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Spatial Modeling of Filariasis Vulnerability Zone Area in Banyuasin District, South Sumatera

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Filariasis (elephantiasis disease) is an infectious disease caused by a worm and transmitted by mosquitoes of Mansonia, Anopheles, Culex, and Armigeres. The incidence rate of filariasis in Banyuasin shows that the trend of filariasis patients increasing every year. In the year of 1983-2000, the Mf Rate average was 2.02%. Risk factors that could be affecting the spread of filariasis were population density, altitude area, air humidity, air temperature, poor families, health services facility and well trained health personnel withfilariasiscases as well as individual factors that causedfilariasis. This study aimed to describe the spread of filariasis and determine the vulnerability of areaspasially. Research method was by ecology design with the data from Health Office and cantonal data from Regional Development Planning Office in Banyuasin. Cases and cantonal data will bescored and analyzed using overlay analysis by analysis software with Quantum GIS 2.8.1. Research shows that the filariasis cases clumped in the adjacent and high vulnerability districts of Suak Tapeh ,Sembawa, and Talang Kelapa. Population and housing density isthe most affecting factor of filariasis vulnerability zone in Banyuasin. In order to reduce and eliminate filariasis, the high filariasis vulnerability area need to be main focused by Health Department in Banyuasin.

Keywords: Spatial; Vulnerability; Filariasis; Overlay

1. INTRODUCTION

Filariasis (elephantiasis) is an infectious disease caused by worms and transmitted by mosquitoes of Mansonia, Anopheles, Culex and Armigeres. The worms live in the lymph nodes drain with acute clinical manifestations such as recurrent fever, inflammation of the channel and the channel the lymph nodes[(1)]. Filariasisis being a global public health problem in accordance with the resolution of the World Health Assembly (WHA) in 1997. Filariasis elimination program in the world started by the declaration of the WHO in 2000. In Indonesia,filariasis elimination program started in 2002. To achieve elimination, in Indonesia set two pillars which will be implemented as follows: break the chain with preventive mass drug administration filariasis (POMP filariasis) in endemic areas; and prevent disability due to filariasis[(2)]. WHO data shows that filariasis has infected 120 million people in 83 countries around the world, especially the countries in the tropics and some temperate regions. In the Regional South-East Asia (SEAR) there are 3 types of parasites filariasis, Wuchereria brancofti, Brugiamalayi, Brugiatimori contained in 9 countries, Bangladesh, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, and Timor Leste. In Indonesia, until 2014 there were more than 14 thousand people suffer from chronic clinical filariasis (elephantiasis) spread across all provinces. In epidemiology, more than 120 million people in Indonesia are in areas of high risk of contracting the filariasis. Until the end of 2014, there were 235 districts/ cities endemic filariasis, from 511 districts / cities throughout Indonesia. The number of endemic filariasis may increase because there are still some districts / cities uncharted. Banyuasinin the years of1983-2000 have the average of Mf Rateas 2.02%. The number of cases of chronic filariasis in Banyuasin in 2009 as many as 133 people, in 2010 approximately 138 people[(4)], and in 2012 cases of filariasis in Banyuasin region increased to 139 peopl [(5)]. From the incidence data, it is known that filariasisin Banyuasinis increase every year. It is necessary for adequate information to determine the

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vulnerability of the area Banyuasin spatially, see the distribution of filariasis using health information systems (GIS) and analyze the factors that have high risk, such as conditions of overcrowding, elevation area, air humidity and air temperature with the number of filariasis cases as well as individual factors may cause the incidence of filariasis.

2. RESEARCH METHOD

This research was using ecology design by secondary data obtained from health centers and health office in Banyuasin, environmental data and cantonal from Office in Banyuasin. This study was conducted in Banyuasin, South Sumatra Province in May-November 2016. The population in this study were all patients with filariasis (elephantiasis and positive microfilaria in the blood) in Banyuasin based on secondary data from health office in Banyuasin. Total sample number of cases acquired using total sampling technique so that all positive cases of filariasis in Banyuasin 2015 will be taken as a sample. Secondary data such as population density area, residential density, altitude region, the humidity and the air temperature will be represented by the signs of polygons. Then the data will be processed using software Quantum GIS 2.8.1 with the overlay technique. Determination mechanism filariasis-prone areas using the following stage:

1. Prepare the filariasis and cantonal data from the Office in Banyuasin
2. Determine the score of each variable with the following conditions

Variable	Category	Scoring
Filariasis case	< 5 case 5-10 case >10 case	1 3 5
Population Density	Very low low moderate high very high	0 1 3 5 7
Residential Density	Very low low moderate high very high	0 1 3 5 7
Altitude	Supported Not supported	1 5
Humidity	Supported Not supported	1 5
Air Temperature	Supported Not supported	1 5

3. Overlay the map and determine total scoring so there is three category that is low, moderate and high vulnerability area.

3. RESULT

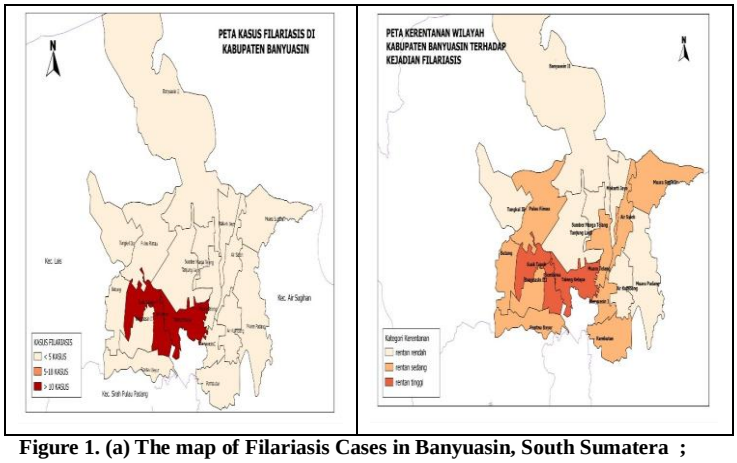

Figure 1. (a) The map of Filariasis Cases in Banyuasin, South Sumatera ; (b) Filariasis vulnerability zone area in Banyuasin, South Sumatera

Figure 1. (a) indicates that filariasis cases are most numerous in 3 districts adjacent to the District of Suak Tapeh, Sembawa and Talang Kelapa. Filariasis cases in three districts are> 10 cases with the highest being in the districts of gutter oil is 20 cases. While other areas tend to lower the number of cases is <5 cases even many districts were found to 0. This map is showing signs of lameness cases of filariasis among districts in Banyuasin.

Based on Figure 1. (b) it can be concluded that there are three sub-districts in Banyuasin classified as areas with high vulnerability filariasis namely Talang Kelapa, Sembawa and Suak Tapeh. Then, there are 9 districts with moderate levels of vulnerability and rest areas with low vulnerability. Districts that have high vulnerability population density and crowded housing, located at a height of 5-35 meters above sea level which is the height of the area at risk of filariasis and topography have tended same that low-lying areas and watersheds.

The findings in this study showed that the temperature, humidity and altitude of each area in Banyuasin relatively the same and are in the risk category for filariasis. Factors affecting this vulnerability zone are population density and housing density. Areas with high vulnerability, has a high population density. This study also found import filariasis cases in the case of filariasis in Banyuasin. So that individual data will be used to investigate this indication.

4. DISCUSSION

The use of remote sensing and GIS can be used as

one method to map the habitat of disease vectors from a vector, where a vector, the vector density, transmission of disease, as well as assessing the risk of disease vectors in order to obtain the source of infection and spread of the infection(6). One of the infectious diseases that can be caused by mosquito vectors are filariasis. Filariasis is one of the infectious diseases that can caused permanent disability in patients thereby decreasing the productivity of patients(7). The useof GIS applications can provide benefits to users because it has an efficient utility value so it is easy to produce risk maps filariasis transmission by using variables that has been determined [6].

Filariasis disease risk factors that may affect the deployment process include air temperature, humidity, altitude region, and population density. All districts in Banyuasin have a temperature, humidity, and altitude regions that are relatively similar but based study showed that the risk factors for the spread of filariasis in Banyuasin. Environmental temperature associated with the life of a mosquito that is visible from the behaviour of mosquitoes in search of food on the condition of low air temperature and air humidity as high as dusk till night (8). In addition, the factors temperature and humidity have a major contribution to the extrinsic incubation period of the parasite. Research that has been done previously found that the climate factor (9.10) and the environment(10) had a significant relationship that the incidence of filariasis in which the region is at risk of filariasis has a varied climate characteristics in each region, such as air temperature <300C, the average rainfall <1200 mm, a height of <600 masl(9.10) and the humidity is 40-90% (9), 130-175 NDVI values correlated to the prevalence of filariasis(10). Socio demographic factors (population density) also have low relevance to the incidence of filariasis(11) .Faktor other risks that may increase the prevalence and distribution of the issue brancofti uncontrolled urbanization and population growth are increasing. On the other hand, the vector can also be damaged habitat due to urbanization and land reclamation(12).Penelitian in Sub Kertoharjo also showed that the risk factors associated with the occurrence of filariasis, environmental factors, individual behavior and socio-demographic(13).

The results of spatial analysis in Figure 1. (a) show that the disease filariasis grouped in several sub-districts adjacent Suak Tapeh, Sembawa, and Talang Kelapa. Distance adjacent districts will increase the risk of transmission because the mobilization of the population and endemic areas of vector-borne filariasis. The frequency of direct contact with the vector microfilariae also affect the incidence of filariasis. The more frequent contact with mosquitoes occurs it will be more at risk for the disease filariasis

The results of spatial analysis in Figure 1. (b) it can be seen that the districts that have high vulnerability of filariasis in the District Suak Tapeh, Sembawa, and Talang Kelapa. The sub-district has a population density and high housing unless the District SuakTapeh. High density of population and housing will affect the transmission of filariasis causes microfilariae carried by mosquitoes Mansonia, Anopheles, Culex, and Armigeres. This factor has contributed greatly to the availability of shelter mosquitoes (breeding sites) because there will be more stagnant water in the environment around the community(14). In addition, the flight range of the mosquito would be lower and the spread of filariasis will be easier because there will be repeated contacts in the community to be around people with filariasis. Determining an area prone to filariasis also be based on the existence of health facilities. In this study, the presence of health facilities in every district does not become a factor that is very influential in vulnerable areas filariasis because every district has had health facilities and the numbers have increased when compared to the previous year so that people are not difficult to find information about filariasis.

Filariasis patients in Banyuasin not too many in number for the process of transmission which is not easy when compared with other infectious diseases, but if it is not taken seriously then the disease would spread easily control every aspect of the area in District Banyuasin. To simplify the process it is necessary to control filariasis mapping vulnerable areas against filariasis. Mapping filariasis in Banyuasin is expected to serve as guidelines in the control and elimination of filariasis in the district because the area or areas that have been exposed to microfilariae should receive appropriate controls(6) that can help improve the quality and degree of community life. In addition to requiring mapping of endemic filariasis also required cooperation and coordination between regions in order of treatment and prevention activities can be done on an ongoing basis(12).

5. CONCLUSION

Areas with high vulnerability to filariasis have third area adjacent to the environmental characteristics with same population density and the high housing.

SUGGESTION

Need to do a deeper analysis related to the indication of imports case from outside Banyuasin. In addition, researchers can then map the individual cases using the Global Positioning System to determine the pattern of filariasis cases in Banyuasin.

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