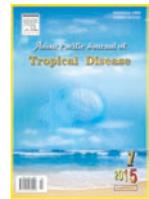




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Opisthorchiasis in Northeastern Thailand: Effect of local environment and culture

Beuy Joob^{1*}, Viroj Wiwanitkit^{2,3,4,5}

¹Sanitation 1 Medical Academic Center, Bangkok, Thailand

²Surin Rajabhat University, Bangkok, Thailand

³Joseph Ayobabalola University, Nigeria

⁴University of Nis, Serbia

⁵Dr DY Patil Medical University, Pune, India

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ABSTRACT

Opisthorchiasis is a kind of trematode infection. This parasitic infestation is a chronic hepatobiliary tract infection and can cause chronic irritation that will finally lead to cholangiocarcinoma. It is highly endemic in northeastern region of Thailand and contributes to many cholangiocarcinoma cases annually. The attempt to control the disease becomes a national policy. However, the sanitation becomes a major underlying factor leading to infection and meanwhile, the poverty and low education of the local people become an important concern. In this opinion, the authors discuss the effect of local environment and culture on opisthorchiasis in northeastern Thailand. Due to the pattern change of local environment, global warming and globalization, the dynamicity can be observed.

1. Introduction

Fluke is a common group of human parasitosis. There are many flukes in our world and many are problematic in public health[1]. Of several flukes, opisthorchiasis is a serious trematode infection. This parasitic infestation is a chronic hepatobiliary tract infection and can cause chronic irritation that will finally lead to cholangiocarcinoma[2,4]. This parasitic infestation is highly endemic in northeastern region of Thailand and contributes to many cholangiocarcinoma cases annually. It is believed that the chronic infestation caused by *Opisthorchis* spp. with the exposure to additional carcinogen in the local environment is the underlying pathogenesis for carcinogenesis of biliary tract cancer.

Of interest, when a cholangiocarcinoma occurs, it is usually severe and the diagnosis is usually late. The patients usually present with unexplained severe hyperbilirubinemia and the tumor is usually detected by imaging investigation[5]. Unluckily, the disease is usually advanced and no curative treatment can be provided to the patients[5].

Since opisthorchiasis is a serious underlying risk for development of cholangiocarcinoma, the control of opisthorchiasis becomes an important local public health issue. The attempt to control this disease becomes a national policy. Several campaigns have been launched[6,7]. Nevertheless, the problem is still persistent. Attempt to get rid of the parasite by universal usage of antihelminthic drug becomes unsuccessful[6,7]. In case of a parasitic infestation, the sanitation becomes an important underlying factor leading to infection, and the poverty and low education of the local people become an important concern.

In this opinion, the authors discuss the effect of local environment and culture on opisthorchiasis in northeastern

*Corresponding author: Beuy Joob, Sanitation 1 Medical Academic Center, Bangkok, Thailand.

E-mail: beuyjoob@hotmail.com

Thailand. Due to the pattern change of local environment, global warming and globalization, the dynamicity can be observed.

2. Poverty in Northeast Thailand and opisthorchiasis

In Thailand, the northeastern region is the poorest region with the lowest average income of local population. In this region, there are a large amount of the poor with low educational level. There is no doubt that there are several endemic diseases in this area. The opisthorchiasis is a major example. In a recent report, the average crude prevalence of infection is about 24.5%, ranging from 2.1% to 70.8%[8]. Whereas the incidence of cholangiocarcinoma in this area is about 93.8 to 317.6 per 100000 person each year, which is considerably high and might be the global highest rate[8]. Focusing on the previous case series of patients with cholangiocarcinoma in Thailand[5], it can be seen that most patients were the poor from the northeastern region. Also, in a recent study on cancer record in this region, it is apparently shown that almost all cancerous cases have low annual income[9]. As noted by Hotez and Ehrenberg, “the 11 Southeast Asian countries together with the People’s Republic of China (P.R. China) account for a significant burden of global poverty and disease[10].” Hence, there is no doubt that poverty is the rooted cause of disease burden in Southeast Asia. In fact, to successfully control opisthorchiasis, a good screening is needed. However, the difficulty is the stool negative infected cases. The administration of universal antihelminthic drug use is also problematic since the chance for repeated infection can be expected[10]. The opisthorchiasis in northeastern Thailand is normally the result of poor sanitation. The poor behaviors, as well as raw food intake, are the big rooted problem[1]. It is an actual challenge to handle the situation. To manage this neglected infection, the focus on the underprivileged and poor population is recommended by Lustigman *et al.*[11].

3. Effect of environmental backgrounds on opisthorchiasis in Thailand

Without a doubt, environment is an important determinant of opisthorchiasis[1]. In northeastern Thailand, a tropical region, it is good for the growth of liver fluke. In the life cycle of liver fluke, intermediate hosts are generally needed, such as snails and freshwater fishes. The tropical environment in northeastern Thailand also promotes the maintenance of life cycle of the liver fluke. Wang *et al.* noted that water is the critical agent for supporting life cycle of liver fluke and also mentioned that “seasonality and water quality appear to affect the habitats and population dynamics of the two intermediate hosts, *Bithynia* snails and cyprinid fish[12].” In Thailand, with monsoon climate, higher humidity and heavier rain than non-tropical countries,

the growth of parasites within the reservoir hosts in the water reservoir is easy. In addition, since the local people are usually poor, they usually have to find the food from nature and the snails and freshwater fish are usually the main food source for them[1-3]. Hence, getting rid of opisthorchiasis in this area is very hard. In fact, the food-borne trematode infections are usually aggravated by social and economic factors including poverty[13].

The other interesting issue is the effect of climate change. In fact, drought is a common problem in summer in northeastern Thailand. In the past when it was extremely hot and dry, there was no enough water and that might naturally control the breeding of the parasites. However, with the development of the irrigation system within the past half century, the water can be available in summer and that helps the parasites to maintain its life cycle. Indeed, Wang *et al.* noted that “the construction of irrigation ditches increases the connections between the hosts, thereby functionally facilitating the disease transmission[12].” In addition to the physical support, it is questionable whether there is any biological alteration of the parasites life cycle due to the climate change. In the recent few years, the great concern is the global warming. Several diseases are mentioned with increasing prevalence due to the global warming. Concerning opisthorchiasis, as noted by Gauly *et al.*, “the epidemiology of liver fluke is favourably influenced by increased temperature and humidity, relations between climate change and disease dynamics should be followed closely[14].” As noted by Swynghedauw, climate change due to global warming can result in “many different changes affecting both biodiversity and ecosystems[15]” and can as well result in “an increased level of poverty[15].”

Due to the effect of increasing environmental temperature in Thailand, the persistent high prevalence of opisthorchiasis might be explained. To support this hypothesis, there are many recent surveys, despite of the implementation of anti-opisthorchiasis campaigns by Thai Ministry of Public Health, confirming that the high prevalence of *Opisthorchis* spp. larvae’s infecting snails and freshwater fishes collected from local water reservoirs in northeastern Thailand[16,17].

4. Effect of cultural backgrounds on opisthorchiasis in Thailand

As mentioned, in the case of a parasitic infestation, the sanitation becomes an important underlying factor leading to infection, and the poverty and low education of the local people become an important concern. Due to low education, there is no doubt that the local people do not know much about how to avoid getting infection. Moreover, there are many rooted cultures that might increase the risk of infection. As noted by Graczyk *et al.*, “century-old traditions of eating” is an important underlying

condition that leads to difficulty in controlling food-borne parasitic zoonosis[13]. In Northeastern Thailand, a rooted eating practice is eating raw fish. The local dishes, namely, “Pla-dip” and “Pla-ra” are widely consumed by local people and that is the starting point of infectious cycle[18]. In the meanwhile, because of the poverty, the local people cannot earn much to buy good food and facility for cooking and that results in finding local foods and eating them uncooked. Besides, the raw fish dishes in local Northeastern Thailand are locally prepared based on the local culture. Adding nitrosamine into the raw fish dishes is common and nitrosamine is proved to be the co-factor that can lead to carcinogenesis[19 - 21]. Forrer *et al.* recently studied the risk among the local people in Laos which is next to northeast Thailand, and concluded that “infection with *Opisthorchis viverrini* appears to be strongly associated with exposure to the second intermediate host fish, human behavior and culture, whereas high transmission is sustained by the lack of sanitation[22].” Grundy-Warr *et al.* concluded that “for disease prevention and health education approaches to be most effective, they must be sensitive to culture, livelihood economics, gender, and age[18].”

Conflict of interest statement

We declare that we have no conflict of interest.

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