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Relation between Population Fluctuations and Dengue Cases in Pasuruan Region, Indonesia, 2013-2017

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Abstract

Dengue Hemorrhagic Fever (DHF) is a tropical disease and its spread is very wide. Control of this disease is relatively easy, with community participation playing a vital role. However, the number of DHF cases is still high. A study reported that unhealthy behavior of the community contributed to the high incidence of the disease. In addition, environmental conditions also support the breeding of mosquitoes.

Keywords: Population; Patients; Indonesia; Epidemiological

Abbreviations: DHF: Dengue Hemorrhagic Fever; CFR: Case Fatality Rate.

Introduction

In Indonesia, the distribution of population density is still uneven, dominated by the island of Java with 56.58%. The population growth rate in 2000-2010 was 1.49% per year, an increase compared to 1990-2000 at 1.4% per year. East Java is the province with the second largest population during 2012-2018. According to the population structure by age, Indonesia has higher percentage of youth population [1-9]. Pasuruan City is a flat area that slopes from south to north with an incline of 0-1% and a height of 0-4m above sea level. The city has two seasons: dry and rainy. The area is ±35.29 km2, divided into four districts. Almost 50% of the four districts are used as residential areas. The residents of Pasuruan are also considered youth population (not unlike Indonesia), characterized by higher percentage of young and productive age groups. Dependent expense ratio in 2012-2017 respectively 0.45, 0.45, 0.44, 0.44, 0.44, 0.44. [10-15].

Indonesia in 2007-2012, the number of DHF patients showed an increase and decrease in the number of cases, respectively 158,115; 137,469; 158,901; 156,086; 65,725; 90,245; with an average of 127,757 cases per year. Patients who died consecutively were 1,599; 1,187; 1,420; 1,358; 597; 816. While the Case Fatality Rate (CFR) respectively 1.01%, 0.86%, 0.89%, 0.87%, 0.91%, 0.90% [1-3]. Pasuruan City is a city in East Java with high dengue cases. In 2010 as many as 29 urban villages (85.3%) were endemic areas out of a total of 34 sub-districts. According to data from 2007-2012, it shows an increase and decrease in the number of cases, respectively 139, 178, 147, 283, 77, and 94; with an average of 153 cases per year. Meanwhile, the Incidence Rate (IR) is 75.3, 94.44, 84.09, 147.23, 41, 49.46 per 100,000 populations. According to data reported from 2012-2017, there were no dengue mortalities and a CFR of 0% means that there were no mortalities. Except for 2016 there were 6 patients who died with a CFR of 1.85% [10-15]. DHF is still a problem in Indonesia. In Pasuruan City, cases of DHF have increased and decreased, and it happens in all regions. Research evidence reports that geographic area often has an influence on disease cases [16].

J.H. Abramson, 1988 stated that epidemiological data can be used for different purposes depending on the interest of the study. Exploration of epidemiological data is expected to be able to find knowledge, the etiology of the disease, determine the natural history of the disease, and the development of a disease. In addition, to find the special condition of a disease in a region is to consider the number of people living in the area [17]. Based on this concept, the scientific approach in this study will use epidemiological data to explain public health problems related to dengue cases in Pasuruan during the 2013-2017 periods. The goal is to find the distribution pattern of DHF in an area.

DHF Cases in Pasuruan City

Table 1 shows the difference in the number of cases each year varies; there is an increase and decrease in cases. The absolute difference was obtained from the difference between the highest and lowest cases, 325-122 = 203 cases. The difference between the relative ratios in 2014 and 2016 is 157.94%, which is calculated from [325-126/126] 100%=157.94%. While the percentage change in 2016 and 2017 was 62.46% or [122-325/325] 100% = 62.46%. In conclusion, DHF cases appear to have decreased sharply but in fact the cases are still high (Table 1).

Year	Total	Relative change
DHF cases		
2013	198	[126 – 198 / 198] 100%= 36,36%
2014	126	[227 –126 / 126] 100%= 80,16%
2015	227	[325 – 227 / 227] 100%= 43,17%
2016	325	[122 – 325 / 325] 100%= 62,46%
2017	122	and so forth
Population		
2013	191,770	[193,480–191,770 / 191,770] 100%= 0,89%
2014	193,480	[194,815–193,480 / 193,480] 100%= 0,69%
2015	194,815	[196,202–194,815 / 194,815] 100%= 0,71%
2016	196,202	[197,696–196,202 / 196,202] 100%= 0,76%
2017	197,696	[199,078–197,696 / 197,696] 100%= 0,70%
2018	199,078	and so forth

Table 1: Number of Dengue cases and population, Pasuruan, Indonesia, 2013-2017
Source: Pasuruan Public Health Office, 2014, 2015, 2016, 2017, 2018 [11-15].

Data on the number of cases each year is not uniform. Variation of data shows changes in absolute values. By calculating the ratio of each observation or the percentage change between pairs of consecutive observations, it is possible to find a relative change to explain the fact that the number of cases of DHF is involving the number of population. The assumption that can explain this phenomenon is the possibility that the number of cases varies randomly during this period. The population for 2013-2017 is needed to find the relative changes each year. In table 1, the percentage changes respectively are 0.89%; 0.69%; 0.71%; 0.76%; 0.70%. The percentage change is relatively the same except for 2013 and 2016, where the percentage change in population is larger. This information shows that when comparing the number of DHF cases each year and the percentage change in the population, it can be seen that the increase and decrease in the number of DHF cases is influenced by the increase and decrease in the population.

Discussion

Dengue fever is an endemic disease in the tropics. The following is an epidemiological concept of the distribution of disease according to population and time. According to time, the number of cases during 2013-2017 showed an increase and decrease. Cases increased in 2013 and 2016, this shows that every 3 years there is a spike in dengue cases. This case is similar in studies in several countries that every 3-5 years there is an increase in DHF cases and deaths during epidemic years [18]. Other studies mention an increase in the number of cases from endemic to epidemic transition every 3-5 years [19]. The number of DHF cases is related to the population. According to Tipayamongkholgu M, et al. [16] empirical evidence finds that villages that are geographically close to

each other have the same vulnerability to dengue fever cases Tipayamongkholgu M, et al. [16]. Risk factors for DHF are also influenced by the number of residents in an area and environmental quality [20]. Population distribution, area (km2), and density, show differences in DHF cases. Even the effect of population density shows the difference in the number of disease cases in an area. Based on this scientific study, the population size can be used to see the distribution pattern of disease in a different area, related to the dynamics of changes in population composition.

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