A Study of Weather Conditions and the Density of Aedes Mosquito Larvae in Phak Mai Subdistrict,Huai Thap Than District,Sisaket Province

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Research Title : A Study of the Relationship Between Weather Conditions and the Density of Aedes Mosquito Larvae in Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province.

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Abstract

This research aimed to investsate the prevalence of Aedes mosquito larvae and its relationship with weather factors affecting the occurrence of dengue fever in Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province. The survey of Aedes mosquito larvae was conducted in households and water storage containers in three villages: Ban Du, Ban Phrai Phanaow, and Ban Ta Thong, from June to August 2025. Data collection was carried out through field surveys, and larval prevalence was analyzed using standard indices, namely the House Index (HI) and Breteau Index (BI), together with weather data including rainfall, relative humidity, and temperature obtained from the Sisaket Provincial Meteorological Station.

The results showed that the overall House Index and Breteau Index values were at levels indicating a risk of dengue fever transmission. All villages had HI values greater than 10 and BI values consistently above the standard threshold, especially during periods of high cumulative rainfall and high relative humidity, which favor the formation of breeding sites and the reproduction of Aedes mosquitoes. In contrast, villages with proper management of water storage containers exhibited lower larval indices than those with inadequate management.

The findings indicate that changes in weather conditions, particularly rainfall and relative humidity, are associated with the prevalence of Aedes mosquito larvae and the risk of dengue fever in the community. The information obtained from this study can be used as a guideline for surveillance, planning, prevention, and effective control of dengue fever at the community level.

Keywords: Aedes mosquito larvae, Weather conditions, Larval indices (HI, BI), Dengue fever

Introduction

1. Background and Significance

Weather-related factors, investigate rainfall, relative humidity, and temperature, are important components that influence the prevalence of Aedes mosquito larvae. Increased rainfall can create standing water and water storage containers that are suitable for egg-laying by Aedes mosquitoes. High relative humidity helps extend the lifespan of adult mosquitoes and increases their reproductive potential, while temperature affects the growth rate of larvae and their development into the adult stage. Therefore, changes in weather conditions play a significant role in increasing or decreasing the prevalence of Aedes mosquito larvae in different areas.

Surveillance of larval prevalence using standard indices, such as the House Index (HI) and Breteau Index (BI), is widely recognized as an effective tool for assessing the risk of dengue fever at the community level. Analyzing these indices in combination with weather data can systematically explain the relationship between environmental factors and the status of Aedes mosquito larvae.

Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province, is a rural community characterized by a monsoon climate, with relatively high rainfall and relative humidity during the rainy season. In addition, most residents store water for household use, which may contribute to the formation of breeding sites for Aedes mosquito larvae. However, there is still a lack of empirical evidence clearly demonstrating the relationship between weather conditions and the prevalence of Aedes mosquito larvae in this area.

Therefore, this study aims to investigate the prevalence of Aedes mosquito larvae and its relationship with weather-related factors, including rainfall, relative humidity, and temperature, in Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province. The findings of this study are expected to provide baseline information for surveillance, planning, prevention, and effective and sustainable control of dengue fever at the community level.

2. Research Question

Does weather affect the prevalence of Aedes mosquito larvae?

3. Research Hypothesis

Weather conditions have an effect on the prevalence of Aedes mosquito larvae.

4. Research Objectives

4.1 To examine the relationship between weather conditions and Aedes mosquito larval indices (House Index and Breteau Index).

4.2 To evaluate the level of risk for dengue fever transmission in the study area.

5.Variables of the Study

Independent Variable: Weather conditions, including temperature, relative humidity, and rainfall

Dependent Variable: Prevalence of Aedes mosquito larvae, measured by the House Index (HI) and Breteau Index (BI)

Controlled Variables: Study area and larval survey methods conducted using the same criteria

6. Expected Outcomes

6.1 To clearly understand the situation and level of Aedes mosquito larval prevalence in the study area.

6.2 To identify the level of risk for dengue fever occurrence in each village.

6.3 To apply the research findings as guidelines for planning dengue fever prevention and control at the community level.

7. Study Area and Determination of Study Sites

The study area is located in Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province. The study sites were designated in three villages: Ban Du, Ban Phrai Phanaow, and Ban Ta Thong.

7.1 Ban Du

It is a village with relatively high population density, and survey data indicate that the larval indices (BI and HI) have consistently remained at a high-risk level.

7.2 Ban Phrai Phanaow

It is a village with dispersed households and a large number of water storage containers in households. The survey results showed that the larval indices were at a low to moderate risk level during certain periods; however, Aedes mosquito larvae were still found in various types of containers. This area is suitable for comparative study with villages that have a high risk level.

7.3 Ban Ta Thong

It is a semi-rural community with relatively dense housing and widespread use of various water containers, such as water jars, water tanks, and rainwater collection containers. Survey data collected over multiple periods showed that the larval indices (BI and HI) were at a high-risk level, indicating that the area has a high potential for dengue fever transmission.

Research Methodology

1. Scope of the Study

Prevalence of Aedes Mosquito Larvae in Relation to Weather Conditions

2. Study Site/Area

The study was conducted across three locations for *Aedes* mosquito larvae surveys: Site 1 (Ban Du), Site 2 (Ban Phrai Phanao), and Site 3 (Ban Ta Thong).

3. Study Period

The mosquito larvae surveys were conducted three times, once per month, between June and August 2025. The specific periods were as follows

Round 1: June 16 – 22, 2025
Round 2: July 14 – 20, 2025
Round 3: July 28 – August 3, 2025

4. Materials and Equipment

4.1 Water Test Strips

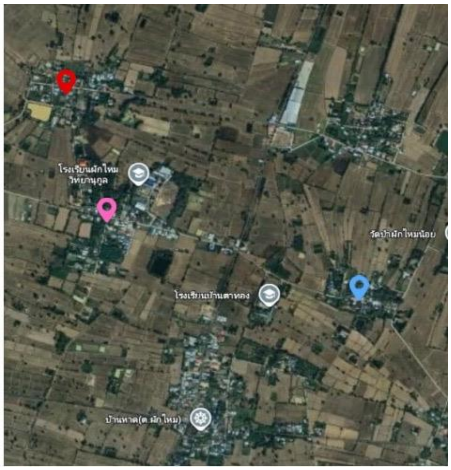
4.2 TDS Meter EC Mete

4.3 Smartphone

4.4 App GLOBE Observer

5. Research Methodology

This study utilized a systematic field survey and data collection approach to investigate the abundance of mosquito larvae across three designated sites: Site 1. Du Village, Site 2. Phrai Phanao Village, and Site 3. Ta Thong Village, all located in Phak Mai Sub-district, Huai Thap Than District, Sisaket Province.



Site 1: Larval Survey in Du Village

Site 2: Larval Survey in Phrai Phanao Village

Site 3: Larval Survey in Ta Thong Village

Figure 1: Location of the mosquito larvae survey area: Site 1.Du Village, Phak Mai Sub-district, Huai Thap Than District, Sisaket Province.

Figure 2: Location of the mosquito larvae survey area: Site 2. Phrai Phanao Village, Phak Mai Sub-district, Huai Thap Than District, Sisaket Province.

Figure 3: Location of the mosquito larvae survey area: Site 3.Ban Ta Thong Village, Phak Mai Sub-district, Huai Thap Than District, Sisaket Province.

Research Results

Based on the field surveys and analysis of mosquito larvae across the three study sites conducted from June 16 to August 3, 2025, the results are as follows

Table 1 Summary of Aedes Mosquito Larvae Abundance Survey, June 16–22, 2025

Village	Total Households			Total Containers		BI	HI	Risk Area Analysis
	Total	Survey	Found Larvae	Survey	Found Larvae			
Du Village	51	42	8	317	29	69.05	19.05	High Risk
Phrai Phanao Village	55	55	3	457	6	10.91	5.45	Low Risk
Ta Thong Village	38	38	10	363	13	34.21	26.32	High Risk

Table 1 summarizes the mosquito larvae prevalence survey conducted between June 16 and 22, 2025. The results reveal that Ban Du and Ban Ta Thong face a higher risk compared to Ban Phrai Phanao. This is attributed to their larger populations, which result in a higher number of water-holding containers, thereby creating more extensive breeding grounds for mosquitoes.

Table 2 Summary of Aedes Mosquito Larvae Prevalence Survey, July 14–20, 2025

Village	Total Households			Total Containers		BI	HI	Risk Area Analysis
	Total	Survey	Found Larvae	Survey	Found Larvae			
Du Village	51	51	7	395	7	13.73	13.73	High Risk
Phrai Phanao Village	55	55	2	583	2	3.64	3.64	Low Risk
Ta Thong Village	38	38	10	312	10	26.32	26.32	High Risk

Table 2 summarizes the mosquito larvae prevalence survey conducted between July 14 and 20, 2026. The results show that Ban Phrai Phanao and Ban Du have a lower risk than Ban Ta Thong. This is because [Ban Ta Thong] has a larger population, leading to more water-holding containers and extensive mosquito breeding grounds.

Table 3 Summary of Aedes Mosquito Larvae Prevalence Survey, July 3 – August 3, 2025

Village	Total Households			Total Containers		BI	HI	Risk Area Analysis
	Total	Survey	Found Larvae	Survey	Found Larvae			
Du Village	51	40	12	306	20	50.00	30.00	High Risk
Phrai Phanao Village	55	55	2	470	2	3.64	3.64	Low Risk
Ta Thong Village	38	38	5	388	6	15.79	13.16	High Risk

Table 3 summarizes the mosquito larvae prevalence survey conducted from July 3 to August 3, 2025. The findings indicate that Ban Du and Ban Ta Thong face a significantly higher risk compared to Ban Phrai Phanao. This is evidenced by their elevated HI (House Index) and BI (Breteau Index) values, which correlate with a greater number of water-holding containers and more prolific mosquito breeding sites.

Table4 A Comparative Study of Temperatures at Phakmai Wittayanukul School and Sisaket Province during July 2025.

The coordinates of the school flagpole area		
Day/Month/Year	**Day/Month/Year**	**Temperature**
18/7/2025 5:00	18/7/2025 11 : 49	29
21/7/2025 1:30	21/7/2025 8 : 18	26
20/7/2025 1:30	20/7/2025 8 : 18	29
22/7/2025 1 : 00	22/7/2025 7 : 48	29
23/7/2025 1 : 00	23/7/2025 10: 48	27
23/7/2025 4 : 00	23/7/2025 10: 48	30
23/7/2025 4 : 00	23/7/2025 10: 48	30
23/7/2025 5 : 18	23/7/2025 12 : 06	31
23/7/2025 5 : 00	23/7/2025 11 : 48	32
23/7/2025 5 : 16	23/7/2025 12 : 04	31
23/7/2025 5 : 10	23/7/2025 11 : 58	32
23/7/2025 5 : 00	23/7/2025 11 : 48	32
23/7/2025 4 : 40	23/7/2025 11 : 28	28
23/7/2025 6 : 08	23/7/2025 12 : 56	31
23/7/2025 9 : 03	23/7/2025 15 : 51	31
23/7/2025 8 : 50	23/7/2025 15 : 38	32
23/7/2025 5 : 30	23/7/2025 12 : 18	30
23/7/2025 6 : 00	23/7/2025 12 : 48	31
23/7/2025 9 : 00	23/7/2025 15 : 48	30
23/7/2025 15 : 50	23/7/2025 15 : 50	28

Table 4 shows The temperature at Phakmai Wittayanukul School
temperature data collected at Phakmai Wittayanukul School between July 18 and 24, 2025, indicated that temperatures ranged from approximately 26 to 32°C. Most recorded values fell within the 28 – 31°C range. However, peak temperatures reached 32°C during certain periods, suggesting that the school area experiences relatively high temperatures, particularly during daytime.

Table 5 The temperature of Sisaket Province

The coordinates of Sisaket Province		
Day/Month/Year	Temperature	Decrease in temperature
21/7/2025	25.1	24.4
21/7/2025	26	24.6
21/7/2025	24.8	24.3
22/7/2025	24.7	24.2
23/7/2025	25.5	24.6
23/7/2025	24.3	23.8
23/7/2025	24.3	23.6
23/7/2025	26	24.6
23/7/2025	25.6	23.3
23/7/2025	26.8	23.3
23/7/2025	27.5	24.5
23/7/2025	29.2	25.8
23/7/2025	29.2	25.8
23/7/2025	29.1	24.2
23/7/2025	30.2	25.7
23/7/2025	30.1	26.5
23/7/2025	28.4	25.8
23/7/2025	27.3	22.2
23/7/2025	25.7	20.7
23/7/2025	26.9	25.5
23/7/2025	25.7	24.5
23/7/2025	25.5	24.6
23/7/2025	26.5	24.9
24/7/2025	25.4	24.4

Table 5 shows The temperature of Sisaket Province shown in the image represents daily data from July 18, 2025.the temperature ranged from approximately 24.3 to 30.2°C. During the morning and nighttime, temperatures remained relatively low, between 24 and 26°C. In contrast, temperatures rose during the daytime, peaking at approximately 30°C. This data indicates that Sisaket Province experiences distinct diurnal temperature variations (daily fluctuations) throughout the day.

Graph 5 The Relationship between Rainfall and the Prevalence of Dengue Mosquito Larvae in Sisaket

Based on the 2025 rainfall data from the Sisaket Meteorological Station, there was a continuous increase in precipitation from May to August. Particularly during June and July, monthly rainfall reached high levels with a significant rise in cumulative precipitation. These findings correlate with the period of community mosquito larval surveys. Weekly survey results revealed that following periods of increased rainfall, the House Index (HI) and Breteau Index (BI) in several villages reached high-risk levels for Dengue Hemorrhagic Fever (DHF) outbreaks.

This was especially evident in households with water storage containers and stagnant water on their premises, which led to an increase in mosquito breeding sites. The increased rainfall resulted in water accumulation in various containers such as jars, buckets, discarded tires, and uncovered vessels, providing ideal conditions for mosquito oviposition (egg-laying) and larval development. Conversely, villages with consistent environmental management and breeding site elimination maintained low larval indices. These results underscore the importance of combined water source management and vigilant surveillance during the rainy season.

Conclusion and Discussion

The objectives of this research were to investigate the prevalence of *Aedes* mosquito larvae and to analyze the correlation between climatic factors—specifically temperature, humidity, and rainfall—and larval indices, namely the House Index (HI) and Breteau Index (BI). The study revealed that most areas remained at a high-risk level, with HI and BI values frequently exceeding established thresholds, clearly indicating a significant risk of Dengue Hemorrhagic Fever outbreaks within the study area.

Analysis of the larval surveys conducted from June to August 2025 showed that high rainfall and humidity led to stagnant water accumulation in various household and community containers, creating ideal breeding sites. Furthermore, recorded temperatures ranged between 26–32°C, which is the optimal range for larval development, thereby accelerating the life cycle and promoting rapid population growth.

The correlation analysis demonstrated that weather conditions play a crucial role in larval abundance. Specifically, rainfall and relative humidity showed a significant trend-related correlation with increased HI and BI values. These findings are consistent with several related studies identifying climate as a key driver of disease transmission. Consequently, dengue prevention and control should not focus solely on adult mosquito eradication but must prioritize the reduction of larval breeding sites, particularly during the rainy season when conditions are most favorable.

Enhancing surveillance through the continuous monitoring of larval indices alongside meteorological data is essential. Therefore, the results of this study serve as a foundational academic resource to support dengue surveillance and control. Furthermore, they can be applied to proactive public health planning and used to promote sustainable community participation in eliminating mosquito breeding sites.

Recommendations

1.Meteorological Data Collection

Weather data, including rainfall and temperature, should be collected on a weekly or monthly basis to analyze and predict mosquito larval surges in advance.

2.Statistical Analysis

Climate variables such as temperature, humidity, and rainfall should be integrated into statistical analyses alongside larval indices (HI and BI) to determine their correlation.

3.Water Source Management

Eliminate unnecessary stagnant water sources by implementing practical measures, such as securing lids on water jars and containers.

Citations

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I AM A DATA SCIENTIST

This research aligns with the 'I AM A DATA SCIENTIST' framework, beginning with the identification of a real-world problem: mosquito larvae infestations in the community.
The study formulated a central question: do environmental factors, such as rainfall and humidity, significantly impact larvae populations? To find the answer, researchers collected empirical data through village surveys and local weather records. This data was then analyzed using HI (House Index) and BI (Breateau Index) metrics.
Ultimately, the insights gained were used to strategize and implement effective dengue fever prevention and control plans. This demonstrates how data-driven decision-making can solve tangible problems—the core philosophy of a Data Scientist's work.

I MAKE AN IMPACT

This research transcends academic study; it translates directly into practical solutions for the community. By identifying dengue fever risk levels and pinpointing the specific environmental factors that drive larvae growth, these findings enable precise and effective disease control planning. Ultimately, this data-driven approach fosters a safer environment and enhances the overall health and well-being of community members.

I MAKE AN IMPACT

This research is the result of a collaborative effort by a team of four, with each member handling specialized responsibilities. Ms. Pearphan Janchai served as the team leader, providing strategic direction and coordinating operations to ensure a smooth workflow. Ms. Pataravadee Wannjan conducted the field surveys and gathered mosquito larvae data, while Ms. Panita Saengsud was responsible for compiling and organizing the collected information. Finally, Mr. Sompon Naknuan processed the data and performed the final quality check to ensure the results were clear and accurate.
Our team operated with high efficiency, demonstrating strong communication and shared accountability. Therefore, we are confident that our teamwork fully embodies the criteria for the 'Collaborator' badge.