RESEARCH ARTICLE

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The Effect of Health Behavior Modification Program for Liver Fluke Prevention among the Risk Group in Rural Communities, Thailand

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Abstract

This quasi-experimental research aimed to study the effect of health behavior modification program in relation to knowledge, self-efficacy, expectation, and practice for liver fluke prevention among the risk group from Bueng Samrong sub-district, Kaeng Sanam Nang district, Nakhon Ratchasima province, Northeast Thailand. The total of 66 participants was assigned to experimental and comparison group, 33 participants in each group, 12-weeks intervene period. The experimental group was received health behavioral modification programs based on health education, self-efficacy, motivation, social support and networking. Pre-and-post-tests were measured using predesigned questionnaires. The comparative analysis was analyzed by paired sample t-test and independent sample t-test at the 0.05 level of significance. The results revealed that the experimental group had significantly greater knowledge, self-efficacy, expectation, and practice for liver fluke prevention than those in the comparison group ($p < 0.05$). In conclusion, this was a successful health education program for liver fluke avoidance. Participants were gained the correct knowledge and had the higher self-efficacy, expectation, and practice regrading liver fluke prevention. Therefore, it may useful for further behavior modification in the other epidemic areas.

Keywords: Health behavior modification program- liver fluke- rural communities- Thailand

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Introduction

Liver fluke infection caused by *Opisthorchis viverrini* is the major causative factor inducing cholangiocarcinoma (CCA) in Thailand, Lao PDR, Vietnam and Cambodia (IARC, 1994; Kaewpitoon et al., 2008; Sripa et al., 2010; Sitthithaworn et al., 2012; Kaewpitoon et al., 2015; Edwards et al., 2018). The highest incidence of CCA worldwide leading to about 20,000 deaths every year in Northeast Thailand (Sripa et al., 2010). Liver fluke infection is acquired by ingestion of raw or undercooked cyprinoid's fish harboring infective metacercariae stage (Kaewkes 2003). The infection is endemic among human populations in northeast and north Thailand, where the most common raw fish is frequently consumed (Preuksaraj et al., 1982; Kaewpitoon et al., 2007). Presently, a nationwide survey in Thailand has been reported by Wongsaroj et al (2014) and found that the prevalent was 5.1% where has the highest of prevalent was found in the northeast (9.2%) and north region (5.2%).

Behavior modification programs regarding prevention and control of liver fluke infection are essential for decreasing the disease. Numerous control programs have been implemented in liver fluke endemic areas particularly the highest provinces prevalent (Sripa et al., 2015), but despite initial decreases in liver fluke following the introduction of such programs, rates of CCA remain high in northeast and north. This liver fluke therefore continues to place a severe burden on the health services and need to urgently problem solving. Previously studied indicated that knowledge, attitude, and practice related to liver fluke infection in rural communities (Kaewpitoon et al., 2007). Improvement of high knowledge, perception, and practice regarding diseases, depend on varieties of health education. Boom (1971), Becker and Maiman (1975), and Janz and Becker (1984) indicated that the success behavior modification should be used many methods and continuous intervention. In addition, self-efficacy and social support influencing behavior modification, common used in the health education program (House and Kahn, 1985). According a serious data on liver fluke in the epidemic areas, therefore, this study aimed to study

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the effect of health behavior modification program for liver fluke prevention among the risk group in Bueng Samrong sub-district, Kaeng Sanam Nang district, Nakhon Ratchasima province, Thailand. The health behavior modification program may useful and effective toward liver fluke prevention and control in the epidemic communities.

Materials and Methods

Two-group pre-posttest design quasi-experimental study was approved by the human research ethics committees of Suranaree University of Technology, 2017. The study was performed during June to September 2017 in Bueng Samrong sub-district, Nakhon Ratchasima province, Thailand where has been reported as the epidemic areas (Kaewpitoon et al., 2012). Bueng Samrong sub-district is located in Kang Sanam Nang district, Nokhon Ratchasima province, northeast Thailand. It is 395 kilometers from Bangkok (the capital of Thailand) and has an area of around 43 square kilometers. The sub-district is divided into 9 villages with about 5,484 populations (Figure 1). 66 participants from 5,484 populations who had verbal screened as the high risk score and stool examined by the formalin ether concentration technique, assigned to 2 groups; 33 participants were experimental group and received health behavior modification programs (HBMP), meanwhile 33 participants were designed as a comparison group that without those program. HBMP was applied based on health education, self-efficacy, motivation, and social support concepts regarding liver fluke prevention and control, according program has been shown in table 1 and figure 2-4. The study was intervened for 12 weeks. Pre-and-post-tests waere measured with questionnaires. A predesigned questionnaire containing 5 parts included (1) demographic characteristics; gender, age, marital status, education, occupation, income, past histories related to liver fluke infection, (2) knowledge, (3) self-efficacy, (4) expectation, and (5) practice regarding liver fluke prevention and control. The questionnaires were completed a content validity by 3 experts regarding liver fluke knowledge, and then tryout in closely neighbor communities for reliability test. The questionnaires has reliability value according to knowledge part with Kuder-Richardson-20 (KR-20 = 0.68), self-efficacy, expectation and practice with Cronbach's Alpha Coefficient = 0.70, 0.73 and 0.75. Each questionnaire was analyzed and interpreted for their parts. Evaluation of knowledge was calculated and analyzed according to Bloom (1971). Knowledge with 15 questions, answer correct=1, incorrect=0, and interpreted to high level; ≥80% points, moderate level; 60%-79.5% points, 0-59.5% points; low level. Self-efficacy, expectation and practice level were calculated and analyzed according to Best (1977). Self-efficacy and expectation with 9 questions/ each part; 3 choice (agree, not sure, dis-agree): positive question=3,2,1, negative question=1,2,3, and interpreted to high level; 21.6-27 points, moderate level; 16.2-21.5 points, and low level; 0-16.1 points. Evaluation of practical level with 9 question; 3 choice (frequently, sometimes, never): positive question=3,2,1, negative question=1,2,3, and interpreted to high level; 21.6-27 points, moderate level; 16.2-21.5 points, and low level; 0-16.1 points. Descriptive and analytical statistical data were analyzed with SPSS software. Percentage, mean, standard deviation, paired t- test, independent t- test, the statistical significance level of .05 were employed for data analyzes.

Results

The majorities of participants were female (63.64%), age between 50-59 years old (42.42%), married (75.76%), primary school (71.21%), agriculture (66.67%), and income 1,000-5,000 Baht (42.42%) (Table 2). Of 7

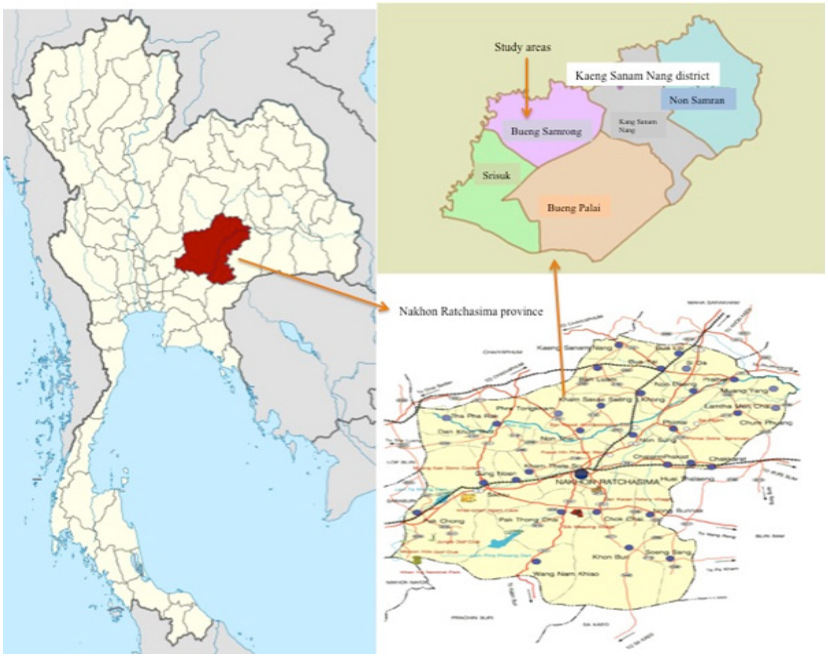

Figure 1. Study Areas was Conducted in Bueng Sarong Sub-District, Kang Sanam Nang District, Nakhon Ratchasima Province, Northeast Thailand.

Table 1. Health Modification Program among the 66 Participants in Each Experimental and Comparison Groups

Time periods	Activities	Outcome
Week 1	Community participatory action with Building relationship	Activities and interested leaders
Week 2	Screening risk group for liver fluke infection by using verbal screening test	Risk group for experimental and comparison groups
Week 3	Collecting data before intervention by health village volunteers using predesigned questionnaires	Score level of knowledge, self-efficacy, expectation and practice
Week 4	Stool collection and examination	Infected patients and treatments
Week 5	Health education based station learning through one day activities learning including **Station 1.** Demonstration of morphology and life cycle of liver fluke; Opisthorchis viverrini using liver fluke adult and egg, Bithynia, cyprinoid fish museum and poster **Station 2.** Demonstration of cholangiocarcinoma (CCA) museum **Station 3.** Health education regarding risk factors, symptoms, pathogenesis, pathology, diagnosis, treatment, prevention and control of liver fluke by facilitators using PowerPoint, poster, brochures **Station 4.** Health education regarding food safety and environmental sanitation by facilitators using PowerPoint, poster, brochures **Station 5.** Case based learning by using VDO clip story of CCA patients **Station 6.** Group discussion for sharing experience about liver fluke and CCA patients	Improvement of knowledge, self-efficacy, expectation and practice regarding liver fluke prevention and control
Week 6	Home visiting experimental group by health village volunteers and local health officers using PDRCSUT handbook	Motivation, self-efficacy and social support regarding liver fluke prevention and control
Week 7	Walking campaign by students, health village volunteers and local health officers using poster, brochures, and giving the fluke free house flag	Motivation, self-efficacy and social support regarding liver fluke prevention and control
Week 8	Home visiting experimental group by health village volunteers and local health officers	Motivation, self-efficacy and social support regarding liver fluke prevention and control
Week 9	Health education regarding liver fluke by health village volunteers and local health officers using village broadcast	Improvement of knowledge, and practice regarding liver fluke prevention and control
Week 10	Home visiting experimental group by health village volunteers, local health officers, and researchers. Meeting and building fluke free village network	Fluke free village network for sustainable liver fluke prevention and control
Week 11	Collecting data after intervention by health village volunteers using predesigned questionnaires, stool collection and examination	Score level of knowledge, self-efficacy, expectation and practice, and re-infected patients
Week 12	Meeting, reflecting, and return data to communities and individualized person	After action review and their sharing the experience

Figure 2. Health Behavior Modification Programs were Intervened for Experimental Group in Bueng Sarong Sub-District, Kang Sanam Nang District, Nakhon Ratchasima Province, Northeast Thailand. This activities were included the health education based station learning through one day activities learning including Station 1-6.

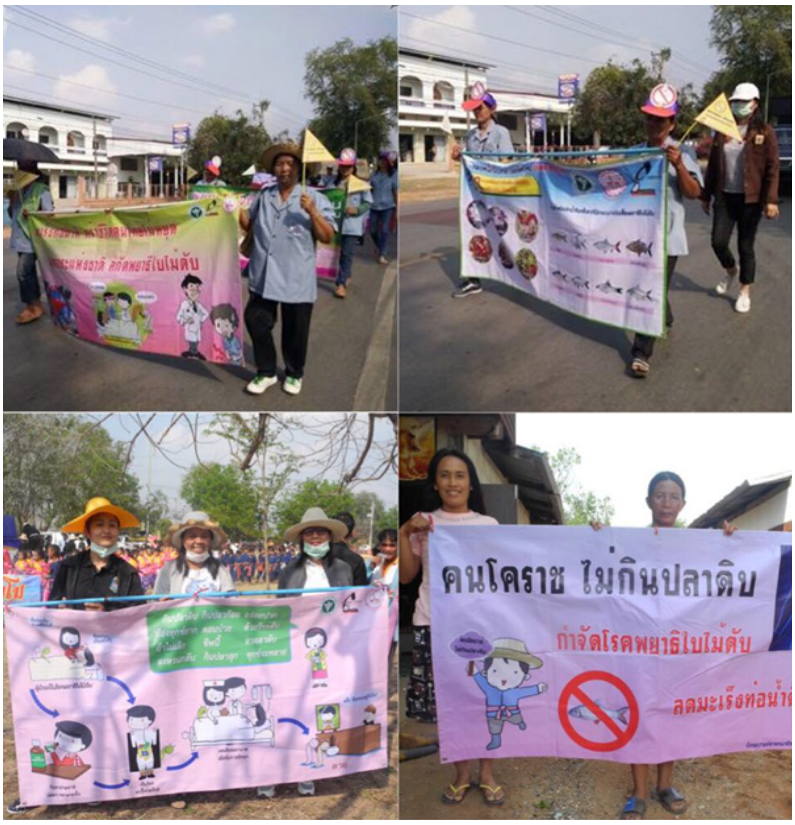

Figure 3. Health Behavior Modification Programs Were Intervened for Experimental Group in Bueng Sarong Sub-district, Kang Sanam Nang District, Nakhon Ratchasima Province, Northeast Thailand. This activities have done for motivated and social supported the participants to liver fluke prevention and control, included the walking campaign by students, health village volunteers and local health officers using poster, brochures, and giving the fluke free house flag.

Figure 4. Health Behavior Modification Programs were Intervened for Experimental Group in Bueng Sarong sub-District, Kang Sanam Nang District, Nakhon Ratchasima Province, Northeast Thailand. This activities have done for motivated, response to self-efficacy and social supported the participants to liver fluke prevention and control, included home visiting by health village volunteers, local health officers, and researchers, meeting and building fluke free village network, stool collection and examination.

Table 2. Demographic Characteristics Among 66 Participants in Experimental and Comparison Groups

Demographic data	Experimental group (n=33)		Comparison group (n=33)	
	No.	%	No.	%
Gender				
Female	24	72.73	18	54.55
Male	9	27.27	15	45.45
Age (year)				
30 – 39	2	6.06	7	21.21
40 – 49	9	27.27	5	15.15
50 – 59	15	45.45	13	39.39
60 – 69	3	9.09	7	21.21
70 – 79	1	3.03	1	3.03
80 – 89	3	9.09	0	0
Mean, S.D.	54.70, 12.52	51.12, 9.88		
Min - Max	34, 87	32, 70		
Education				
Primary school	21	63.64	26	78.79
Junior secondary school	8	24.24	6	18.18
High school	2	6.06	0	0
Uneducated	2	6.06	1	3.03
Marital status				
Married	24	72.73	26	78.79
Divorced/widowed/separated	9	27.27	6	18.18
Single	0	0	1	3.03
Occupation				
Agriculture	23	69.7	21	63.64
Employee	6	18.18	9	27.27
Housewives	2	6.06	2	6.06
Trader	1	3.03	1	3.03
Government officers	1	3.03	0	0
Family income (Thai Baht/month)				
< 1,000	3	9.09	15	45.45
1,000 – 5,000	11	33.33	17	51.52
6,000 – 10,000	11	33.33	0	0
10,001 – 15,000	3	9.09	1	3.03
15,001 – 20,000	1	3.03	0	0
> 20,000	4	12.12	0	0

participants were *O. viverrini* egg positives who were 4 experiemntal and 3 comparison members. They had administered for treatment with praziquantel after examination and then follow up for curative treatment.

Table 3. Past Histories Regarding Liver Flue Disease among 66 Participants in Experimental and Comparison Groups

Past histories	Experimental group (n=33)		Comparison group (n=33)	
	No.	%	No.	%
Past history with liver fluke infection				
No	30	90.91	28	84.85
Yes	3	9.09	5	15.15
Past history with praziquantel used				
No	30	90.91	28	84.85
Yes	3	9.09	5	15.15
Raw cyprinoid fish consumption				
Yes	31	93.94	30	90.91
No	2	6.06	3	9.09
Frequencies of raw cyprinoid fish				
Never	2	6.06	3	9.09
1 time/week	1	3.03	1	3.03
4 times/week	1	3.03	1	3.03
2 times/month	5	15.15	3	9.09
1 time/year	21	63.64	20	60.61
4 times/year	3	9.09	5	15.15
Cyprinoid fish species				
Esomus metallicus (Pla Siew Khao)	31	100	7	50
Barbonymus gonionotus (Pla Ta Pien Khao)	28	90.32	13	92.85
Henicorhynchus siamensis (Pla Khao Soi)	22	70.96	9	64.28
Puntius brevis (Pla Ta Pien Sai)	11	35.48	2	14.28
Hampala macrolepidota (Pla Kra Soob Keed)	1	7.14	3	21.42
Hampala dispar (Pla Kra Soob Jood)	1	7.14	3	21.42
Osteochilus vittatus (Pla Soi Nok Khao)	1	7.14	1	7.14

None of infected person was examined after intervention in the experimental group but one was *O. viverrini* egg positive in the comparison group. Of 8 participants had a past history with liver fluke infection and praziquantel used who were 3 and 5 participants in the experimental and comparison groups. The majorities of participants had histories with raw cyprinoid fish consumption (92.42%), included 31 and 30 participants in the experimental and comparison groups. The frequencies of raw cyprinoid fish consumption, they frequently consumed raw

Table 4. Compared Mean Score for Knowledge, Self-Efficacy, Expectation of Response Efficacy, and Practice Regrading Liver Fluke, within Experimental Group (n=33)

Categories	Before Experiment		After Experiment		Mean Difference	T-test	95%CI	p-value
	Mean	SD	Mean	SD				
Knowledge	15.94	2.71	19.42	0.61	3.48	4.23	-0.67, -0.23	<0.001
Self-efficacy	2.61	0.49	2.82	0.39	0.21	2.93	-0.35, -0.06	<0.05
Expectation	2.72	0.45	2.84	0.36	0.12	2.1	-0.23, -0.00	<0.05
Practice	2.21	0.41	2.52	0.51	0.31	3.73	-0.46, -0.13	<0.001

Table 5. Compared Mean Score for Knowledge, Self-Efficacy, Expectation of Response Efficacy, and Practice Regrading Liver Fluke, between Experimental and Comparison Groups

Categories	Experimental group (n=33)		Comparison group (n=33)		Mean Difference	T-test	95%CI	p-value
	Mean	SD	Mean	SD				
Knowledge								
Before experiment	15.94	2.71	15.06	1.74	0.88	1.41	-0.38, 2.14	>0.05
After experiment	19.42	0.61	15.79	1.72	3.63	12.76	3.05, 4.21	<0.001
Self-efficacy								
Before experiment	2.61	0.49	2.54	0.51	0.07	0.27	-0.19, 0.25	>0.05
After experiment	2.82	0.39	2.57	0.51	0.25	2.1	0.00, 0.47	<0.05
Expectation								
Before experiment	2.72	0.45	2.63	0.48	0.09	0.46	-0.20, 0.32	>0.05
After experiment	2.84	0.36	2.61	0.49	0.23	2.26	0.02, 0.46	<0.05
Practice								
Before experiment	2.21	0.41	2.2	0.48	0.01	1.15	-0.41, 0.11	>0.05
After experiment	2.52	0.51	2.24	0.43	0.28	2.05	0.00, 0.54	<0.05

dished fish 1 time/year (60.61%). The cyprinoid fish species were often took for the under cooked include Barbonymus gonionotus (62.12%), Esomus metallicus (57.58%), and Henicorhynchus siamensis (46.97%), respectively (Table 3).

The results reveal that after the intervention, the experimental group had the mean scores of knowledge (mean difference=3.48, t=4.23, 95%CI=- 0.67, -0.23 p-value<0.001) regarding liver fluke prevention and control, higher more than before the intervention with a statistical significantly. In addition, the experimental group had the mean scores of self-efficacy (mean difference=0.21, t=2.93, 95%CI=- 0.35, -0.06 p-value<0.05) to liver fluke prevention and control, higher more than before the intervention with a statistical significantly. Meanwhile, the expectation (mean difference=0.12, t=2.1, 95%CI=- 0.23, -0.00 p-value<0.05), and practice (mean difference=0.31, t=3.73, 95%CI=-0.46, -0.13 p-value<0.001) to liver fluke prevention and control, higher more than before the intervention with a statistical significantly. The compared mean scores for knowledge, self-efficacy, expectation of response efficacy, and practice regarding liver fluke, in the experimental group are shown in table 4.

The results also found that after the intervention, the experimental group had the mean scores of knowledge (mean difference=3.63, t=12.76, 95%CI=3.05.38, 4.21 p-value<0.001) regarding liver fluke prevention and control, higher more than the comparison group with a statistical significantly. Furthermore, the experimental group had the mean scores of self-efficacy (mean difference=0.21, t=2.93, 95% CI=- 0.35, -0.06 p-value<0.05) to liver fluke prevention and control, higher more than the comparison group with a statistical significantly. Moreover, the expectation (mean difference=0.23, t=2.26, 95% CI=0.02, 0.46 p-value<0.05), and practice (mean difference=0.28, t=2.05, 95% CI=0.00, 0.54 p-value<0.05) to liver fluke prevention and control, higher more than the comparison group with a statistical significantly. The compared mean scores for knowledge, self-efficacy, expectation of response efficacy, and practice regarding liver fluke, in the experimental and comparison group are shown in Table 5.

Discussion

Numerous control programs have been implemented in liver fluke endemic areas. Development of a community-based approach to liver fluke control has been recommended. Toward integrated liver fluke control in northeast Thailand: the Lawa project has been shown to be the best model (Sripa et al., 2015). Therefore we used that model to solve the problem in our study areas particularly community participatory action by health volunteers, local health officers, local governors, and village leaders using healht behavior modification program based on health education, self-efficacy, motivation and social support concepts. Our study reveals that 7 participants were *O. viverrini* egg positive who were 4 experiemntal and 3 comparison members. In addition, verbal screening tests showed that 8 participants had a past histories with liver fluke infection and praziquantel used. The majorities of participants had histories with raw cyprinoid fish consumption. The frequencies of raw cyprinoid fish consumption, they frequently consumed raw dished fish 1 time/year. The cyprinoid fish species were often took for the under cooked include B. gonionotus, E. metallicus, and H. siamensis, respectively. In this study confirmed that some villagers in Bueng Samrong subs-district, Nakhon Ratchasima province, are still have a problem with liver fluke infection. Development of a health behavior modification program based approach to liver fluke control is need required. Here we described the quasi-experimental study that conducted in the epidemic areas where have been reported the liver fluke infections.

The results reveal that after the intervention, the experimental group had the mean scores of knowledge and practice regarding liver fluke prevention and control, higher more than before the intervention with a statistical significantly. This result is similar to that Boom (1971) suggested the success of behavioral modification should be composed varieties activities. Here, we facilitated them with health education based station learning through one day activities learning including Station 1: demonstration of morphology and life cycle of liver fluke using liver

fluke adult and egg, Bithynia, cyprinoid fish museum and poster, Station 2: demonstration of CCA museum, Station 3: health education regarding risk factors, symptoms, pathogenesis, pathology, diagnosis, treatment, prevention and control of liver fluke by facilitators using PowerPoint, poster, brochures, Station 4: health education regarding food safety and environmental sanitation by facilitators using PowerPoint, poster, brochures, Station 5: case based learning by using VDO clip story of CCA patients, and Station 6: group discussion for sharing experience about liver fluke and CCA patients. Therefore, experimental group had a high score of knowledge and practice regarding liver fluke infection. This result is similarly to other studies mainly Kompor et al., (2016) reporting that the effectiveness of health intervention in the population at risk for liver fluke infection and CCA in Meuang Yang district, Nakhon Ratchasima province, northeastern Thailand. Participants were completed health intervention comprising 4 stations; 1, VDO clip of moving adult worm of liver fluke; 2, poster of life cycle of liver fluke; 3, microscopy with adult and egg liver fluke; and 4, brochure with the knowledge of liver fluke containing infection, signs, symptoms, related disease, diagnosis, treatment, prevention, and control. Knowledge, attitude, and practice, changed between before and after time points with statistical significance. The results indicate that the present health intervention program was effective and easy to understand, with low cost and taking only a short time.

In addition, the experimental group had the mean scores of self-efficacy to liver fluke prevention and control, higher more than before the intervention with a statistical significantly. The expectation, and practice to liver fluke prevention and control, higher more than before the intervention with a statistical significantly. This continuous good self-efficacy, expectation, and practice are dependent on motivation and social support that influencing behavior modification, this is similarly to Becker and Maiman (1975), Janz and Becker (1984), and House and Kahn (1985). We also previously reporting the effectiveness of health education program based on self-efficacy and social support in different areas of Kang Sanam Nang district, Nakhon Ratchasima province (Kaewpitoon et al., 2016b) and Tha Tum district, Surin province, Thailand (Kaewpitoon et al., 2016a). Those results showed a successful for liver fluke avoidance. However, recent study has some point different mainly health behavior modification program is contained Week 6: Home visiting experimental group by health village volunteers and local health officers using PDRCSUT handbook, Week 7: Walking campaign by students, health village volunteers and local health officers using poster, brochures, and giving the fluke free house flag, Week 8: Home visiting experimental group by health village volunteers and local health officers, Week 9: Health education regarding liver fluke by health village volunteers and local health officers using village broadcast, Week 10: Home visiting experimental group by health village volunteers, local health officers, and researchers, meeting and building fluke free village network, Week 11: Collecting data after intervention by health village volunteers using predesigned questionnaires, stool collection and examination, Week 12: meeting, reflecting, and return data to communities and individualized person. Those activities were important factors leading to the maintenance of good behaviors and effecting theirs improve perception, response to self-efficacy, motivation and practice regarding liver fluke prevention and control. This was a successful health education program for liver fluke avoidance. Participants were gained the correct knowledge and had the higher self-efficacy, expectation, and practice regarding liver fluke prevention. Therefore, it may useful for further behavior modification in the other epidemic areas.

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