RESEARCH ARTICLE

Raw Fish Consuming Behavior Related to Liver Fluke Infection among Populations at Risk of Cholangiocarcinoma in Nakhon Ratchasima Province, Thailand

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Abstract

Opisthorchiasis is a health problem in rural communities of Thailand, particularly in the northeast and north regions. Therefore, this study aimed to investigate raw fish consuming behavior related to liver fluke infection among the population at risk for opisthorchiasis and cholangiocarcinoma (CCA). A cross-sectional descriptive study was conducted in Meuang Yang district, Nakhon Ratchasima province, northeast Thailand, between June and October 2015. Participants were screened for CCA, and samples who had a high score of CCA risk were purposively selected. A predesigned questionnaire was utilized to collect the data from all participants. X^2-test was used for analysis of associations between demographic data and raw fish consumption. The results revealed that participants had past histories of stool examination (33.0%), liver fluke infection (21.0%), praziquantel use (24.0%), raw fish consumption (78.0%), relatives family consuming raw fish (73.0%), and relatives family with CCA (3.0%). Participants consumed several dished related to liver fluke infection, mainly raw fermented fish (13.0%), under smoked catfish (5.00%), raw pickled fish (4.00%), and raw spicy minced fish salad (3.00%). The most common types of cyprinoid fish were *Barbodes gonionotus* (39%), *Hampala dispar* (38%), *Puntius brevis* (37%), *Cyclocheilichthys armatus* (33%), *Puntioplites proctozysron* (32%), and *Luciosoma bleekeri* (30%), respectively. Participants had a low level of knowledge (mean=3.79, SD=0.74), moderate attitude (mean=7.31, SD=7.31) and practice (mean=38.64, SD=6.95) regarding liver fluke prevention and control. Demographic variables like age (>36 years old; X^2-test=17.794, p-value=0.001), education (primary school; X^2-test=18.952, p-value=0.001), marital status (married; X^2-test=12.399, p-value=0.002), and income (<5,000 baht; X^2-test=27.757, p-value=0.015) were significantly associated with raw fish consumption. This result indicates that the population had risk consumption for liver fluke infection particularly of various cyprinoid fishes that are 2nd intermediate hosts. Therefore, health education is required to improve their behavior.

Keywords: Raw fish consuming behavior - liver fluke - cholangiocarcinoma - Thailand

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Introduction

Opisthorchis viverrini is an endemic in Southeast Asia particularly in Thailand, Lao People's Democratic Republic, Cambodia and central Vietnam (Sripa et al., 2010). The under-estimate of infections are considered, more than 10 million people are infected with *O. viverrini* in that areas (Sithithaworn et al., 2012). It is estimated that 6 million people are infected with the *O. viverrini* in Thailand (Jongsuksuntikul and Imsomboon, 2003). It is a serious health problem in Thailand, particularly in northeast and north region (Kaewpitoon et al., 2008; Sripa et al., 2010; Kaewpitoon et al., 2015a). 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 1 carcinogens by the International Agency for Research on Cancer, World Health Organization (WHO) (IARC, 1994). In addition, the high mortality rate of CCA was reported in the northeast areas where found frequently of *O. viverrini* infection (Sripa et al., 2010). 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

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urgently needed (Sripa and pairojkul, 2008).

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). Furthermore, a total of 640 Cyprinidae family fish including 5 species were collected from different study sites of Nakhon Ratchasima province, and investigated for *O. viverrini* metacercariae. The infection rate was 12.3% (79/640), predominantly in *Cyclocheilichthys armatus*, C. repasson, Puntioplites proctzysron, Hampala macrolepitota and *Hampala dispar*, respectively. The prevalence of *O. viverrini* metaceria was found covered 78.1% of areas, predominantly in Sida and KiaKham Thale So (Kaewpitoon et al., 2012a).

These figure indicate that *O. viverrini* infection is still a problem in Nakhon Ratchasima, therefore, this aimed to investigate the raw fish consuming behavior related to liver fluke among the population at risk for opisthorchiasis and cholangiocarcinoma (CCA) in Meuang Yang district, Nakhon Ratchasima province, northeast Thailand. This data may able useful for further work on health intervention, prevention and control.

Materials and Methods

A cross-sectional descriptive study was conducted in Mueang Yang district, Nakhon Ratchasima province, northeast Thailand, between June and October 2015. Meuang Yang is a district in the northeastern part of Nakhon Ratchasima province. Neighboring districts are (from the north clockwise) Ban Mai Chaiyapot, Phutthaisong and Kho Mueang of Buriram province, Lam Thamenchai, Chum Phuang and Prathai of Nakhon Ratchasima Province. The district is subdivided into 4 sub-districts, and 44 villages. This district is coverage areas 255.5 km2 (98.6 sq mi), and has 28,359 populations. Populations at risk for opisthorchiasis and 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. Population at risk was identified following 1+2+3+4+5+6+7+8, who had a score with more than 5 points was selected. Of 100 participants was purposive selected from population at risk who had highest of risk score.

Participants were completed a predesigned questionnaire which composed (1) demographic data; gender, age group, education, agriculture, marital status, and income, (2) past history with stool examination, liver fluke infection, raw fish consumption, relative family consuming raw fish, and relative family with CCA, (3) types of raw fish dish, (4) types of cyprinoid fish, (5) knowledge; 15 questions, (6) attitude; 20 questions, and (7) practice; 20 questions. Reliability and validity of questionnaire was analyzed, knowledge (Kruder-Richardon-20) = 0.85, attitude and practice (coefficient of Cronbach's alpha) = 0.92 and 0.76, respectively.

Descriptive and analytical statistical data were analyzed with SPSS software. Each questionnaire was analyzed and interpreted for their parts. Evaluation of knowledge level was calculated and analyzed according to Bloom et al (1971), answer correct=1, incorrect=0, and interpreted to high level; 11-15 points, moderate level; 6-10 points, 0-5 points; low level. Evaluation of attitude and practice level was calculated and analyzed according to Best (1977), attitude with 3 choice (agree, not sure, disagree): positive question=3,2,1, negative question=1,2,3, and interpreted to good level; 48-60 points, moderate level; 36-47 points, and low level; 0-35 points, practice with 3 choice (frequently, sometimes, never): positive question=3,2,1, negative question=1,2,3, and interpreted to good level; 48-60 points, moderate level; 36-47 points, poor level; 0-35 points. X^2-testing was used to analyzed the associated between demographic data and raw fish consumption.

Results

A total of 100 participants, was included in this study. The majorities of participants were female (73.00%), age group 46-55 years old (48.00%), primary school (92.00%), marriage (91.00%), agriculture (99.00%), income 5,001-15,000 bah/month (36.00%) (Table 1). Participant had past histories with stool examination (33.00%), liver fluke infection (21.00%), praziquantel used (24.00%), raw fish consumption (78.00%), relative family consuming raw fish (73.00%), and relative family had CCA (3.00%) (Table 2).

Table 1. Demographic Data and Factors Related to Raw Fish Consumption

Characteristic baseline	No. of participant	%	X^2-test	p-value
Gender			1.033	0.597
Male	27	27		
Female	73	73		
Age			17.794	0.001
25-35	3	3		
36-45	31	31		
46-55	48	48		
56-65	16	16		
>65	2	2		
Education			18.952	0.001
Primary school	8	8		
Secondary school	92	92		
Marital status			12.399	0.002
Single	3	3		
Marriage	91	91		
Widow/separated	6	6		
Occupation			5.94	0.285
Agriculture	99	99		
Trader	1	1		
Income (Baht/month)			27.757	0.015
<5,000	13	13		
5,001-15,000	36	36		
15,001-25,000	4	4		
25,001-35,000	21	21		
35,001-45,000	18	18		
>45,001	8	8		

The most of participants was occasionally consumed raw pickled fish (74.00%), raw fermented fish, (78.00%). Participant had a several dish related to liver fluke infection mainly raw fermented fish (13.00%), under smoked catfish (5.00%), raw pickled fish (4.00%), and raw spicy minced fish salad (3.00%) (Table 3). The highest of types of cyprinoid fish dish that participants answer, was *Barbodes gonionotus* (39.00%), *Hampala dispar* (38.00%), *Puntius brevis* (37.00%), *Cyclocheilichthys armatus* (33.00%), *Puntioplites proctozysron* (32%), and *Luciosoma bleekeri* (30.00%), respectively (Table 4). Participant had a low level of knowledge (mean=3.79, SD=0.74), moderate level of attitude (mean=7.31, SD=7.31) and practice (mean=38.64, SD=6.95) regarding liver fluke prevention and control (Table 5).

Table 2. Past Histories of Stool Examination, Opisthorchiasis, Raw Fish Consumption, and relative Family with Cholangiocarcinoma

Histories	No. of participant	%
Stool examination		
Yes	33	33
No	67	67
Liver fluke infection		
Yes	21	21
No	79	79
Praziquantel used		
Yes	76	76
No	24	24
Raw fish consumption		
Yes	78	78
No	22	22
Relative family consuming raw fish		
Yes	73	73
No	27	27
Relative family had cholangiocarcinoma		
Yes	3	3
No	97	97

Table 3. Types of Raw Fish Dish and Consumption

Types of dish	Frequency of consumption		
	Frequently	Sometime	Never
Raw pickled fish (Pla Som)	4	74	22
Raw pickled small fish (Pla Jom)	2	8	90
Raw fermented fish (Pla Ra)	13	78	9
Raw spicy minced fish salad (Lahb Pla)	4	23	73
Raw fish in Spicy Condiment (Koi Pla)	3	15	82
Under smoked catfish (Pra Lom Kwan)	5	20	75

Table 4. Types of Cyprinoid Fish and Consumption

Types of Cyprinoid fish	Consumption	
	Yes	No
Luciosoma bleekeri (Pla Sai Aw)	30	70
Puntioplites proctozysron (Pla Kra Mang)	32	68
Osteochilus melanopleurus (Pla Prom Hua Men)	23	77
Anematichthys repasson (Pla Sai Tan Ta Kaow)	20	80
Labiobarbus siamensis (Pla Sa)	25	75
Cyclocheilichthys armatus (Pla Pak Liam)	33	67
Hampala dispar (Pla Kra Soob Jood)	38	62
Hampala macrolepidota (Pla Kra Soob Keed)	35	65
Puntius orphoides (Pla Kam Cham)	23	77
Henicorhynchus siamensis (Pla Soi)	28	72
Barbodes gonionotus (Pla Tapien Kaow)	39	61
Puntius brevis (Pla Tapien Sai)	37	63

Table 5. Knowledge, Attitude, and Practice of Participant Regarding Liver Fluke

Behavior	Mean	SD	Level
Knowledge	3.79	0.74	Low
Attitude	39.45	7.31	High
Practice	38.64	6.95	High

The association between demographic data and raw fish consumption, was analyzed and found that age (>36 years old; X^2-test=17.794, p-value=0.001), education (primary school; X^2-test=18.952, p-value=0.001), marital status (married; X^2-test=12.399, p-value=0.002), income (<5,000 baht; X^2-test=27.757, p-value=0.015) (Table 1)

Discussion

O. viverrini has been classified as Type 1 carcinogens by the International Agency for Research on Cancer, World Health Organization (IARC, 1994). The high prevalence of *O. viverrini* infection has been reported and it also found the high mortality rate of CCA (Sripa et al., 2010). The distribution *O. viverrini* infection in Nakahon Ratchasima province has been reported that 2.48% were infected with *O. viverrini*. (Kaewpitoon et al., 2012c). This figure indicates that *O. viverrini* infection is still a health problem in Nakahon Ratchasima province. Therefore, investigation of the raw fish consuming behavior related to liver fluke among the population at risk for opisthorchiasis and CCA in Meuang Yang district was conducted. Recently, the majorities of participants were female, age group 46-55 years old, primary school, marriage, and agriculture. This characteristic is similarly to other publication toward opisthorchiasis that found that gender, age, education, occupation in the rural communities (Kaewpitoon et al., 2012c; Kaewpitoon et al., 2015a,b,c). The association between demographic data and raw fish consumption, was analyzed and found that age (>36 years old), education (primary school), marital status (married), income (<5,000 baht). This result is similarly to Kaewpitoon et al., (2015b) reported that age (61-70 and 71-80 year old), education (primary school) and occupation (agriculture), were significantly associated with *O. viverrini* infection (p-value<0.05). In addition, *O. viverrini* infection was most frequent in the 51-60 year age group and was found to be positively associated with education (Kaewpitoon et al., 2012c). Therefore, further health intervention is concerned in this group.

Participant had past histories with liver fluke infection (21.00%), praziquantel used (24.00%), and relative family

had CCA (3.00%). This group has opportunity to initiate the CCA. Based on data publish in PubMed indicate that opisthorchiasis (Viranuvatti and Mettiyawongse (1953); Bhamarapravati and Viranuvatti (1966); Koompairochana et al (1978); Sonakul et al (1978); Boonpucknavig et al. (1986), and repeated praziquanltel used are strongly associated to CCA (Mairiang et al., 1992; Mairiang et al., 1993; Chernrungroj 2000; Kamsa et al., 2015). Therefore, health education joint CCA screening in this group are urgently need required. Furthermore, participant had a history with raw fish consumption (78.00%), relative family consuming raw fish (73.00%). This result shows that they have a chance infect the liver fluke. The most of participants was occasionally consumed raw pickled fish (74.00%), raw fermented fish, (78.00%). Participant had a several dish related to liver fluke infection mainly raw fermented fish (13.00%), under smoked catfish (5.00%), raw pickled fish (4.00%), and raw spicy minced fish salad (3.00%). The highest of types of cyprinoid fish dish that participants answer, was *Barbodes gonionotus* (39.00%), *Hampala dispar* (38.00%), *Puntius* brevis (37.00%), *Cyclocheilichthys armatus* (33.00%), Puntioplites proctozysron (32%), *Luciosoma bleekeri* (30.00%). Previously, the study reported that *O. viverrini* metacercariae in fresh water fish was found in Nakhon Ratchasima, the infection rate was 12.3% (79/640). The prevalence of *O. viverrini* metaceria was found covered 78.1% of areas (Kaewpitoon et al., 2012a). Perceive susceptibility and severity to liver fluke, perceive benefit and barrier to liver fluke prevention and control are need required for those group.

Participant had a low level of knowledge, moderate level of attitude and practice regarding liver fluke prevention and control. This is a high risk group for CCA who were screened by mini-verbal screening test, therefore, they have a low-moderate behavior toward disease. Previous study indicated that knowledge, attitude, and practice related to liver fluke infection in the northeastern Thailand (Kaewpitoon et al., 2007). This recent result suggest that opisthorchiasis is still a problem in this areas. Therefore, health intervention based on self-efficacy and social support in the population at risk is need required. Lawa model (Sripa et al., 2015); the success model for liver fluke prevention and control in the rural community, this is inspiration for intervention. In the concept, the project's primary challenge has been learning how to build an effective disease prevention and control program from the "bottom-up", including creating an understanding of liver fluke infection disease risk with the community. Preliminary results suggest treatment and education campaigns are only effective to the extent engage with the community in a reciprocal learning process. This includes understanding the local culture and broader health and well-being concerns held by a community and ensuring these are aligned with intervention program approaches and activities.

Conclusion, this result indicates that people had a risk consuming behavior related to liver fluke infection particularly raw fish consumption with relative 2nd intermediate host, furthermore, they had low knowledge and moderate attitude and practice regarding liver fluke prevention and control. Therefore, therefore, health education is need required for improve their behavior.

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