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Distribution of intestinal parasitic infections amongst aborigine children at Post Sungai Rual, Kelantan, Malaysia

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Abstract. Intestinal parasitic infections are important public health problems among underprivileged communities. This study was carried out to evaluate the infection rate of intestinal parasites among aborigine children at Pos Sungai Rual, Kelantan, Malaysia. A total of 111 faecal samples from aborigine children aged 4-12 years were screened for intestinal parasites by direct smear technique. Harada-Mori culture was also performed to identify hookworm and *Strongyloides stercoralis* larvae. The results showed that 87.4% of the children examined were positive for one or more parasites. Intestinal parasites were significantly lower in boys (78.7%) as compared to girls (93.8%). The infection occurred in very young children aged 4-6 years (80.0%) and the percentage of parasite-positive cases appeared to be significantly higher (92.9%) among the children aged 7-9 years. *Trichuris trichiura* was the most common parasite found in aborigine children (65.8%). Low socioeconomic status, poor environmental sanitation and poor personal hygiene are possible contributing factors that increase the rate of intestinal parasitic infections among the children. Thus, the parasitic diseases will continue to threaten the people's health especially among communities from rural areas if no appropriate actions are taken to diminish the transmission of the parasites.

INTRODUCTION

Intestinal parasitic infections such as soil-transmitted helminths (STH) and protozoan infections are amongst the most common infections in developing countries because of poor living conditions. The aborigines in Malaysia frequently face these parasitic infections. Intestinal parasites are transmitted by faecal-oral route and the infections can be severe if left untreated and if the immune system is weak (Idris *et al.*, 2010). A study by Norhayati *et. al.* (2003), indicated that parasitic diseases are associated with growth impairment, school performance and cognitive functions of children. The aborigines of Malaysia are the indigenous minority people who live in the tropical forests of peninsular Malaysia. Today, many of the aborigines live outside the forest itself, but most of them live close to the forest periphery.

Ascaris lumbricoides, *Trichuris trichiura* and hookworm are the most common STH found in Malaysian (Norhayati *et al.*, 2003). Previous studies have demonstrated that infections caused by STH are still prevalent among aborigine children, ranging from 66.2% to 79.8% (Rahmah *et al.*, 1997; Yusof & Abd. Ghani, 2011). A number of studies in Malaysia have reported that the prevalence of protozoan infections was high among aborigines, ranging from 35.9% to 100% (Rahmah *et al.*, 1997; Noor Azian *et al.*, 2007; Yusof & Abd. Ghani 2011).

The aim of this study was to evaluate the prevalence of intestinal parasitic infections among 4-12 year olds aborigine children at Pos Sungai Rual, Jeli, Kelantan.

MATERIALS AND METHODS

Subjects and study area

A cross-sectional study was conducted in Pos Sungai Rual, an aborigine settlement situated in Jeli, Kelantan. This aborigine settlement comprises of 125 families with a total population of about 550 residents. Kampung Manok, Kampung Sungai Rual, Kampung Seberang and Kampung Kalok were four villages selected for this study. The aborigines are from the Jahai tribe and most of them are animal hunters or earned a living selling forest products. There are basic facilities such as electricity and toilets but no piped water were provided for the families in these villages. They used well water, river water or gravity feed system for water supply and preferred to use nearby bushes for defecation. In this parasitic infection study, aborigine children aged 4 to 12 years olds who studied in the kindergarten and the primary school at Pos Sungai Rual have been recruited as study subjects.

After an informed consent was obtained, a total of 111 plastic containers for collection of faecal samples were distributed to the aborigine children. Each container was labeled with the name, age, sex and sampling location. Brief instructions on how to collect the faeces were given to the children and their parents and conveyed through the school teachers as well. The faecal samples were collected the next morning and were immediately screened upon arrival at the temporary laboratory set-up in the field. All of 111 children (47 boys and 64 girls) returned their samples for examination. The subjects' particulars together with the results of the faecal examinations were recorded.

Faecal parasitological examination

Each faecal sample was subdivided into three parts: one part was fresh sample; the second part was fixed with 10% formalin and the third part was fixed with PVA (polyvinyl alcohol). The fresh faecal samples were screened immediately for the presence of ova and parasites in the field using the direct smear technique. At the same time, Harada-Mori culture was also performed on all faecal samples. The incubation of stool cultures was done for 10 days at room temperature to favour the development of infective larvae and its presence was checked daily. Both types of larvae were differentiated by the tail under microscope. In the laboratory, the presence of STH and protozoan infections were detected on the 10% formalin-fixed faecal samples by formalin-ether concentration. Meanwhile, trichrome staining procedure was carried out on PVA-fixed faecal samples for the diagnosis of intestinal protozoa.

Data analysis

Data were analyzed using Microsoft Excel 7.0 programme. Statistical differences of the data were analyzed by Chi-square goodness of fit tests. P values < 0.05 were considered statistically significant.

RESULTS

One hundred and eleven faecal samples were examined by direct wet faecal smear and Harada-Mori culture respectively. Out of 111 aborigine children, 97 (87.4%) were found to be positive for one or more parasites. Ten different types of intestinal parasites were detected in the faecal samples. The most common soil-transmitted helminth present in aborigine children were *Trichuris trichiura* (65.8%) followed by *Ascaris lumbricoides* (40.5%) and hookworm (25.2%). The most common intestinal protozoa were *Entamoeba coli* (34.2%) followed by *Entamoeba histolytica* (32.4%), and the lowest infection rate was *Trichomonas hominis* (9.0%) (Table 1).

Table 2 shows that the intestinal parasites was significantly higher (93.8%) in girls compared to boys (78.7%) ($c2=5.45$, $df=1$, $p=0.02$). There was also a significant difference in parasitic infection rate between age groups ($c2=12.52$, $df=2$, $p=0.002$). The highest infection rate was found among the aborigine children aged 7-9 years (92.9%).

Table 1. Prevalence of intestinal parasitic infections among 111 aborigine children at Pos Sungai Rual, Kelantan, Malaysia according to species

Intestinal Parasites	Number of children examined	Number of positive samples	Prevalence (%)
Ascaris lumbricoides	111	45	40.5
Trichuris trichiura	111	73	65.8
Hookworm	111	28	25.2
Entamoeba histolytica	111	36	32.4
Entamoeba coli	111	38	34.2
Iodamoeba butschlii	111	11	9.9
Blastocystis hominis	111	34	30.6
Giardia intestinalis	111	14	12.6
Chilomastix mesnili	111	13	11.7
Trichomonas hominis	111	10	9.0
Total	111	97	87.4

Table 2. Prevalence of intestinal parasitic infections according to gender and age among aborigine children at Pos Sungai Rual, Kelantan, Malaysia

Gender	Number of children examined	Number of positive samples	Prevalence (%)
Male	47	37	78.7
Female	64	60	93.8
Age			
4-6	20	16	80.0
7-9	42	39	92.9
10-12	49	42	85.7
Total	111	97	87.4

DISCUSSION

This study revealed that 87.4% of the aborigine children suffer from parasitic infections. This was similar to the findings reported among aborigine children in Malaysia (Rahmah *et al.*, 1997; Yusof & Abd. Ghani, 2011; Sinniah *et al.*, 2012). *Trichuris trichiura* was found to be the commonest STH infection, with 65.8%, followed by *A. lumbricoides* (40.5%) and hookworm (25.2%). The infection rate of STH infections in this present study is similar to the earlier studies done on aborigine community (Norhayati *et al.*, 1997; Al-Mekhlafi *et al.*, 2006, 2007) where the infection rates of *Ascaris*, *Trichuris* and hookworm ranged between 62.9–98.2%, 61.9–91.7%, 13.4–37%, respectively. A possible reason for this finding may be the stronger resistance by *T. trichiura* to the regular antihelminthics used compared to *A. lumbricoides* (Adam *et al.*, 2004). A low prevalence of hookworm infection among aborigine children can be explained by the age-related pattern of infection. Generally, the pattern of hookworm infection increases with age and reaches its peak in adulthood.

The present study demonstrated a high rate of intestinal pathogenic protozoa infection with *E. histolytica* (32.4%) followed by *Blastocystis hominis* (30.6%) and *Giardia intestinalis* (12.6%). In Malaysia, the

prevalence of *E. histolytica* infection varied from 6.92% to 22.5% (Mohamed Kamel *et al.*, 2002; Yusof & Abd. Ghani, 2009a) while the prevalence of *B. hominis* infection was reported to range from 15.4% to 93% among aborigine community (Noor Azian *et al.*, 2007; Abd Ghani & Yusof, 2011). The *E. histolytica* infection was still prevalent among aborigines but further investigations by using better diagnostic tools are important to determine the true infection rate among communities in Malaysia (Tengku & Norhayati, 2011). A high sensitivity and specificity of nested polymerase chain reaction can be used in distinguishing between pathogenic *E. histolytica* and non-pathogenic *Entamoeba dispar*. Meanwhile, a study conducted by Nimri (1993) on preschool children in Jordan suggested that *B. hominis* was associated with diarrhea. Although the pathogenicity of *B. hominis* has been controversial, it is currently believed that, in the absence of other pathogens, large numbers of this parasite may be responsible for symptoms of gastroenteritis (Sukthana, 2001). A number of local studies have indicated that *G. intestinalis* infection in aborigine settlements ranged from 6.92% to 43.7% (Mohamed Kamel *et al.*, 2002; Yusof & Abd. Ghani, 2009b).

The prevalence of intestinal parasitic infections is closely related to and dependent on socioeconomic and hygienic conditions (Nematian *et al.*, 2004). A number of studies have reported that inadequacy of safe water supply and poor sanitary disposal as the significant risk factors for parasitic infections in Orang Asli community (Norhayati *et al.*, 1998; Al-Mekhlafi *et al.*, 2007). Due to low family income and poor educational level of the villagers at Pos Sungai Rual, the children live in poor conditioned houses together with the lack of safe water supply. They also had to resort to alternative sources such as well water, river water or gravity feed system since there was no piped water provided to these aborigine villages. All of these water resources were untreated which resulted in waterborne infections. The aborigines also do not practice boiling water before drinking which makes them more susceptible to the infections. It was also observed that this aborigines' settlement also has low standard of sanitation and lack of proper garbage disposal. Although toilets have been supplied but most of the aborigines refused to use it and the aborigines, especially children, were inclined to defecate indiscriminately among the bushes close to their homes. Besides bushes, some of them used the river as a defecation site and using river water to clean themselves. The improper disposal of excreta practiced by this community increase the risk of parasitic infections through fecal-oral route. These factors render the Pos Sungai Rual community especially the children vulnerable to parasitic infections.

This post has no accessible road for the provision of adequate garbage disposal. Hence, piles of garbage were left exposed and unattended which attracted flies, cockroaches and other pests. They are potential mechanical vectors for parasitic infections, which could spread the infections by transmitting the infective ova and cysts to the community with poor sanitary conditions (Maipanich *et al.*, 2008).

Poor personal hygiene was observed among the aborigine children due to the lack of knowledge about health and hygiene practices. Hand washing before eating and after defecation was not regularly practiced by the children. They also ate raw food especially fruits without washing them first. This is one of the factors that contribute for high positive rate of intestinal parasites. Recent study carried out by Singh *et al.* (2010) has proved that poor personal hygiene was significantly associated with higher infection rate of parasitic infections.

The aborigine girls were more likely to be infected with parasites (93.8%) than boys (78.7%) because they usually get involved more with food preparation and in using surface water for household activities. Thus, they are highly exposed to contaminated food and water (Tigabu *et al.*, 2010). This finding is in accordance with the previous report by Nematian *et al.* (2004), who found that the girls showed a significantly higher positive rate of intestinal parasites than boys. Based on age groups, there were significant higher positive cases among the 7-9 years old children but fewer cases found in the 4-6 years

group. This has been observed in another parasites study (Saksirisampant *et al.*, 2006) and is due to the risky behaviour where children age are actively spending more time out of the house. Therefore, they have higher chances of exposure to the infective agent especially when playing in contaminated areas. On the other hand, the younger children are usually under constant supervision by their parents and spend more time indoors thus reducing exposure to parasites.

This present findings have provided baseline data for the government to define and promote strategic plans in reducing parasitic infections rate among aborigines. Besides providing of basic facilities, health education campaigns should be activated and expanded for all regardless of age in order to nurture the community about health awareness. The life cycle of intestinal parasites, mode transmission and the risk factors of parasitic infections are important elements to be included in the continuous education.

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