HISTORY OF DENGUE HEMORRHAGIC FEVER-LIKE SYMPTOMS, CARE-SEEKING BEHAVIORS, AND HOUSEHOLD CONDITIONS AMONG RESIDENTS OF WANG WISET DISTRICT, TRANG PROVINCE, SOUTHERN THAILAND

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ARTICLE HISTORY
Received: 16 August 2024 **Revised:** 30 August 2024 **Published:** 13 September 2024

ABSTRACT

The objective of this study is to describe the prevalence of dengue-like symptoms, dengue care-seeking behaviors, and household conditions among residents of Wang Wiset District, Trang Province, Southern Thailand. We conducted a community-based cross-sectional study with mised method (structured interview and non-participatory rapid observation of household conditions) among residents of Wang Wiset District. We requested the help of local village health volunteers in introducing us to residents under their area of responsibility and asked for permission to conduct interview and observed the exteriors of their households. We entered data into online KoboToolbox platform or the KoboCollect application and analyzed the study data using descriptive statistics. We collected data from 363 participants in 256 households. The participants were mostly women with a mean age of 55 years. Only a minority of the study participants (7%) had dengue-like symptoms within 12 months before the survey, most of whom (78%) sought medical care at public hospitals. More than four-fifths of the households had wet containers, and 18% of all households had a wet container with mosquito larvae. In 14% of the households, members of the investigation team reported encountering mosquitos at least once. The findings of the study contribute to the understanding of the health determinants of the local population and also offer insights for disease prevention. However, limitations regarding the generalizability and potential selection and information biases should be considered as caveats in the interpretation of the study findings.

Keywords: Dengue, Environment, Observation, Trang Province, Thailand

CITATION INFORMATION: Wichaidit, W., Thepmaneerat, W., Tinnaitorn, W., Rahman, M., Prima, R. R., Zhang, Y., Zhang, L., Sekarini, Y. A., Seeyong, S., Chotipanvithayakul, R., Chongsuvivatwong, V., & The Department of Epidemiology Investigation Team. (2024). History of Dengue Hemorrhagic Fever-Like Symptoms, Care-Seeking Behaviors, and Household Conditions among Residents of Wang Wiset District, Trang Province, Southern Thailand. *Procedia of Multidisciplinary Research, 2*(9), 6.

INTRODUCTION

Contrary to the general pattern of epidemiological transition from infectious diseases to NCDs (Forouzanfar et al., 2016; GBD 2019 Demographics Collaborators, 2020), dengue fever has been on the rise in the past 3 decades (Yang et al., 2021). Dengue fever is an infectious disease with the second-highest mortality in the southern Thailand province of Trang, after leptospirosis, possibly influenced by the local humid climate (Chumpu et al., 2019; Sahavechaphan et al., 2024). Wang Wiset District is a dengue-endemic area of Trang Province with the highest burden of disease relative to the population. However, current prevalence data are based on passive surveillance (Chumpu et al., 2019), i.e., cases that sought care at health facilities, thus the true prevalence of the disease could have been higher. Considering that delayed treatment of dengue can lead to prolonged shock, organ failure, and even mortality (Kalayanarooj et al., 2017), it is very important that delayed treatment for dengue is measured and studied. Such data are needed to provide empirical evidence for relevant stakeholders for future health program planning and resource allocation.

On a related note, dengue prevention efforts in Thailand are focused on environmental control, i.e., fumigation and elimination of wet areas. However, other household conditions may also affect the likelihood of dengue infection, including the conditions of indoor bathrooms, availability of window screens, and the number of wet containers within a household (Chastonay & Chastonay, 2022; Lippi et al., 2021; Montenegro-Quiñonez et al., 2023).. The household conditions in dengue-endemic areas such as Wang Wiset District have not been described. Such data can also yield empirical evidence for relevant stakeholders in future health program planning and resource allocation.

The objective of this study is to describe the prevalence of dengue-like symptoms, dengue care-seeking behaviors, and household conditions among residents of Wang Wiset District, Trang Province, Southern Thailand.

LITERATURE REVIEWS

The global burden for dengue has become heavier during the past 30 years, particularly in South East Asia (Yang et al., 2021). However, despite the role of humans as hosts of dengue that can further spread the disease (World Health Organization, 2024), surveillance systems commonly under-report dengue cases (Silva et al., 2016; Tsheten et al., 2021). Underestimated burden of diseases can lead to inadequate allocation of resources for disease prevention and control.

In addition to routine environmental control procedures, i.e., fumigation and elimination of wet areas, studies have shown that other household conditions may also affect the likelihood of dengue infection, including housing density in the community, crowding within a household, having indoor bathrooms, availability of window screens, and the number of wet containers within a household (Chastonay & Chastonay, 2022; Lippi et al., 2021; Montenegro-Quiñonez et al., 2023). Therefore, new empirical evidence may be needed in order to inform relevant stakeholders of the need to engage in comprehensive environmental health intervention for dengue prevention and control.

RESEARCH METHODOLOGY

We conducted a cross-sectional study with mixed methods (structured interviews and non-participatory rapid observation of household conditions). We conducted the study in residential and community areas under the responsibility of sub-district health promoting hospitals in Wang Wiset District, Trang Province.

Population & Sample

The target population included residents of Wang Wiset District, Trang Province, who are potentially at risk of dengue fever. The study participants included residents of households

under the responsibility of sub-district health promoting hospitals in Wang Wiset District, Trang Province. We included residents who: 1) were 18 years of age or older; 2) had stayed overnight at a household within Wang Wiset District, Trang Province for at least 4 days per week within the past 12 months. We excluded residents who could not effectively participate due to physical, mental, or linguistics barriers.

We performed sample size calculation to meet the primary study objective of describing prevalence of dengue-like symptoms among the study population. We assume that the prevalence of dengue-like symptoms in the past 12 months is similar to the reported incidence in a previous study at approximately 5 percent (p = 0.05) (Sabchareon et al., 2012), with an assumed margin of error of half the prevalence (i.e., delta or δ = 2.5% or 0.025). Using the formula for estimation of proportion in a population at 95% level of confidence:

$$n = \frac{Z^2_{1-\alpha/2} * p * (1-p)}{\delta^2}$$

Where Z = 1.96; p = 0.05; and δ = 0.25

We obtained the following outputs using R and epicalc package:

```
> n.for.survey(.050, delta=0.025)
 Sample size for survey.
Assumptions:
 Proportion      = 0.05
 Confidence limit = 95 %
 Delta  = 0.025 from the estimate.
 Sample size    = 292
```

Thus, we calculated that we would need to interview 292 residents of Wang Wiset District (and observed their housing conditions, where possible). We assumed that an arbitrary 30% of the potential participants will refuse to participate in the study, thus we estimated that we would need to collect data from 292*1.30 = 379.6 ~ 380 residents (n = 380 community residents).

Data Collection

Our study instruments included an online structured interview questionnaire and an online rapid observation questionnaire, delivered via the KoboToolbox web-based platform (or KoboCollect application).

Operational definition and variables in the study included the following:

History of dengue-like symptoms: We based our variable definition on that of the World Health Organization (World Health Organization, 2009), i.e., but only included symptoms as we had no laboratory facility, adapted the question to enable data collection without lab results. We asked the participants "*In the past 12 months, have you ever experienced fever for 3 days or more with at least two of these following symptoms? 1. Nausea, vomiting; 2. Rash; 3. Aches and pains*" with four possible choices: *0) No; 1) Yes; 88) Not sure; 99) Refuse to answer*. We also asked the participants about the time since the latest episode of such symptoms.

History of Seeking Care for Dengue: We designed questions on care-seeking behavior for dengue-like symptoms in our study areas based on questions used in previous studies on actions taken by individuals when having suspected dengue fever (Ng et al., 2022; Roslan et al., 2020). We asked the participants the following questions: 1) "*On the most recent episode, did you seek medical care for your symptoms" (only asked to those who experienced symptoms)*"; 2) "*On the most recent episode, which type of health facility did you contact for medical care for your suspected dengue?*"; and; 3) "*On the most recent episode, how many days after the appearance of symptoms did you seek medical care?*". We defined early and delayed care-seeking by the number of days after symptom onset that patients sought medical care in any healthcare facility: 4 days for early care-seeking and 5 days for delayed care-seeking groups (Wongchidwan et al., 2018).

Conditions of the participants' household: We also asked for the participant's permission to observe their household using a structured questionnaire for rapid observation. Observed characteristics included the number of windows with and without screens, the number of windows screens with openings large enough for mosquitos to enter, the presence of wet containers in the household, whether the wet containers were properly covered or regularly emptied, the presence of mosquito larvae in the wet containers, and encounters with mosquitos during the interview or rapid observation, as self-reported by the rapid observation data collectors. The investigators did not make a detailed observation of the inside of the home in order to respect the participants' privacy.

The investigators contacted the Trang Provincial Public Health Office and the Wang Wiset District Public Health Office to request permission to conduct the study and assistance in connecting the investigators to health-promoting hospitals in Wang Wiset District. Investigators then contacted the health promoting hospitals, requested permission to conduct the study, and asked the hospitals to connect the investigators to the village health volunteers working for each hospital. Investigators introduced themselves to the village health volunteers, explain to the volunteers about the study, and asked for the volunteers' assistance in bringing the investigators to all households under the volunteers' care. Investigators repeated this process until the required sample size of 76 participants per health promoting hospital was met. In each visited household, investigators requested the health volunteer to introduce members of the investigation team to the residents. Thai-speaking investigation team members introduced themselves and assessed the eligibility of all household members who met the eligibility criteria. Investigators gave information and asked for informed consent according to the Participant Information Sheet and Informed Consent documents. After completion of data collection, the investigators would thank the participant for their time and provide the participant with a brochure about dengue fever containing local referral information and mosquito repellant packs.

Investigation team members entered all data onto the KoboToolbox web-based platform (or KoboCollect application). Within the platform and the application, all data were uploaded onto a password-protected server. The investigation team did not enter any personally identifiable information into the system to ensure the confidentiality of the study participants. A member of the investigation team served as the data manager who performed regular quality checks to identify and address potential data-related issues. The investigation team performed routine data cleaning and export the clean data set for statistical analyses.

Data Analysis

We analyzed the study data using descriptive statistics. We merged the household observation data with the individual-level data using the household ID. and univariate / multivariate logistic regression analyses to identify factors associated with delayed care-seeking behaviors for dengue fever.

Human Research Ethics

We received approval for the study from the Human Research Ethics Unit, Faculty of Medicine, Prince of Songkla University (REC.66-509-18-2). During the information and informed consent process, investigators gave the information, asked for informed consent, and conducted the study interview at the place of residence of the potential participants, outside of the hearing range of the village health volunteer, in order to reduce acquiescence vulnerability when making the decision to participate. Investigators informed the participants that they were allowed to stop the interview or ask the investigation team to stop observing household conditions at any time. Investigators would stop data collection (i.e., withdraw study participants) in case of emergency or when they deemed data collection to disrupt necessary activities within the household. While one investigator conducted the structured interview,

another member of the investigation team would simultaneously conduct rapid observation of the household (conditional upon the participant's consent).

RESEARCH RESULTS

A total of 353 persons from 256 households participated in our study. Most participants were female, with mean age of 55.3 years, worked in agriculture, identified as Buddhists, were married with children, had junior high school education or lower (*Table 1*). Just under half of the participants had a personal monthly income of 10,000 THB or less, were the head of the household, and had one or more chronic diseases. Approximately 12% of the participants had been diagnosed or treated for dengue in their lifetime, and 7% had dengue-like symptoms within the past 12 months prior to the survey, most (81%) of whom had the latest episode more than 3 months prior to the survey. Most (78%) of the participants who experienced symptoms within the past 12 months sought care, mostly at public hospitals, 1-2 days after the symptoms appeared.

Table 1 Characteristics of the study participants and history of dengue-like symptoms (n=363 participants)

Characteristic	Frequency (%), unless otherwise indicated
Sex (Female)	254 (70.0%)
Age (years), (mean ±SD)	55.3 ± 14.0
Occupation, (n/%)	
Civil servant / state enterprise	27 (7.4%)
Private sector employee	2 (0.6%)
Small-scale vendors / service providers	24 (6.6%)
Business owner / entrepreneur	20 (5.5%)
Laborer / manual workers	14 (3.9%)
Retired / homemaker	36 (9.9%)
Agriculture / Fishery	196 (54.0%)
Student	5 (1.4%)
Unemployed	33 (9.1%)
Refuse to answer	5 (1.4%)
Religion	
Islam	3 (0.8%)
Buddhism	354 (97.5%)
Christianity	0 (0.0%)
Others	6 (1.7%)
Refuse to answer	0 (0.0%)
Marital status, (n/%)	
Single	33 (9.1%)
Married with children	286 (78.8%)
Married, no children	18 (5.0%)
Widows / Divorced / Separated	21 (5.8%)
Refuse to answer	5 (1.4%)
Highest level of education completed	
Never went to school	8 (2.2%)
Primary school	156 (43%)
Junior high school	38 (10.5%)
High school	53 (14.6%)
Vocational certificate	8 (2.2%)
Associate's degree	18 (5.0%)

Characteristic	Frequency (%), unless otherwise indicated
Vocational diploma	3 (0.8%)
Bachelor's degree	66 (18.2%)
Higher than bachelor's degree	7 (1.9%)
Others	6 (1.7%)
Refuse to answer	0 (0%)
Personal Monthly Income	**(n=310 participants)**
10,000 Bahts or less	165 (53.2%)
More than 10,000 Bahts	143 (46.8%)
Relation with the head of household	
Respondent is the head of household	151 (41.6%)
Wife / husband / partner	140 (38.6%)
Others	72 (19.8%)
Comorbidities / medical conditions	**(n=360 participants)**
None or No Disease	184 (51.1%)
One or more chronic diseases	176 (48.9%)
Lifetime history of being diagnosed or treated for dengue	45 (12.4%)
History of dengue-like symptoms in the past 12 months	27 (7.4%)
The latest episode of dengue-like symptoms	**(n=27 participants with symptoms in the past 12 months)**
More than 3 weeks ago but within the past 12 months	22 (81.5%)
Less than 3 weeks ago but not within the 4 days	2 (7.4%)
Day of survey	1 (3.7%)
Not sure or cannot remember	2 (7.4%)
Sought medical care on the most recent episode (n=27 participants with symptoms in the past 12 months)	21 (77.8%)
Health facility used during the most recent episode	**(n=21 participants who sought care)**
Public hospital	14 (66.7%)
Private clinic / private hospital	7 (33.3%)
On the most recent episode, how many days after the appearance of symptoms did you seek medical care?	**(n=21 participants who sought care)**
Less than 1 day	3 (14.3%)
1-2 days	14 (66.7%)
3-4 days	1 (4.8%)
More than 4 days	3 (14.3%)

Rapid observation of household conditions showed that households in the study area had an average of 5.5 windows, but only 15% of the windows had screens (*Table 2*). Among windows with screens, 60% had holes or openings large enough for mosquitos to enter. More than four-fifths of the households had wet containers, and 18% of all households had a wet container with mosquito larvae. In 14% of the households, members of the investigation team reported encountering mosquitos at least once.

Table 2 Observed characteristics of the participants' hosueholds (n=256 households)

Characteristic	Frequency (%), unless otherwise indicated
Number of windows per household (mean +/- SD) (n=256 households)	5.5 +/- 2.8
Number of windows with screens (n=1415 windows)	212 (15.0%)
Number of window screens with opening large enough for mosquitos to enter (n=212 windows)	126 (59.4%)
Percent of households where enumerator encountered wet container	208 (83.2%)
Wet containers properly covered or regularly emptied to prevent mosquito breeding	45 (17.5%)
Mosquito larvae observed in the container	44 (17.2%)
Data collector or other members of the team encountered mosquitoes during the visit	35 (13.7%)

DISCUSSION & CONCLUSION

In this community-based cross-sectional study, we described the lifetime and past-year history of dengue fever among residents of Wang Wiset District, Trang Province, as well as their household conditions. We found that although the minority of the participants reported history of dengue in their lifetime and in the past 12 months, most households had a wet container which had mosquito larvae. The findings of the study contribute to the understanding of the health determinants of the local population and also offer insights for disease prevention.

The predominance of female participants in middle adulthood and elderly age groups aligns with the general trends observed in community-based cross-sectional studies, particularly those conducted during the daytime on weekdays, as other community members were not as likely to be at home. This distribution of the population characteristics could impact the generalizability of the study findings as the prevalence of dengue and the implication of the study findings from such data may vary by age, gender, and socioeconomic status.

The fact that approximately one-fourth of all participants who experienced dengue-like symptoms did not seek medical care aligns with findings from a previous study (Piroonamornpun et al., 2022). The predominance of public hospitals as the choice for medical care aligns with findings from a previous study in Malaysia, which also found that public hospitals were more commonly used for outpatient care of dengue (Woon et al., 2019). The lack of care-seeking behaviors among the participants nonetheless emphasizes the needs for targeted public health campaigns to address common barriers to seeking timely medical attention (Ng et al., 2022).

Rapid observation of household conditions in this study helps to triangulate information obtained from study interviews and provide additional insights into the nature of the study area, similar to the technique used in previous studies (Wichaidit, Biswas, et al., 2019; Wichaidit, Steinacher, et al., 2019). However, one notable caveat is that we did not observe the presence of wet containers and mosquito larvae inside the households (Ferdousi et al., 2015) or drinking water containers (Waewwab et al., 2020), which could provide additional breeding grounds for Aedes sp. mosquitos. Considering that in the local area, the house door and windows are normally left open during the daytime to enable ventilation, it is highly likely that mosquitos from outside the household could enter and breed inside the household or in drinking water containers. Thus, the observation data in this study should only be considered as preliminary findings, and not the complete information on the household conditions.

The primary strength of this study was the use of rapid observation of household conditions combined with structured interview data, which added insights to the study findings. However,

a number of limitations should also be taken into consideration. Firstly, the investigators relied on the assistance of village health volunteers, who introduced the study participants from the households under their care based on travel feasibility and convenience. Such practices could have introduced selection bias to our study findings. Secondly, the investigators introduced themselves as public health researchers, and the participants might have been compelled to report care-seeking behaviors if such practices were deemed to be socially desirable. Thus, social desirability bias could not be precluded from our study findings. Thirdly, the lack of rapid observation data from inside the household implies that our study findings remain incomplete and should only be considered preliminary in nature.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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