHF patients in Pasuruan is more higher than the number of female DHF patients.

Dengue Haemorrhagic Fever trend factors in 2013 showed the number of population density low categories correlated 0% with the high category of DHF cases, the high household with PHBS categories correlated 0% with the high category of DHF cases, and the number of population mobility low categories correlated 71,43% with the low category of DHF cases. The conclusion of this study show up that Population Density, Household with PHBS And population mobility are fit up with the Dengue Haemorrhagic Fever transmission theory.

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