

Intestinal parasitic infections in Srimum suburban area of Nakhon Ratchasima Province, Thailand

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Abstract. A survey on intestinal parasitic infections and some risk factors of infection (social, economic and behavioral) was conducted in suburban area at Simum subdistrict, Mueang district, Nakhon Ratchasima Province during the period of April 3rd to April 11th, 2007. A total of 214 stool samples, from 85 males and 129 females were examined using simple direct smear, Kato's thick smear and modified Harada-Mori Filter Paper Strip culture technique. The results showed that the prevalence rate of protozoa infections by simple direct smear method was 17.3% (37 infected samples) in 11 males and 26 females and were from all age groups. Mixed infections (56.8%), showed higher results than single infection. The highest number of intestinal protozoan infections was *Entamoeba histolytica* (11.7%), followed by *Blastocystis hominis* (5.6%). Fifty four percent of protozoan infection was at a moderate to high level. Ninety five percent of infected cases consumed unboiled water. The prevalence rate of helminthic infections was 7% total by Kato's thick smear and Modified Harada-Mori Filter Paper Strip culture technique. Kato's Thick smear Technique showed the highest rate of *Strongyloides stercoralis* (2.8%), followed by hookworm infection (1.4%) *Taenia* spp. (0.9%), and *Enterobius vermicularis* (0.5%), respectively. All infections showed a light intensity, (<200 epg), using Kato-Katz thick smear. Although Modified Harada-Mori's culture Technique showed higher *S. stercoralis* (3.3%) and hookworm infection (2.3%) than Kato's thick smear in the area where there is low Soil transmitted helminthes, we recommend using Simple or Kato's thick smear to determine the prevalence of parasitic infection due to these techniques being able to detect various groups of parasites, and being inexpensive and less time consuming.

INTRODUCTION

Parasitic infections are commonly found in tropical countries, especially in rural areas of Thailand (Jongsuksuntigul *et al.*, 2003). Malabsorption, diarrhoea, blood loss, impaired work capacity, and retarded growth can be found, causing important health and social problems (World Health Organization, 1987). The high prevalence of parasitic infections is closely correlated with poverty, poor environmental hygiene and impoverished health services (Montresor *et al.*, 1998; Albonico *et al.*, 1999). Many surveys have been conducted in various areas of the country including the central region (Sadun & Maiphoom, 1953; Bunnag & Harinasuta, 1981).

Most parasitic infection surveys focus on rural areas while urban and suburban areas are neglected because of their higher socio-economic status. Suburbanization in developing countries usually results from unplanned, uncontrolled and constant migration of people from the rural areas to the urban centre in search of employment opportunities. However, some parts of this urban area are still kept as agricultural land where parasites might be found. The present study was therefore carried out to update records on the prevalence of intestinal parasites, including the emerging protozoan pathogens in the Srimum suburban areas of Nakhon Ratchasima where 32% of people still work in the agricultural field.

MATERIALS AND METHODS

Study area

The study was conducted in 3 villages of the Simum subdistrict, located in Northeastern Thailand, 11km away from Nakhon Ratchasima Province town. People in Simum suburban areas who volunteered for this study were recruited from the 3 villages, which were the responsibility of the Public Health care of Simum subdistrict. A cross-sectional survey was carried out from April 3th to April 11th, 2007. Two hundred and fourteen volunteers were recruited for the present study, comprising 85 males and 129 females.

Stool collection and examination techniques

An oral description and specific instructions for handling and contamination avoidance of the stool specimen were given to all the participants who gave consent. Each individual was provided with a plastic container marked with an identification number and with the name of the subject. Each subject gave one stool sample. Stool samples were examined within 8 h for evidence of protozoan infections by simple direct smear method. The prevalence of helminthic infections was observed by simple direct smear, Kato's thick smear technique and if any case indicated positive for helminthic eggs, the parasites were counted using Kato-Katz quantitative technique (Montresor *et al.*, 1998). The Kato-Katz slides were examined within 30 min to avoid missing evidence of hookworm eggs. The remaining stool samples were cultured using Modified Harada-Mori Filter Paper Strip Culture technique (Harada & Mori, 1955) and the larvae were observed after 7 days of culture.

Risk factors of infection (social, economic and behavioral)

A questionnaire concerning demographic distributions and socio-economic conditions, including risk behaviors that might affect parasitic infections, was given orally.

Data analysis

Descriptive analysis was used with percentages to explain the data.

RESULTS

Intestinal protozoan infections

A total of 214 out of 2,004 people (10.7%) responded. Thirty seven cases out of 214 (17.3%) were infected with protozoa. Protozoan infection in various age groups is shown in Table 1. There were 11 males (12.9%) and 26 females (20.2%). Sex ratio male: female was 1: 1.6.

Intestinal protozoan infection is shown in Table 2. Mixed infections (56.8%), were higher than single infections. The prevalence of protozoa infection was 37 (17.3%). They were infected by pathogenic-like protozoa such as *Entamoeba histolytica*-like protozoa

Table 1: Protozoan infection in various age groups

Age (years)	No. positive/ total sample	% prevalence
≤15	6/22	27.3
16–25	4/21	19.1
26–35	2/16	12.5
36–45	10/50	20
≥46	15/105	28.9
Total	37/214	17.3

Table 2: Intestinal protozoan infection in the Simum subdistrict, Nakhon Ratchasima Province

Intestinal protozoa	No. of infections (%) (n=214)
<i>Entamoeba histolytica</i> *	25 (11.7)
<i>Blastocystis hominis</i>	12 (5.6)
<i>Giardia lamblia</i>	2 (0.9)
<i>Entamoeba coli</i>	25 (11.7)
<i>Endolimax nana</i>	20 (9.4)
Single infection	16 (43.2)
Mixed infection	21 (56.8)

*: It may include *E. dispar*, since we did not differentiate these two by molecular tools (Tachibana *et al.*, 1991).

which showed the highest prevalence (11.7%), of intestinal protozoa in this community, followed by *Blastocystis hominis* (5.6%) and 0.9% of *Giardia lamblia*, respectively. The non pathogenic protozoan such as *Entamoeba. coli* (11.7%) and *Endolimax nana* (9.4%) were also found in people living in this suburban area.

Eighty-one percent of infected cases showed soft-loose form stool and 54.1% of these cases presented a moderate-high level of protozoan infection. Only 19% of infected protozoa cases showed hard stool (Fig. 1).

About 55% of infected cases worked in the agriculture sector. However, only 5% of infected cases consumed boiled water.

Helminthes infection

Helminthic infection in Simum village showed a prevalence of 7% of people infected, using Kato's thick smear and modified Harada-Mori culture. *Strongyloides* showed the highest prevalence of 46.7% of

infected cases followed by hookworm, *Taenia* and only 1 person was infected with *Enterobius* (Table 3). Kato's Thick smear Technique showed the highest rate of *Strongyloides stercoralis* (2.8%), followed by hookworm infection (1.4%) *Taenia* spp. (0.9%), and *Enterobius vermicularis* (0.5%), respectively. Modified Harada-Mori's culture Technique showed higher *S. stercoralis* (3.3%) and hookworm infections (2.3%) than Kato's thick smear. About 11.8% of infected cases were males and 3.9% were females with ratio male: female of 3:1. All infections showed a light intensity, (<200 epg), using Kato-Katz thick smear.

Sixty seven percent of helminthic cases were workers. More than 53.3% of infected cases earned > 15,000 baht a month. Most people used toilets in houses and when working outside. Sixty three percent of infected cases always wore shoes. Two cases of *Taenia* infection had ingested improperly cooked meat.

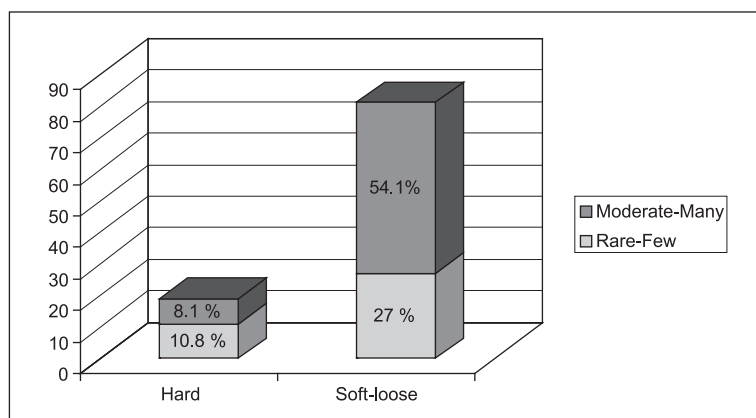


Figure 1. Form stool and intensity of protozoan infection.

Remark Intensity of protozoa; Rare-Few : at least 2-5 protozoa/ cover slip
Moderate-Many : at least 1-2 protozoa/HPF

Table 3: Prevalence of helminthes infection in Simum village, Nakhon Ratchasima Province

Technique	No. positive				Total
	<i>Strongyloides</i>	Hookworm	<i>Taenia</i>	<i>Enterobius</i>	
Kato's thick smear	6	3	2	1	12
Harada-Mori	7	5	–	–	12
Total	7 (46.7)	5 (33.3)	2 (13.3)	1 (6.7)	15/214 (7%)

DISCUSSION

Intestinal parasitic infections determined by simple direct smear in the Srimum Suburban area showed a large number of protozoa infection (17.3%) such as *E. histolytica*-like protozoa (11.7%) or opportunistic protozoa such as *B. hominis* (5.6%), which can cause diarrhoea if infection is high. Eighty one percent of infected cases showed soft-loose formed stool. In contrast, eight schools located in Phuttamonthon District, Nakhon Prathom Province, central Thailand, (a suburban area), showed less prevalence of protozoan infection, 10.7%, using formalin-ethyl acetate concentration technique (Ngrenngarmert *et al.*, 2007). These protozoa were transmitted by the fecal-oral route and we found that 95% of people in this community drank unboiled rainwater, which might be the reason for protozoa transmission. The highest prevalence was found in the under 15 years old age group, (27.3%), which showed a higher prevalence in females than males at 1.6: 1. Fifty seven percent of people had mixed infections. Only 11% of people lived and stayed at home during the study period and sent fecal samples back for examination. Many people in this area work in factories, study in towns or other provinces. People have no time and not much knowledge of parasites and so do not participate. This may be because parasites in this area have not caused any serious disease. However, protozoa such as *E. histolytica* may cause intra and extra intestinal amoebiasis, but this finding does not confirm whether this *E. histolytica* is a pathogenic or non pathogenic strain. Molecular methods may be needed in future studies to identify pathogenic strains (Tachibana *et al.*, 1991; Hamzah *et al.*, 2006). This study also recorded 13 infected cases with *E. histolytica*-like protozoa (52%) which showed soft stool and 8 cases (32%) showed diarrhoea form stool. Eighteen out of 25 infected cases with *E. histolytica*-like protozoa (72%) showed moderate intensity of infection. *Blastocystis hominis* is said to be pathogenic if more than 5 organism is present in every 40x magnification field (Stenzel & Boreham, 1996). In our study 11

infected cases (91.7%) of *B. hominis* showed soft-diarrhoea form stool. Although *B. hominis* and *E. nana* are considered to be nonpathogenic organisms, Graczyk *et al.* (2005) demonstrated that they can be associated with diarrhoea in children from developing countries when they occur at high prevalence and intensity and also with deficient sanitation and low hygiene standards. This study also showed the prevalence of *E. nana* was 9.4%. *G. lamblia*, a pathogenic protozoa was reported only in 2 cases and both cases showed rare intensity of infection with diarrhoea form stool.

The low prevalence of intestinal helminthic infection (7%), might be due to urbanization, public investment in basic sanitation, improvement of general living conditions, (>50% of people showed high income >15,000 baht per month), and the accessibility to health services (health care to house distance <1 km and hospitals about 10 km from communities). Four parasitic species were reported in our study, of which 2 were transmitted by skin penetration which were found to be dominant species (hookworm and *Strongyloides*). Only 2 cases were infected by eating raw meat that contained *Taenia* cyst and 1 case of a 10 year old boy who was infected with *Enterobius vermicularis*. However, our study showed a 7% prevalence rate, a higher helminthic infection rate than a previous study in suburban Nakhon Prathom Province, which found a 0.5% infection rate (Ngrenngarmert *et al.*, 2007). In the border area of Nan, Kanchanaburi and Srakaew the study showed a higher prevalence of 55.8%, 49.4% and 49.5%, respectively (Maipanich *et al.*, 2004). Only 32% of people in this suburban area worked in agriculture and 13% of this group showed helminthic infection. Ninety two percent of people in this community studied at a higher level than primary school and every house has their own private toilet. Eighty percent of people eat cooked meat. Eighty seven percent of people wear shoes when they go out or go to work. Our study tried to use various techniques for determining parasitic infection. However, in the areas where helminthes or soil transmitted helminthes might have a low

prevalence, simple smear and Kato's thick smear might prove useful for protozoa and helminthic infection survey. This is because the culture technique takes a longer time, (7 days), and gives no obvious difference in results. Our findings suggest that in suburban areas where protozoa might have a higher prevalence than helminthes that this may be a warning to look after sanitation and educate people in the community to drink boiled water as protozoa may cause asymptomatic reactions in infected people. For example, 81% of infected cases suffered only with soft-loose form stool, but this might be a warning sign of chronic disease.

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