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BanSaiKluay ACER Model for Dengue Hemorrhagic Fever Prevention and Control

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ABSTRACT

This action research aimed to develop the model of dengue hemorrhagic fever (DHF) prevention and control in BanSaiKluay Village, Phattalung, Thailand. The sample were 212 of household representatives (162), teachers (21), village health volunteers (12), Buddhist monks (7), community leaders (6), public health officers (2), and local government organization officers (2). Two phases of model development were applied. The result emerged the BanSaikluay ACER model for DHF prevention and control consisted of 4 stages. Assessment stage (A) consisted of 1) identifying the involved persons, 2) collecting mosquito larva index, 3) assessing DHF risk area, 4) assessing the policies and supports by administrators of involved organizations, and 5) assessing the knowledge, attitude, practice, participation and learning community of involved persons. Co-creating stage (C), the cooperation of involved persons, consisted of 1) installing the Mosq App. on involved person smartphones, 2) planning for the improvement of knowledge, attitude, practice, participation and community learning of an individual involved person and 3) improving as the plan. The evaluation stage (E) consisted of 1) comparing the knowledge, attitude, practice, participation and learning community of involved persons before and after the co-creating stage, 2) comparing mosquito index before and after the co-creating stage and 3) collecting the number of DHF patients. Returning stage (R) was conducted after ACE stages were accomplished and ready to return the model, Mosq.App. and important data to BanSaiKluay village to continue implementing the activities in the model. The ACER model was an original model which requires the continuous refinement for more effectiveness. The model could be generalized for DHF prevention and control in other communities, especially in tropical area.

Keywords: *BanSaiKluay ACER Model, Dengue hemorrhagic fever, Prevention and control*

1. INTRODUCTION

The domestic mosquito, Aedes aegypti, is the main disease vector of dengue hemorrhagic fever (DHF) which can be life threatening. Currently, vaccine for DHF prevention is still under development [11-12]. DHF begins abruptly with high continuous fever and headache follows with respiratory and intestinal symptoms. Shock occurs after 2 to 6 days in some cases [8]. The case of DHF was first reported in late 18 century in Asia, Africa and North America. In Thailand, the first reported was in 1958 and remains a public health problem. According to the World Health Organization (WHO), it is estimated that 50 to 100 million infections of dengue fever occur each year over 100 countries. In 2020, dengue affected several countries, with increased number of cases in Bangladesh, Brazil, Cook Islands, Ecuador, India, Indonesia, Maldives, Mauritania, Mayotte (Fr), Nepal, Singapore, Sri Lanka, Sudan, Thailand, Timor-Leste and Yemen. In 2021, dengue continues to affect Brazil, Cook Islands, Colombia, Fiji, Kenya, Paraguay, Peru and Reunion island [11]

The incidence rate of DHF in the South is at third rank comparing to the other regions of Thailand. The incidence rate of the Southern during 2016-2020 was 19.42 - 265.30 per 100,000 population. BanSaiKluay village locates in Papayom district, Phattalung province, Southern Thailand. Within 5 years, the BanSaiKluay incidence rate was vary and up to 244.20 per 100,000

populations in 2019 and decreased to 115.47 per 100,000 populations in 2020 [5-6]. BanSaiKluay is a small Buddhist village of 3.76 square kilometers with 866 people of 162 families [1]. The major careers for living are rubber and palm oil plantation and paddy rice farming. The community network is very strong leading by Buddhist monks, village leaders, local organization administration officers, BorSai Health Promotion Hospital staff, and teachers. Moreover, there are aging club, housewife group, village volunteer group who always affect the success of the village. The most impress and important driving force is village health volunteer (VHV). One VHV is responsible for 10-15 families nearby his/her house. VHV is a volunteer endorsed by Ministry of Public Health after required training and assigned 8 major duties including prevention and control of village health problems. These are prominent strengths of BanSaiKluay village in driving through the problems as well as prevention and control of DHF. Strong community involvement can improve vector control substantially and sustainable.

Dengue prevention and control depends on seriously continuous effective vector control. There are three types of index for mosquito larva detection: house index (HI), container index (CI) and Breteau Index (BI). BI. These indices should be controlled as low as we can and approached zero to ascertain DHF vector control. Using formula; HI = (infested houses/ inspected houses) x 100; CI = (positive containers/ inspected containers) x 100; BI = (positive containers/ inspected houses) x 100.

There are some models for DHF prevention and control developed and implemented in Thailand such as Chaiya, Koksak, and BanPoh model [3,7,9]. which are widely applied in the villages. However, those models could not perfectly fit with a particular area with different context. This study, thus, aimed to develop the model of DHF prevention and control for BanSaiKluay village.

2. METHOD

2.1. Study Design

This research was an action research aiming to develop the model of DHF prevention and control in BanSaikluay village. The conceptual framework was conducted based on the concept analysis [10]. The study consisted of 2 phases: 1) assessment of required information of BanSaiKluay context consisted of 5 activities and 2) development of the DHF prevention and control model consisted of 7 activities.

2.2. Participants

The key participants consisted of 162 household representatives, 21 teachers from primary school and child development center, 12 village health care volunteers, 7 Buddhist monks, 6 community leaders, 2 public health officers, and 2 sub-district administration organization officers. These participants are the key persons who will drive the model in the future after the researcher fading out from the project. In addition, there was a programmer who developed the application on smartphone for mosquito larva indices.

2.3. Study Instruments

The research instruments were 1) DHF epidemic risk area assessment form, 2) interview form of policy and support for DHF prevention and control, 3) index of mosquito larva form, 4) questionnaire of knowledge attitude practice co-operation and community learning, 5) DHF prevention and control kit, and 6) mosquito larva index application on smartphone (Mosq. App). The instruments were ascertained for content validity and reliability of measure.

2.4. Data collection

There were 2 phases of model development. The data collection in each phase depended on the purpose of data utilization as shown in Table 1.

Table 1. Activity or tool, data, and data analysis of the model development.

Activity/Tool	Data	Data analysis
1. DHF epidemic risk area assessment	-Repetitive outbreak -Herd immunity -Incidence of DHF -Physical environment -Population density -Community involvement - BI/HI/CI	- Descriptive statistics - Cut of point =17
2.Policy and support for DHF prevention and control	In-depth interview	Thematic analysis
3. Mosquito larvae detection	-Infested house -Inspected house -Positive container -Inspected container	- HI/CI/ BI
4.Knowledge attitude practice co-operation and community learning of the key participants	Level of knowledge attitude practice co-operation and community learning	Descriptive statistics (Mean / SD/ Percentage/ Frequency)
5.Mosq. App.	-Identified data entry and designed report -GIS of 162 houses	-HI/BI/CI -House location on GIS based on larva indices

6.Improvement plan (for a particular participant)	Selected 20% of worse items from activity#4	Mean SD
7.Comparing knowledge attitude practice co-operation and community learning of the key participants before and after improvement	Level of knowledge attitude practice co-operation and community learning (repeated in the same group)	t-test

3. RESULTS

The research was conducted from January 2020 to September 2021. The Mosq. App was installed in household representatives and key participant smartphone and the results was real time HI/CI/BI reported as shown in figures below.

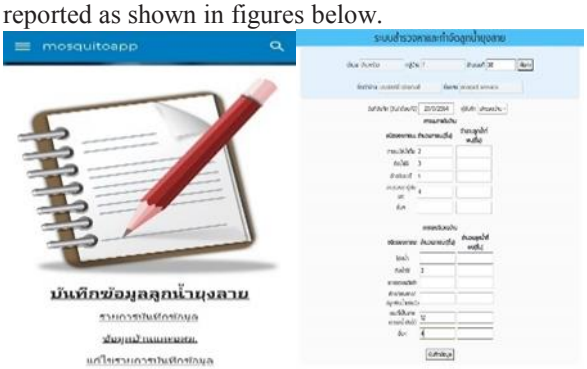

Figure 1. Example of the input for Mosq App.

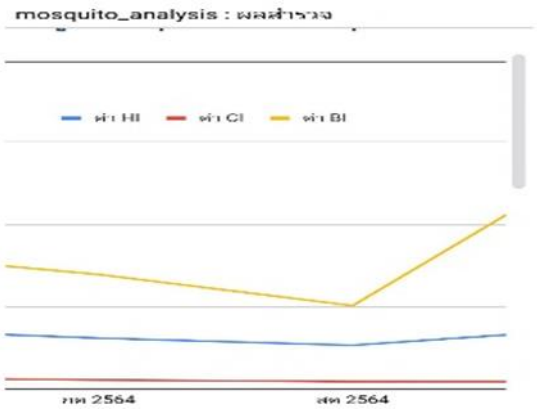

Figure 2. Example of the output for Mosq App.

Figure 3. GIS for HI, CI, BI of household before and after co-creating stage.

After the improvement or co-creating stage, it was found that HI, CI, and BI decreased and none of DHF patient reported. The percentage of increasing ranging from 5- 11 among the knowledge, attitude, practice, cooperation, and community learning (table 2)

Table 2. Comparison of knowledge attitude practice cooperation and community learning of the key participants before and after co-creating phase.

Dimension	**Before (N=197)**		**After (N=186)**		**Diff. ($\bar{x}2 > \bar{x}1$)**	**% of Increasing**
	$\bar{x}1$	**SD**	**$\bar{x}2$**	**SD**		
Knowledge	12.94	2.10	14.22	1.35	1.28	5
Attitude	4.05	0.67	4.36	0.55	0.31	6
Practice	3.70	0.61	4.07	0.57	0.37	7.4
Cooperation	3.33	0.84	3.80	0.74	0.47	9.4
Community learning	3.31	0.52	3.86	0.61	0.55	11

Then, the model was concluded and called **"**Bansaikluay ACER model for dengue hemorrhagic fever prevention and control**".** The ACER model consisted of 4 stages of assessment, co-creating, evaluation and returning**.** Stage 1**:** Assessment stage consisted of 1**)** Identifying involved person, **2)** Assessing HI, CI, BI, and morbidity rate periodically, 3**)** Assessing DHF epidemic risk area, 4**)** Following up the policy and support for DHF prevention & control from related administrators of responsible organizations, and 5**)** Assessing knowledge attitude practice co-operation and community learning of the key participants**.** stage 2**:** co-creating consisted of 1**)** Installing Mosq**.** app**.** on smartphone of household representatives and involved persons including administrators of responsible organizations, 2**)** Developing improvement plan regarding to information in stage a , and 3**)** Co-creating as planed to ascertain that DHF vector is under control**.** stage 3**:** evaluation consisted of 1**)** Comparing knowledge attitude practice co-operation and community learning of the key participants before and after co-creating to assess the improvement of DHF prevention and control, 2**)** Comparing HI/CI/BI/ rate before and after co-creating to assess the effectiveness of co-creating stage and 3**)** Reporting morbidity rate to determine the alternative goal of effective DHF prevention and control**.** Morbidity rate is the lagging indicator of Bansaikluay ACER model for dhf prevention and control**.** stage 4: Returning was required after ace stage accomplished. returning consisted of delivering the acer model, Mosq**.**app and important data to Bansaikluay village to continue implementing the activities in the model for sustainability. The model is presented below.

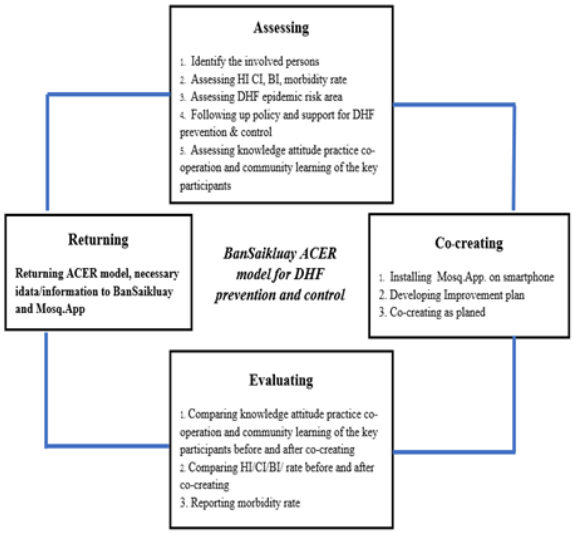

Figure 4. BanSaiKluay ACER model fir DHF prevention and control.

4. DISCUSSION

The BanSaiKluay ACER model for DHF prevention and control is an original model which fits for use in BanSaiKluay village and other villages in the southern part of Thailand which appears similar in physical environment. This model applies Mosq. App. on smartphone of household representatives and involved persons to detect the real time HI, CI, and BI which can act to solve promptly. Moreover, GIS shows the color of houses based on DHF risk which motivate house members to immediately get rid of mosquito larva. Similarity to Chaiya, BanPoh, and Koksak model, the community involvement is very strong and expected to sustain. However, the refinement of ACER model is required for more effectiveness.

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