

HEALTH EDUCATION BENEFIT FOR CHOLANGIO-CARCINOMA PREVENTION IN THAILAND: HEALTH BELIEFS ARE ANOTHER OPTION TO CONSIDER

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Abstract

There are various strategies and policies for cholangiocarcinoma (CCA) prevention to reduce people's incidence and mortality rates in epidemic areas of Thailand. One of them is applying health theory, especially health belief, but the conclusion is not clear. Therefore, benefits analysis of health education programs based on the health belief model (HBM) is essential for effective prevention of CCA. This study aimed to assess the benefits of the health education programs for CCA prevention in the epidemic areas of Thailand using systematic review and meta-analysis. The research studies in electronic databases, including MEDLINE, SCOPUS, Cochrane library, and ThaiJo, were searched. The cross-sectional analytic study, experimental research, and quasi-experimental research were selected. The researchers determined articles based on the specified criteria and analyzed them based on mean and 95% confidence interval. We decided on five studies (N=344) to perform analyses with random-effects models. The effect sizes for knowledge scores (standard mean difference: SMD=1.30), perceived risk (SMD=2.09), perceived severity (SMD=1.91), perceived benefits (SMD=2.02), perceived barriers (SMD=1.96), and preventive behaviors of CCA (SMD=2.07). After implementing the health education programs based on the HBM for CCA prevention, they all increased statistically. It is noted that the health education programs based on the HBM can help people gain knowledge, correct perception, and behaviors in CCA prevention. The health education programs can be implemented at individual, family, and community levels if they are adjusted to the context of the area. They can also be developed into the health behavior modification model.

Keywords: Health belief model, Cholangiocarcinoma, Health education program, Prevention

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Introduction

Cancer is the major public health problem and the number one cause of death in Thailand. In Thai men, the most common cancers are liver and bile duct cancers, lung cancer, colorectal cancer, prostate cancer, and lymphoma. The most common cancers in Thai women are breast cancer, liver and bile duct cancers, cervical cancer, colorectal cancer, and lung cancer, respectively (Imsamran *et al.*, 2018). Cholangiocarcinoma (CCA) is still a significant public health problem for people in the Greater Mekong Sub-region. Because they are developing countries, there is a problem with the multidimensional poverty index. In Thailand, it was found that the CCA incidence ratio was between 0.05-0.85 (Sripa *et al.*, 2007). The highest rate of incidence was in the Northeastern region in both males (43.5 age-standardized incidence rate (ASR) per 100,000) and females (18.4 ASR per 100,000) (Imsamran *et al.*, 2018). It was also reported that CCA was associated with the prevalence of liver fluke infection. The three provinces in the Northeastern regions of Thailand with more than 30% of liver fluke infections were the Nakhon Phanom (60.8%), the Sisaket (38.6%) and the Amnat Charoen (32.0%) (Sithithaworn *et al.*, 2012).

The policies on disease prevention and control of the local public health organization consist of 1) providing services to vulnerable people to have a stool test for detecting liver fluke, 2) organizing training activities to educate people by using public relations media installed in places, 3) checking out restaurants to encourage the use of boiled-fermented fish, and 4) encouraging people to consume fruit and vegetables (Songserm *et al.*, 2016). These activities may potentially increase people's knowledge by emphasizing the importance of self-protection. But, on the other hand, the information that the people at risk have received may not be enough to modify their health behaviors. They only know the causes and the reinforcing factors of the disease. Still, they lack the perception of the potential risks that will cause the disease, its severity, the benefits of disease prevention, and the barriers when the condition occurs.

Moreover, when the causes are known, they have relatively little reinforcement to change behaviors. It can be determined from the public relations that still have limitations on the inaccessibility of the source of information. Traditional attitudes and local beliefs also block the information that should be used for behavior modification. For these reasons, the researchers have realized that health education programs use various media strategies, including public

relations/creative media/multimedia media accessible to the public. Together with enhancing self-awareness to strengthen the perceived risk, severity, benefits, and barriers of CCA, allowing people to take care of their health correctly will cause changes in their health care behaviors until they can prevent CCA.

However, in order to determine if the health education programs based on the health belief model (HBM) are helpful for CCA prevention in people at-risk areas. It is necessary to analyze and synthesize such issues to serve as a valuable resource for researchers to develop suitable models for changing people's behavior in the epidemic areas in the future. Therefore, this research aimed to assess the benefits of the health education programs for CCA prevention in the epidemic areas of Thailand by using systematic review and meta-analysis.

Materials and Methods

Search strategy

This research employed systematic review and meta-analysis. The data were searched using electronic databases by collecting critical health research studies, including MEDLINE, SCOPUS, Cochrane library, and ThaiJO in the past fifty years (1971-2021). We used the keywords "liver fluke," "cholangiocarcinoma," "health belief," "health education," "opisthorchiasis."

Selection criteria of research reports

1) They must be cross-sectional analytic studies and experimental and quasi-experimental studies in two or more groups.

2) They must be the research articles studying the knowledge and the behavior modification by applying the HBM in CCA prevention.

3) They must be the research studies conducted in Thailand, which was once reported as the highest incidence area in the world (Vatanasapt *et al.*, 1990), and published from 1971-2021.

4) They must be published in Thai or English.

5) The study results were divided into (i) the primary outcome: the perceived health belief in CCA prevention and (ii) the secondary outcome: the knowledge and the behaviors in CCA prevention.

Selection of papers

Two researchers (SP and NS) independently screened the research articles according to the selection criteria. We resolved the disagreement through a discussion process with other researchers (MR, SW, and AA). Each researcher read

the article's appraisal and used a standardized chart to enter data from eligible studies following the screening. Study quality was assessed using the Cochrane Collaboration's tool for assessing risk for bias (Higgins *et al.*, 2017). We considered six criteria: 1) sequence generation, 2) blinding of study participants, 3) blinding of outcome assessors, 4) incomplete outcome data, 5) selective reporting bias, and 6) other sources of bias. Moreover, we used the Newcastle-Ottawa Quality Assessment Scale for a cross-sectional study (Modesti *et al.*, 2016). We considered the appropriateness of research design, recruitment strategy, response rate, representativeness of sample, objectivity/reliability of outcome, power calculation provided, and appropriate statistical analyses.

Data extraction

After authors selected research articles according to criteria, each article's data were extracted based on the following topics.

1) Basic information of research, consisting of researcher's name, research title, study setting, and sample group

2) The study designs, consisting of cross-sectional analytic study, experimental research, and quasi-experimental study

3) Health education programs based on the HBM

4) The mean scores of knowledge, perceived health belief in CCA prevention, and preventive behaviors of CCA both before and after the experiment

5) The mean differences of knowledge, perceived health belief in CCA prevention, and preventive behaviors of CCA both before and after the experiment

6) The mean scores of knowledge of CCA prevention, perceived health belief in CCA prevention, and preventive behaviors of CCA of the experimental group and the control group

7) The differences of the mean scores of knowledge of CCA prevention, perceived health belief in CCA prevention, and preventive behaviors of CCA between the experimental group and the control group

Statistical analysis

The general data of the research, including the researcher's name, the study setting, the study design, and the health education programs based on the HBM in the CCA prevention, were analyzed using the excel program. Authors examined the effectiveness of the health education programs based on the HBM in the prevention of CCA in terms of the knowledge of CCA prevention,

the perceived risk of CCA, the perceived severity of CCA, the perceived benefits of CCA prevention, the perceived barriers of CCA prevention and the preventive behaviors of CCA. Publication bias was assessed with funnel plots and the Egger test. A random-effects model was used to compute the weighted standard mean difference (SMD) with 95% confidence intervals (95% CI) using a statistical package, STATA version 10 (Stata, College Station, TX)

Results and Discussion

Search results from electronic databases: Fifty-seven reports were from the same research. So, the same reports and those that did not meet the selection criteria were sorted out. Finally, only five research reports meeting the selection criteria were selected, as presented in Figure 1.

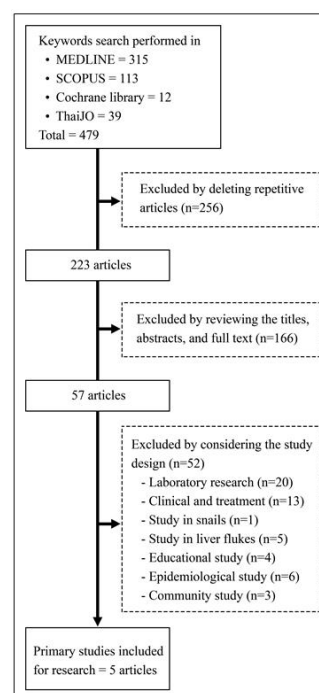


Figure 1. Flow diagram of the searching results and article selection process

Details of the selected research reports:

1) Research design: Four quasi-experimental studies and one cross-sectional research were selected.
2) Output: (i) Measuring the effectiveness of the application of the HBM for CCA prevention of the five articles: We used the outcome measure asking about gender, age, occupation, education, marital status, income, liver fluke infection, raw or

undercooked food consumption, health awareness, and behavior in CCA prevention. (ii) Sorting the articles according to the method of health education: One article used the HBM in combination with self-efficacy theory; two articles used the HBM with social support; one article used the HBM together with self-efficacy theory and social support. 3) Study setting: All five articles were reported from studies conducted in the Northeast of Thailand. 4) Analysis results: The study of the effectiveness of the health education programs in CCA prevention can be divided into each issue.

Publication bias was assessed with funnel plots and the Egger test. The funnel plot bias analysis did not show significant evidence of a missing study effect, with the Egger test $P > 0.05$ (Figure 2).

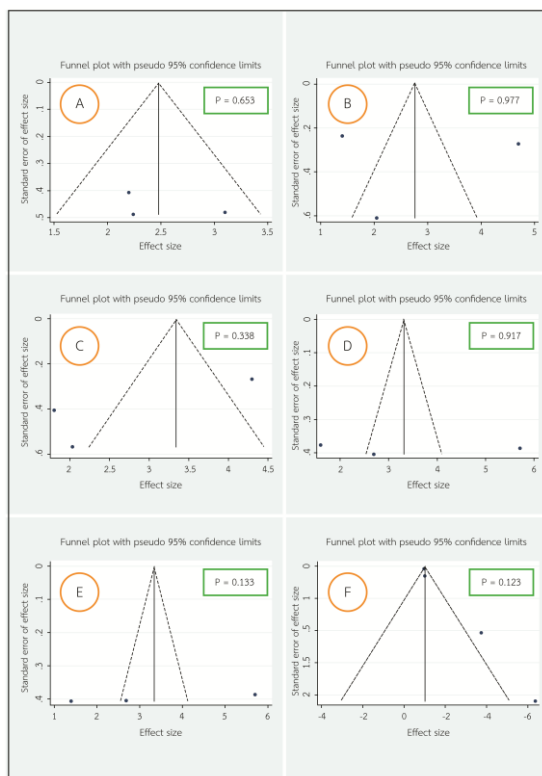


Figure 2. Assessment of publication bias using the funnel plot bias analysis. (A) for knowledge of CCA prevention; (B) for perceived risk of CCA; (C) for perceived severity of CCA; (D) for perceived benefits of CCA prevention; (E) for perceived barriers of CCA prevention; (F) for preventive behaviors of CCA

Based on the meta-analysis of three studies in Figure 3, it was found that the health education programs based on the HBM for CCA prevention can increase the knowledge score of CCA

prevention by 1.30 points (SMD=1.30; 95% CI=0.97-1.64) with statistical significance at the level of 0.05.

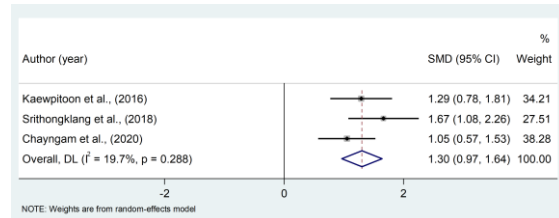


Figure 3. The analysis results of the knowledge of CCA prevention

It was found that the health education programs based on the HBM for CCA prevention can increase the score of the perceived risk of CCA by 2.09 points (SMD=2.09; 95% CI=0.40-3.77) with statistical significance at the $P=0.05$ (Figure 4).

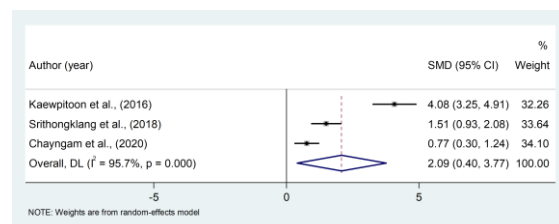


Figure 4. The analysis results of the perceived risk of CCA

Based on the meta-analysis of three studies in Figure 5, it was found that the health education programs based on the HBM for CCA prevention can increase the score of the perceived severity of CCA by 1.91 points (SMD=1.91; 95% CI=0.34-3.47) with statistical significance at $P=0.05$.

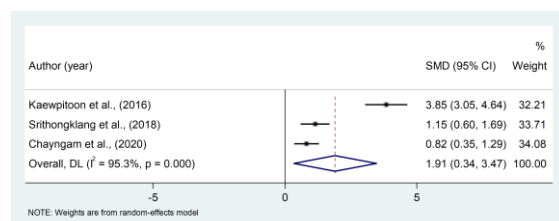


Figure 5. The analysis results of the perceived severity of CCA

Figure 6 shows the meta-analysis results; it was found that the health education programs based on the HBM for CCA prevention can increase the score of the perceived benefits of CCA

prevention by 2.02 points (SMD=2.02; 95% CI=0.75-3.30) with statistical significance at $P=0.05$.

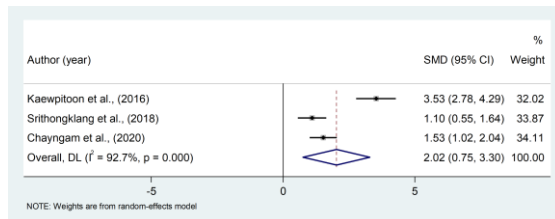


Figure 6. The analysis results of the perceived benefits of CCA prevention

According to the meta-analysis of three studies in Figure 7, it was found that the health education programs based on the HBM for CCA prevention can increase the score of the perceived barriers of CCA prevention by 1.96 points (SMD=1.96; 95% CI=0.60-3.31) with statistical significance at $P=0.05$.

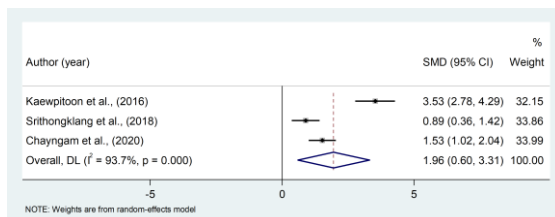


Figure 7. The analysis results of the perceived barriers of CCA prevention

It was found that the health education programs based on the HBM for CCA prevention can increase the score of the preventive behaviors of CCA by 2.07 points (SMD=2.07; 95% CI=0.89-3.25) with statistical significance at $P=0.05$ (Figure 8).

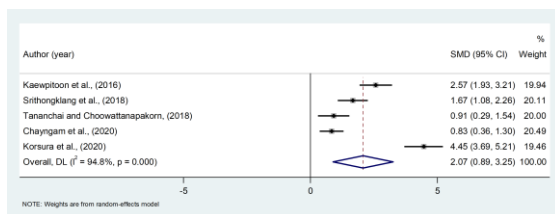


Figure 8. The analysis results of the preventive behaviors of CCA

We selected 5 out of 57 research articles. All studies were conducted in the highly epidemic areas of Northeast Thailand from 1971-2021. There were two study designs, namely quasi-experimental research and cross-sectional study. The keywords

for searching were "liver fluke," "cholangiocarcinoma," "health belief," "health education," "opisthorchiasis." According to the meta-analysis, it was observed that the health education programs based on the HBM for CCA prevention could increase the knowledge, the perceived risk, the perceived severity, the perceived benefits, the perceived barriers, and the preventive behaviors of CCA with statistical significance at the level of $P=0.05$. According to the literature review, examining the benefits of the health education programs in CCA prevention in Thailand's epidemic areas can be classified into six aspects.

Knowledge of CCA prevention

From the literature review, the mean score of the knowledge of CCA prevention from the health education programs increased by 1.30 points (SMD=1.30; 95% CI=0.97-1.64). It was related to the other research conducted in Northeast Thailand using the health education program based on the HBM and self-efficacy in the CCA screening group in Nakhon Ratchasima Province (Srithongklang *et al.*, 2019) and the health education program on HBM application with social support in people aged 40 years and over in Nong Bua Lamphu Province (Chayngam *et al.*, 2020). In the community, there was behavioral modification regarding liver fluke and CCA with the HBM using integrated learning in Nakhon Ratchasima Province (Phatisena *et al.*, 2016). It was also consistent with the study on the health education program based on self-efficacy and social support for preventing liver fluke infection in rural people of Surin Province (Kaewpittoon *et al.*, 2016).

Perceived risk of CCA

The mean score of the perceived risk of CCA from the health education programs increased by 2.09 points (SMD=2.09; 95% CI=0.40-3.77). It was consistent with the research conducted in Northeast Thailand using the health education program on HBM application with social support in Nong Bua Lamphu Province (Chayngam *et al.*, 2020) and the health education program based on the HBM and self-efficacy in the CCA screening group in Nakhon Ratchasima (Srithongklang *et al.*, 2019). There was also integrated learning using the HBM for CCA prevention in Nakhon Ratchasima (Phatisena *et al.*, 2016).

Perceived severity of CCA

The mean score of the perceived severity of CCA increased by 1.91 points (SMD=1.91; 95% CI=0.34-3.47). Consistent with the previous research conducted in the Northeast of Thailand

using the health education program on HBM application with social support in Nong Bua Lamphu Province (Chayngam *et al.*, 2020) and the health behavior modification program for liver fluke and CCA prevention based on the HBM and social support theory (Padchasuwan *et al.*, 2016). Also, it was related to the community participation in CCA prevention in Ubon Ratchathani Province (Songserm *et al.*, 2015), the health education program based on the HBM, and self-efficacy in the CCA screening group in Nakhon Ratchasima Province (Srithongklang *et al.*, 2019) and the health education program based on self-efficacy and social support for preventing liver fluke infection in rural people of Surin Province (Kaewpitoon *et al.*, 2016).

Perceived benefits of CCA prevention

The mean score of the perceived benefits of CCA prevention increased by 2.02 points (SMD=2.02; 95% CI=0.75-3.30). Thus, it was consistent with the research conducted in Northeast Thailand using the health education program based on self-efficacy and social support for preventing liver fluke infection in rural people of Surin Province (Kaewpitoon *et al.*, 2016) and the health education program on HBM application with the social backing in Nong Bua Lamphu Province (Chayngam *et al.*, 2020). Moreover, it was related to participants with received the health education program based on the HBM and self-efficacy for creating prevention behaviors of CCA in Nakhon Ratchasima Province (Srithongklang *et al.*, 2019), and the behavioral modification program for liver fluke and CCA prevention based on the HBM in Nakhon Ratchasima Province (Phatisena *et al.*, 2016).

Perceived barriers of CCA prevention

According to the literature review, the mean score of the perceived barriers of CCA prevention increased by 1.96 points (SMD=1.96; 95% CI=0.60-3.31). Consistent with the research conducted in Nong Bua Lamphu Province using the health education program on HBM application with social support (Chayngam *et al.*, 2020) and the health behavior modification program for liver fluke and CCA prevention based on the HBM and social support theory (Padchasuwan *et al.*, 2016) as well as the study in rural areas using the health education program based on self-efficacy and social support for preventing liver fluke infection in Surin Province (Kaewpitoon *et al.*, 2016) and the behavioral modification program for liver fluke and CCA prevention based on the HBM in the community in Nakhon Ratchasima Province (Phatisena *et al.*, 2016). The group screened for

CCA received the health education program based on the HBM for CCA prevention in Nakhon Ratchasima (Srithongklang *et al.*, 2019).

Preventive behaviors of CCA

The mean score of the preventive behaviors of CCA increased by 2.07 points (SMD=2.07; 95% CI=0.89-3.25). It was related to the study on behavioral risk factors for CCA in five Greater Mekong Sub-Region Countries (Songserm *et al.*, 2020a). Also, it was related to sharing scale freshwater fish with neighbors (Saenna *et al.*, 2017), consumption culture, and trading of freshwater fish affecting the spread of liver fluke infection (Kim *et al.*, 2017). Moreover, it was consistent with the research conducted in Northeast Thailand using the health education program based on self-efficacy and social support for preventing liver fluke infection in the rural areas (Kaewpitoon *et al.*, 2016), the behavioral modification program for liver fluke, and CCA prevention based on the HBM in creating community participation (Phatisena *et al.*, 2016; Korsura *et al.*, 2020), and the health behavior modification program for liver fluke and CCA prevention based on the HBM and social support theory (Padchasuwan *et al.*, 2016; Tananchai and Choowattanapakorn, 2018;). It also used the Leader Village Health Volunteer (VHV) Training Program for CCA prevention to increase options and channels in the areas with limited public health personnel (Songserm *et al.*, 2020b). Moreover, it was also applied in the sustainable prevention of CCA through community participation (Songserm *et al.*, 2020c).

However, research reports still had some limitations since most of them were conducted in the areas with the prevalence and the incidence of liver fluke infection and CCA, such as the provinces in the northeastern region of Thailand. Other areas in Thailand also have the incidence of CCA that can perform a comparative study. The selection of the samples by considering the site's context, the consumption culture, the folk wisdom, or the traditional beliefs of each village that are originally different inevitably affects the research. If the health education programs based on the theory of health are used, it must take traditional perceptions into account because they have different knowledge, health perception, and preventive behaviors.

Conclusions

From the literature review, it can be seen that in changing people's behaviors in disease prevention, the basic concept and the health behaviors should be

modified based on the context of the area for the production of knowledge in the community. Then, it must be used to increase the people's perception so that they are ready to modify their health behaviors based on the theory of health used to create health education programs where people can access without technology restrictions. In terms of public relations media and knowledge, people should quickly seek them without wasting time and opportunity to create new knowledge. It will change people's attitudes toward disease prevention, and the command will be disseminated more easily to families and communities.

Ethical considerations

The authors have ultimately observed ethical issues (including plagiarism, informed consent, misconduct, data fabrication or falsification, double publication or submission, redundancy, etc.).

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