Development of a Community-Based Approach to Opisthorchiasis Control

Rujira Duangsong¹, Supannee Promthet²*, Kesorn Thaewngiew³

Abstract

A liver fluke, *Opisthorchis viverrini* (OV), is the major cause of the high incidence of cholangiocellular carcinoma in North-eastern Thailand. The prevalence of OV infection remains high in various parts of the country, especially in wetland rural areas where a large proportion of the community work in agriculture and continue the traditional practice of eating raw or uncooked cyprinoid fish products. The national control program seems to have little impact in many of these areas, and it has been difficult to make precise assessments of the overall effectiveness of the program. Therefore there is a need for a community-based approach to prevent infection with the parasite, ideally involving as many players as possible. Here we document an attempt to assess the best means to prevention on the basis of a community intervention in three villages in north-east Thailand, with participation of representatives of Health Promotion Hospitals of the Ministry of Public Health with dedicated staff, but also school teachers, independent government sponsored village health volunteers, and housewives responsible for cooking and diet selection. An action plan was followed, allowing detailed discussions of practical proposals, their introduction and then repeated reflection and further proposals at the individual village level.

Keywords: *Opisthorchis viverrini* - infection control programs - rural Thailand - community-based action plans

Introduction

The liver fluke, *Opisthorchis viverrini* (OV), continues to be a serious public health problem in north and north-east Thailand, associated with a very high incidence of cholangiocellular carcinoma (Shin et al., 2010). Over six million Thai people are estimated to be infected, and the highest prevalence rates are found in Issan and to a lesser extent in the North. A survey of information in the literature for actual prevalence rates is given in Table 1 (after Sriamporn et al., 2011). The geographic pattern of OV infection rates in Thailand is very uneven, but high rates are more likely in rural than urban environments, especially in wetlands and agricultural areas (Wattanayingcharoenchai et al., 2011) where there are rivers, lakes, man-made watercourses for irrigation, ponds for aquaculture and rice-fields and where the food-culture of the local people includes the consumption of raw or undercooked fish (Grundy-Warr et al., 2012). 4.6% to 60.8% ( Sithithaworn et al., 2012). High variability has also been reported between the different districts within a province; for example, the age and gender adjusted proportion of the population infected in the 20 districts of Khon Kaen Province varied between 10.0% and 70.9% (Sriamporn et al. 2004). Over the period

### Table 1. Overview of Publications regarding Prevalence Rates of Opisthorchiasis Infection

<table>
<thead>
<tr>
<th>Reference</th>
<th>Region/place</th>
<th>Study type</th>
<th>Method</th>
<th>% OV positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jongsuksuntigul et al., 1998</td>
<td>Thailand</td>
<td>Survey</td>
<td>Kato's¹</td>
<td>21.5%</td>
</tr>
<tr>
<td>Jongsuksuntigul et al., 2003</td>
<td>Thailand</td>
<td>Survey</td>
<td>Kato's¹</td>
<td>1984 and 1987, 63.6%</td>
</tr>
<tr>
<td>Sriamporn et al., 2005</td>
<td>Khon Kaen</td>
<td>Cohort</td>
<td>Kato's¹</td>
<td>1988, 35.6%</td>
</tr>
<tr>
<td>Sayasone et al., 2007</td>
<td>Lao PDR</td>
<td>Case-control</td>
<td>Kato-Katz²</td>
<td>Male, 27.9%; Female, 21.3%</td>
</tr>
<tr>
<td>Poomphakwaen et al., 2009</td>
<td>Khon Kaen</td>
<td>Cross-sectional</td>
<td>Kato-Katz²</td>
<td>58.5%</td>
</tr>
<tr>
<td>Wattanayingcharoenchai et al., 2011</td>
<td>Northeast Thailand</td>
<td>Cross-sectional</td>
<td>Kato-Katz²</td>
<td>24.6%</td>
</tr>
<tr>
<td>Saengsawang et al., 2012</td>
<td>Yasothon</td>
<td>Cross-sectional</td>
<td>Kato-Katz²</td>
<td>20.4%</td>
</tr>
<tr>
<td>Sohn et al., 2012</td>
<td>Kratei, Cambodia</td>
<td>Cross-sectional</td>
<td>Kato-Katz²</td>
<td>20-65Male, 40.1%; Female, 37.5%</td>
</tr>
<tr>
<td>Yong et al., 2012</td>
<td>Takeo, Cambodia</td>
<td>Cross-sectional</td>
<td>Kato-Katz²</td>
<td>5-86, 4.6%, 1,799 villagers, 47.5%</td>
</tr>
<tr>
<td>Suwannahitatorn et al., 2013</td>
<td>Thailand</td>
<td>Cohort</td>
<td>Kato and F-EA¹</td>
<td>2002-2004 = 21.6%; 2007-2009 = 21.4%</td>
</tr>
</tbody>
</table>

¹Kato’s thick smear; Kato-Katz thick smear; Kato and formalin-ethyl acetate

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Development of a Community-Based Approach to Opisthorchiasis Control
1981-2001 a variety of different surveys indicated that the national prevalence of OV infection had fallen from 63.6% to 9.6%, but the most recent a data indicate the prevalence rate in the Northeast region remains high at 16.6% and had not decreased over the previous decade (Sithithaworn et al., 2012).

Whereas OV infection is usually asymptomatic, the organism has been classified as a type-1 carcinogen for many years (IARC, 1994) and is a major risk factor for the subsequent development of cholangiocarcinoma (Watana and Watana, 2002; Poomphakwaen et al., 2009; Songserm et al., 2012), which is a usually fatal form of liver cancer (Khan et al., 2005).

**Conceivable Intervention Routes**

The life cycle of OV is well-known (see Figure 1), but briefly the definitive hosts are man and other animals, such as dogs, rats and especially cats (Enes et al., 2010; Aunpromma et al., 2012) who eat raw, uncooked or under-fermented freshwater cyprinoid fish. Eggs of the liver fluke are shed in faeces and are ingested by the *Bythinia* snail. The eggs encyst, reproduce asexually and are then released into water as free-swimming cercariae which penetrate cyprinoid fish and encyst to become metacercariae. When the raw, uncooked or under-fermented infected fish are eaten by definitive hosts, the metacercariae excyst and develop as adult liver flukes in the bile duct...

Clearly, given the nature of the environment in the endemic area, as well as the non-human hosts, it is not feasible to completely prevent eggs reaching the aquatic environment (see Figure 1). Therefore, attention must be concentrated on avoiding infestation by refraining from eating raw fish infected with metacercariae and possibly by effective use of the antihelminthic drug praziquantel. Otherwise attention must be focused on early detection and screening so that clinical treatment is more effective.

**Development of a Community-based Approach to Opisthorchiasis Control**

Clearly the most effective interventions are in communities which are most effected and have the highest incidence rates. The present commentary is based on experience gained with three villages, chosen for their location near rivers and wetlands. Within each community, there is a Health Promotion Hospital of the Ministry of Public Health with dedicated staff, but also school teachers, independent government sponsored village health volunteers, representative housewives responsible for cooking and diet selection. The schedule of the the program developed is illustrated in Figure 2.

Strategies for the control of OV infection have involved identification by stool examination and treatment of infected cases with praziquantel, health education campaigns to encourage the consumption of only properly cooked fish, and the improvement of sanitation and discouragement of defaecation in wetland areas to prevent transmission by human hosts (Jongsukuntigul and Imsonboon, 1998; Wattanayingcharoenchai et al., 2011). A concise history of opisthorchiasis control programs in Thailand and their apparent effectiveness has been detailed by Jongsukuntigul and Imsonboon (2003) and Sripa et al. (2011). The demonstrated effectiveness of praziquantel in 1980 and its use on a community basis was to prove a major step forward in subsequent control strategies, and region-wide control programs were established from 1987 onwards under the Five-year National Development Plan for 1987-1991. By 1992 a national control program was operating in 162 provinces. The control program is now integrated with the rural health services, which cover all provinces, and the Ministry of Public Health has set a target prevalence of 5% by 2016.

In order to assist in control of infection a community project was initiated at Khon Kaen University, Faculty of Public Health, which is the subject of the present Commentary. This aimed to establish groups of important players at the village level, with a series of phases of discussions and interventions (see Figure 2).

**Phase 1: Situation Analysis**

In all three villages the initial action was an analysis of the environment and culture, as well as risk behaviour for OV infection.

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**Figure 1. Opisthorchis viverrini Life Cycle and Intervention Strategies for Control in Northeast Thailand**

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**Clinical treatment**

- Cholangiocellular carcinoma

**Early Detection**

- Screening

**Inflammation**

- Cholangiofibrosis

**Avoidance behaviour**

- Flukes in bile ducts (Humans & domestic animals)
- Metacercariae ingested, excyst in duodenum
- Cyprinoid fish muscle: cercariae - metacercariae

**Cooking processes**

- Miracidia - sporocysts - rediae - cercariae
- Praziquantel

**Hygiene**

- Eggs in faeces
- Excreted into water, ingested by Bithynia snails

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**Phase 2: Action - First Loop**

This first involved selection of the community leaders, as shown in Figure 2. The facilitator in each case was a staff member of the Department of Education at Khon Kaeun University, Faculty of Public Health. The essential members were professionals from the HPH, and in addition volunteers, cooks, and a teacher to provided input from education services, as well as local NGO. reason for inclusion.

Then using media such as video power point, flipchart,

<table>
<thead>
<tr>
<th>Community 1</th>
<th>Community 2</th>
<th>Community 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nampong</td>
<td>Ban Phai</td>
<td>Ubonrat</td>
</tr>
</tbody>
</table>

**Phase 1: Situations Analysis (all communities)**

1. Environment and culture that enhance OV infection
2. Risk behavior for OV infection

**Phase 2: Actions 1 (all communities)**

1. Prepared community leaders i.e., - Village Health Volunteers (7), Cookers: representative persons who cook for family (7), Village committee (2), Health professional from Health Promotion Hospital (HPH)(2)
2. Local organization (1), Teacher (1), Total 20 (in each community)

2) Training these 20 + 20 + 20 leaders for health education about OV prevention.

OV prevention using many techniques + media such as video, power point, flipchart, posters,

| Group discussion - These 20+20+20 persons start to develop the plan by AIC (Appreciation Influence Control) then implement using their own plan from the above steps, each in their own community. |

**Phase 2: Actions 2**

1) Teach cookers 2) Screen for OV infection, and suggest infected person to be in behavioral projects.
3) Give education to all villagers about OV infection and OV prevention.
4) Create group of villagers: not eating raw fish.
5) Made a big cutout board to announce to people not to eat raw fish.

<table>
<thead>
<tr>
<th>Phase 2: Actions 2</th>
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<th>Phase 2: Actions 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Teach cookers 2) Screen for OV infection for behavioral change subjects 3) Give education to all villagers about OV prevention by targeting elderly, DM and hypertension groups. 4) Create health education media such as folk and use i.e. during exercise, village broadcast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Teach cookers 2) Screen for OV infection and then give education to them 3) Give education to all villagers by broad cast Kamsoi, song for prevention, home visit to teach OV prevention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanitation, hygiene, toilet</td>
<td></td>
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</tbody>
</table>

**Phases 3 and 4: Reflection and Replanning (all communities)**

Repeated meetings to refine action plans

**Phases 3 and 4: Actions**

1. Villagers eat cooked fish
2. Students aware of eating cook fish
3. SAO (Subdistrict Administrative Organization) support budget
4. Give education at night
5. Contest for slogans 3. Contest recipe of cooked food
6. Demonstrate how to make fish sauce from fermented fish
7. Campaign for OV prevention and control

<table>
<thead>
<tr>
<th>Phases 3 and 4: Actions</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. VHV (Village health volunteer) take care of village divided in area of houses about eating habit 2. Tradeswoman stop to sell raw fish food in the village 3. Campaign for OV prevention slogan contest, role play 4. Contest folk song then take the winner on radio 5. Training for the infected persons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Evaluation phase (all communities)**

1) Processes: How many projects done by community leaders to implement in the community about OV control; The participation of the community; Budget; co-funding from each local organization
2) Behaviour change: Knowledge about OV infection and OV prevention; Perceived susceptibility of disease; Perceived severity of disease

Figure 2. Development of a Community-Based Approach to Opisthorchiasis Control in Northeast Thailand
poster, group discussions were held and these 20+20+20 persons start to develop the plan by AIC (Appreciation Influence Control)

Phase 2: Action - Practical Measures Chosen

In all three villages teaching of those responsible for cooking was a high priority, as well as screening for OV infection and suggesting behavioural change projects. In addition separate plans were adopted at the village level.

Phases 3 and 4: Reflection on Results and New Plans

Approximately four months later, the project members from all three villages gathered for discussion of the results, indicated again in Figure 2. This generated new plans for the three communities and was followed by further reflection and generation of new plans.

Evaluation

This is for basically for future reference to determine the long-term efficacy of the measures taken.

Community-based Interventions in Thailand

Community-based approaches are well established in Thailand, examples of reports on reduction HIV stigma and discrimination (Jain et al., 2013), prevention of drowning (Sansritaweesek et al., 2013), stroke risk reduction (Suntayakorn and Rojjanasrirat, 2013), behaviour modification for type II diabetes sufferers (Ounnapiruk et al., 2013), risk behaviour for agrochemical exposure (Raksanam et al., 2012), all having appeared in the recent literature. One focused on use of lay health workers in a community-based chronic disease control program (Wiangnon et al., 2007) resulted in improvement in overall knowledge of all the diseases, except lung and cervical cancer (Promthet et al., 2012) and suggested that improving people’s health requires cooperation of community people through fun activities and some initial external support (Saranrititchai et al., 2012).

Unfortunately one earlier Opisthorchis viverrini infection intervention after the implementation of control program in a rural community, central Thailand (Suwananhatatorn et al., 2013) resulted in no appreciable change in infection rates. Rangsin et al. (2009) completed a two-year prospective survey of villagers of Chachoengsao Province in the Central region east of Bangkok and reported that the prevalence rate of OV infection increased from 21.3% to 26.2%. Therefore continuing efforts like the present program remain necessary.

For sustainability, it is essential that there is a network of committed individuals be established and 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 study program. Certainly, it is hard to avoid the conclusion that existing control programs are not working in rural areas due to underfunding and limited outreach, especially in the neglected Northeast and where people continue to eat raw, semi-cooked or fermented fish dishes such as koi pla, lap pla, and pla som (Grundy-Warr et al., 2012).

In the present intervention the individuals positive for O viverrini eggs were advised to take praziquantel, a very effective anti-helminthic drug (Soukhathamavong et al., 2011; Lovis et al., 2012), although it is unwise to depend on praziquantel as a primary element in a control programme as stressed earlier (Saengsawang et al., 2013). This has important implications in terms of evaluation of the efficacy of our present program since a simple comparison of before and after infection rates would not have meaning until the period typical for reinfection to occur has passed, which might stretch to many years. Alternative evaluation parameters might include consumption of foodstuffs possibly containing metacercariae, perceived susceptibility and severity of possible resultant disease, numbers and types of projects undertaken for prevention and the level of local participation. Attention also needs to be paid to the budgets available for ongoing community action.

Conclusions

Develop of networks with participation of the group stakeholders to share experiences, should facilitate the participants similar perceptions of the problem and allow the best methods to be chosen for effective control. Learning processes with team work will help development of skills to cooperate and coordinate villagers, knowing the work done by other groups. Social movement is an important aspect for spread of information. Stress should continue to be placed on improvement of networking suitable for each community, to guarantee that programmes are sustainable.

Acknowledgements

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References


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