RESEARCH ARTICLE

Behavioral Modification Regarding Liver Fluke and Cholangiocarcinoma with a Health Belief Model Using Integrated Learning

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Abstract

This study aimed to modify behavior regarding liver fluke and cholangiocarcinoma prevention in Chumphuang district, Nakhon Ratchasima province, Thailand through integrated learning. A total of 180 participants were included through purposive selection of high-risk scores on verbal screening. Participants attended the health education program which applied the health belief model included family based, knowledge station based, academic merit based and community based learning. Data were collected using a questionnaire composed of 4 parts: 1) personal information, 2) knowledge, 3) perceived susceptibility, severity, benefits, and barriers, 4) practice regarding liver fluke and cholangiocarcinoma prevention. The result revealed that the majority were female (79.9%), age ≥ 60 years old (33.2%), primary school educational level (76.1%), and agricultural occupation (70.1%). The mean scores of knowledge, perception, and practice to liver fluke and cholangiocarcinoma prevention, before participated the integrative learning were low, moderate, and low, respectively. Meanwhile, the mean score of knowledge, perceived susceptibility, severity, benefits, and barriers, and practice regarding liver fluke and cholangiocarcinoma prevention, were higher with statistical significance after participation in the integrated learning. This finding indicates that health education programs may successfully modify health behavior in the rural communities. Therefore they may useful for further work behavior modification in other epidemic areas.

Keywords: Behavioral modification - liver fluke - cholangiocarcinoma - integrative learning

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Introduction

Liver fluke infection caused by *O. viverrini* remains a major public health problem in Thailand particularly Northeastern and Northern region (Kaewpitoon et al., 2008b; Sitthithaworn et al., 2012; Kaewpitoon et al., 2015f). A nationwide survey in Thailand found that the prevalent was 5.1%. The highest of prevalent was found in the northeast (9.2%) and followed by the north region (5.2%) (Wongsaroj et al., 2014). The distribution *O. viverrini* infection in Nakahon Ratchasima province has been reported, a total of 1,168 stool samples were obtained from 516 males and 652 females. Stool examination showed that 2.48% were infected with *O. viverrini*. (Kaewpitoon et al., 2012c). Recently, we reported the re-examination of *O. viverrini* infection in the 3 districts of Nakhon Ratchasima province, Thailand. A total of 355 participants from a 194,152 population, was selected through multi-stage sampling. Prevalence of *O. viverrini* infection was 2.25% (8/355 participants). *O. viverrini* infection was found in Mueang Yang (2.82%), Bua Yai (2.48%), and Chum Phuang district (1.84%), respectively (Kaewpitoon et al., 2016a).

The *O.viverrini* infection is associated with hepatobiliary diseases including hepatomegaly, cholangitis, cholecystitis, and gallstones (Harinasuta and Vajrasthira 1960; Thamavit et al., 1978; Harinasuta et al., 1984). Recently, *O. viverrini* has been classified as Type

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1 carcinogens by the International Agency for Research on Cancer, World Health Organization (WHO) (IARC, 1994). Mortality rate of liver cancer has been reported and found that Nakhon Ratchasima province has 13.67-16.2 per 100,000 populations. Eradication of the fluke and identification of high-risk populations are urgently needed (Sripa et al., 2010). The annual reports of District Public Health Office of Chum Phuang have been reported that dead cases with cholangiocarcinoma in 2010, 2011, and 2012 were 1, 6, and 4 cases, respectively. This figure indicates that behavior modification is required in the risk group of this district.

Opisthorchiasis which people contract by ingestion of metacercariae in flesh of raw or undercooked freshwater fishes, that are a favorite dish in Northeastern and northern Thailand (Sripa B et al., 2010). Behavior on prevention and control of liver fluke infection are essential for decreasing the disease. Previously studied indicated that knowledge, attitude, and practice related to liver fluke infection in rural communities (Kaewpitoon et al., 2007). Raw attitudes, wetland cultures, life-cycles: socio-cultural dynamics relating to *O. viverrini* in the Mekong Basin (Grundy-Warr et al., 2012).

Inadequate knowledge, misbeliefs, and social and cultural mores were important factors leading to the maintenance of risk behaviors. Moreover, unhygienic defecation and insufficient diagnosis and treatment were found to facilitate *O. viverrini* transmission. Precise and regular health education and promotion targeting the main risk factor, Koi pla consumption, improving diagnosis and treatment, and promoting hygienic defecation should be used in the prevention and control program (Suwannahitatorn et al., 2013). Viriyavipart et al (2015) reveals that knowledge, perception, and behavior about food consumption related to the prevention *O. viverrini* among people in upper northeastern Thailand, this study indicates that people did not know the appropriated cooking to kill the causative agent. Many people are still eating raw fish and raw fermented fish dish. Lifestyle modification is needed to improve particularly risk behavior, knowledge, perception, and practice regarding liver fluke. 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. According a seriously data regarding liver fluke and cholangiocarcinoma in the epidemic areas, therefore, this study aimed to study the effectiveness of health education program based on health belief model using the integrative learning regarding liver fluke and cholangiocarcinoma prevention in Tha Lat sub-district, Chum Phuang district, Nakhon Ratchasima province, Thailand.

Materials and Methods

The study was conducted in Chum Phuang district, Nakhon Ratchasima province, northeast Thailand, between June and December 2015. Chum Phuang is a district in the eastern part of Nakhon Ratchasima province, located in coordinates: 15°20'56"N 102°44'31"E. Neighboring districts are (from the north clockwise) Prathai, Mueang Yang and Lam Thamenchai of Nakhon Ratchasima Province, Lam Plai Mat of Buriram Province, and Huai Thalaeng and Phimai of Nakhon Ratchasima again. The district is subdivided into 9 sub-districts. Chum Phuang is the only township of the district, covering parts of the Chum Phuang sub-district. There are further 9 sub-district administrative organizations, including Chum Phuang, Prasuk, Tha Lat, Sarai, Talat Sai, Non Rang, Non Lak, Non Tum, and Non Yo. Chum Phuang district is coverage areas 540.6 Kilometer2 (208.7 sq mi), and has 83,096 populations.

Populations at risk for CCA, were screened by using Korat CCA verbal screening test (KCVST) which contained the history with (1) opisthorchiasis (2) under-cooked fish consumption, (3) praziquantel used (4) cholangitis or cholecystitis, (5) relative family with CCA (6) naïve northeastern people, (7) agriculture, and (8) alcohol consumption. Scores were summarized following 1+2+3+4+5+6+7+8, and calculated the population at risk; none (0 point), low (1-4 point), and high risk (5-8 point). A total of 180 populations from Thalat sub-district who have age over 35 years old, was completed the verbal screening and purposive selected to participated the health education program that applied based on theory of health belief model using the integrative learning (Figure 1). The integrative learning for health behavioral modification regarding liver fluke and cholangiocarcinoma was included 1) Family based learning; teaching knowledge, created awareness, and motivated about the epidemiology, morphology, life cycle, transmission, sign and symptoms, pathogenesis of liver fluke and cholangiocarcinoma, at each family (all family members) by public health student corporate village health volunteers, public health officers, and research team (Figure 2), 2) knowledge station based; health education including station 1: poster and pamphlet, station 2: museum of liver fluke, cholangiorcarcinoma, and cyprinoid fish, station 3: VDO clip about liver fluke, cholangiorcarcinoma, and related patients, and station 4: group discussion with their health belief, sharing their ideas and experience toward liver fluke prevention and control (Figure 3), 3) academic merit based learning (we named in Thai language is Gnan Bun Wichakarn); this learning was integrated the knowledge of susceptibility and severity of liver fluke and cholangiocarcinoma, benefits and perceived barriers to prevention of liver fluke and cholangiocarcinoma, in local event or festival mainly Buddhist day, Buddhist lent day, through (3.1) performed about liver fluke and cholangiocarcinoma stories by public health student and village health volunteers, (3.2) integrated in local folk song (northeastern-style song; Mor lam), and (3.3) short movie (Figure 4), and 4) community based learning; meeting, discussion and engagement by participants, community leaders, village health volunteers, public health officers, member of sub-district administrative organization (Figure 5). The followed-up has done by research teams corporate with public health students, village health volunteer, and public health officers. The study was implemented for 10 weeks. Pre-and-post-test was measured with questionnaires.

Data were collected using a questionnaire composed of 4 parts: 1) personal information data, 2) knowledge, 3) perceived susceptibility, severity, benefits, and barriers, 4) practice to liver fluke and cholangiocarcinoma prevention. The questionnaire was validated by 3 experts and tested for reliability. The Kuder-Richardson-20 coefficients of knowledge question was 0.80. The Cronbach's alpha coefficients of perceived susceptibility, severity, benefits, barriers, and practice were 0.82, 0.80, 0.81, 0.81, and 0.77 respectively. 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% (12-15 points), moderate level; 60%-79.5% (9-11 points), low level; 0-59% (0-8 points). Perceive and practice level were calculated and analyzed according to Best (1977). Perceive with 5 questions of each susceptibility, severity, benefits, and barriers; 3 choice (agree, uncertain, dis-agree): positive question=3,2,1, negative question=1,2,3, and interpreted to high level; 10-15 points, moderate level; 5-9 points, and low level; 0-4 points. Evaluation of practical level with 16 questions and interpreted to high level; 32-48 points, moderate level; 16-31 points, and low level; 0-15 points. Descriptive and analytical statistical data were analyzed with SPSS software. Percentage, mean, standard deviation, Paired t- test, the statistical significance level of .05 were employed for data analyzes. This study was approved by the human research ethic committee of Suranaree University of Technology (EC-58-48).

Results

Among 180 participants, the majorities were female (79.9%), age ≥ 60 years old (33.2%), educational level with primary school (76.1%), and occupation with agriculture (70.1%). General data was shown in Table 1. The majority of participants (46.7%) had a low level of knowledge before participated the integrative learning

Table 1. General Data of 180 participants

General data	%
Gender: female	79.9
Age: ≥60 years old	33.2
Education: Primary school	76.1
Occupation: Agriculture	70.1
House is located near natural water reservoirs (1 Km)	44.6
Family members ate under-cooked cyprinoid fish	48.4
Past histories with	
Stool examination	52.2
Praziquantel used	66.8
Relative family with cholangiocarcinoma	9.2
Perception of liver fluke information	74.5

Table 2. Knowledge Questions with Lowest of Score among 180 Participants Before Intervened the Health Education Program

Questions	No	%
Types of cyprinoid fish; 2nd intermediate host for liver fluke	99	54.9
The best control of liver fluke transmission	70	39.1
Liver fluke prevention	51	28.3

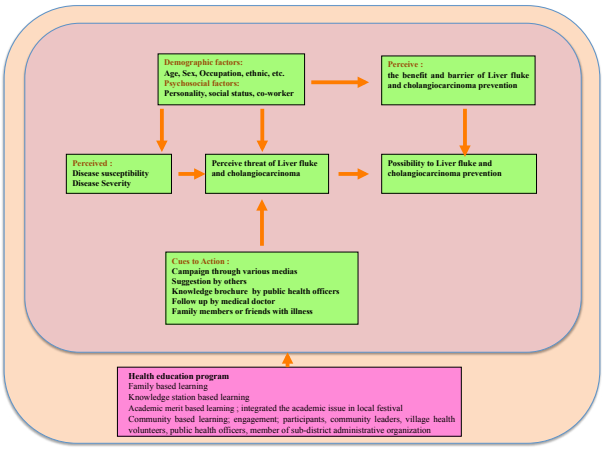

Figure 1. Schematic of Integrative learning through health belief model (adapted from Janz and Becker, 1984)

Figure 2. Family Based Learning

Figure 3. Knowledge Station Based Learning

Figure 4. Academic Merit Based Learning

Figure 5. Community Based Learning

Table 3. Perceive Regarding Liver Fluke Disease among 180 participants; 5 Questions with High Frequent Misunderstood (%)

Perceive	Agree	Uncertain	Disagree
Stool examination makes a waste times	57.8	21.6	13.7
Too expensive cost for stool examination and drugs	49.0	25.5	18.6
Liver fluke prevention is by praziquantel used	36.3	26.5	30.4
Liver fluke is treated by praziquantel, therefore prevention and control are not required	24.5	23.5	46.1
Liver fluke is killed by lemon juice	10.8	24.5	58.8

Table 4. Risk Dish Regarding Liver Fluke Transmission among 180 Participants (%)

Practice	Frequently	Sometimes	Never
Medium cooked cyprinoid fish curry in banana leaves	10.9	56	30.4
Raw fermented cyprinoid fish consumption	5.4	70.1	21.7
Raw pickled cyprinoid fish	2.7	40.2	54.3
Raw spicy minced cyprinoid fish	2.7	38.6	56
Medium fried cyprinoid fish	1.6	19.6	76.1

(mean=8.85, SD=1.87). Knowledge questions with lowest of score were (1) the type of cyprinoid fish; 2nd intermediate host for liver fluke (54.9%), (2) the best control of liver fluke transmission (39.1%), and (3) liver fluke prevention (28.3%) (Table 2). Participants had perceived susceptibility, severity, benefits, and barriers to liver fluke prevention before participated the integrative learning (mean=8.71, SD=1.73). Of 5 questions was the lowest of score including (1) stool examination makes a waste times (49.0%), (2) too expensive cost for stool examination and drugs (57.8%), (3) Liver fluke prevention is by praziquantel used (36.3%), (4) Liver fluke is treated by praziquantel, therefore prevention and control are not required (24.5%), and (5) Liver fluke is killed by lemon juice (10.8%), respectively (Table 3). Participants had a low practice to liver fluke prevention before participated the integrative learning (mean=14.23, SD=3.87). The high-risk consumption with a variety of disk including medium cooked cyprinoid fish curry in banana leaves (10.9%), raw fermented cyprinoid fish consumption (5.4%), Raw pickled cyprinoid fish (2.7%), Raw spicy minced cyprinoid fish (2.7%), and Medium fried cyprinoid fish (1.6%), respectively (Table 4). The mean score of knowledge regarding liver fluke of participants was higher in the after participated than before participated the integrative learning with a statistical significant (t=4.85, p<0.001). The results revealed that the mean score of perceived susceptibility, severity, benefits, and barriers to liver fluke prevention after participated were high level more than before participated the integrative learning with a statistical significant. Meanwhile, practice regarding liver fluke and cholangiocarcinoma prevention and control among 180 participants was high level after participated the integrative learning with a statistical significant (t=4.80, p<0.001) (Table 5).

Discussion

Liver fluke infection remains a major public health problem in Thailand particularly Northeastern and Northern region where have been the highest of cholangiocarcinoma (Kaewpitoon et al., 2008b; Sitthithaworn et al., 2012; Kaewpitoon et al., 2015a). Improvement of behavior regarding liver fluke and cholangiocarcinoma prevention is need required. The success behavior modification should be used many methods and continuous intervention. Improvement of high knowledge, perception, and

Table 5. Comparison of knowledge, perceived, and practice regarding liver fluke among 180 participants (%), before and after attended health education program

Behavior	Health Education Program through Health Belief Model using Integrative Learning				t	p-value
	Before		After			
	Mean	SD	Mean	SD		
Knowledge	8.85	1.87	13.25	1.75	4.85	<0.001
Perceive						
Perceived Susceptibility	9.60	1.47	14.82	0.93	4.19	<0.001
Perceived severity	8.36	2.50	13.93	1.47	3.36	<0.001
Perceived benefits	8.72	1.05	12.80	2.21	4.59	<0.001
Perceived barriers	8.14	1.88	12.05	2.85	2.91	< 0.005
Practice	14.23	3.87	38.85	2.24	4.8	<0.001

practice regarding diseases, depend on varieties of health education (Boom 1971; Becker and Maiman 1975; Janz and Becker 1984). Here we recent study the behavioral modification among 180 participants, the majorities were female (79.9%), age ≥ 60 years old (33.2%), educational level with primary school (76.1%), and occupation with agriculture (70.1%). Viriyavipart et al (2015) indicated that people in upper northeastern Thailand who had older age, educated with primary school, and agriculture are the risk group for liver fluke. The majority of participants had a low level of knowledge before participated the integrative learning. They had a lowest of score with the question (1) the type of cyprinoid fish; 2nd intermediate host for liver fluke, (2) the best control of liver fluke transmission, and (3) liver fluke prevention. This finding indicates that participants had a high risk to liver fluke infection. The present result is similar to other that knowledge, perception, and behavior about food consumption related to the prevention *O. viverrini* (Viriyavipart et al., 2015). Participants had perceived susceptibility, severity, benefits, and barriers to liver fluke prevention before participated the integrative learning. Of 5 questions was the lowest of score including (1) stool examination makes a waste times, (2) too expensive cost for stool examination and drugs, (3) Liver fluke prevention is by praziquantel used, (4) Liver fluke is treated by praziquantel, therefore prevention and control are not required, and (5) Liver fluke is killed by lemon juice, respectively. Participants had a low practice to liver fluke prevention before participated the integrative learning. The high-risk consumption with a variety of disk including medium cooked cyprinoid fish curry in banana leaves, raw fermented cyprinoid fish consumption, raw pickled cyprinoid fish, raw spicy minced cyprinoid fish, and medium fried cyprinoid fish, respectively. Previous study indicated that knowledge, attitude, and practice related to liver fluke infection in the northeastern Thailand (Kaewpitoon et al., 2007). In addition, Chudthaisong et al (2015) reported that the factors which had a statistically significant association with *O. viverrini* infection, were the habit of consuming unsafely prepared fish (ORadj=5.17, 95%CI=2.49- 10.74), the similar habit of family members (ORadj=3.25, 95%CI=1.63-6.49). Thaewnongiew et al (2014) reported that the factors related to opisthorchiasis were the duration living near a water body, and eating raw and/or fermented fish. Furthermore, Suwannahitatorn et al (2013) indicated that inadequate knowledge, misbeliefs, and social and cultural mores were important factors leading to the maintenance of risk behaviors. Moreover, unhygienic defecation and insufficient diagnosis and treatment were found to facilitate *O. viverrini* transmission. Our study similar to other investigators, therefore health behavior with their misperception is need approached.

The success models and recommendation have been reported. Development of a community-based approach to opisthorchiasis control has been recommended (Duangsong et al., 2013). Toward integrated opisthorchiasis control in northeast Thailand: the Lawa project was showed to be the best model (Sripa et al., 2015). Community-based health education and communication model development for opisthorchiasis prevention has been also implemented in a high-risk area, Khon Kaen Province, Thailand (Promthet et al., 2015). Recent study revealed that the mean scores of knowledge, perceived susceptibility, severity, benefits, barriers, and practice regarding liver fluke and cholangiocarcinoma prevention among 180 participants were high level after participated the integrative learning with a statistical significant. This result is similar to that Boom (1971) suggested the success of behavioral modification should be composed varieties activities. Here, we have family based learning, knowledge station based learning, academic merit based learning (we named in Thai language is Gnan Bun Wichakarn), and community based learning. All of variety based learning in this recent study shows a success model for motivation of liver fluke and cholangiocarcinoma prevention. This success is similarly to Becker and Maiman (1975), and Janz and Becker (1984). Discussion and sharing of the perceived susceptibility and perceived severity of disease, perceived benefits and perceived barriers to prevention of disease, effecting their improve perception. In addition, the continuous good practice is dependent on social support that influencing behavior modification, this is similarly to House and Kahn (1985). Furthermore, Kaewpitoon et al (2016) suggested that health educational program based on self-efficacy and social support effected to prevent liver fluke infection in rural people. Meanwhile, Phongsiripapat et al (2016) indicated that people participation effected to *O. viverrini* prevention and control in Chaiyaphum province, Northeastern Thailand.

In conclusion, this health education program is success to health behavior modification in the rural communities therefore it may useful for further work behavior modification in the other epidemic areas.

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