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Community capacity for sustainable community−based dengue prevention and control: study of a sub−district in Southern Thailand

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ABSTRACT

Objective: To assess the level of community capacity for dengue prevention and control and to study household environments and larval indices in southern Thailand. **Methods:** A cross−sectional survey was designed for the study, enrolling two communities with higher dengue incidence rate than the standard over the past five years. Data gathering was conducted by the dengue leader group (DLG), including 15 leaders and 15 non−leaders trained by the research team. The dengue community capacity assessment tool (DCCAT) for leaders (115 items, 14 domains) and non−leaders (83 items, 11 domains). Participants were selected by the DLG based on their communities´ dengue risk. In the low−dengue incidence (LDI) community, 32 leaders and 177 non−leaders were selected; while in the high−dengue incidence (HDI) community, 31 leaders and 199 non−leaders were chosen. **Results**: The leaders from the LDI and the HDI communities demonstrated high levels of dengue community−capacity (360.47 ± 58.82, 416.22 ± 57.72). Non−leaders in the LDI community demonstrated a moderate level of dengue community capacity competence (205.90 ± 60.76), while the non−leaders in the HDI community had a high level (254.78 ± 50.34). **Conclusions**: These initial levels of dengue community capacity serves as a baseline for diagnosing each community. For a community that needed to improve its capacity, the DCCAT is essential tool to conduct a pre−post intervention assessment or a serial assessment. A participatory approach is taken to enable local communities to carry out anti−dengue efforts on their own, rather than have intervention by an outsider.

1. Introduction

Dengue is a serious public health problem, and its solution must come from a community−based approach[1−8], due to several factors[9−12]. Previously, a new paradigm for changing its epidemiology involved a community−based program[11,13] to identify such elements as setting, targets, agents, and resources of intervention[14], but this program was not very successful because it lacked sustainability[11,13,15]. Sustainability is measured differently based on the specific situation. In this study, sustainability of community−based dengue prevention and control is defined as the successful outcome of community capacity building for dengue prevention and control, and is measured by community capacity for sustainable dengue prevention and control, the housing environment, larval indices, consisting of the Breteau Index (BI), House Index (HI), and Container Index (CI), and the epidemiology index for the morbidity rate and mortality rate of dengue[4,16−18].

To achieve sustainability, community capacity building is a necessary intervention process which increases a community´s competence to define, analyze, evaluate, and act on the health concerns of its members[19−21]. It is not only concerned with the large−scale prevention and control of communicable diseases, but is also focused on individual protection within communities[22]. Community capacity building, community capacity, and the community capacity domains are related. Community capacity is the ability of a community to conduct anti−dengue efforts, and the domains

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of community capacity are based on specific situations or areas[19, 23–27]. The domains of dengue community capacity were defined as a set of characteristics relating to dengue prevention and control undertaken by leaders and non–leaders in the community. These capacity domains were developed and measured by the dengue community capacity assessment tool (DCCAT).

In Thailand, dengue has been a significant public health problem for the past thirty years. The effectiveness of dengue treatment has improved but the mortality rate is still higher than the Ministry of Public Health´s disease standard. The Ministry of Public Health´s most recent plan calls for a morbidity rate that does not exceed twenty cases per 100 000 people and a mortality rate which does not exceed 0.2%. This was the Ministry of Public Health´s "Plan 9", in line with the 9th National Social and Economic Development Plan for 2002–2006. Due to the changing nature of dengue in Thailand, the disease is difficult to manage by case management. Although the mortality rate has decreased in hospitals, the morbidity rate has unfortunately increased in all areas. The southern area, especially, has seen higher dengue incidence than other areas, possibly due to factors such as a greater number of rainy days, the amount of rainfall, the relative humidity, and a warmer temperature[28].

If a community needs to build capacity of community, it must assess its current dengue community capacity level as a baseline measurement, implement the intervention steps, and conduct a reassessment[23–25]. The assessment capacity of community against dengue is the first step of community capacity building. The objective of this study was to assess opinions on levels of dengue community capacity among leaders and non–leaders in the concerned communities, to survey household environments, and to take larval indices from communities with both low and high rates of dengue incidence. The results of this study can be used as baseline data and basic information to plan future strategies for dengue prevention and control.

2. Materials and methods

The study was revised and forwarded to the International Review Board (IRB), the Ethical Review Committee for Research Involving Human Research Subjects, the Health Science Group, and Walailak University. The cross–sectional survey used the community participatory approach. It involved three steps: community preparation, community assessment and community consensus.

2.1. Community preparation

The second district of Nakhon Si Thammarat province, Southern Thailand, and the Pakpoon sub–district of the Muang district in Nakhon Sri Thammarat were selected using purposive criteria: a low dengue incidence (LDI) community and a high dengue incidence (HDI) community.

The dengue leader group was a data collection team consisting of 15 village health volunteers (VHVs) and 15 other available villagers. VHVs were community members who took responsibility for implementing dengue control activities in a community, covering about 15 to 20 households each. These villagers partnered with the village health volunteers in carrying out dengue prevention and control activities.

The dengue support team consisted of a health worker representative who was involved with dengue solutions in the communities, local administrative officers, and the researcher. The team supported and facilitated the activities for building community capacity, such as meeting with and training the dengue leader group (DLG) to increase its members´ dengue knowledge.

2.2. Dengue community–capacity assessment tool

The DCCAT was developed and tested by both qualitative and quantitative methods [29–31]. The format consisted of four parts: general characteristics, dengue community capacity, household environment observation form with open ended questions, and larval indices survey form. These forms in part were actually old entomological vector surveillance forms, consisting of the following indices: HI, BI, and CI, which were calculated to indicate the density of dengue occurrence. The DCCAT contained separate questionnaires for community leaders and non–leaders. The dengue community capacity questionnaire for leaders contained 115 items over 14 domains. It produced the best fit regarding content validity (CVI=0.90), construct validity (commutative percent of variance=57.58), and Cronbach´s alpha coefficient (0.98). The dengue community capacity of non–leaders questionnaire covered 11 domains totaling 83 items. Factor analysis produced the best fit for content validity (CVI=0.91), construct validity (com % of variance=57.11), and Cronbach´s alpha coefficient (0.97).

2.3 Participants and sample size

The responsible parties for dengue prevention and control intervention included two groups in the communities: non–leaders and leaders[4, 25, 26]. The leader groups of the two communities contained 32 and 31 members, respectively. The leaders group consisted of representatives holding both formal and informal leadership positions, i.e., local administrative officers (LAO), health care workers, school health teachers, community political leaders, religious leaders, village health volunteers, students, and community club members. They were selected by health workers based on their positions and responsibilities concerning community dengue activities. The two non–leader groups contained 177 and 199 members, respectively. The non–leaders group was considered the group with the ability to achieve sustainable dengue prevention and control activities. They were representatives of households in the communities selected by the dengue leader group. Members of both groups were required to have resided in their respective communities for more than one year, to be eighteen years of age or older, to be fluent in communication, and to be available for the study. Concerning the demographics of both communities, nearly all participants were female, Buddhist, married, possessing a basic elementary education, and employed in unskilled labor positions. The average age, monthly income, and community position of leaders in both communities was similar, and the same was true of the two non–leader groups. In an entomology survey involving a large community of more than 300 households, a sample size of approximately 10%, or 100 households, should be taken[4]. In this study, the high and low dengue incidence communities contained 473 households and 375 households, respectively.

Consequently, 100 non–leader participants and 30 leader participants were selected. This number of participants was considered sufficient to cover the entire area of the communities.

2.4. Data collection

Researchers and the DLG, who were well trained in data collection, introduced themselves and presented the objectives of the study to community council representatives. They then met a health worker for assistance in collecting data and making the objective of the study clear to participants. Next, they obtained consent from participants at the first session and began collecting data.

2.5. Data analysis

The data analysis followed data collection and was aimed at evaluating sustainable community–based dengue prevention and control. Both descriptive and inferential statistics were used in this study. The characteristics of participants were analyzed using descriptive statistics, such as percentage, mean, median, range, and standard deviation.

2.5.1. Level of dengue community capacity

Dengue community capacity was analyzed with descriptive statistics and was divided into different domains for each group of participants. The dengue community capacity questionnaire for leaders consisted of 115 items covering 14 domains. The mean scores ranged from 0–575 and were divided into five levels for ranking purposes: 0–115 being very low, 116–230 being low, 231–345 being moderate, 346–460 being high, and 461–575 being very high. The questionnaire for non–leaders consisted of 83 items divided among eleven domains. The mean score categories were 0–83 as very low, 84–166 as low, 167–249 as moderate, 250–332 as high, and 333–415 as very high.

2.5.2 Larval indices

Standard larval index surveys[33] as epidemiological indicators of dengue transmission should be viewed with caution. The three traditional larval indices were: HI, the percentage of houses infested with larvae and/or pupae; CI, the percentage of water–holding containers infested with larvae and/or pupae; and BI, the number of positive containers per 100 houses inspected.

2.6. Community consensus

The main activity in the community consensus step was a series of workshops attended by the members of DLG and the dengue support team, as well as the researchers and other stakeholders who were involved in dengue prevention and control in the communities. Research results were presented at the meetings, and plans and strategies to solve problems were discussed.

3. Results

Concerning the average time spent on dengue education in the past 12 months, the LDI community (0.50 ± 0.50, 0.32

±0.86) scored lower than the HDI community (3.32 ± 3.38, 0.78 ± 1.67).

Almost half (50.0%) of the leaders and a few of the non–leaders (15.8%) in the LDI community, and most of the leaders (83.9%) and one–third of the non–leaders (36.2%) in the HDI community, had received information about dengue prevention and control in the past 12 months.

3.1. Levels of dengue community capacity

Table 1 showed various levels of dengue community capacity for leaders in the LDI and HDI communities. One of the 14 domains for leaders, the "sense of community" domain, had a very high result. Half of the domains (7) had results at high level and 6 domains had results at moderate level. In the HDI community, almost all of the 14 domains were rated highly, only the "religious leader capacity" had a moderate score.

Table 1

Level of dengue community capacity for leaders in the LDI and HDI communities(mean$\pm$SD).

Domains of leaders	Leaders in LDI community (n=32)	Leaders in HDI community (n=31)
L1: Critical situation management	30.34±4.61*	34.25±6.46*
L2: Personal leadership	40.09±7.15*	45.51±4.47*
L3: Health care provider capacity	27.91±5.70*	32.70±4.06*
L4: Needs assessment	25.84±4.96*	29.87±6.08*
L5: Sense of community	44.31±6.45☆	43.35±8.40*
L6: Leader group networking	34.13±7.63*	39.29±10.53*
L7: Communication of dengue information	27.56±10.46△	32.77±7.94*
L8: Community leadership	22.00±7.31△	29.12±5.20*
L9: Religious leader capacity	21.13±9.74△	25.93±11.40△
L10: Leader group and community networking	23.31±5.13*	24.22±6.62*
L11: Resources mobilization	9.88±4.01△	13.19±4.07*
L12: Dengue working group	16.53±6.26△	20.41±4.63*
L13: Community leader participation	17.88±3.85△	22.96±3.25*
L14: Continuing activities	19.56±4.34*	22.58±3.73*
Total	360.47±58.82	416.22±57.72*

*:High, ☆: very high, △: moderate.

Table 2 showed that for non–leaders, the LDI community scored moderately on average regarding dengue community capacity, whereas the HDI community scored at high levels. In the LDI community, 2 of the 11 domains, the "sense of community" domain and the "needs assessment" domain, did come back at high levels. Half of the domains were found to be at moderate levels, while the religious leader capacity domain, communication of dengue information domain, and resources mobilization domain were rated low. In the HDI community, 6 domains were rated high and 5 domains were rated moderately.

Table 2
Level of dengue community capacity for non–leaders in the LDI and HDI communities (mean±SD).

Domains of Non–leaders		Non–leaders in LDI community (n=177)	Non–leaders in HDI community (n=199)
NL1:	Critical situation management	33.66±12.17*	40.65±10.31☆
NL2:	Personal leadership	20.46±8.39*	24.53±6.05*
NL3:	Religious leader capacity	16.60±11.14△	25.27±10.21*
NL4:	Community leadership	18.48±9.06*	23.28±6.53*
NL5:	Health care provider capacity	17.59±5.21*	20.89±4.51☆
NL6:	Sense of community	29.85±6.49☆	30.60±5.19☆
NL7:	Communication of dengue Information	12.98±8.90△	19.38±6.68*
NL8:	Continuing activities	15.19±5.81*	19.10±4.48☆
NL9:	Dengue working group	17.12±7.92*	21.08±5.45*
NL10:	Resources mobilization	10.62±5.01△	14.33±4.30*
NL11:	Needs assessment	13.36±5.34☆	15.68±4.31☆
	Total	205.90±60.76*	254.78±50.34☆

*:moderate, ☆: high, △: low.

3.2. Larval indices

In the LDI community, 201 houses were inspected and 75 were found to be positive for larvae. The larval index values were BI = 185%, HI = 37%, and CI = 16%. The total number of houses inspected in the HDI community was 215, and 129 were found to be positive for larvae. The values were BI = 203%, HI = 61%, and CI = 20%.

In the LDI community, 2 269 containers were inspected in the sample, and 372 (16%) were found to be positive with larvae. Of these, the top ranking positive container types by percentage were discarded containers surrounding domiciles at 38%, waste water containers at 15%, and drinking water containers at 14%. In the HDI community, 2 232 containers were inspected and 438 (20%) were found to be positive with larvae. Concerning type, 48% were containers surrounding domiciles, 23% were water containers in bathrooms, and 18% were drinking water containers.

3.3. Household environment

Of the 209 LDI households and the 224 HDI households, most were stand–alone, scattered homes (68.0% and 64.7%, respectively). Half of the people in the LDI community (50.2%) had houses surrounded by untidily discarded containers, and the HDI community was similar at 49.6%. Most people in the LDI community (44.5%) resided in a rural area near a market, and this statistic was even higher for the HDI community (52.2%).

4. Discussion

The high level of dengue community capacity for leaders

and the moderate level for non–leaders in the LDI community generally indicate a fairly strong existing capacity. More than half of the domains for leaders were highly rated, and half of those for non–leaders were moderately rated. There were 3 domains for non–leaders which were rated at low level: religious leader capacity, communication of dengue information, and resources mobilization. For both leaders and non–leaders in the LDI community, the average dengue–education time in the past twelve months was less than the statistic for the HDI community. In the HDI community, the dengue community capacity of both leaders and non–leaders was at a high level on average; almost all the domains for leaders were rated highly and half the domains for non–leaders were rated moderately. There were naturally some domains of dengue community capacity for participants in the LDI community that were rated at lower levels than the corresponding HDI community domains. In the LDI community, the three indices were lower than in the HDI community.

Half of the households (50.4%) studied in the HDI community had houses with tidy surroundings, while the other 49.6% had things like old tires, broken jars, cans, and coconut shells in the yard. For houses with untidy yards, the dengue indices were higher than the standard levels from the Thai Ministry of Public Health (BI = 203%, HI = 61 % and CI = 20%). Measures such as larval indices, household environments, and types of containers rated positive for larvae, were not consistent between leaders and non–leaders. The results show that one single measurement cannot be used to compare communities because there are several factors relating to sustainable community–based dengue prevention and control in communities. However, communities can use statistics, such as the levels of leaders and non–leaders for the various domains, as baseline data for developing their capacities, and for conducting reassessments after future interventions.

Both communities need to build their capacity in the domain of religious leader capacity because successful *Aedes aegypti* control requires shared responsibilities, the participation of all stakeholders, and good communication of dengue–related information [21,33–35]. Single assessments may be the most useful for making decisions to build community capacity for dengue prevention and control. If communities need to develop their capacity for dengue control, then pre–post intervention assessments or serial assessments should be designed that incorporate feedback, with the goal of improving community capacity. Multiple measures across time are essential for sustainable community–based dengue prevention and control [20–23,36].

A community participatory approach is enable local communities to carry out dengue activities, rather than outsiders doing so. The study confirms the potential for community capacity building in sub–districts to sustain community–based dengue prevention and control, based on assessment, development, implementation, and reassessment. The DLG or the dengue working group in each community is important. These teams are responsible for discussing and sharing their opinions on dengue information, activities, and resources, in order to improve

planning and better create strategies for dengue prevention and control. The groups involved were in agreement with the study concerning the achievement of sustainable community–based dengue control [26].

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

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