

Perceived illness drives participation in mass deworming campaigns in Laos

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Abstract

Multiple helminth infections are very common in communities of southern Laos. Preventive chemotherapy in combination with health education is the mainstay of control. We assessed the knowledge, perceptions and practices of rural communities related to endemic helminthiasis and their control during a mass drug administration (MDA) campaign. Short interviews with household heads (n = 192), direct observations and discussions with attendants of mass drug administrations, and in-depth interviews with local opinion leaders (n = 21) were carried out. Quantitative and qualitative data analysis was performed. Results showed that opinion leaders and villagers were well aware of the importance of attending MDA. Leaders perceived the effectiveness of MDA against severe schistosomiasis and appreciated that it was provided for free and in their village. They encouraged villagers to attend it. Anticipated adverse effect of praziquantel was a barrier for participation. A majority of leaders purchased deworming tablet (mebendazole, albendazole) in a local pharmacy for deworming when MDA is absent in their villages (19/21). Most leaders (20/21) had a good knowledge on severe schistosomiasis though only a few of them (5/21) described its cause correctly. They knew little about the disease consequences of liver fluke (3/21) and soil-transmitted helminth (4/21) infections but more about their causes. A high risk for worm infection was observed: consumption of raw or insufficiently cooked fish (100%), frequent physical contacts with Mekong River water (76.0%) and low number of latrines (14.5%). In conclusion, MDA is widely accepted in affected communities. Avoiding severe schistosomiasis was the main motivation to comply. Participation rates increased significantly with drugs provided free of charge in the villages. Better knowledge on the consequences of worm infections and on its modes of transmission will foster the distribution and acceptance of appropriate preventive treatment and other measures in helminth endemic communities. Where multiple infections require several drugs for MDA, preceding health education and information about MDA and its benefits are a prior condition.

Key words: knowledge, perceptions, mass drug administration, *Opisthorchis viverrini*, *Schistosoma mekongi*, soil-transmitted helminth, deworming, praziquantel, mebendazole, albendazole

1. Introduction

Preventive chemotherapy campaigns combined with information, education and communication (IEC) are the mainstay of large-scale control of helminthiasis promoted by the World Health Organization (WHO) (Hotez et al., 2006; WHO, 1995; WHO/HTM/NTD, 2011). WHO recommends that more than 75% of an affected population should attend a mass drug administration (MDA) (Hotez et al., 2006). Several drugs are recommended depending on endemic helminthiasis. In area where multiple helminth infections are prevalent several drugs are used simultaneously, e.g., praziquantel (against schistosomiasis and opisthorchiasis) and albendazole (against soil-transmitted helminthiasis [STH]). Areas of multiple parasitic infections are very common.

Lao People's Democratic Republic (Lao PDR, Laos) is committed to preventive chemotherapy. The National Centre for Malariology, Parasitology and Entomology (CMPE) under the supervision of the Ministry of Health is thereby a main body for implementing the corresponding control activities. In the 1980ties and 90ties, MDA has been carried out in Champasack Province's endemic foci of Mekong schistosomiasis and opisthorchiasis between 1989 and 1999 (Khamkeo and Pholesena, 2003; Montresor et al., 2008; Muth et al., 2010; Urbani et al., 2002). Following the results of national parasitological survey on STH among primary school children in Laos (Rim et al., 2003), a nationwide annual mass treatment against STH in primary school children is carried out since 2005 (Phommasack et al., 2008). Concurrent helminth infections are very common in the southern provinces of Laos (Sayasone et al., 2007; Sayasone et al., 2009; Sayasone et al., 2011).

The objective of this study was to better understand knowledge, perceptions and practices in communities on helminth control in areas where the prevalence rates of concurrent helminthiasis infections are very high and thus where MDA based interventions require the use of several drugs.

2. Population, materials and methods

2.1 Ethical consideration

Ethical clearance was obtained from the National Ethic Committee on Health Research, MOH, Lao PDR, No 027/NECHR, and the Ethic Committee of Kanton Basel-Stadt 255/06. Informed consent was obtained from interviewees before enrolment.

2.2 Study area

The study was carried out on Donelong Island, Khong District, Champasack Province, in southern Laos. The Mekong island area is the most important source of freshwater fish (including Cyprinoid fish species) in southern Laos. Fishery is the main livelihood together with rice cultivation and livestock (Singhanouvong and Phouthavong, 2002). Widespread rocky banks are suitable habitats for *Neotricula aperta* snail, the intermediate host for *Schistosoma mekongi* transmission (Ohmae et al., 2004). Donelong Island is highly endemic for the Mekong schistosomiasis (Sayasone et al., 2011). Four villages are on Donelong, namely Houalong, Longsong, Longkang and Hanglong (Figure 1). The total population is 2,054 inhabitants (316 households). Most villagers are subsistence farmers and fishermen. Mekong River is a main water source for household and cultivation activities. A pharmacy and health facilities do not exist on the island. The nearest pharmacy is located in Meaungsen village on the mainland, approximately 30 minutes by motorboat. The closest health facility is the Khong District hospital which is accessible by motorboat and then by

road, roughly within a one hour travel time. There is no drug revolving fund scheme in these four villages.

In Khong District including this island study area *S. mekongi* control started in the 1980ties (Muth et al., 2010; Urbani et al., 2002). Several MDA rounds combined with health education were conducted between 1984 and 1999 using a single oral dose of praziquantel and mebendazole/albendazole (Urbani et al., 2002).

In 2006, multiple helminth infections were documented at high prevalence rates on Donelong Island. Infections with *S. mekongi* and *Opisthorchis viverrini* reached 68.0% and 92.0%, respectively. STH were very common (hookworm 76.8%, *Ascaris lumbricoides* 31.7%, *Trichuris trichiura* 25.0%), and *Taenia* spp. (1.8%) (Sayasone et al., 2011) and in addition minute intestinal flukes (e.g., *Haplorchis taichui*) were highly reported (Chai et al., 2013; Lovis et al., 2009). In 54% of the examined Donelong population 3-6 simultaneous helminth species infections were diagnosed. In addition intestinal protozoa such as *Giardia intestinalis* (3.0%) were detected (Sayasone et al., 2011).

On Donelong Island, profound liver and intestinal morbidity was frequent due to *S. mekongi* infection (Muth et al., 2010). Co-infection with *O. viverrini* aggravated the liver morbidity (Sayasone et al., 2012). In addition bile duct morbidity associated to *O. viverrini* such as dilated bile ducts were frequent and of considerable severity (Sayasone et al., 2012). They are a risk factor for the development of cholangiocarcinoma, a fatal bile duct cancer (Sripa et al., 2011).

2.3 Study population and data collection

Data collection was carried out in June 2007 when a MDA campaign took place on Donelong Island. The research team spent four days and nights in each study village. Three methods of data collection were pursued: (i) short interviews with household heads, (ii) direct observations of attendees during MDA, and (iii) in-depth interviews with key informants (i.e.,

opinion leaders) such as head of village, village health volunteer, head of Lao Women Union, trained birth attendant, teacher and monk.

All heads of household who have participated in the MDA were interviewed using a pre-tested structured interview form in Lao language. It consisted of the general demographic characteristics of the respondents, household data like household assets, and type of house, risk factors for helminth infections like habit of eating raw or insufficiently cooked fish, possession of latrine, and having contact with the Mekong River like washing, bathing and fishing, and previous participations in deworming campaigns. Each interview lasted 10 to 15 minutes.

During the distribution of deworming medicine, one researcher observed the MDA attendees as well as assessed their willingness to attend the treatment. The discussions during the waiting period before and after receiving the medicine were noted. All collected information about perceived importance of the medicines, their effects on worms and health, and the reasons for MDA participation were recorded. The results of the observations were also written down during the four days in each village. The mass treatment was provided by the district and provincial authorities. Albendazole (400mg, oral, single dose) and praziquantel (40mg/kg BW, single dose) was given to all villagers except (i) children below four years of age, (ii) pregnant and breast-feeding women, (iii) people with any sickness on treatment day, and (iv) persons under tuberculosis and epilepsy treatment.

In-depth interviews with opinion leaders of each village were performed. The interviews followed a pre-tested and pre-established discussion guide consisting of questions related to knowledge on MDA, on risk factors for helminth infections and on relationship between infection and disease, and to the perceptions and practices with respect to deworming in the community. Each interview lasted between 30 and 45 minutes. The physical presence and availability during the survey days decided on whom the research team could interview.

2.4 Data management and analysis

Quantitative data was entered into EpiData freeware (www.epidata.dk). Descriptive analysis was performed with SPSS program (version 11.5). Qualitative data from the individual interviews were transferred into a notebook in Lao language and restored in full sentences after each interview. Interesting statements were directly quoted. All field notes were typed into a MS Word document in English. Subsequently, themes related to the general objectives of the study were marked. Information collected through direct observation was summarized daily. The interesting ideas and discussions among MDA attendees were quoted. Field notes from observation and qualitative statements from interviews constitute the qualitative data set. Finally, all these qualitative data were coded and categorized, analysed and interpreted.

3. Results

During the interviews and observations, several Lao terms related to intestinal worms, worm infections, the associated disease and their treatments were mentioned by the villagers. They are presented in Table 1 together with their literal translation and equivalent medical terms. A relatively rich terminology was found. Many of the Lao terms used by villagers are a description of the adult parasite (e.g., “worm with round body” for *Ascaris lumbricoides*) or of its location in the body (e.g., “worm of liver leaves” for liver fluke parasite) or related to the way of transmission (e.g., “snail disease” for schistosomiasis).

3.1 Interviews with heads of household

The interviews with 192 heads of household from four villages indicate a low variation of the answers between the villages. The socio-demographic profile shows that most interviewees were male (80.7%); the average age was 43.8 years (17-89 years; SD 12.9 years); more

than half of them (54.5%) attended primary school. Most of them (77.6%) were farmers with a considerable amount of household assets: about half of the households (47.4%) owned cattle, and at least one motorboat (48.4%) while about one third of the households had a motorbike (31.8%) and a TV set (39.1%). Almost eighty per cent (79.2%) of their houses were permanent, with wooden walls and floors and iron sheet roofs.

Risk factors for helminth infections and transmission were highly prevalent in these households. All heads of household reported to consume regularly raw or insufficiently cooked fish dishes. Less than one sixth of the households had a latrine (14.5%). Almost two-thirds of households pumped water directly from the Mekong into the household (63.0%), and three quarter of villagers took regularly a bath in the river (76.0%).

Asked about deworming programmes in the community, 50.5% of the interviewees replied that they had already participated in earlier MDA campaigns. 63.9% of them attended MDA after the year 2000 while 36.1% of them participated even before the year 2000. Adverse effects after treatment with praziquantel (PZQ) were reported by 10.3%.

3.2 Direct observations and discussions with MDA attendees

The distribution of the drugs took place in the central part of each village, on the ground floor of a villager's house. Benches and tables served as seats where health staff (two national, one provincial and one district health staff) arranged the materials and provided the treatment. MDA attendees were waiting nearby on benches and plastic chairs. The MDA campaign was carried-out between 7.30 am and 5 pm.

Most attendees were aware of the importance of MDA. They attended although the MDA took place during the rain-fed farming season where the majority of villagers were intensively working in the paddy fields or stayed in their distant fields; they were informed previously by relatives. They attended the treatment either in the early morning or in the late afternoon.

Some villagers refused the treatment due to their experience with adverse effects from previous mass treatments. A frequent topic of conversation during drug distribution was the issue of medicine causing tiredness. Thus, some villagers mentioned that not all household members should attend the treatment on the same day in order to maintain the physical strength for field work. A woman who just took the medicine said: *“After taking the medicine today I do not go back to the field anymore. I will take a rest. I know that this medicine causes tiredness. I experienced that from a previous campaign.”*

During the MDA, some attendees experienced adverse effects after PZQ treatment. One girl (5 years old) had an allergic reaction just 15 minutes after her treatment whereas other treated villagers had neurological and gastrointestinal symptoms: dizziness, stomach-ache, vomit, and light diarrhoea. Apart from these “bad” symptoms people were glad that they received this drug treatment.

We observed that village leaders encouraged their community to participate in the treatment. A teacher announced: *“Please take this opportunity, you know you cannot find this drug in the pharmacy. It is a good chance for you. I heard from the visit of the health staff that the more snail diseases you have, the more serious the side effects may occur. Myself, I think these side effects are common, you must be patient if you want to be healthy.”*

3.3 In-depth interviews with key informants

In-depth interviews were carried out with 21 opinion leaders. Three of them were teachers, one was a laboratory technician, and seventeen of them were farmers. Six were women; their mean age was 44.6 years (ranged 25-55 years), which was not different from the mean age of men (45.9 years, ranged 25-76 years; Table 3).

Schistosomiasis related discussion

Almost one fourth of opinion leaders (5/21, 23.8%) were aware that swimming or staying in Mekong River was a risk of acquiring infection with schistosomiasis. They obtained this knowledge from the health staff when they visited their village a while ago. In contrast, many opinion leaders (15/21, 71.4%) believed that the snail disease was caused by drinking the water from rocky river banks; and a few persons believed that schistosomiasis resulted from their previous generations as a punishment because they drunk the cursed water and by this they were accused of doing 'bad things'.

Almost all interviewees (20/21) knew that this severe disease resulted from an infection with a parasite. They described the illness with developing a "big belly" and becoming "slim" and "pale". All of them had observed patients with severe schistosomiasis in their village before the MDA were conducted. Today this condition is rarely seen anymore. They said that the most severe cases vomited a lot of blood, and once this symptom happened, they were never cured and have died.

Soil-transmitted helminths discussion

Most opinion leaders (20/21) understood that eating raw meat, not using latrines, not hand-washing before eating, and being bare-footed when walking outside the house were the actual risk factors for worm infection and its transmission. However, when they were asked about the type of worms, none of the leaders could describe them.

The villagers were encouraged by most leaders (20/21) to follow the three rules of hygiene and cleanliness: proper eating, proper living and proper clothing. In addition, they stimulated the villagers to use latrines and to avoid eating raw meat. They gained this knowledge from friends, during visits of health staff, and through radio and TV. They have never been formally trained. Only a few leaders (4/21) could describe the effects of a worm infection such as exhaustion, dizziness, rash, and nausea.

None of the opinion leaders thought to be infected with worms because no worms were expelled with faeces. In addition, they stated that an infection with worms was clearly not so harmful for their health like malaria, diarrhoea and fever, where they push people to seek care urgently.

Liver fluke infection discussion

More than the half of the opinion leaders (14/21) understood that eating raw fish was a risk factor for an infection with liver fluke while most of them (18/21) did not know the consequences of this infection. When asking them to make a relationship between a liver fluke infection and corresponding illness symptoms, only three leaders (3/21) stated that an infected person would become sick and could develop tiredness very easily, and showing *tap kheng* (hard liver).

Two leaders (2/21) reported that they themselves and fellow villagers believed that the sour nature of lemon juice killed the worms in fresh fish meat; therefore, when preparing raw fish salad, they added a lot of lemon juice. A leader (aged 50 years) said: *“Most villagers including me believe that when we put a lot of lemon juice in the raw fish meat, it is equivalent to fish meat being well cooked because the sour juice of lemon kills the worms.”*

Deworming in community

All opinion leaders (21/21) were aware of the drug called praziquantel and its therapeutic effect against the snail disease. They recalled that the shape of a praziquantel tablet is elongated and has four segments.

They were convinced that after the villagers had participated in the MDA conducted in the community, the cases with big belly were rarely seen, and people's health was better today than before. For instance, children gained weight and did not suffer any longer from paleness. A head of a village (aged 46 years) said: *“Have you seen Mr. Meo who is staying*

in Longkang village? He had a big belly when he was a child. His parents gave him the drug for the snail disease. Today he is very healthy and married, and has three children. This drug is so effective.”

No one of the opinion leaders (0/21) understood that the deworming tablets were also provided as a medicine against STH. Few leaders (3/21) thought that MDA campaigns and drugs were effective also against the liver flukes.

All leaders perceived the positive effect of drugs against schistosomiasis. All were aware that the drug was not available in the local pharmacy and was provided free of charge during the deworming activities. Therefore, they actively encouraged their villagers to attend the deworming activity whenever it was conducted in their villages.

All opinion leaders reported to have participated in the MDA when it took place in their villages. In absence of deworming activities leaders reported that villagers treated worm infections as soon as they would observe worms in their faeces. They bought drugs directly from a pharmacy from the mainland without any prescription. They learned about the drug from own experience, friends, radio, TV, and the owner of the pharmacy. Some few leaders (2/21) used traditional medicine for treatment of tapeworms namely *mark keua* (a wild and bitter fruit) and *ya louk korn* (a small lump with the grinded bark of the *peuark had* tree).

4. Discussion

Our study assessed knowledge, perceptions and practices on worm infections and their control in rural communities of Khong District, Champasack Province in southern Laos. Mass treatment against *S. mekongi* combined with health education was conducted regularly by the Ministry of Health between 1989 and 1999. [As a result](#) the prevalence rate and intensity of *S. mekongi* and other helminthiasis declined during that period (Khamkeo and Pholesena,

2003). However, today multiple intestinal helminth infections are yet endemic in this study area. Mekong schistosomiasis, intestinal flukes, opisthorchiasis, STH and other helminthiases are currently highly endemic, and other intestinal parasitic infections such as taeniasis, intestinal protozoa and minute intestinal flukes are also prevalent (Sayasone et al., 2011). In addition, one quarter of the Donelong population was diagnosed in a recent study with *Strongyloides stercoralis*, the most neglected among the neglected tropical infections (Vonghachack unpublished document, 2013). In 2013, the infection with *H. taichui* in Champasack Province was reported to be highly prevalent and even higher than other parasitic helminths including *O. viverrini*, and *taenia* sp (Chai et al., 2013).

Our results showed that MDA was widely accepted as an effective measure for the control of *S. mekongi* in the community. However, it was less known that MDA was also an effective treatment of other parasitic infections such as opisthorchiasis and STHs. The interviewed villagers recognized that the health status in their community has fairly improved after a MDA was conducted in their village: cases with a big belly are today rarely seen in a village, and children are looking much healthier than before. Opinion leaders knew the positive effect of the treatment program against schistosomiasis only by means of observing the health changes in their community. Our study also shows that in previous MDA opinion leaders did not receive sufficient health education about efficacy of medicine against different worms. In addition, we found that leaders preferred the MDA program in their village because it provides medicine free of charge and directly in the village which meant that villagers had immediate access to treatment without travelling to a specific place and without spending additional resources. Furthermore, they recognised that praziquantel treatment was not available in local pharmacies.

Other studies report similar observations: people attend the MDA because this medication is free of charge and very convenient to be obtained (Gunawardena et al., 2007; Katsivo et al., 1993). It is because of this pragmatic perception that the opinion leaders in this study are so

eager to stimulate their community to participate and to get treatment in this current MDA. A high MDA compliance rate in the community can be certainly reached if the deworming program is provided for free in the villages. This finding shows very distinctly that community participation in a MDA deworming program depends to a great extent on the provision of free medication for the villagers. High affordability in relation to high availability – and by this less the villagers understanding and notion on the specific therapeutic effects of this medication – is thus one major reason to increase the MDA participation rate once the MDA is available in the villages.

It was interesting to note that many local terms were derived from the physical characteristics of the worm, e.g. “worm with round body” for the roundworm (*Ascaris lumbricoides*) or “worm with hook mouth” for hookworms. Most probably this community lay knowledge originated from exposure to health education programs provided to the community and also from direct communication with health professional but does not originate from traditional health concepts.

Due to its observable severity and its life-threatening nature of a long-lasting infection with *S. mekongi* opinion leaders were much more aware of Mekong schistosomiasis, its health consequences and the risk factors for infection than of other infections. The four study villages are also located in an endemic zone for *S. mekongi*; people’s daily life is very much depending on the water from Mekong River, and they share therefore a very high risk of *S. mekongi* infection. Surprisingly, however, the knowledge on transmission of *S. mekongi* was limited. Thus health education is the most essential element to strengthen knowledge of the community members on the issues which may help to better cope with it (Acka et al., 2010). Certainly, transmission is not easily preventable given the environment (Mekong as the only water source) and the socio-economic status of the villages in this area. However, with relatively little efforts, e.g., construction of showers in the households could reduce the exposure to the Mekong substantially and hence reduce transmission. To achieve this

improvement a better knowledge of community on the transmission and its importance for disease development is much-needed.

Most leaders in this study knew the risk factors for opisthorchiasis but only a few understood the relation between infection and this disease. It is well noted that this illness is diagnosed only by stool examination. At low intensity of infection, opisthorchiasis manifests in an asymptomatic way, while at moderate or high intensity the disease develops non-specific gastric symptoms but later may lead to severe disease (Fürst et al., 2012). At the community level it is actually a “disease without illness” (Helman, 2007) as the symptoms cannot be perceived by laymen until a very late stage. Therefore, it is most difficult to convince communities to participate in control activities.

In fact, *O. viverrini* infection is a main risk factor for cholangiocarcinoma, a fatal bile duct cancer (Sripa et al., 2012). In Laos, ultrasonographic examination among 6,396 subjects in 9 provinces between 2007 and 2011 revealed that in area with high *O. viverrini* prevalence, the suspected cases of cholangiocarcinoma are more frequent than in *O. viverrini* non-endemic areas (Korea Foundation for International Healthcare et al., 2012). By this, it is understandable that opinion leaders could not recognize the health impact of opisthorchiasis at a low intensity of infection. Furthermore, when the disease appears, people suspect another ailment unless they have been informed by health staff.

We found that opinion leaders were able to cite risk factors for acquiring worm infections. However, they could not describe the type of worm present and the negative impact of worm infections on health. Though most leaders told their villagers to observe the three hygienic rules (hygienic eating, living and clothing) and urged their villagers to use latrines, they have never been trained in a formal way. In Lao PDR, the concept of the three hygienic rules is promoted nationwide through mass-media and health staff who works in communities (albeit in irregular intervals). Therefore, in order to support a sustainable and effective control of helminthiasis in the community, local opinion leaders should be trained properly on this issue.

Our study shows that with the absence of MDA in the community all opinion leaders said that they bought deworming drugs from pharmacy and a few of them were using traditional medicine like *mark keua* (a wild and bitter fruit) and *ya louk kone* (a small lump with the grinded bark of the *peuark had* tree) for treatment of tapeworm – but only in case they observed worms expelled in faeces. In pharmacies, only albendazole and mebendazole are available but not praziquantel. Praziquantel can be found only in institutions that deal with helminth control. It is a donated drug provided directly to the community through the MOH and its institutions (such as CMPE, and Provincial and District Malaria Stations). Occasionally it is available in provincial or district health facilities but not available at health centres. Moreover, it is also rarely found in big pharmacies in cities (grade 1).

The consumption of raw and insufficiently cooked fish in these four communities is widely practiced which is similar to other studies conducted in Lao PDR (Sayasone et al., 2007; Tomokawa et al., 2012). This practice will sustain the spreading of *O. viverrini* infections in the community. Sayasone and colleagues reported that the consumption of raw and insufficiently cooked fish dishes was strongly associated with infection of *O. viverrini* (Sayasone et al., 2007): raw fish dishes like *Koi Pla* were scientifically confirmed to contain hundreds of viable *O. viverrini* metacercariae (Prasongwatana et al., 2013). A similar nutritional practice exists also in northeastern Thailand where a high prevalence of opisthorchiasis was found; but after training sessions using video tapes and researchers talking about cholangiocarcinoma in villages, community members are now better aware of the danger of opisthorchiasis (Wongba et al., 2011).

It is an interesting point that opinion leaders in this study think that the sour juice of lemons kills the worm in the fish: if they put a lot of lemon juice, they believe that it is equivalent to a well-cooked dish. This perception is one major reason that the eating of raw fish in the villages is yet very common. Similar findings to our study are reported in another survey recently conducted in Saravane District, Saravane Province, in southern Laos. Communities

believed that after squeezing hundreds of weaver ants – this ant contains a sour juice – over the fish meat this would turn to white colour which was comparable to a well-cooked dish and therefore safe for eating (Xayaseng et al., 2013). In Lao PDR, freshwater fish are infected in high prevalence rates with *O. viverrini*, *H. taichui* and other minute intestinal flukes (Rim et al., 2013; Chai et al., 2007; Chai et al., 2009). Thus local conceptions on preparation technique of raw fish dish will keep up a high infection prevalence with *H. taichui* and *O. viverrini* in the communities. Nevertheless, health education can support people to change gradually their practices as already reported from Thailand (Sornmani et al., 1984) and Lao PDR (Strandgaard et al., 2008).

In all four villages helminth infections were not perceived to be as important as other infectious diseases such as malaria, diarrhoea, and fever symptoms. This attitude is evidently represented by the curative practice of most opinion leaders who applied self-medication for helminthiasis, but only after they have observed worms in their faeces. We conclude that the communities prioritize in general only those diseases which cause serious health problems for their members and are considered to be life-threatening.

This research was conducted during the provision of mass drug treatment in the four study villages. We could investigate the pretension of opinion leaders, heads of household and villagers that they do their best while we were there. However, by the application of the three methods for data collection – individual interview, direct observation, and in-depth interview – we could reassess this pretended engagement in comparison with everyday health practices by means of this methodological triangulation.

5. Conclusion

MDA is regarded by village members as a widely accepted measure for helminth control in affected communities with multiparasitism. However, researchers and the concerned

institutions need a clear understanding about the many different drugs, which poses particular problems such as the distribution of appropriate information about possible adverse effects of a certain medication and its correct management as well as about its effectiveness against different worms. A better understanding of community members regarding the health consequences of opisthorchiasis and STH infections will foster further preventive measures such as altered practices of defecation, of nutrition and of personal hygiene. This is particularly true for opisthorchiasis which may lead finally to a deadly cancer – a sad fact which is not yet well recognised by the local communities.

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Figure Legend

Figure 1: Map of Laos indicating Khong District (study district)

Table 1: Lao terms mentioned during intervention and discussion and their meaning and biomedical terms for helminth infections

Lao term	Meaning	Biomedical equivalent term
Helminth infection		
<i>Mae thong to kom</i>	Worm with round body	<i>Ascaris lumbricoides</i> (roundworm)
<i>Mae thong to pea</i>	Worm with flat body	<i>Taenia</i> (tap worm)
<i>Mae thong pak khor</i>	Worm with hook mouth	Hookworm
<i>Xeua pha yat bai mai nai tap</i>	Worm of liver leaves	<i>Opisthorchis viverrini</i> (liver fluke)
<i>Xeua pha yat hoi</i>	Worm of snail disease	<i>Schistosoma mekongi</i> (blood fluke)
<i>Mae pha yat</i>	Worm	Helminth
Disease		
<i>Pha yat bai mai nai tap</i>	Liver leave disease	Opisthorchiasis (liver fluke disease)
<i>Tap kheng</i>	Hard liver	Cirrhosis
<i>Pha yat hoi</i>	Snail disease	Schistosomiasis
<i>Pha yat thong poun</i>	Big belly	Schistosomiasis
<i>Khai gnoung</i>	Mosquito fever	Malaria
<i>Khai malaria</i>	Malaria fever	Malaria
<i>Thork thong</i>	Discharge from abdomen	Diarrhoea
<i>Khai</i>	Fever	Fever
Treatment		
<i>Khong kanh pha yat hoi</i>	Project for snail disease	MDA
<i>Ya pha yat hoi</i>	Drug for snail disease	Praziquantel
<i>Ya thay pha yat</i>	Drug for worms	Deworming medicine
<i>Ya thay mae thong</i>	Drug for worms	Deworming medicine
<i>Khao lap</i>	Afraid of side effect	
<i>Thay pha yat</i>	Deworming	

Table 2: Results of interviews with heads of household on Donelong Island (n = 192)

Items	Houalong	Longsong	Hanglong	Longkang	Total
	(n = 59)	(n = 50)	(n = 44)	(n = 39)	(n = 192)
	n (%)	n (%)	n (%)	n (%)	n (%)
1. General characteristic of heads of household					
Age (in years)					
Mean	43.1	43.7	44.3	44.7	43.8
Range	20-70	21-72	20-89	17-75	17-89
SD	11.1	12.8	14.2	14.5	12.9
Sex					
Male	49 (83.1)	39 (78.0)	40 (90.9)	27 (69.2)	155 (80.7)
Female	10 (16.95)	11 (22.0)	4 (9.0)	12 (30.8)	37 (19.8)
Education					
Primary school	19 (35.2)	28 (59.6)	26 (68.4)	23 (62.2)	96 (54.5)
Secondary school	12 (22.2)	10 (21.3)	6 (15.8)	5 (13.5)	33 (18.8)
High school	7 (12.9)	0	2 (5.3)	1 (2.7)	10 (5.7)
Illiteracy	1 (1.9)	0	0	0	1 (0.6)
Missing	15 (27.8)	9 (19.1)	4 (10.5)	8 (21.6)	36 (20.4)
Occupation					
Farmer	40 (67.8)	39 (78.0)	40 (90.9)	30 (76.9)	149 (77.6)
2. Economic status of households					
Household assets					
Cattle (cow and buffaloes)	15 (25.4)	31 (62.0)	30 (68.2)	15 (38.5)	91 (47.4)
Motorboat	22 (37.3)	33 (66.0)	22 (50.0)	16 (41.0)	93 (48.4)
Bicycle	15 (25.4)	10 (20.0)	8 (18.2)	3 (7.7)	36 (18.7)
Motorbike	26 (44.1)	17 (34.0)	7 (15.9)	11 (28.2)	61 (31.8)
TV	23 (38.9)	23 (46.0)	16 (36.4)	13 (33.3)	75 (39.1)
Mobile phone	18 (30.5)	12 (24.0)	12 (27.3)	6 (15.4)	48 (25.0)
House condition					
Permanent house	40 (67.8)	41 (82.0)	40 (90.9)	31 (79.5)	152 (79.2)
3. Risk factors for helminth infection					
Having latrine	8 (13.6)	9 (18.0)	6 (13.6)	5 (12.8)	28 (14.5)
Eating behaviour					
Consumption of raw fish	59 (100)	50 (100)	44 (100)	39 (100)	192 (100)
Exposure to Mekong River					
Pump water from Mekong River	32 (54.0)	27 (54.0)	37 (84.1)	25 (64.1)	121 (63.0)
Regular bathing in Mekong River	41 (69.5)	37 (74.0)	39 (88.6)	29 (74.4)	146 (76.0)
4. Deworming received in communities					
Received MDA with praziquantel	27 (45.8)	22 (44.0)	21 (47.7)	27 (69.2)	97 (50.5)
Received before the year 2000	6 (22.2)	16 (72.7)	9 (42.9)	4 (14.8)	35 (36.1)
Received after the year 2000	21 (77.8)	6 (27.3)	12 (57.1)	23 (85.2)	62 (63.9)
Report of adverse events	3 (11.1)	2 (9.1)	2 (9.5)	3 (11.5)	10 (10.3)

Table 3: Profession of interviewed opinion leaders (n = 21) in 4 villages on Donelong Island

Position in the village	Houalong			Longsong			Hanglong			Longkang			Total
	sex	age	Occ										
HV	M	50	Fa	M	60	Fa	M	57	Fa	M	46	Fa	4
DHV										M	37	Fa	1
TBA	F	52	Fa	F	55	Fa				F	40	Fa	3
VHV	M	30	Fa	M	55	Fa	M	42	Fa	M	25	Fa	4
Zone health worker							F	48	La				1
LWU	F	25	Fa				F	48	Fa				2
Youth Union	M	30	Fa										1
Monk	M	76	Fa	M	31	Fa							2
Teacher	M	50	T	M	50	Fa				M	50	T	3
Total			7			5			4			5	21

Note: Male (M); female (F); farmer (Fa); teacher (T); laboratory technician (Lab); occupation (Occ); traditional birth attendant (TBA); village health volunteer (VHV); Lao Women Union (LWU); deputy head of village (DHV); head of village (HV)