

The Effect of Climate on Dengue Cases in Mueang Nakhon Si Thammarat, Thailand.

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ABSTRACT

This study investigated the effect of Climate Change on dengue cases and the number of mosquito larvae in Watpramahathat School and Nakhon Si Thammarat province, Thailand. Mosquito larvae data was collected during the COVID-19 epidemic, so samples were collected in the our school by using the number of buildings point instead of the number of houses. We identified *Aedes* larvae up to species level under mobile phone microscope. The results showed that the mosquito larvae populations at Watpramahathat School had house index of 50.0%. This indicated that Watpramahathat School dengue sensitive. Climate factors, Mean Temperature (°C), and temperature index affect to dengue cases in Muang Nakhon Si Thammarat showed the average temperature In the past 10 years, higher than the average temperature in the past 30 years. The number of dengue cases during the rainy season (June-August and November-January) is higher than dry season This area is the dengue high risk area according to the WHO standard for dengue risk area.

Keywords: Dengue cases, *Aedes. aegypti* and Muang Nakorn Si Thammarat, Thailand

Research Question and Hypothesis :

Research Question : How do the temperature and relative humidity and the number of mosquito larvae influence the dengue cases in Muang Nakhon Si Thammarat?

Hypothesis : Temperature and climate affect vectorial capacity, extrinsic incubation period in mosquitoes, the disease will increase when the temperature warms up.

Introduction :

Dengue is transmitted to humans through the bite of certain species of female mosquitoes mainly of the species *Aedes. aegypti* that carry one of the virus's four serotypes: dengue viruses 1–4. (WHO 2018). These mosquitos mostly inhabit subtropical and tropical places. Dengue has emerged as the most widespread and rapidly increasing vector-borne disease in the world. Of the 3.5 billion people around the world living in dengue endemic countries and at risk of contracting dengue fever, 1.3 billion live in dengue endemic areas in 10 countries of the SEA Region. From 2015 to 2019, dengue cases in SEA region increased by 46% (from 451,442 to 658,301) whereas deaths decreased by 2% (from 1,584 to 1,555). (WHO,2021) Thailand is a country affected by dengue fever. In 2015 shows the highest number of patients in 20 years, there were 142,925 cases and 141 deaths. (Bureau of sexually transmitted disease by insects, Department of Disease Control, the Ministry of Health, Thailand. 2017).

In January 2023, 2023 dengue cases were reported in Thailand. Which the number of patients has steadily increased over than 2022 in the this month. (Figure 1) (Department of Disease Control, 2023). The previous report showed Dengue cases in Muang Nakhon Si Thammarat in the wet season were higher than in the dry season (Phuwadon Noradin, Thanayot Mounkaew and Thiranai Keatpimol, 2016 Virtual Science Fair) and Rainfall (mm) Rainy days (days) Mean Temperature and Relative Humidity (%) were positively correlated with dengue cases in Muang Nakhon Si Thammarat in El Niño times, and La Niña times, Rainy days (days) was only factor positively correlated with dengue cases, other factors were not significantly correlated with dengue cases. (Kasima Theangtum, Nichakan Chanprasit and Thanyachanok Paimanee, 2018 Virtual Science Fair). During the ongoing COVID-19 pandemic, countries worldwide have implemented physical distancing measures to reduce the spread of SARS-CoV-2, but the dengue outbreak is still high fever. Until entering the second consecutive year Of the COVID outbreak, That resulted in a slight decline in the outbreak. In the meantime, limitations of the study include the possibility of

underreporting cases due to fear of leaving one's home to seek medical treatment and the burden of the COVID-19 pandemic on healthcare systems.

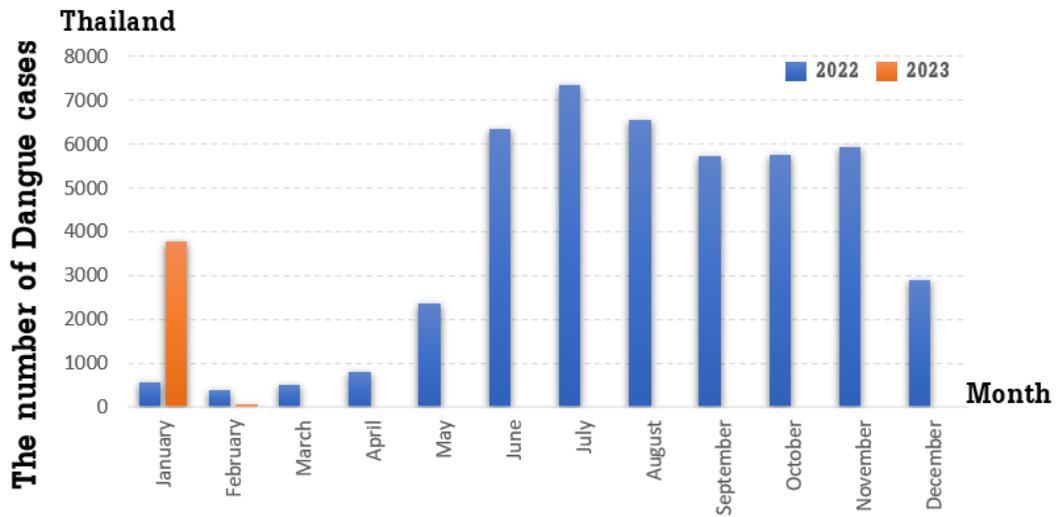


Figure 1. Monthly Danguge Cases in Thailand, Year 2022-2023.

The objectives of this study are study the affect of climatic factor to the number of dengue cases in Muang Nakhon Si Tammarat, Thailand and the affect of the number of mosquito larvae to number of dengue cases.

Research Methods and Materials :

Study site : The study site was located at Watpramahathat School, Muang Nakhon Si Thammarat, southern Thailand (8.4139346 N and 99.9661670 E) (Figure 2). This province is one of most dengue outbreaks consecutive years in southern Thailand.



Figure 2. Map of study site, Watpramahathat School, Nakhon Si Thammarat province, Thailand

Data Collection

Dengue cases in January 2020-February 2023 were obtained from the Vector-Borne Disease Control Centre laboratory 11, Nakhon Si Thammarat. Atmospheric data were collected from the Meteorological Department of Thailand during January 2020-December 2022.

Mosquito larvae data was collected during the COVID-19 epidemic, so samples were collected in our school (8.4139346 N and 99.9661670 E) by using the number of buildings point instead of the number of houses.

Environmental studies

We collect daily weather information and mosquito larvae using GLOBE Observer.

Data analysis

House index was calculated as the number of positive households (building point in study area) divided by the total number of households (total building point) inspected. Household locations with the number of mosquito larvae were visualised, the research process during the COVID-19 epidemic, so samples were collected in our school by using the number of buildings point instead of the number of houses. Descriptive statistics were calculated. Dengue cases and climatic factors are influenced by daily temperature. The temperature index is higher than monthly mean temperature and the average of each month in the past 30 years. The study scope of the effect of climatic factor on the number of dengue cases in Muang Nakhon Si Thammarat, Thailand and the effect of the number of mosquito larvae on the number of dengue cases.

Results :

The study of the average temperature compared with the average temperature in the past 30 years

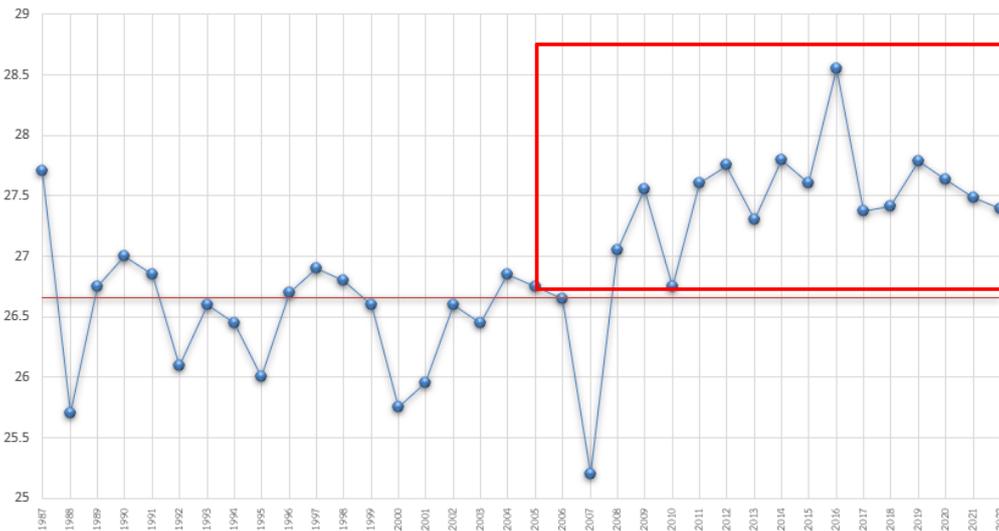


Figure 3 The average temperature compared with the average temperature in the past 30 years

Muang Nakhon Si Thammarat, Thailand showed the average temperature In the past 10 years, higher than the average temperature in the past 30 years.

The number of Danguue Cases in Muang Nakhon Si Thammarat and Monthly Temperature

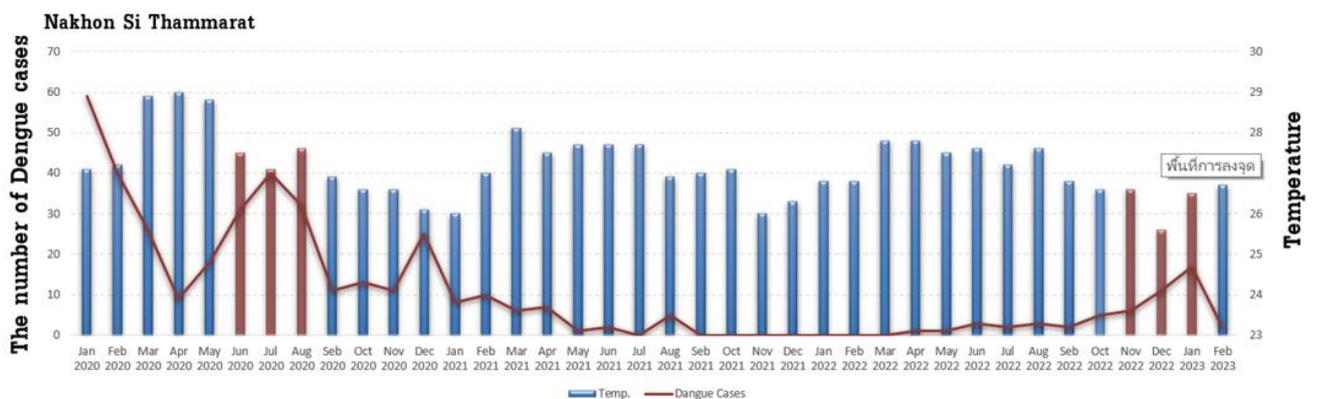


Figure 5 The number of Danguue Cases in Muang Nakhon Si Thammarat and Monthly Temperature

It was found that the number of dengue cases during the rainy season (June-August and November-January) is higher than dry season.

House index at Watpramahathat School, Nakhon Si Thammarat

Table 2: Relationship between HI(%) in Watpramahathat School Muang Nakhon Si Thammarat.

	Aedes Larvae
No. of households (building point)	10
No. of positive households (buildingpoint)	5
House Index (%)	50.0

From the households collected in January 2023, house indices for *Ae. aegypti* and *Ae. albopictus* were very high (Table 2). Watpramahathat School, Muang Nakhon Si Thammarat have HI >5%, indicates that these districts are dengue sensitive.

Discussion

Climate change is affected influencing dengue cases such as Temperature variation influenced the vector efficiency of *Aedes*. Larvae. Beacure this effects on parasitism comprise, Temperature, humidity, affect the incidence of dengue, either through changes in the duration of mosquitoes and parasite life cycles or through their influences on human, vector, or parasite behaviour (Gubler et al. 2001, Wongkoon et al. 2013). Our results showed that the average temperature In the past 10 years in Muang Nakhon Si Thammarat, Thailand higher than the average temperature in the past 30 years. In figure 2, indicates that mosquito eggs tend to be more viable in high temperature than normal cold season, it mean that on when the temperature index higher than 30 years mean temperature the weather should be warmer than normal, identifying large effects of on dengue expected.

Larval surveillance during this study was important to find out the extent of prevalence of vectors in a locality. House index was used in this study to help stratifying DHF risk areas for further control and monitoring of the vector population in defined areas. House index from our study indicated a high risk of DHF transmission. The WHO standard for high DHF risk areas was 5 % house index. This indicates a high risk of DHF transmission in Nakhon Si Thammarat Province, Thailand. Our results showed 50.0 % house index for *Ae. aegypti* larvae at Watpramahathat school, Muang Nakhon Si Thammarat. As we are GLOBE

students, we should launch some campaign to raise some awareness on mosquito larvae in the area.

Acknowledgements

We thank Master GLOBE training from Walailuk University, Teacher Kanokrat Singnui and with give an advice experimental design, data analysis and manuscript preparation. This work was supported in part by Watpramahathat school, Princess Chulabhorn Science High School Nakhon Si Thammarat and all staff of the Walailak University.

References

- Gubler, D. J., P. Reiter, K. L. Ebi, W. Yap, R. Nasci, and J. Patz. 2001. *Climate variability and change in the United States: potential impacts on vector- and rodent-borne diseases. Env. Health Perspec.*, 109(Suppl. 2), 223-233.
- Health Service District 11, Nakhon Si Thammarat Province, 2020. *Dengue Haemorrhagic Disease Rate per 100,000 Population. A Review*, Retrieve at:http://61.19.202.217/hdc/reports/report.php?source=formatted/format_2.php&cat_id=7f9ab56b0f39fd053143ecc4f05354fc&id=d4034b79ce2c889f3318a624543a4740. Published: 22/01/2017.
- Kasima Theangtum, Nichakan Chanprasit and Thanyachanok Paimanee. 2018. *The effect of ENSO on dengue cases in Muang Nakhon Si Thammarat*. 2018 Virtual Science Fair.
- Province Health Office Epidemiological Surveillance Report. 2020. Issue 1 January 2020.
- Phuwadon Noradin, Thanayot Mounkaew, Thiranai Keatpimol and Kanokrat Singnui , 2016. *Seasons and Climatic Factors Affecting Dengue Cases in Muang Nakhon Si Thammarat, Thailand*. 2016 Virtual Science Fair.
- WHO. 2018. *Climate change and health*. Retrieved at: <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>
- WHO. 20121. *Climate change and health*. Retrieved at: <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>
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