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The Relationship of Population Factors, Water Sources, and Agricultural Areas with the Pandemic of Dengue Hemorrhagic Fever in the COVID-19 Epidemic Situation, Nonthaburi Province, Thailand

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Abstract:- The dengue virus, which is carried by Aedes mosquitoes, causes dengue hemorrhagic fever (DHF). In the midst of the COVID-19 epidemic, DHF has emerged as a problem for public health in several countries around the world. A cross-sectional study was used to conduct the research. The goal of the study was to investigate the association between population factors, water source factors, agricultural area factors, and DHF epidemics during the COVID-19 pandemic. Secondary data was acquired by the researcher from the Ministries of Public Health, the Interior, and Agriculture and Cooperatives. Six districts in Nonthaburi Province were studied. The study was carried out in November and December of 2022. The data in this study was analysed using frequency, percentage, mean, standard deviation, and correlation. The findings demonstrated that population numbers were significantly connected to DHF epidemics during the COVID-19 pandemic and in the same direction (r = 0.922).At a significance level of 0.05, irrigation water sources had a significant relationship with DHF epidemics, as well as a reverse relationship (r = -0.904). As a result, a strong DHF monitoring network built on relevant technology is required. Moreover, research should be performed to identify new techniques for DHF management and prevention, and local wisdom should always be considered.

Keywords:- *Population Factors, Water Sources, Agricultural Areas, The Pandemic of Dengue Hemorrhagic Fever (DHF), The COVID-19 Epidemic Situation.*

I. INTRODUCTION

Dengue hemorrhagic fever (DHF) is caused by the dengue virus, which is spread by mosquitos. DHF has become a public health hazard in many countries around the world because of *Aedes* mosquitoes in the midst of the COVID-19 pandemic. Since DHF has expanded globally, the number of patients has increased over the last 30 years. DHF has grown endemic in more than 100 countries, threatening the health of more than 40% of the world's population (2.5 billion people).70% of patients are from Asian countries, particularly in tropical and temperate regions. Cases of DHF were first recorded in Thailand in 1949.The first outbreak was discovered in Thailand in 1958, while the largest was discovered in 1987. Over 170000 cases have been reported, with over 1000 deaths. DHF has seasonal variations, with an increase in cases in April and a peak in June–August, which is the rainy season. While September tends to decrease cases, if the number of cases does not drop by the end of the year and remains on the rise, it may cause an epidemic the following year [1].

Dengue fever is an epidemic triggered by infection with the dengue virus. The carrier is *Aedes* aegypti, mainly female Aedes mosquitos that feed during the day. A person who is bitten by an Aedes mosquito carrying the dengue virus might become infected and get dengue fever symptoms. The dengue virus has four strains: dengue 1, 2, 3, and 4, and any of them may cause dengue fever, so individuals can be infected with dengue multiple times. Whenever infected with a specific strain, the body develops immunity to that strain but is only temporarily immune to others [2]. The situation of DHF in many provinces in Thailand in 2022 is an outbreak according to the criteria of the Department of Disease Control, Ministry of Public Health. The outbreak has affected 387 districts across the country. While DHF outbreaks are present in all six districts of Nonthaburi province, research studies are required to find solutions.

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II. METHOD

The research in this article is based on a cross-sectional study. The study's purpose was to look at the relationship between population factors, water sources factors, and agricultural areas factors, and DHF epidemics in the midst of the COVID-19 pandemic. According to [3], population factors have a relationship with DHF epidemics. In [4], water source factors have a relationship with DHF epidemics, and in [5], agricultural area factors all have a relationship with DHF epidemics. The researcher gathered secondary data from either the Ministry of Public Health, the Ministry of the Interior, and the Ministry of Agriculture and Cooperatives.

The research included six districts in Nonthaburi Province, Thailand. The study was conducted out during November and December of 2022. The researcher uses data on population factors, water source factors, and agricultural areas factors, and DHF epidemics in six districts in Nonthaburi. Frequency, percentage, mean, standard deviation, and correlation were used to analyse the data in this study.

III. RESULT

According to the findings of this research, Mueang Nonthaburi district has the largest population (364,074 people). Followed by Bang Bua Thong, Pak Kret, Bang Kruai, and Bang Yai districts, they had 279,320, 252,170, 147,182, and 123,905 people, respectively. Sai Noi district has the least population (121,986 people), as shown in figure 1. District of Sai Noi has the most agricultural areas (59,051 rai). Followed by Bang Yai, Bang Bua Thong, Pak Kret, and Bang Kruai districts, they had 15,540.7, 14,969.72, 4,989.66, and 3,865.91 rai, respectively. Mueang Nonthaburi district has the least agricultural areas (2,174.62 rai), as shown in figure 2. While the situation of DHF found that Mueang Nonthaburi district has the largest DHF patients (43 cases). Followed by Bang Bua Thong, Pak Kret, and Bang Yai districts, they had 25, 18, and 15 cases, respectively. Sai Noi and Bang Kruai districts, they had the least DHF patients (11 cases), as shown in figure 3.

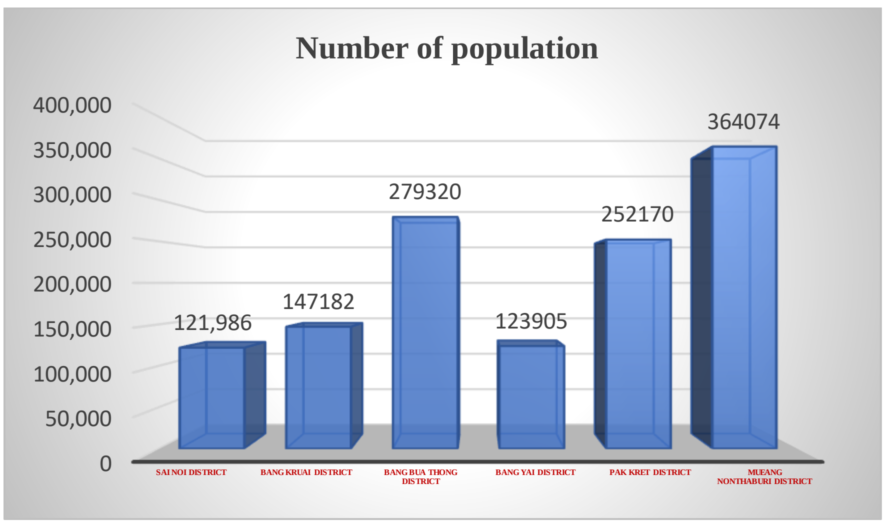

Fig 1. Number of population

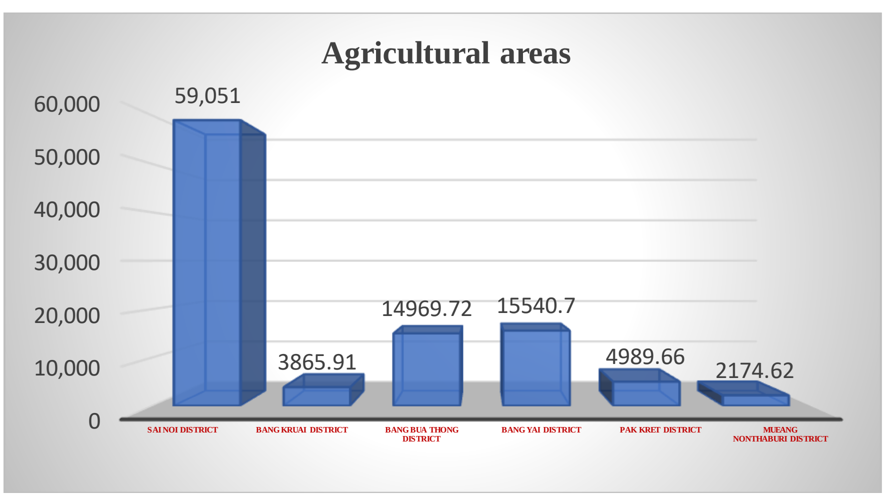

Fig 2. Agricultural areas

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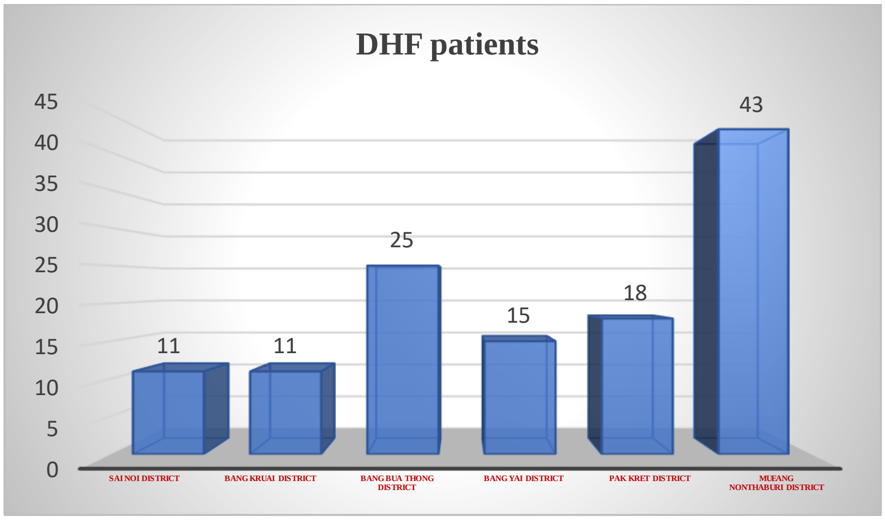

Fig 3. DHF patients

Using correlation statistical analysis to determine the relationship from Table 1, the number of population was significantly related to the DHF epidemics during the COVID-19 pandemic and in the same direction (r = 0.922). While population density has no relationship with the DHF epidemics in the midst of the COVID-19 pandemic. At a level of 0.05, irrigation water source had a significantly relationship with DHF epidemics during the COVID-19 pandemic, as well as a reverse relationship (r = -0.904). While natural water sources, ground water sources, and other water sources have no relationship with the DHF epidemics in the midst of the COVID-19 pandemic, as shown in table 2. Agricultural areas and other areas had no relationship with the DHF epidemics in the midst of the COVID-19 pandemic, as shown in table 3.

Table 1. Illustrates the correlation between number of population, population density with the DHF epidemics in the midst of the COVID-19 pandemic

Factors	The DHF epidemics in the midst of the COVID-19 pandemic		
	Pearson Correlation (r)	Sig. (2-tailed)	Relationship level
Number of population	0.922	0.009**	High level
Population density	-0.565	0.242	-

**$p < 0.01$

Table 2. Illustrates the correlation between natural water source, ground water source, irrigation water source, and other water sources with the DHF epidemics in the midst of the COVID-19 pandemic

Factors	The DHF epidemics in the midst of the COVID-19 pandemic		
	Pearson Correlation (r)	Sig. (2-tailed)	Relationship level
Natural water source	0.159	0.764	-
Ground water source	0.221	0.674	-
Irrigation water source	-0.904	0.013*	High level (reverse)
Other water sources	0.314	0.544	-

*$p < 0.05$

Table 3. Illustrates the correlation between agricultural areas, and other areas with the DHF epidemics in the midst of the COVID-19 pandemic

Factors	The DHF epidemics in the midst of the COVID-19 pandemic		
	Pearson Correlation (r)	Sig. (2-tailed)	Relationship level
Agricultural areas	-0.442	0.380	-
Other areas	-0.296	0.570	-

IV. DISCUSSION AND CONCLUSION

The findings of this research demonstrated that population numbers were substantially connected to DHF epidemics during the COVID-19 pandemic, and in the same direction (r = 0.922), at a level of 0.01. Cited as follows: Tian, N. et al., [6] have shown that high population growth and urbanisation in many dengue-endemic countries have significant implications for DHF outbreaks. According to [7], studies have shown that higher incidence is associated with population growth and inter-regional movement. While population density has no relationship with the DHF epidemics in the midst of the COVID-19 pandemic, consistent with the study of Istiqamah, S. N. A. et al., [8], it has been shown that in Kendari City, there was no significant correlation between population density and DHF incidence from 2014 to 2018. Inaccording to [3], studies have shown that the incidence of DHF is related to population density. At a 0.05 level, irrigation water source had a significantly positive relationship with DHF epidemics, as well as a negative relationship (r = -0.904). Cited as follows: Tian, N. et al., [9] have shown that the relationship between water reservoirs and DHF is not significant.

Dengue fever was reported in various countries in 2020, including Bangladesh, Brazil, Cook Islands, Ecuador, India, Indonesia, Maldives, Mauritania, Mayotte (Fr), Nepal, Singapore, Sri Lanka, Sudan, Thailand, Timor-Leste, and Yemen. In 2021, dengue fever will continue to impact Brazil, India, Vietnam, the Philippines, the Cook Islands, Colombia, Fiji, Kenya, Paraguay, Peru, and the Reunion Islands. [10] DHF prevention necessitates collaboration between the public, private, and public sectors. The findings of this investigation revealed a significant relationship between the number of people and the incidence of DHF. As a result, a powerful DHF monitoring network based on appropriate technologies should be established. The strategy, as well as the irrigation water supply, must be created with the assistance of the community and specialists. Furthermore, research should be conducted to discover new techniques for DHF control and prevention, and local wisdom should always be included.

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