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MODEL DEVELOPMENT FOR OUTBREAK OF DENGUE FEVER SURVEILLANCE SYSTEM IN DISTRICT LEVEL

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ABSTRACT: There is reportedly confirmed that the number of epidemics of dengue fever has increased. Use of health surveillance system on epidemic of dengue fever at the district level is restricted. A study to develop a suitable Model for Outbreak of Dengue Fever Surveillance System (MODFSS) in district level. The 60 participants, including 3 government officers leaders, 10 local leaders, 3 specialists, and 44 village health volunteer of participating in the development of the model. The present study utilized three sets of a database, reported on a monthly basis. These included dengue fever cases, notification in advance of the mosquito breeding sources, problems and obstacles of the related organization and epidemic of dengue fever by the local community leaders. The five approaches to develop of the MODFSS included situational analysis, prototype system design, system test, system improvement and model dissemination. This study was conducted in 10 communities. The MODFSS model application was created at the district level. The model evaluated and monitored epidemic of dengue fever practices of prevention and control actions in communities. The five important constituents of the MODFSS were 1) organizations of epidemiology networks, 2) indicators of epidemic, 3) data collection tools, 4) data analysis and 5) dissemination of information. The MODFSS consisted of six core activities (detection, registration, confirmation, reporting, analysis and suggestion) and four support activities (communication through meeting and brainstorming, training, supervision and resource-provision). The developed MODFSS is an effective of health surveillance suitable for district level.

Keywords: Model Development, Outbreak, Surveillance System, Dengue Fever

1. INTRODUCTION

There is reportedly confirmed that the number of epidemics of dengue fever has increased, especially in tropical and subtropical regions distributed globally. Dengue fever(DF) is an acute infectious disease the mosquito Aedes aegypti-borne is responsible for transmitting the dengue virus (DENV) between human [1]. In Thailand, with a population of over 65.12 millions in 2014[2] was around 39,569 cases of dengue fever and morbidity rate was 61.75 for dengue fever per 100,000 in 2014. Of which, they were aged between 5 to 34 years. Their occupations included students (46.1%), pre-school child (19.2%), employed(17.7%) and others (17.0%), respectively[3].

The national policy of Thailand has placed dengue fever on the national strategic since the last decade up to present[4]. However, there were some problems in operation of the policy into real practice the control on dengue fever such as organizations system , authority of local related organizations, local legislation and regulation of dengue fever control[5].

Since there is restricted use of public health surveillance system in dengue fever at the district level in Thailand, this research aimed to study and develop suitable dengue fever surveillance system in district level. Findings will indicate the effective model for bottom up dengue fever surveillance system suitable for communities at the district level. Consequently, reported data, information and message deriving from the surveillance model will aid appropriate solutions in prevention and control of dengue fever, control of major breeding sources of mosquitoes, and people potentially at risk relevant to problems and needs of the district level.

2. MATERIALS AND METHODS

This research was carried out from June, 2014 to June, 2015 in 10 communities located in Bang Yi Rong Sub-district, Bang Khonthi District, Samut Songkham Province, Central Thailand. It consist 60 participants from all sectors involving with dengue fever in the participating in the model development. These included direct responsible government officers leaders (3), local leaders(10),

university specialists(3), and village health volunteer(44). For design, monitoring and evaluation of the developed MODFSS model. The study utilized three sets of database reported on a monthly basis, such as databases included dengue fever cases, notification in advance of the mosquito breeding sources and problems and obstacles of the related organization and epidemic of dengue fever by the local community leaders. The study used five-processual step approach and began with situational analysis of Step 1 and followed by reforming the existing surveillance system into the developed MODFSS of Step 2 to Step 4. Step 5 involved dissemination of the MODFSS.

2.1 The Research Step

Each step yielded specific and measurable outputs and outcomes that guide the next steps.

2.1.1 Research step 1: Situation analysis.

This step involved assessment of the current community context, environmental condition, status of the dengue fever surveillance system and action by using secondary data sources, survey, observation, interview, and meeting. This step led to finding about the strengths and weaknesses of the existing situation and the current system.

2.1.2 Research step 2: Prototype system design.

This step included creation and reformation of the working committee, stakeholders and networks in the dengue fever surveillance system in the district with an assistance of the university specialists. Through the support activities such as meeting and brainstorming using information derived from research step 1.

2.1.3 Research step 3: System test.

This step focused on carrying out the process-oriented action steps developed and started the full implementation of the developed MODFSS in the existing condition to achieve goals and objectives of the model. It allowed the working committee and stakeholders/networks to assess effectiveness of the model and to help identifying problematic areas in the processes of model implementation.

2.1.4 Research step 4:

System improvement. This step involved modification of the MODFSS and setting guidance for monitoring and evaluation of the overall reform progress of an implementation. Its end result of this step guided to the effectiveness of the MODFSS suitable for local communities at the district level.

2.1.5 Research step 5: Model dissemination.

This step involved transferring of the newly developed model (MODFSS) for further implementation in other areas.

2.2 Research Tools

This research utilized both quantitative and qualitative data collection tools. Quantitative data were collected by using three forms of record sheets of the surveillance system, MODFSS1-MODFSS3 to elicit data on,

1) dengue fever cases

2) Index and to identify the major breeding sources of mosquitoes, House Index(HI), Container Index(CI), Breteau Index (BI), and

3) people potentially at risk

In addition, it also used qualitative data were obtained by using focus group discussion, secondary data review, and participant observation in the meeting and brainstorming sessions of the working committee, networking groups and stakeholders.

2.3 Data Analysis

Quantitative data on arrested dengue fever cases, index and to identify the major breeding sources of mosquitoes, and reported people potentially at risk, and were analyzed by using descriptive statistics such as frequency, percentage, rate, average and standard deviation. Qualitative data were analyzed by using content analysis.

The study was approved by the Ethics Review Committee for Research Involving Human Subjects, Sirindhorn College of Public Health, Khon Kaen, Thailand (number 050/2557).

3. RESULTS

Bang Yi Rong Sub-district, Bang Khonthi District, Samut Songkham Province was a comprised 10 communities, based on its total population of 1,978 in 2014, there were 1,184 population aged 5-34 years (59.8%) currently living in the area. Results on situational analysis on community context and existing dengue fever surveillance system, and the developed MODFSS were described as the following.

3.1 Situational Analysis

The results of the study reflected community context of Bang Yi Rong Sub-district, Bang Khonthi District and its existing dengue fever surveillance system.

Community Context: The study found that there were numbers and rate of dengue fever treatment between January to May, 2015 in the areas report to 26 cases (79.5 per 100,000 population). Of which, they were aged between 2 to 72 years(Mean 25.1 years). Their occupations included students (37.4%), employed(33.0%), self-employed (10.5%) and others (19.1%), respectively.

Existing dengue fever Surveillance System: The dengue fever surveillance system on epidemic of dengue fever at the district level is limited. As a result, the incomplete data management could impair solutions to help solve the dengue fever problems of the people in responsible areas.

3.2 The Developed MODFSS

The development of the MODFSS in this current study grew out from the restricted management of dengue fever data generated among authorities and responsible staffs at district level. Using five-process approach for model development, the attributes of the developed MODFSS, including system structure, delineated as the followings.

3.2.1 The system structure:

The structure of the developed MODFSS comprised three important attributes: responsible organizations of epidemiology networks, indicators of epidemic situation, and dissemination of dengue fever information.

3.2.1.1 Responsible organizations of epidemiology networks: The developed MODFSS comprised of staff from both government and private organizations and networks to contributed in the collaborative work. There were five responsible groups: 1) Government official group, including the Public Health Chief Officer, Nurses, and Public Health Officers; 2) Local politician group, including the Mayor, Vice Mayor, and Alderman; 3) Community leader group, comprising heads of the sub-district and communities; 4) Volunteer group comprising village health volunteer, and 5) Expert group, included the specialists from Suan Sunandha Rajabhat University (College of Allied Health Science) and Sirindhorn College of Public Health, Khon Kaen. Each group had to either carry out dengue fever surveillance tasks, or participate in the monthly meeting, or both. Details of the roles and activities of each responsible organization and network were shown in Table 1.

Table 1 Dengue fever surveillance activities and support activities divided by the responsible organizations and networks.

Organizations/ Networks	Dengue fever surveillance activities						Support activities			
	Detection	Registration	Data collection	Reporting	Analyses	Feed back	Communication	Training	Supervision	Resource provision
District level										
District Health Center		x				x	x	x	x	x
Sub-district level										
Health Promotion Hospitals	x	x	x	x	x	x	x	x		
Sub-district Administration Organizations	x		x	x			x			
Community Leaders	x		x	x			x			
Village Health Volunteers	x		x	x						

3.2.1.2 Indicators of epidemic situation : Using database on monthly dengue fever cases generated by the Ministry of Public Health , the indicators for determining dengue fever situation in communities had been modified from its original source (Ministry of Public Health). Such modified indicators were then divided into two groups: Index and to identify the major breeding sources of mosquitoes, HI, BI, CI, and people potential at risk.

Group 1-Indicator of dengue fever cases. The indicator for determining morbidity rate of dengue fever cases were divided as the following alarming signs were served as indicators for taking precaution on of dengue fever cases problems in the area: if there were more than 20.0% of the median of morbidity rate of dengue fever over the last 5 years.

Group 2-Indicators of major breeding sources of mosquitoes. The indicators for determining major breeding sources of mosquitoes were divided into three categories. These included indicators for House index (HI), Container index (CI), and Breteau index (BI). The following alarming signs were served as indicators for taking precaution on of dengue fever cases problems in the area: 1) HI: having more than 5.0 % of houses

infested with larvae and/or pupae; 2) CI : having more than 2.5% of water-holding containers infested with larvae or pupae; and 3) BI : having more than 2.5 of number of positive containers per 100 houses inspected.

Group 3- Indicators of people potentially at risk. The indicators for determining enabling factors of the people potentially at risk were divided into two categories, including proportion of people potentially at risk and existing dengue fever risk area. The following indicators served as alarming signs for taking precaution on dengue fever problems pertaining to people potentially at risk in the area: 1) having people with dengue fever risk behaviors more than 5 per 1,000 population and 2) having more than 5 of number of positive areas per 100 houses inspected.

The above indicators inter-wovently served as information and guideline leading to appropriate public actions in prevention and control of dengue fever in communities at a district level.

3.2.1.3 Dissemination of dengue fever information: The developed MODFSS recognized the importance of transferring raw data obtained from the surveillance system into information and message to guide public actions, particularly prevention and control of dengue fever problems in the target communities. Consequently, data dissemination in this newly developed model was done by several means to both public and private sectors. These included communication through meeting and brainstorming among working committee and staff in responsible organizations and networks, as well as reporting to local leaders and village health volunteers.

4. DISCUSSION

At the initiation period, the first application of surveillance system in public health in global was in disease prevention and control[6],[7]. Application of surveillance in dengue fever in Thailand was recent, started in 1958. However, the surveillance systems previously set up were not consistently and continuously operated[8]. In addition, an existing dengue fever surveillance system does not reach its full coverage. Consequently, there was limited use of dengue fever surveillance system in district level . This current study provided ways to sustainable the dengue fever surveillance system in district level. The newly developed MODFSS in this study was effective for system, findings also indicated the use of information related to dengue fever in several public actions, including prevention and control of dengue fever problems, as well as suppression of such problems.

Dengue fever surveillance system in Thailand basically utilized 2 principal strategies prevention and control such as control of mosquito breeding sources and public health education. Unlike the situation in the Singapore that had implemented the successful dengue fever control by making use of 3 principal strategies, source reduction of Aedes aegypti population, public education, and law enforcement[5]. Consequently, the use of Dengue fever surveillance system in Thailand was more likely to benefit public actions in regards to prevention and control tasks rather than for curative law enforcement. Furthermore, a policy does not focus on developing active surveillance. On the other hand, general surveillance system used in the have focused on passive surveillance[6], [7] ,[9].

The MODFSS in this study is useful for determining magnitude of dengue fever problems for it provides early warning signs of occurrences of emerging problems. The data has gathered from hospital registration and records, survey of mosquito breeding sources, and people potentially at risk. In addition, this MODFSS was effective and simple for usage in communities[10]. Finally, the MODFSS developed in communities at Bang Yi Rong Sub-district, Bang Khonthi District is recommended to be further utilized in other districts elsewhere.

5. CONCLUSION

The MODFSS developed in this current study was a bottom up and effective form of public health surveillance suitable for communities at a district level. A surveillance system of dengue fever in communities has effectively for monitored a dengue fever problems . A completeness to develop surveillance system has to attention from public sector was a key success factor.

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