https://doi.org/10.47811/bhj.04 ORIGINAL ARTICLE

The effects of a behavioral change program in reducing the house index of mosquito larvae in households in Phetcabun province, Thailand

Ugyen Tshering[1], Kamonchanok Pooma[2], Kiratikarn Meksaengsee[3], Nongnooch Aiemsa-ard[4]

[1]*Gross National Happiness Commission, Tashichhodzong, Thimphu, Bhutan*
[2-4]*Ministry of Public Health, Thailand*

ABSTRACT

Introduction: The purpose of this quasi-experimental research was to study the effectiveness of a behavioral change program in reducing house index of mosquito in Village Baan-Wangpong, Lomsak district in Phetcabun province, Thailand. **Methods:** The sample size of experimental and control group was 42 representatives of household in each group. Representatives of each sampled household were tested for knowledge, perception and behavioral practice in prevention of dengue fever before and after the program intervention. The program included training on dengue fever prevention by health personnel, demonstration of making mosquito repellents from local product, organising an awareness contest, broadcasting health messages through media and surveying households for mosquitoes' larvae. **Results:** The study found that most households in village Baan-Wangpong had low knowledge (60.4%), perceived risk (60.4%), perceived severity (64.6%) and behavioral practice (77.1%) in the prevention of dengue fever prior to the program, with comparability in intervention versus control. The results showed that after the program intervention, the experimental group had a significantly higher level of knowledge (p=0.001), perceived risk (p=0.042), perceived severity (p=0.002) and behavior (p=0.028) in preventing dengue fever than before the program intervention and higher than the control group post-intervention. The experimental group's house index was also significantly (p=0.001) lower than before the program and lower than the control group post-intervention. **Conclusions:** This study suggests that a proactive program about knowledge, perceptions and behaviors on prevention of dengue fever with support from public health personnel and community participation, can positively change health behavior, resulting in reducing the house index of mosquito larva.

Keywords: Behavioral change program; Dengue fever; House index of mosquito larvae.

INTRODUCTION

Dengue fever is a mosquito-borne infection that causes a severe flu-like illness[1]. The symptoms include fever, hemorrhage, shock and death mainly in young children or tourists[2]. In the last 50 years, dengue incidence has increased 30-fold with increasing geographic expansion to new countries[3]. Over 2.5 billion people, over 40% of the world's population are now at risk from dengue. World Health Organisation (WHO) currently estimates 50– 100 million dengue infections worldwide annually[4]. In Thailand, dengue fever was first reported in 1958 and it has infected both children and adults since then[5-7]. The case numbers rose from 51 cases in 2006, rising to a peak at 156 cases in 2008 and declining to 76 cases in 20098. As of 29th October 2013 there were 137,221 dengue cases with 128 deaths in the country, resulting to the morbidity rate of 213.5 to 100,000 population[9]. Phetcabun province is ranked 9th in the country regarding the highest incidence rate of dengue and Lomsak district was ranked 2nd in the province. In 2012, 5 cases were reported in village of Baan-Wangpong, resulting an incidence rate of 1,042 per 100,000.

Corresponding author:
Ugyen Tshering
utshering@gnhc.gov.bt

In this setting, measures are needed to reduce the incidence of dengue fever. We hypothesized that a household and community-level intervention of health education could significantly improve dengue knowledge and awareness and positively change people's behavior with respect to prevention. Moreover, such an intervention would have an impact on mosquito larva indices. We therefore conducted a quasi-experimental design in two villages in Phetchabun province.

METHODS

This research was a quasi-experimental research by using the PRECEDE-PROCEED framework theory and the health belief model (HBM) including concepts, theories and related researches to the applications of arranging activities for family's representatives in creating behavioral changes to prevent dengue fever[10].

The health belief model was one of the first theories of health behavior and remains one of the most widely recognized in the field. The HBM theorizes that people's beliefs about whether they are at risk for a disease or health problem and their perceptions of the benefits of taking action to avoid it. Precede framework is structured as a participatory model, to incorporate the ideas and help of the community. Community involvement is also a means of building community ownership of the intervention, leading to more community support and a greater chance of success.

The purpose of this quasi-experimental research is to study the effectiveness of behavioral program to the reduction of house index of mosquito in household at village Baan Wangpong, Laanba sub-district, Lomsak district in Phetcabun province.

Research Design

The research was a quasi-experimental research with Pretest – Posttest Two Groups design. Both experimental and control group had their knowledge, perceptions and behaviors in prevention of the dengue fever assessed before and after the experiment. An experimental group was given training on dengue fever prevention by health personnel, demonstrating making mosquito repellents from local products, organising an awareness contest, broadcasting health messages through media and surveying households for mosquitoes' larvae while the control group was not given any training

Population and Sample

The sample in this research has experimental group of 42 representatives of families from village Baan Wangpong, Laanba sub-district, Lomsak district in Phetcabun province and control group of 42 representatives of families from village Dongmuang, Laanba sub-district, Lomsak district in Phetcabun province. This research was approved by ethical committee of Department of Community Health, Faculty of Public Health, Naresuan University. Moreover the participants gave their informed consents to participate in the research.

An a prior sample size of 42 households per study arm was estimated based on an estimated effect size of a 20% reduction in mosquito larva index, a significance of 0.05, 80% power, and a z-test for the difference in mosquito index intervention vs. control. The selection of participants was done by random selection in two targeted villages having participants of same age, sex, ethnics, cultural background, and socioeconomic status. The inclusion criteria for sample size were: are the representatives of households falling under the area of study; not physically and mentally disabled; can understand and speak Thai language and has voluntarily consented to participate in this study.

Procedures

The study of this research started from 13 November 2013 to 13 December 2013.

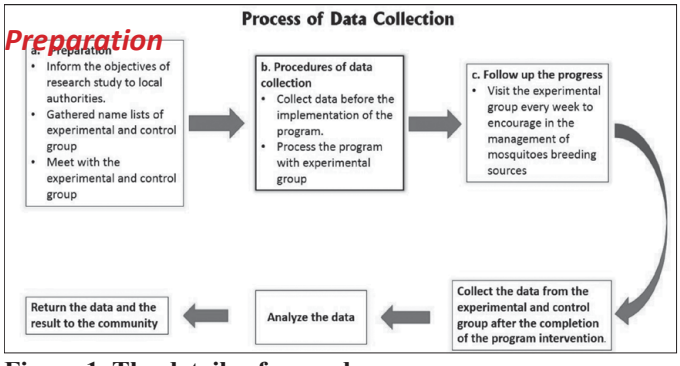

Figure 1. The details of procedures

Firstly, the information about the objectives of research study was provided to the health officials of Ngewngam Sub-district Health Promotion Hospital and other local authorities. The information about the representatives of families from village Baan Wangpong (experimental group) and village Dongmuang (control group), Laanba sub-district, Lomsak district in Phetcabun province was gathered. After meeting with the experimental and control group, information on the objectives of this study was shared and participants were to ask for cooperation in our program intervention.

Procedures of data collection

The data in the questionnaires were collected from both experimental and control group before implementing of the program. Then we implemented number of program activities with experimental group according to the folowing activities: Activity 1 was giving training on knowledge, perceived risk and perceived severity of dengue fever preventing dengue fever by health experts and personnel. In the activity 2 we demonstrated and let participants practice to make herbal mosquitoes repellants. Our activity 3 was broadcasting health messages and advices on dengue fever through village broadcast tower. Then the activity 4 includes taking record on the manual book "We will do away with Dengue fever" and surveying household for mosquitoes' larvae. Last activity was organising the contest called "House free from Mosquitoes' larvae".

The research team visited an experimental group every week to encourage in the management of mosquitoes breeding sources and follow up the progress of eliminating mosquito breeding sites according to the manual. After the completion of the program intervention, the team collected the data from both experimental and control group. Subsequently, study findings were disseminated to the community leaders, village health volunteers and all the participants. The results dissemination was in the form of presentation and giving our full our comprehensive research in both hardcopies and softcopies.

Statistical analysis

The statistical analysis for the study was done by using the software program SPSS (Version 20). The general information was analyzed by descriptive statistics including frequency, means of percentage and standard deviations (SD). However the comparison of difference in knowledge, perceived risk, perceived severity and the behaviors to prevent dengue fever between the experimental group and control group for both before and after the program intervention was done by using Independent t-test. The comparison of difference of knowledge, perceived risk of dengue fever, perceived severity and the behaviors to prevent dengue fever within an experimental group and control group for both before and after the program intervention was done by using Paired Sample t-test.

The comparison of difference of house index of mosquito larvae before and after the implementation of

program within experimental group and control group was done using the statistics McNemar's test. While the comparison of difference of house index of mosquito larvae before and after the implementation of program between experimental group and control group was done using statistics Chi-square. The standard of level of significance was kept at 0.05 for accepting a hypothesis.

RESULTS

The sample has 42 family's representatives of household each from both experimental group and control group from Phetcabun province. In both the experimental and the control group females are more than males at 94.6% and 88.0 respectively (Table 1). The aged group between 40-49 years were highest for both the experimental and the control group at 35.7 and 38.1% respectively. Regarding the profession and education level, majority were farmers and had primary education qualification. It was also found that the most average income for experimental and control group was between 2000-6999 baht at 45.2 and 42.9% respectively. Both experimental and control group has most household members of 3-4 people at 54.8 and 61.9% respectively. There was no differences in the level of knowledge on dengue fever (p=0.82), perceived risk of dengue fever (p=0.62), perceived severity of dengue fever (p=0.14) and the behaviors to prevent dengue fever (p=0.84) between experimental and control group before the program was intervened. The control group did not change over the time period in terms of the knowledge in the prevention of dengue fever (p=0.556), perceived risk of dengue fever (p=0.560), perceived severity of dengue fever (p=0.890) and the behaviors to prevent dengue fever (p=0.846).

It was found that after the program implementation, experimental group had knowledge, perceived risk, perceived severity and behaviors to prevent dengue fever higher than before the intervention of program at the level of significance at 0.001, 0.05, 0.01 and 0.05, respectively (Table 2).

Further, it was also found that the knowledge, perceived risk, perceived severity and the behaviors to prevent dengue fever of experimental group was higher than control group after the intervention of program (Table 3).

The study found that the house index of mosquito for the experimental group and control group before the program did not differ statistically (Table 4). However, after the intervention of program, the experimental group has the house index of mosquito lower than before program intervention at the level of significance at 0.001 (Table 4).

Table 1. Demographic characteristics of family representatives from households in control and experimental groups in villages in Phetcabun province, Thailand, 2013-2014

Household respondent characteristics	Experimental group (n=42)		Control group (n=42)	
	n	%	*n*	%
Sex				
Male	1	2.4	5	11.9
Female	41	94.6	37	88.1
Age				
Below 20	3	7.1	1	2.4
20 - 29	5	11.9	6	14.3
30 – 39	9	21.4	10	23.8
40 – 49	15	35.7	16	38.1
50 – 59	7	16.7	8	19.0
60 years and above	3	7.1	1	2.4
Religion				
Buddhism	42	100.0	42	100.0
Level of Education				
Primary school	21	50.0	26	61.9
Junior high school	14	33.3	13	31.0
High school	3	7.1	2	4.8
Degree and above	4	9.5	1	2.4
Profession				
Not employed	3	7.1	1	2.4
Agriculture	27	64.3	29	69.0
General Contracts	6	14.3	9	21.4
Trade / business,	2	4.8	2	4.8
Private employees	3	7.1	1	2.4
Civil servants	1	2.4	0	0

Experimental group χ= 42.14, SD = 12.371, Min = 18, Max = 68
Control group χ = 41.10, SD = 10.328, Min = 20, Max = 67

Table 2. Comparison of knowledge, perceived risk, perceived severity and the behaviors to prevent dengue fever in the Experimental group Before and After the program, in village Baan-Wangpong in Phetcabun province, Thailand, 2013-2014

Average score	*n*	χ	SD	*t*	df	*p*-value
Knowledge in the prevention of dengue fever						
- Before program	42	12.33	1.41	-3.591	41	0.001
- After program	42	13.83	2.11			
Perceived risk of dengue disease						
- Before program	42	17.79	1.72	-2.098	41	0.042
- After program	42	18.60	1.98			
Perceived severity of dengue fever						
- Before program	42	19.21	2.37	-4.292	41	0.002
- After program	42	21.21	1.79			
Behaviors to prevent dengue fever						
- Before program	42	18.12	2.57	-2.276	41	0.028
- After program	42	19.36	2.08			

SD – Standard Deviation, df- degree of freedom

Table 3. Comparison of knowledge, perceived risk, perceived severity and the behaviors to prevent dengue fever between Experimental and Control group after the intervention of program, in villages in Phetcabun province, Thailand, 2013-2014

Mean score	*n*	χ	SD	*t*	df	*p*-value
Knowledge in the prevention of dengue fever						
- Experimental group	42	13.83	2.11	2.738	82	0.008
- Control group	42	12.64	1.87			
Perceived risk of dengue disease						
- Experimental group	42	18.60	1.98	3.200	82	0.002
- Control group	42	17.38	1.46			
Perceived severity of dengue fever						
- Experimental group	42	21.21	1.79	3.062	82	0.003
- Control group	42	19.86	2.25			
Behaviors to prevent dengue fever						
- Experimental group	42	19.36	2.08	2.064	82	0.042
- Control group	42	18.29	2.64			

SD – Standard Deviation, df- degree of freedom

Table 4. Comparison of house index of mosquito larvae between the experimental and control group before the program intervention and after the program intervention

Sample	Households with mosquito's larvae				
	Yes	No	χ^2	df	*p*-value
Experimental (before)	38	4	1.954	1	0.569
Control (before)	37	5			
Experimental (after)	5	37	21.413	1	<0.001
Control (after)	35	7			

Table 5. Comparison of house index of mosquito larvae in the experimental group and control group before and after the program implementation

Sample	Households with mosquito's larvae		
	Yes	No	*p*-value
Experimental (before)	38	4	<0.001
Experimental (after)	5	37	
Control (before)	37	5	0.250
Control (after)	35	7	

Moreover, we found that the control group had no significant differences of house index of mosquito larvae before and after the intervention of program (Table 5). After the intervention of program, experimental group has the house index of mosquito larvae lower than the control group at the level of significance at 0.001 (Table 5).

DISCUSSION

The study revealed that a community health education program with support for family representatives significantly increased knowledge, risk perception, and preventive behaviors compared to a comparable control community in Thailand. In addition, the intervention significantly improved the house index of mosquito larvae in the experimental group compared to control group. Moreover, all these factors significantly improved for intervention households compared to before the intervention, but not for control households. Together, these results support our hypothesis that the training on dengue fever increased the knowledge in the prevention of dengue fever and perceived severity of dengue fever in experimental group.

This conclusion corresponds with the study by Chomphon Khongjamnong (2009) about the effectiveness of health education program in conjunction with providing social support to village health volunteer with knowledge, perception and behavior in prevention and control of dengue fever of health representatives from family at Bingkrajub sub-district, Wichienburi district, Phetchabun province[11]. His study found that after the implementation of program, experimental group had an average score of knowledge about dengue fever higher than before implementation of program and higher than the control group at the level of significance 0.05. We similarly conclude that the health education program about knowledge, perceptions and behaviors on prevention of the dengue fever on family's representatives with the social support from public health personnel, causes the change of health behaviors. The components of our program demonstrate how the change is accomplished through involving local communities. We recognize limitations of the study. First, the quasi-experimental design does not guarantee that experimental and control communities are comparable on all measures. For example, the experimental community appeared to have higher level of education. This may affect the uptake and success of the intervention. Second, we do not directly measure the incidence of dengue fever. The low number make a full RCT with dengue incidence as the outcome very large. Lastly, there should be assessment for longer duration after the program is implemented.

Despite these limitations, our study supports the beneficial effects of such intervention programs in changing people's behaviors in preventing the incidence of dengue fever. However, further similar studies in urban areas in order to change the people's behavior in preventing and controlling of dengue fever in urban areas is necessary.

CONCLUSIONS

The study concluded that the behavioral change program to reduce the house index of mosquito's larvae in households with the support from public health personnel and community participation contributes in creating health behaviors. It also increase knowledge, perceived risk and severity of dengue fever in participants and influence to change the behavior in preventing dengue fever. The mosquito larvae's house index of households in village Baan Wangpong, Lomsak district in Phetchabun was also significantly reduced by statistics.

ACKNOWLEDGMENTS

The authors express their thanks to Faculty of Public Health for the granting and providing necessary materials. We also expressed our gratitude to all the health staffs of Ngewngam Memorial Health Promotion Hospital. This research was financially supported by the Municipal of Lanba Sub-district, Lomsak District, Phetcabun Province. The authors have no conflict of interest to report.

REFERENCES

1. Medical News Today. What is Dengue fever? What causes Dengue fever? [Internet]. Medical News Today; 2010 Feb 17 [Cited 2013 Dec]. [Full Text]
2. Durman PJ. The Balikpapan Dengue control project. Journal of Rural and Remote Environmental Health. 2002;1(2):35-39. [Full Text | DOI]

3. World Health Organization,the Special Programme for Research and Training in Tropical Diseases . Dengue guidelines for diagnosis, treatment, prevention and control. New ed. France: World Health Organization,the Special Programme for Research and Training in Tropical Diseases;2009. [Full Text]
4. World Health Organization. Dengue and severe Dengue [Internet]. (Unknown place): World Health Organization Media Centre; 2013. [cited 2013 Dec]. [Full Text]
5. Hammon WMD, Rudnik A, Sather GE. Viruses associated with epidemic hemorrhagic fevers of the Philippines and Thailand. Science. 1960;131(3407):1102-3. [PubMed | Full Text | DOI]
6. Chareonsook O, Foy HM, Teeraratkul A, Silarung N. Changing epidemiology of dengue hemorrhagic fever in Thailand. Epidemiology and Infection. 1999;122(1):161-6. [PubMed | Full Text | DOI]
7. Kantachuvessiri A. Dengue hemorrhagic fever in Thai society. Southeast Asian Journal. Tropical Medicine. Public Health. 2002 Mar;33(1):56-62. [PubMed | Full Text]
8. Thailand Bureau of epidemiology. National disease surveillance 1996-2005. Thailand: Department of Disease Control, Ministry of Public Health (Thailand); 2006. [Full Text]
9. Bureau of Epidemiology (Thailand). Weekly epidemiological surveillance report (Thai- land): Department of Disease Control, Ministry of Public Health (Thailand); 2013 April. [Full Text]
10. Raingruber B. Contemporary health promotion in nursing practice. 1st ed.(unkown place): Jones & Bartlett Publisher;1999. 434p. [Full Text]
11. Karen G, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. Public health[Internet]. 2010[cited 2013 Dec];31:399-418. [Full Text | DOI]
12. Khongjamnong, Chomphon. The effectiveness of health education program in conjunc- tion with providing social support to village health volunteer with knowledge, perception and behavior to control dengue fever of health representatives from family at Bingkrajub sub-district, Wichienburi district, Phetchabun province. Forthcoming 2009.

AUTHORS CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

UT: Concept, design, literature search, data collection and analysis, manuscript writing and review.

KP: Concept, design, data collection, manuscript writing and review.

KM: Concept, design, data collection, manuscript writing and review.

NA: Concept, design, data collection, manuscript writing and review.

Author agree to be accountable for all respects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST

None

GRANT SUPPORT AND FINANCIAL DISCLOSURE

None