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Impact of Climate Change on Dengue Hemorrhagic Fever Epidemics

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Abstract: The study of Impact of climate change with dengue fever epidemic in South of North Eastern of Thailand 4 province (Nakornratchasima, Chaiyaphum, Burirum and Surin) to correct data with climate data in 30 years ago (1979-2008) with rainfall intensity number of raining days and temperature by maximum-minimum temperature and relative humidity data of dengue fever by incidence of dengue Morbidity rate from data dengue case report in 30 year ago (1979-2008). Result that rainfall intensity and number of raining days correlation with dengue morbidity rate ($F = 159.32, 203.52$ $p<0.05$) $R = 0.55$ and 0.60, R^2_{adj} = 031 and 0.36 Standard Error (SE_{est}) = 0.39 and 0.76 model of incidence rate of rainfall intensity = 0.17+0.35* rainfall intensity and model incidence rate of number raining days = 0.05+0.76* number of raining.

Key words: Climate change, dengue, dengue hemorrhagic fever, epidemics, impact, rainfall intensity

INTRODUCTION

In the moment Climate change was continuity affect to increase of temperature about 0.74°C since 1800s and suppose that the global average land temperature has increase between 1.8-4°C in 2100s. While was total rain was change not be stable both period of time and area (McMichael *et al*., 2006) besides activity in daily of human effect to climate change cause pollution affect to healthy (Bernard *et al*., 2001).

Climate change lead to correlated to factor of epidemic with climate to severe of disease while temperature be high and environmental change lead to more complicate of epidemic important aspect effect to health by affect tendency occurrence epidemic in long term was be great should attend continuously and sustainable (Martens, 2002) climate change affect to change of life cycle mosquito and insect with regard to germ had a sensitive to host also help increase of host. We were necessary control between host and environmental for reduce survivor to prevent increase contagious (Khasnis and Nettleman, 2005). When was global warming lead to spread of germ and climate change cause rate of survival increase mosquito. The general of vector borne diseases can properly in condition rate of hatching was depended on body temperature. Virus or parasite was habitat in sect will fast evolution depend on increase body temperature of vector borne diseases. This disease was pandemic by vector carrier can lead to germ from person to person or from host animal. Effect of amount increase vector born lead to born fast of gem. Germ had mutated human high risk and increase death rate. Change behavior for eat and mutation of vector and germ (Hunter, 2003) besides of difference of total rain and temperature in 3 season affect to occurrence dengue fever (Chakravarti and Rajni, 2005). Dengue fever was significant relationship between seasonal so that high epidemic in high rainfall and high humidity (Patz and Corvaran, 2004). The epidemic appeared to occur increasing temperature humidity high rainfall. The dengue seasonality is evident in individual in temperature and rainfall at present in the world fine population risk to dengue about 2,500 million each the year had patient 50 million in Thailand at the 10 year ago fine be high tendency incidence a tendency in B.C. 2007 compare with B.C. 2006 at the same time fine a patient increase 66%.

In the south of North east of Thailand compound with 4 Province (Nakornratchssima Burirum Surin and Chaiyaphum) the type of topography is a high land with combination of clay climate in rainy season had a monsoon west south begin mid May to mid October affect to damp climate and rain fall spread. The winter begin mid October to mid February high air pressure affect to be cold and dry. In the summer begin mid February to mid may climate be hot and leeward (Fig. 1-3).

Geographic information system is a procedure for analyzing regional relationship for data with spatial and correlation with location epidemics (Tzai-Hung *et al*.,

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2006) analyst and show spatial data for learn to factor which concern environment for the way to separation of boundary for high risk of born disease (Liang *et al*., 2002).

MATERIALS AND METHODS

Study design survey research is a Retrospective Study in area south of north eastern 4 provinces Thailand. (Nakornratchasima, Chaiyaphum, Burirum and Surin). This area was the most of dengue epidemic in part and population most 1 in 3 of North eastern:

- Research design of data base and survey and correct environmental data spatial scale 1: 50000 Universal Transverse Mercator: UTM Zone 48 Ministry of Natural Resources and Environmental affect to correlate of Disease Mapping
- Survey and correct data of Climate data in 30 years (1979-2008) data compound that Rainfall Intensity Number of Raining Days Average Ambient Temperature Maximum-Minimum Temperature and Relative Humidity Thai Meteorological Department Ministry of Information and Communication technology

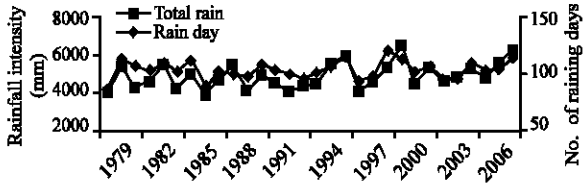

Fig. 1: Rainfall intensity and number of raining days year 1979-2008

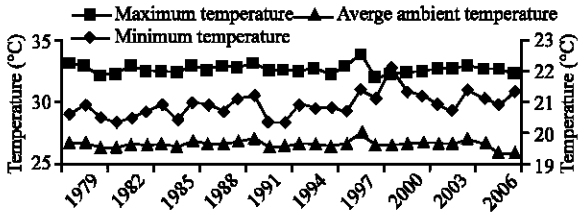

Fig. 2: Average ambient temperature, maximum-minimum temperatur year 1979-2008

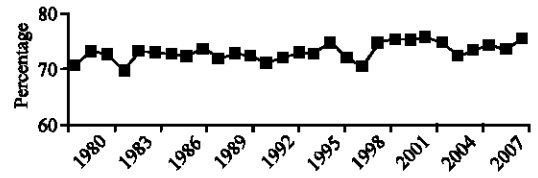

Fig. 3: Relative humidity year 1997-2008

- Survey and correct data of epidemiological data were obtain to in 30 years (1979-2008) from the bureau of Epidemiology Ministry of Public Health of Thailand

Data analysis: Analysis of correlation from temperature rainfall and relative humidity with incidence rate by Linear Regression was use to identify risk factors and Multiple Regression analysis: Stepwise Method to identify from temperature rainfall and relative humidity.

RESULTS AND DISCUSSION

Results of correlation of spatial with incidence epidemic of dengue fever high in low lying canal and pool to consume effort to effect of high temperature which Aedes aegpti was carrier can adaptation and breed well in this area so Global worming lead to dengue fever (Khasnis and Nettleman, 2005).

Result of climate change with dengue fever epidemics Relative Humidity and Minimum Temperature were correlate with dengue fever epidemics (t = 8.83, 6.32; p = 0.00,0.00); R = 0.64 and R^2_{adj} = 0.40 and SE_{est} = 0.36, Table 1.

- Model of Climate change with dengue fever epidemics risk factor
- Model of dengue fever with Relative Humidity: Incidence Rate = -1.88+0.04* Relative Humidity Fig. 4
- Model of dengue fever with Minimum Temperature: Incidence Rate = -1.46+0.10* Minimum Temperature Fig. 5

This study shows effect of climate change from temperature rainfall and relative humidity with epidemics of dengue hemorrhagic fever in area South of

Table 1: Result analysis with multiple regression by stepwise of climate change with dengue fever epidemics

Factors	B	SE	Beta	t	p-value	VIF
Relative humidity	0.02	0.00	0.42	8.83	0.00*	1.39
Average minimum temp.	0.05	0.00	0.30	6.32	0.00*	1.39

Constant = -2.41, $R^2_{Adjusted}$ = 0.40, R^2 = 0.41, SE_{est} = 0.36; *Significant 0.05

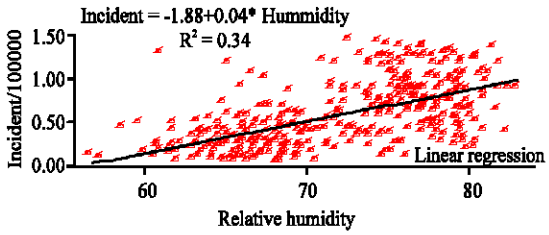

Fig. 4: Correlation of incidence rate with relative humidity

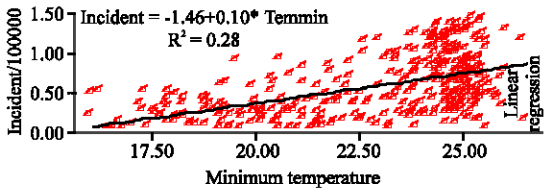

Fig. 5: Correlation of dengue incidence wtih minimum temperature

North Eastern 4 provinces Thailand. The indicate factor to forecast correlation were relative humidity and minimum temperature which conform to Global warming affect to dengue is a most important aedes aegypti. This mosquito is well adapted to the urban environmental. Aedes mosquito thrive in warmer but not in dry environment (Khasnis and Nettleman, 2005) besides the different of the rain and temperature also 3 season affect to epidemics of dengue hemorrhagic fever (Chakravarti and Rajni, 2005) and dengue hemorrhagic fever was significant of epidemics that matching with seasons which rate of increase epidemics in the month which the much rain and high humidity (Patz and Corvaran, 2004) and in the month that variance of climate change both temperature and rain.

Supervision to control and prevent dengue hemorrhagic fever we must to control life cycle of mosquito by control source and environment to decrease of survivor to prevent an infection and death rate. The way of life to reduce death rate by immunology and effective to control spread and sustainable.

CONCLUSION

From this research, result that rainfall intensity and number of raining days correlation with dengue morbidity rate ($F = 159.32, 203.52$; $p<0.05$); $R = 0.55$ and 0.60 $R^2_{adj} = 031$ and 0.36; Standard Error (SE_{est}) = 0.39 and 0.76 model of incidence rate of rainfall intensity = 0.17+0.35* rainfall intensity and model incidence rate of number raining days = 0.05+0.76* number of raining.

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