Climate Change: An Overview of the Prevalence of Dengue Hemorrhagic Fever in The South Sulawesi Province of Indonesia

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Climate Change: An Overview of the Prevalence of Dengue Hemorrhagic Fever in The South Sulawesi Province of Indonesia

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Abstract

Makassar City, Maros Regency and Tana Toraja Regency in South Sulawesi Province are regions with varying topography. Makassar City is a lowland area (1-19 DPAL), Maros Regency is a middle-land region with variations in height of 15-700 DPAL and Tana Toraja Regency located in the Toraja highland region 700 - 820 DPAL which is ideal for the breeding of Aedes aegypti mosquitoes as a vector which is dominant to the incidence of dengue hemorrhagic fever, because it has a temperature between 19,00^0 - 31,00^0 C (Central Meteorology Climatology and Geophysics Council region IV Makassar), with humidity between 63-94%. Between temperature and humidity affect each other for the breeding of Aedes aegypti, climate conditions (temperature and humidity) will support the increase in mosquito population density and subsequently have an impact on the transmission and spread of dengue hemorrhagic fever. Temperature between 20^o C - 30^o C with a humidity range of 60% - 90% is the optimum moisture for growth and development of the Aedes aegypti mosquito[4]. The aim of the study was to determine the effect of climate conditions on the transmission and spread of dengue hemorrhagic fever in South Sulawesi Province. This type of research is cross-sectional by measuring all variables at the same time. The research sites were Makassar City, Barru Regency and Tana Toraja Regency. Analysis using Spearman Correlation. The results showed that there was a significant relationship between air temperature and duration of solar radiation on the number of cases of dengue hemorrhagic fever (rs = 0.281 and 0.265 p <0,000), while also having a significant relationship but with negative rs (p = 0.001).

Conclusion climate factors are related to the incidence of dbd in the province of South Sulawesi. Prevention of dbd should be by anticipating environmental improvements to eliminate climate factors in order to suppress cases of dengue hemorrhagic fever.

Keywords: *climate, dengue hemorrhagic fever.*

Introduction

In 2014 there were 139 cases of dengue fever in all Puskesmas areas in Makassar City with rates of illness/ IR = 10.15 per 100,000 population of whom there were 2 deaths due to DHF. Cases in 2014 declined compared to 2013 with the number of cases 265 with rates of illness/IR = 19.6 per 100,000 population of whom there were 11 cases of deaths due to dengue, the number of 2012 was 86 cases with a rate of illness/IR = 6.3 per 100,000 population and there are 2 deaths[1,5,7]. In addition to Makassar City, Maros Regency is also an endemic area of DHF, from 14 Subdistricts in Turikalle District, the highest incidence of DHF. While in Tana Toraja Regency, it is also prone to dengue attacks, especially in Makale District[2,3,4].

Makassar City, Maros Regency and Tana Toraja Regency in South Sulawesi Province are regions with varying topography. Makassar City is a lowland area (1-

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19 DPAL), Maros Regency is a middle-land region with variations in height of 15-700 DPAL and Tana Toraja Regency located in the Toraja highland region 700 - 820 DPAL which is ideal for the breeding of Aedes aegypti mosquitoes as a vector dominant to the incidence of DHF, because it has a temperature between 19.00o C - 31.00o C (Central BMKG region IV Makassar), with humidity between 63-94%[8,10,15]. Between temperature and humidity affect each other for the breeding of Aedes aegypti, climate conditions (temperature and humidity) will support the increase in mosquito population density and subsequently have an impact on the transmission and spread of dengue disease. Temperatures between 20 oC - 30 oC with a humidity range of 60% - 90% is the optimum moisture for growth and development of the Aedes aegypti mosquito[9,11,12]. DHF is one of the public health problems in Indonesia where the number of sufferers tends to increase as well as the wider area of spread. DHF is affected by dengue virus which is transmitted by Aedes sp vector, especially Aedes aegypti and Aedes albopictus[4].

Disease transmission is strongly influenced by climate factors in a region. Parasites and vectors of disease are very sensitive to climate factors, especially air temperature, rainfall, humidity and wind. DHF needs to be watched out because transmission of this disease will increase with climate change[13,14,20]. Climate is related to the breeding habitat of Aedes aegypti mosquitoes. The conditions of rain and heat alternating at the turn of the season are more positive for the mosquito population because rainwater does not flow and stagnate in several places[16,17,19]. The climate of South Sulawesi Province varies as in Maros Regency which is a lowland area, namely 26.0 ° C to 28.8 ° C, Makassar City 25.5 ° C to 29.0 ° C, and Tana Toraja District which is a plateau ranging from 21.1 ° C to 29.0 ° C[18,21].

Mosquitoes are cold-blooded animals so that the metabolic processes and life cycles depend on the temperature of the environment, unable to regulate their own body temperature against changes outside their body. Mosquitoes can survive at low temperatures but the metabolic process decreases and even stops when the temperature drops to a critical temperature. At temperatures higher than 35ºC, also experience limitations in physiological processes. The optimum average temperature for mosquito growth is 25º - 27ºC[8]. Based on the description above, the relationship between air temperature, humidity, rainfall, duration of solar radiation, and rainy days has been investigated with an increase in the incidence of dengue hemorrhagic fever in South Sulawesi Province.

Material and Method

This type of research is quantitative and is an analytical study to analyze the relationship of climate with the incidence of dengue hemorrhagic fever. This design aims to reveal correlative relationships between variables. The location of the study was carried out in South Sulawesi Province in three regions, namely Makassar City, Maros Regency and Tana Toraja Regency. The selection of this location is based on the consideration that the three regions are endemic areas of DHF with different social demographics as well as the topography. Time of research for 1 year starting June 2015 until May 2016.

The population and sample in this study were purposive sampling by directly assigning 250 people each study area who had symptoms of endemic DHF. So the sample size in this study was 750 respondents.

The independent variables are climate (air temperature, humidity, rainfall and duration of sun and rainy days) obtained from the data of the Meteorology and Geophysics Agency of Makassar City, Barru Regency and Tator in 2011-2015, while the dependent variable is dengue hemorrhagic fever using data the number of cases of dengue hemorrhagic fever in 2011-2015 was obtained from the Makassar City Health Office, Barru Regency and Tator. Data analysis using the Spearman correlation test.

Findings

The duration of solar radiation for the Makassar region tends to be higher than that of Maros and Tana Toraja. The highest Makassar irradiation rate occurred in 2015, the Maros region had the highest sun exposure rate in 2015, and Tana Toraja the highest rate of solar radiation occurred in 2013. The high level of solar radiation in a the area will have an impact on the breeding and spread of mosquitoes.

The relation between rainy days and the spread of dengue disease is determined by the presence of wind speeds that influence the flight and spread of mosquitoes,

if the wind speed is 11-14 m/sec or 25 - 31 miles/hour it will inhibit mosquito flight. Wind speed on rainy days is when mosquitoes fly into or out of the house, and this is one of the factors that determine the amount of contact between humans and mosquitoes.

Table 1: Climate Relationship with 2011-2015 Dengue Fever Events

Relationship		r_s (Spearman Correlation)	p
Air temperature	Number of cases of dengue hemorrhagic fever	0,281	0,000
Humidity		-0,263	0,001
Rainfall		-0,274	0,001
Duration of sunlight		0,265	0,001
Rainy day		-0,265	0,001

Climate relations which include air temperature, humidity, rainfall, and duration of solar radiation with the number of DHF cases show a probability value of <0.05, which means there is a significant relationship of climate to DHF cases

Discussion

Climate change can affect the ecosystem of animal habitats that transmit disease, even natural growth of colonies of germs. Climate can affect the pattern of infectious diseases because vectors and viruses are sensitive to changing climate[9,10].

The incidence and spread of dengue hemorrhagic fever in South Sulawesi Province cannot be separated from the existence of climate as a cause of the proliferation of various types of parasites and vectors of diseases that are very sensitive to climate. In relation to the incidence and spread of dengue fever, the existence of climate, especially temperature, humidity, rainfall, rainy days according to wind speed, and solar radiation is a climate that directly affects the occurrence of various distributions and densities of vector organisms and intermediate hosts. Vector-borne diseases such as malaria and dengue fever need to be watched out for because transmission of such diseases will increase in accordance with climate change. As in South Sulawesi Province, where in the three regions observed, Makassar City, Maros and Tana Toraja Regency are tropical regions whose climate supports the proliferation of disease vectors.

Climatic conditions in the three regions observed showed that rainfall, humidity, temperature and sun exposure throughout the year greatly supported the proliferation of dengue fever disease vectors which greatly affected the vector life cycle of Aedes, especially in breeding from eggs, larvae, larvae and mosquitoes adult. Therefore, to anticipate climate support that affects the proliferation of Aedes aegypti vectors, efforts are needed to improve the environmental system.

The air temperature is a state of heat or cold air. The temperature of the air due to climate change causes the mosquito incubation period to be shorter. As a result, mosquitoes will breed faster. The increasing population of mosquito vectors will increase the chances of disease agents to infect humans.

Air humidity has an indirect influence on the metabolic process and the development of mosquitoes. When low humidity causes evaporation of water from the body which causes dryness of body fluids. One of the enemies of mosquitoes is evaporation because low humidity shortens the life of mosquitoes, although it does not affect parasites. The humidity level of 60% is the lowest limit to allow mosquitoes to live. Humidity also affects the ability to fly mosquitoes. Small mosquitoes have a large surface because of the respiratory system with the trachea. At the time of flight, mosquitoes need more oxygen so that the trachea is opened. Thus evaporation of water from the mosquito's body becomes larger. in the body from evaporation, the flight distance of mosquitoes is limited.

Rainfall variability can have direct consequences for infectious diseases. Increased rainfall can increase the presence of disease vectors by expanding the size of existing larval habitats and creating new mosquito breeding grounds. Rain is an important factor in influencing vectors, such as mosquitoes.

The presence of rainfall affects the humidity of the air and the breeding places of mosquitoes also breeding places the incidence of diseases transmitted by mosquitoes usually increases some time before the heavy rainy season or after heavy rains that can leave inundation where mosquitoes are favored. Mosquitoes carrying Dengue Fever are at tropical and subtropical regions, which are dominated by high rainfall[21].

There are several results of previous studies that showed that the climate greatly determines the incidence of Dengue Hemorrhagic Fever. The results of the study of show the results of the study based on the results of observations revealed that climate factors have a close relationship with the incidence of DHF[16]. The results of this study observe that there are influences of temperature, humidity, rainfall, and solar radiation that are positive and significant for the incidence or incidence of DHF. In addition, the climate can affect the pattern of infectious diseases because agents of disease in the form of viruses, bacteria, or parasites and disease vectors are sensitive to the presence of temperature, humidity, rainfall, wind speed, and solar radiation in the environment. WHO also states that mosquito-borne diseases such as dengue are highly associated with very bad climatic conditions.

Conclusion

Climate factors in the form of temperature, humidity, rainfall, duration of solar radiation and the number of rainy days are determinants of mosquito breeding as disease vectors that can cause Dengue Hemorrhagic Fever. Bad climate factors support mosquito breeding compared to stable climate factors.

Conflict of Interest: Between subjects and researchers does not include conflict, because the data used is secondary data with the permission of the authorized institution.

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Ethical Clearance: Before the research, the research protocol was reviewed by the research ethics commission of the Faculty of Public Health, Airlangga of University, Surabaya, Indonesia.

REFERENCES

1. South Sulawesi Provincial Health Office. Health Profile in South Sulawesi Province. 2013: 54-67.
2. Makassar City Health Office. Health Profile in Makassar City. 2014: 28-43.
3. Dewi, N. Climate relations with the incidence of dengue in the city of Padang. Essay : Public Health Sciences, Andalas of University. 2015: 12-21.
4. Chasan S. Kusnadi. Vector Control and Intruder Animals (Vector Control Manual), Installation Issuance of Environmental Health Department at Makassar Health Polytechnic. 2006: 12-21.
5. Gubler, Duane J., Paul Reiter, Kristie L.Ebi, Wendy Yap, Roger Nasci and Jonathan A.Partz. Climate Variability and Change in the United States: Potential Impacts on Vectorand Rodent-Borne Diseases. Environmental Health Perspectives. 2001: Vol (1) 09: 5.
6. Ramesh CD, Sharmila P, Dhllons GPS, Aditya PD. Climate Change and TreathOf Vector Borne Diseases in India. New Yorkeidelberg : Springer Verlagvol. 2010: 106.
7. The Meteorology, Climatology and Geophysics Agency of Makassar City, 2016: 34-42.
8. Harijanto, P.N.2000. Epidemiology, Pathogenesis, Clinical Manifestations, and Management EGC. Jakarta. 200: 56-73.
9. Achmadi UF. 2008. Region-Based Disease Management. Jakarta. University of Indonesia (UI Press. 2008: 23-31.
10. Achmadi UF.2010. Region-Based Disease Management. Epidemiology Window Bulletin. Jakarta. 2010: 15-20.
11. Ahmed TU, Rahman, GMS, BasherK, Suzzaman M, Samajpati S, Sultana S, Hossain MI, BanuNN and Rahman MS. Seasonal Prevalence of Dengue vector Mosquito in Dhaka City, Bangladesh. J.Zool. 2007: 35(2): 205-212.
12. Amah Majidah Vidyah Dini, Rini.N. Fitriani dan Ririn A. Wulandari. Climate Factors and Incidence of Dengue Hemorrhagic Fever in Serang District. Makara Healthy. 2010: Vol 14(1): 38-46.
13. Angel, B and Joshi, V. Distribution and sensasional of vertically Transmitted Dengue Virus in Aedes mosquitoes in Arid and Arid Semi-Arid Areas of Rajasthan. India Jvector Borne Diseases. 2008: 45 (3) :56-59.
14. Siregar, A.F. Epidemiology and eradication of dengue fever in Indonesia. Faculty of Public Health, University of North Sumatra. 2004: 54-62.
15. Schwartz E, Weld LH, Wilder-Smith A, von Sonnenburg F, Keystone JS, Kain KC. Seasonality,

annual trends, and characteristics of dengue in ill returned travelers, 1997–2006. Emerg Infect Dis [serial on the Internet] 2008: 23-34.

16. Richwanto, Fuel. Relationship between the occurrence of Aedes aegypti mosquito breeding sites and the incidence of Dengue Hemorrhagic Fever in Three Endemic Villages in Palangka Raya City in 2012. Jurnal Kesehatan Masyarakat, Vol. 2 No. 2.2013: Vol(2) 2: 43-49.
17. Ringga Fidayanto, HariSusanto, Agus Yohanan, Ririh Yudhastuti. Dengue Hemorrhagic Fever Control Model. National Public Health Journal. 2013: vol (7) 11: 22-29.
18. Rondonuwu MR. DHF Control Policy in North Sulawesi Province. Seminar on the Management of Dengue Hemorrhagic Fever. Sam Ratulangi University Public Health Faculty. Manado. 2010: 12-25.
19. Santoso, Budiyanto A. Relationship between Knowledge of Attitudes and Behavior (PSP) of the Community Against the DHF Vector in Palembang City, South Sumatra Province. Health Ecology Journal. 2008: vol (7) 2: 54-59.
20. Sayono. Effect of ovitrap modification on the number of trapped Aedes mosquitoes, Master of Epidemiology Study Program, Postgraduate Program, Diponegoro of University Semarang, Thesis. 2008: 67-71.
21. Seran, MD dan Orasetyowati H. Transovarial Transmission of Dengue Virus in Aedes aegypti Mosquito Eggs. Jurnal Aspirator. Local litbang P2B2 Ciamis. 2012 vol (4)2 : 53-58.

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