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Potential Risk Zoonotic Diseases of Soil Transmitted Helminths Infection by Stool Analysis from Human, Cats, and Rats

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Abstract

This study explained potential zoonotic diseases especially by contact transmission of population on rural area with cats and rats which infected by soil transmitted helminths infection/STHs infection. Stool samples were collected from 27 human, 15 cats and 7 rats at rural area Magelang district Central of Java Indonesia. Methods were used in this research for observation stool samples are; Kato katz method and Koga Agar Plate Culture. The result of study showed human infected; 12/27- (44, 4%) *Ascarislumbricoides*, and 1/27 (3, 7%) hookworm, cats have infected; 14/15-(93%) Ascarisspp, 10/15 (66, 67%) hookworm, 12/15 (80%) double infected (*Ascarislumbricoides* and hookworm), rats had multiple infected *Ascarislumbricoides*, *T. Trichiura*, hookworm 86% (6/7) and double infected *Ascarislumbricoides*, hookworm- 14%- (1/7), potential zoonotic diseases of soil transmitted helminths infection could be showed from defecation of cats and rats via contact with soil around houses, especially infected of *Ascarislumbricoides*. Zoonotic of STHs diseases became had potential risk if there are human, animal and environment that could support with human behavior and facilitate sanitation.

Keywords: STHs infection, Human, Cats, Rats, Zoonotic Diseases

Introduction

Worldwide, there is a significant variation in the prevalence of gastrointestinal zoonotic helminths in dogs and cats. Soil transmitted helminth infections (STHs) are the most common infections among humans and domestic animals such as dogs, cats and pigs, particularly in the rural areas of Southeast Asia. Infection of zoonotic helminths has previously been researched in Thailand. Where has a high prevalence of hookworm Ancylostomaceylanicum was reported among dogs in temple communities in Bangkok. Chronic infections with one or several of the most common soil-transmitted helminths (STHs), *Ascarislumbricoides, Trichuristrichiura* and hookworms, might account for a global burden of 39 million disability-adjusted life years lost annually. Another STHs, *Strongyloidesstercoralis*, is often neglected in helminth surveys, yet previous studies show high *S. stercoralis* infection rates in Cambodia. School-aged children in the developing world are at highest risk of morbidity due to STHs and intestinal protozoan infections. Many of the IPIs in animals, especially those with the larval stages of hookworms, *Gnathostoma spp.* and *Toxocara spp.*, may result in zoonotic diseases such as eosinophilic enteritis, cutaneous larval migrans, and toxocariasis.

However, mass treatment only focuses on three major STHs (*Ascaris*/hookworm/-*Trichuris*). Other nematodes like *S. stercoralis*, trematodes and protozoan infections are not addressed. In rural Southeast Asia, little is known about the zoonotic potential of STHs in humans and animals. Therefore of domestic animals, such as cats, dogs and pigs, as contributors to human STHs and as reservoir hosts for zoonotic parasites remain unexplored and/or the data are inaccessible.

Although surveys of zoonotic gastrointestinal helminths in dogs and cats had been done in Thailand, most of the studies have focused on the Central or-North eastern region. This was the first study to investigate prevalence of zoonotic helminth infection in humans, cats and rats in Magelang district Central of Java Indonesia that is introduction potential risk zoonotic diseases of soil transmitted helminth infections.

Objectives

1) To Analyze prevalence of soil transmitted helminths infection in human, cat and rat.

2) This study explained potential zoonotic diseases especially by contact transmission of population on rural area with cats and rats which infected by soil transmitted helminths infection/STHs infection.

Research Methodology

Study design and area

The study was carried out in July to August 2017 in seven villages in rural area of Magelang-district, Central of Java province, Indonesia). The climate is tropical, with cold temperatures all year round and alternating dry and wet seasons. Households from these villages were randomly selected. Stool samples from humans and animals (cats and rats) were assessed for STHs using a single diagnostic test. Risk factors for infection of humans and animals were assessed based on information collected through interviews and observations.

Field procedures and sample collection

On the day of the first visit, informed consent was obtained from all household members and interviews were conducted with enrolled participants. Interviews with young children were conducted with the help of a parent or legal guardian. All enrolled participants received a prelabelled stool container. Participants were asked to fill the container with feces passed the following morning. Upon collecting the first sample, a second stool container was given to participants for filling. The collected stool samples were transported to a laboratory in Department of Parasitology Central Zoonotic Diseases Health Ministry of Republic Indonesia. Stool samples from each human and cat present at the time of the visit and belonging to the household were obtained. For each animal, approximately five grams of fecal-sample were collected from around houses, placed into a sterile plastic fecal container and chilled immediately in a box containing ice. For each human, one stool sample given on consecutive day was analyzed and for each animal, one sample was analyzed.

Laboratory procedures

For each human stool sample, the following tests were performed: Kato Katz, Koga Agar culture, as they arrived in the laboratory, human samples were processed as follows:

First, duplicate Kato Katz smears were prepared. Stool was filtered using a nylon mesh and then placed on the standard Kato Katz template, leaving 41.7 mg of stool for examination on a microscopic slide. Examination was performed at 100x magnification for hookworm and S. stercoralis.

Second, a Koga Agar test was prepared by placing a piece of stool (3-5 g) on a freshly produced Agar plate. The plates were then incubated for 48 hours at 28 °C. Larvae were washed from the plate into a tube, the liquid was centrifuged and the entire sediment was read at 40x magnification for hookworm and S. stercoralis larvae.

Results/ Conclusion

The result of study showed

Human infected; 12/27-(44,-4%) *Ascarislumbricoides,* and 1/27-(3,-7%) hookworm. Cats have infected; 14/15-(93%) Ascarisspp, 10/15-(66,-67%) hookworm, 12/15 (80%) double infected (*Ascarislumbricoides* and hookworm).

Rats had multiple infected-*Ascarislumbricoides,-T. Trichiura,* hookworm-86%-(6/7) and double infected *Ascarislumbricoides,* hookworm 14% (1/7).

Potential zoonotic diseases of soil transmitted helminths infection could be showed from defecation of cats and rats via contact with soil around houses, especially infected of *Ascarislumbricoides.*

Table 1. Prevalence Soil Transmitted Helminths Infection in Human

No	Name	Prevalence/Diagnostical Methods		
		DWS	Kato Katz	Agar Culcur
1.	*Ascaris l*	11/27-(40,-7%)	12/27-(44,-4%)	Un-examination
2.	*T. Trichiura*	-	-	Un-examination
3.	*S, stercoralis*	-	-	Un-examination
4.	*Hookworm*	1/27(3,-7%)	1/27-(3,-7%)	Not found
5.	*Ascaris+hookworm*	1/27(3,-7%)	1/27-(3,-7%)	Not found

Table 2. Prevalence Soil Transmitted Helminths Infection in Cats

No	Name	Prevalence/Diagnostical Method		
		DWS	Kato Katz	APC
1.	*Ascaris l*	14/15-(93%)	14/15-(93%)	Un-examination
2.	*T. Trichiura*	-	-	Un-examination
3.	*S, stercoralis*	-	-	Not found
4.	*Hookworm*	8/15-(53,-3%)	10/15-(66,-67%)	Not found
5.	*Single ascaris*	3/15 (20%)	2/15 (13,-3%)	Un-examination
6.	*Single hookworm*	-	-	Not found
7.	*Ascaris+hookworm*	10/15-(66,-67%)	12/15 (80%)	Not found

Table 3. Prevalence Parasite in rats

No	Parasite	Prevalence
1.	*Ascaris l, T. Trichiura, hookworm*	86%-(6/7)
2.	*Ascaris, hookworm*	14%-(1/7)
3.	*S, stercoralis*	-
4.	*Single Hookworm*	-
5.	Single Trichuristrichiura	-

Discussion

In this research we reported the prevalence soil transmitted helminth in human,-cats and rats such as human infected ; 12/27-(44,-4%) *Ascarislumbricoides,* and 1/27-(3,-7%) hookworm, cats have infected; 14/15-(93%) Ascarisspp, 10/15-(66,-67%) hookworm, 12/15 (80%) double infected (*Ascarislumbricoides* and hookworm), rats had multiple infected *Ascarislumbricoides,- T. Trichiura,* hookworm- 86%- (6/7) and double infected-*Ascarislumbricoides,* hookworm-14%-(1/7), The zoonotic soil transmitted helminth infection helminthic and six protozoan parasites. Of the 218 participants, 27 (12.8%) were negative in all examinations. More than a quarter of the human participants (64, 29.4%) were infected with one parasite and a third (72, 33.0%) with two or more parasites. Three (1.4%) and one (0.5%) participant(s) harboured five and six parasites, respectively, the prevalences of parasites (those with the highest infection rates) are given for the different age-groups. For hookworm, the prevalence increases from less than 50.0% in children up to the age of ten to more than 60.0% in adolescents and then remains above 60.0% in all subsequent age-groups. For *S. stercoralis*, the prevalence also increases over age, reaching its peak in age-groups 30 years and older. It shows that the average number of helminthic co-infections increases over age, whereas the average number of protozoan co-infections is highest in children and lowest in adults older than 51 years.

However, in this study, there cases of human *Ascaris spp*. infection were detected by microscopy. This coincides with the findings of Park and colleagues. We demonstrated that in all age-groups, the average number of co-infections is about the same, yet helminthic co-infections accumulated over time, with a peak in 30-50yearold individuals. The trend for protozoan co-infections is reversed, with the highest number of protozoan co-infections occurring in children. This pattern might reflect higher exposure of children. Alternatively, it could be because of higher infection intensities rather than prevalence in children, as microscopy can miss low-intensity protozoan infections, although this applies also for helminthic infections.

DNA Analysis very important for analyzing characteristic of species of worm that this have not completed to do in our research, that like identify species of hookworm is *N. americanus*, but cats usually could be infective by *Ancylostomacanimum*, condition of data this research not similar with research in Northern Thailand that it has significant zoonotic hookworms include A. ceylanicum, A. braziliensis and *A. caninum*. Molecular analysis revealed that the most prevalent hookworm (over 80%) found in dogs and cats in the lower Northern area was *A. ceylanicum. A. ceylanicum* is highly prevalent in many areas in Asian countries and is known to produce potent infections in humans. *A. ceylanicum* is the second most common hookworm infection in humans that can lead to anemia.-PCR and sequencing were used for detection and identification of parasites in various specimens with high sensitivity and specificity. In our survey, molecular analysis was applied for two significant helminths infection, hookworms and *O. viverrini*. Morphological identification of hookworm larvae or eggs to species is difficult, and molecular identification provides great results in this regard.

This research has deference with research in Cambodia which it showed that in humans about half of the infections (51.6%) were *Ancylostomaceylanicum* and the remaining *Necatoramericanus* infections. In dogs over 90% were *A. ceylanicum* indicating that most probably dogs are the source of infection. We hypothesize that regular deworming in communities lead to a replacement of *N. americanus* by *A. ceylanicum*. Parallel deworming of the dog population is likely to reduce the incidence in humans.

Zoonotic Risk factors, in this research could see via behavior of defecation cats and rats, environmental factors and personal hygiene also facilitate sanitation have contribution became spread STHs infected from animal to human, defecation of cats observation had not potential risk infection from cats to human because cats usually closed with soil after defecated and cat only defecated round houses and the fecal dry by solar contact then parasite was killed, deferent with studied in Nortern Thailand that Zoonotic hookworm, *A. caninum*, was found to have low infection rates in both dogs and cats. Similar to other areas, prevalence of *A. caninum* was lower than that of *A. ceylanicum*. Although its infection rate was low, this hookworm can result in eosinophilic enteritis and chronic abdominal pain in human.

Environmental factors have potential zoonotic determined of hookworm infection and strongylidiasis where this area researched location have poor sanitation, without wastewater drainage that made wet surrounding houses and organic clay soil round houses could make easy to spread *Ascarislumbricoides* and potential risk zoonotic diseases by contamination from cats and rats to human via defecated cats and rats could spread of soil transmitted helminth infection.

Recommendations

This study given statement that cats and rats was equal with human soil transmitted helminth infections only *Ascarislumbricoides*- infection,- and hookworm,- *Strongyloidesstercoralis*, and *T trichiura*but have not equal zoonotic potential because could infected in cats and rats but could not infected to human because cats behavior on defecation made larvae of soil transmitted helminth not completed to infective filariae form larvae especially hookworm and *Strongyloidisisstrercoralis* and *Trichuris* from rats didn't infective to human because defecation of rats usually on soil or place where wet that seldom had contacted to human actifity.-Further environmental epidemiology studies of soil transmitted helminth infection are important for determined analysis zoonotic diseases especially in community with have deferent geography.

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