REVIEW

THE IMPACT OF A DECADE LONG OPISTHORCHIASIS CONTROL PROGRAM IN NORTHEASTERN THAILAND

P Jongsuksuntigul[1] and T Imsomboon[2]

[1]Department of Communicable Disease Control, Ministry of Public Health, Nonthaburi, Thailand; [2]Thai-German Community Health Development through Parasite Control Project, Department of Communicable Disease Control, Ministry of Public Health, Thailand

Abstract. Based on the figures obtained from a regional survey in 1981, the overall prevalence of opisthorchiasis in northeastern Thailand was as high as 34.6%. Traditional consumption of improperly cooked fish dishes and unhygienic defecating habits among rural inhabitants have been recognized as significant factors determining such high prevalence of this liver fluke in that area.

Following experience of Mahidol University's Faculty of Tropical Medicine in Thailand of treating liver fluke infected individuals with praziquantel, the Ministry of Public Health started a liver fluke control program in the northeast as special service units in 1984 in 4 provinces. In 1988, the program was expanded to cover all 19 northeastern provinces, services being rendered at a community level covering stool examination and treatment of positive cases. Intensive health education was integrated as one element of liver fluke control program. During the early phase of operation (attack phase) a mobile stool examination team was the crucial strategy for active service. Following the attack phase, passive service was operated at each health service facility provided that results of population based program evaluation in each area showed a low pervalence according to the set target.

Regionwide assessments in 1991 and 1992 indicated a declining trend of prevalence from 34.6% to 30.19% and 24.01%, respectively.

In 1994, a population-based sampling survey was carried out to measure the effect of the liver fluke control program over 10 years operation (1984-1994) on both behavioral outcomes and prevalence impact. Sample for the assessment of behavior were 1,268 individuals, while another 1,912 samples were used for determining disease prevalence. Health related behaviors regarding frequent consumption of uncooked fish dishes decreased from 14% in 1990 to 7% in 1994 while occasional consumption remains as high as 42%. The prevalence of opisthorchiasis is 18.5% with a large variation in infection rate (5.20-56.25%).

INTRODUCTION

Opisthorchiasis has been recognized as a major local public health problem in northeastern Thailand for more than forty years. Its high prevalence with chronic infection contributes to development of liver cirrhosis and cholangiocarcinoma among the northeastern population.

In 1911, the first case of opisthorchiasis was reported by Leiper at an autopsy in Chiang Mai. Sadun (1953); Harinasuta and Vajirasthira (1961), and Wykoff (1965) demonstrated the complete life cycle of *Opisthor-chis viverrini* in Thailand.

In Thailand, opisthorchiasis is caused by *Opisthorchis viverrini*. The definitive hosts other than human are cat, dog, and other fish eating animals. The first intermediate hosts are snails, *bithynia*. The second intermediate hosts are numerous species of cyprinidae fishes. The egg hatches when ingested by a snail. The cercariae leave the snail in about 2 months encysted in the flesh of cyprinidae species fish, and become infective metacercariae. When ingested by a definitive host, they excyst in the duodenum and pass to the distal bile ducts, where they reach maturity in 3-4 weeks.

Figures obtained from epidemiological surveys during the past 30 years indicate that there has been an increase of infection in the northeastern region of Thailand. Its prevalence was 25% in 1953 and 29.80% in 1957. Later in 1981 the prevalence rose to 34.6%.

During 1950-1958, the Ministry of Public Health organized intestinal helminthiosis control units in 5 provinces, namely Nakhon Ratchasima, Udon Thani, Sakon Nakhon, Ubon Ratchathani and Songkhla. The units were operated under support from the US government. Services provided by the control units covered the diagnosis and treatment of intestinal parasites and liver flukes. Following the termination of US aid in 1958, the helminthiasis control units were dissolved while their activities still continued. Later on they were integrated into the rural health development project of the Health Development Division. Helminthiasis control was one element of village health development at that time. Stool examination prior to and after health development in each village was the main strategy.

From 1967 to 1974, a liver fluke control unit was established in Skon Nakhon Province as on the trial operation basis. Control activities emphasised community health education with various approaches to strategy such as a cooked fish dish demonstration, provision of low cost cooking pot, etc. After the discontinuation of the liver fluke control trial unit in 1974, extensive health education was the only measure for the control of opisthorchiasis.

In 1980, the Faculty of Tropical Medicine, Mahidol University found that a single dose of 40 mg praziquantel per 1 kg body weight gave a cure rate for liver fluke as high as 91% (Bunnag *et al*, 1983).

Following the initial finding, a joint field trial between the said institution and the Helminthiasis Section of the Department of Communicable Disease Control conducted during 1980-1983 demonstrated the cure rate of a single dose praziquantel for liver fluke was as high as 95.5%.

During 1983-1987, the Department of Communicable Disease Control organized 4 liver fluke treatment units in the northeast: in Khon Kaen; Roi Et; Sakon Nakhon; and Ubon Ratchthani Provinces. It provided stool examination service for 629,522 cases and treatment of liver fluke for 400,452 positive cases.

The significant development of liver fluke control operation on the regionwide scale started in 1987 when the liver fluke control program was included in the Sixth 5 Year National Public Health Development Plan (1987-1991). According to the plan all existing health facilities in the northeastern region would be responsible for liver fluke diagnosis and treatment under technical support and supplies from the Department of Communicable Disease Control, including training and evaluation. It was reported that 5,238,062 cases had their stools examined, and 1,774,929 positive cases were treated.

In addition to the regular program, the Federal Republic of Germany government provided technical support and partial operational support through the established project on the Promotion of Community Health through Parasite Control in 7 northeastern provinces covering approximately three million population over a 3 years period (1989-1992). It was reported that 1,839,813 cases received stool examinations and 531,175 positive cases were treated.

Following the expansion of liver fluke control program to all provinces of the northern region and some provinces in the central region in 1992, the program has increased its coverage up to 42 provinces. Figures of the control outcomes showed that 5,238,062 cases had been diagnosed by stool examination, and 632,869 positive cases were treated during 1992-1994.

Up to present, the liver fluke control program remains in the National Public Health Development Plan, whereas control activities are integrated into comprehensive rural health service of all provinces in the northeast. The degree and extent of activities vary depending on situation of the problem and priorities given by each province.

Approaches to liver fluke control

The main strategies for liver fluke control are comprised of 3 related approaches (Fig 1). They are: stool examination and treatment of positive cases with praziquantel for eliminating the human host reservoir; health education aiming at a promotion of cooked fish consumption for interrupting infection of liver fluke; environmental sanitation development to improve hygienic defecation for interrupting transmission.

Crucial activities designated for the strategies include the following elements:
- organizing of mobile stool examination team,
- community preparation,
- mobilization of individual, family, and community participation,
- continuing effective health education.

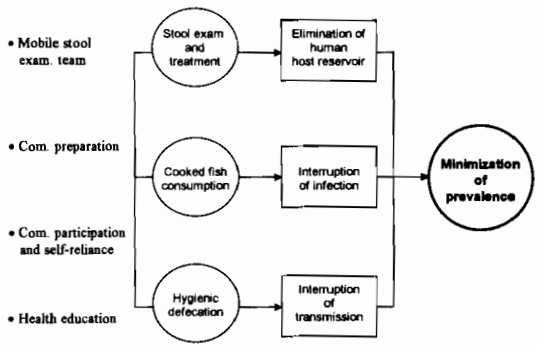

Fig 1–Conceptual frame of liver fluke control.

In each area stool examination service is provided once a year by collecting stool boxes from each household with a ten baht per case contribution as a stool examination fee. All positive cases are treated with single dose praziquantel with a contribution of 10 baht per one case. These activities have to be carried out for 2-3 consecutive years with a coverage of at least 60% for each round. Whenever the situation of prevalence in any area goes down below 10%, the services are then gradually switched to the passive services where health facilities in the area provide stool examination and treatment on the basis of passive case detection.

Recently, some degree of reinfection has been recognized. The regionwide situation needs to be assessed every 2-3 years. Information obtained would indicate need for maintaining and sustaining activities in focus areas. This will safeguard a recurrence of this problem in prospect.

The objectives were:

1. To determine situations of opisthorchiasis in northeastern Thailand in terms of
   i) its prevalence
   ii) its intensity
   resulting from regionwide control operation over the past 10 years.
2. To determine the existing of health risk behaviors conducive to the transmission and infection of the disease in the region resulting from health education program continuously implemented in the area as the crucial element of liver fluke control.

The evaluation was conducted during July to October of 1994. Samples were obtained from 60 villages of 19 northeastern provinces on a population proportional basis. Upon obtaining sample villages, systemic sampling of sample households and individual samples was applied. Stool examination was done by experienced technicians, while behavioral data were collected by health education staff. The stool examination technique used for this measurement was Kato's thick smear. Egg count for intensity was made by using Kato-Katz technic.

The total samples obtained for this evaluation were 1,912 cases, comprised of all age groups varying from the lowest 4.6% under 5 years age group to the highest 19.98% in the 30-39 years group (Table 1).

Table 1

Distribution of sample size.

Age group	No.	%
0-4	88	4.60
5-9	174	9.19
10-14	159	8.32
15-19	112	5.86
20-29	294	15.38
30-39	363	18.95
40-49	294	15.38
50-59	201	10.51
60 and up	193	10.09
Total	1,912	100.00

The prevalence rates of opisthorchiasis indicated by the result of stool examination with Kato's thick smear technic in northeastern provinces were follows.

In Table 2, the overall prevalence of liver fluke was 18.57%. The positive rates of all provinces varied from the lowest 5.20% of Nakhon Ratchsima Province to the highest 56.25% of Nakhon Phanom Province. It is obvious that one third of positive rates in northeastern provinces remain higher than 20%, which has been considered as the set targeted prevalence of the northeast in the National Public Health Plan.

In Table 3, the degree of infection increases with age until the twenties. From the age of 20 and up it reaches the level of more than 20%. This pattern of infection is due to habit of risk food consumption

Table 2

Prevalence of opisthorchiasis in the Northeastern Region by province.

Province	No. of samples	No. of positive	%
Nakhon Ratchsima	222	8	5.20
Chaiyaphum	96	9	9.37
Buri Ram	127	7	5.51
Surin	127	12	9.45
Maha Sarakham	96	21	21.88
Khon Kaen	159	27	16.98
Udon Thani	127	25	19.68
Nong Khai	96	22	22.92
Loei	64	11	17.19
Sakon Nakhon	96	47	48.96
Nong Bua Lam Phu	32	6	18.75
Kalasin	96	21	21.88
Ubon Ratchthani	159	31	19.5
Amnat Charoen	32	5	15.63
Nakhon Phanom	64	36	56.25
Mukdahan	32	5	15.63
Yasothon	64	9	14.06
Roi Et	96	41	42.71
Si Sa Ket	127	12	9.45
All provinces	1,912	355	18.57

Table 3

Distribution of opisthorchiasis infection in different age groups in the Northeast.

Age group	No. of stool exam	No. of positives	%
0-4	88	1	1.13
5-9	174	7	4.02
10-14	159	21	13.21
15-19	112	17	15.18
20-29	294	67	22.79
30-39	363	75	20.66
40-49	294	69	23.47
50-59	201	50	24.88
60 and over	193	48	24.87
Total	1,912	355	18.57

among the older population group.

In relation to the prevalence of liver fluke obtained in this assessment, it is markedly lower than the infection in 1981 (Preuksaraj *et al*, 1982) and 1991 (Jongsuksuntigul *et al*, 1992). This decrease might be the effect of sustaining control program in the area (Fig 2).

The intensity of opisthorchiasis infection in the

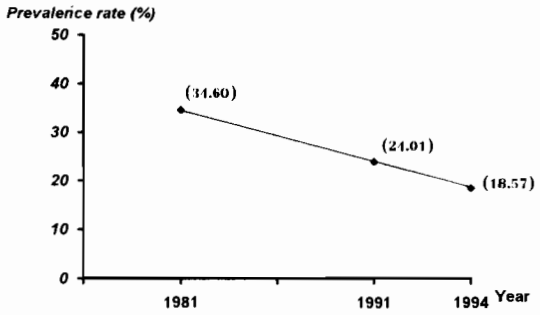

Fig 2–Comparison on prevalence rates of opisthorchiasis in northeastern Thailand in 1981, 1991 and 1994.

Based on the design for behavioral evaluation of the liver fluke control program, 1,268 individuals were chosen for this investigation. Results obtained are presented in Tables 5, 6, 7.

From Tables 5-7, health behaviors necessary for the prevention and control of liver fluke remain low compared to the set target of 80% for all aspects of desired health behavior. Though the proportion of frequent high risk food consumption decreased from 14% in 1990 to 7.0% in 1994, the moderate risk remains as high as 42% which can potentially cause infection among population at risk group (Fig 3).

Table 4

Intensity of opisthorchiasis infection in northeastern Thailand by age group and level of egg per gram.

Age group	No. of sample	MEPG	EPG < 1,000		EPG = 1,000-9,000		EPG = 10,000 and over	
			No.	%	No.	%	No.	%
10-14	5	230	5	100.0	-	-	-	-
15-19	1	92	1	100.0	-	-	-	-
20-29	7	480	6	85.7	1	14.3	-	-
30-39	16	603	413	81.2	3	18.8	-	-
40-49	19	2,745	16	84.2	1	5.3	2	10.5
50-59	12	1,778	8	66.7	3	25.0	1	8.3
60 and over	5	275	5	100.0	-	-	-	-
Total	65	1,371	54	83.1	8	12.3	3	4.6

area has been measured by egg count technic of Kato-Katz. Sixty-five positive cases were randomly chosen for this evaluation (Table 4).

From Table 4, the mean egg per 1 gram of stool of liver fluke infection was 1,371. The highest one was in the 40-49 years age group. Eighty-three percent of cases had EPG less than 1,000 which has been considered as a mild infection or a low intensity.

Regarding the intensity of liver fluke infection, most existing cases are mild infections. Their overall MEPG is 1,371 which is comparatively low. Furthermore, 83% of infected cases had an MEPG of less than 1,000. This might have been resulting from positive case treatment together with new infection and reinfection following treatment during the past 3 years.

Table 5

Health behavior relating to liver fluke control among northeasterners : knowledge and attitude.

Knowledge/attitude	No.	%
Knowledge :		
Poor	52	4.1
Fair	484	38.2
Good	732	59.1
Attitude :		
Poor	2	0.2
Fair	2,576	21.8
Good	990	78.1
Total	1,568	100.0

Table 6

Health risk behavior relating to liver fluke infection among northeasterners : risk food consumption.

Risk behavior	No.	%
Low risk	647	51.0
Moderate risk	532	41.9
High risk	89	7.0
Total	1,268	100.0

Table 7

Health behavior relating to liver fluke transmission among northeasterners.

Health behavior	No.	%
Mostly hygienic defecation	642	50.0
Occasionally unhygienic defecation	548	43.3
Frequently unhygienic defecation	78	6.2
Total	1,268	100.0

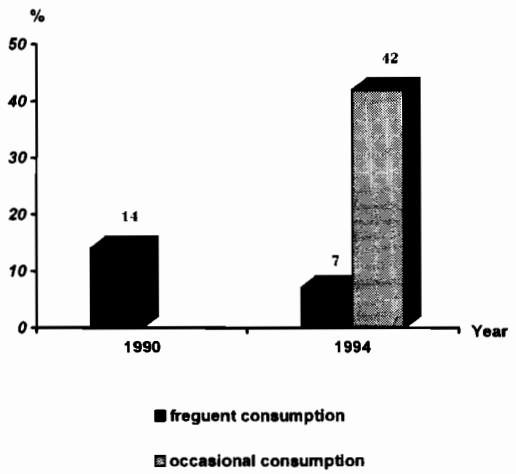

Fig 3–Comparison of risk food consumption behaviors among northeasterners in 1990 and 1994.

The percentage of villagers who can transmit their parasite eggs to the natural environment is almost 50%. This figure should alert local public health services.

Recommendations

1. The overall prevalence obtained from this evaluation indicated a considerable decrease of liver fluke in the region. However, positive rates of several province remain high. Further assessment needs to be conducted by increasing the sample size and number of clusters to the extent that positive rates can be interpreted as a prevalence of each province.
2. Figures of intensity indicated existing reinfection among the treated cases. A number of cases showed high EPG. It is assumed that a certain percentage of population do not have their stools examined. Stool examination activity has to be carried out in certain focus areas in order that the source of transmission can be maximally reduced.
3. As desired health behaviors relating to liver fluke control remain far from the target level, active health education activities need to be continuously carried out with a special emphasis on identified risk groups with effective strategies.
4. As the regionwide control program is concerned with a large number of health service agencies and public health workers at different level, the weakness of its operation is predominantly confined to their ineffective management. To strengthen the national program, planning, monitoring and supervision for all operational elements have to be seriously considered.

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