Prevalence of Giardiasis among Malaysian Primary School Children

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Summary

Giardiasis, a gastrointestinal disease caused by *Giardia intestinalis* is endemic in Malaysia. The prevalence rate has been reported to range from 1.4% to 11.1%. The present study was undertaken between 1992-1994 in three health districts in three states viz. Pahang, Negeri Sembilan and Selangor. Seven thousand five hundred and fifty seven (7557) primary school children between the ages of 6-12 years from the lower socio-economic groups were screened. The prevalence was 0.21%. The study suggests that improved water supply, toilet facilities and sanitation have lowered the prevalence of a waterborne disease in the areas surveyed.

Key Words: Giardiasis, Parasitic disease, *Giardia intestinalis*, Intestinal parasite, Water-borne infection

Introduction

Acute diarrhoeal disease is an important cause of childhood morbidity and mortality in developing countries particularly in children between the 0-5 years age group. One of the pathogens linked with gastroenteritis among children is *Giardia intestinalis.* It is a protozoan parasite that inhabits the upper gastrointestinal tract of humans and causes a wide spectrum of conditions including an asymptomatic carriage, fulminant diarrhoea and chronic diarrhoea with malabsorption. The prevalence of giardiasis has been estimated to be as high as 30% in some areas[1] especially where sanitary practices are poor and where faecal contamination occurs. It is endemic in parts of the developing world. Pocket epidemics have occurred in cities with presumably contaminated water supplies.

The infection spreads directly from person to person by faecal oral contamination or indirectly by transmission of cysts in water and occasionally in food. People of all ages are affected but in endemic areas infection is frequently seen in infants[1].

The prevalence of giardiasis in Malaysia have been reported to range from 1.4% to 11.1%[2]. All ethnic races of all ages have been found to be infected. The purpose of the survey was to seek 250 patients for a clinical trial approved by the Ministry of Health, Government of Malaysia, to study the efficacy of albendazole and metronidazole in the eradication of infection in children. The results below provide baseline data about the prevalence of *Giardia intestinalis* in primary school children from low socio-economic levels in three states in Peninsular Malaysia.

Materials and Methods

Study areas

Three health districts from three states of Peninsular Malaysia were selected for this project viz. Port Dickson (Negeri Sembilan), Kuala Selangor (Selangor) and Bentong (Pahang). The districts were selected on the basis of the different ecological niche: Port Dickson (estates and rural town), Kuala Selangor (fishing villages and estates) and Bentong (new villages and semi-urban town areas). Children from two Orang Asli settlements (Kg Semaloi and Kg Labong in Mersing) and one estate community (Muar River Estate in Segamat) were also chosen to see whether *Giardia* infection was present in the population in these areas.

All the areas chosen for this survey had electricity, adequate piped water supply, waste disposal system in terms of toilets and health care facilities. The district's maternal and child health programme was carried out weekly by the district health office. The study spanned a period of two and a half years (1992-1994).

Subjects

Seven thousand five hundred and fifty seven (7557) primary school children (ages 6-12 years) were randomly selected. The children were from low socio-economic backgrounds and the three main races. Orang Asli children formed 7.4% of those screened. At least 10% of the school children examined appeared to be malnourished, as defined by children whose height and weight were below the anthropometric measurements established by the Ministry of Health.

Stool collection

Specially made plastic bags (8500) with a spatula were distributed to the children. The children were instructed to put in approximately 10 grams of the day's faeces. The bags with faeces were then sealed by the children and their names, ages and sex written on it. The sealed plastic bags with the contents were collected over a period of two days by the class teacher. The collected stools (total 7557 received) were then sent to the district health office. The remaining school children did not comply. All stool samples were then collectively sent to the laboratory for investigation. Stool samples were kept in the department's cold room to prevent disintegration of ova or cysts before examination.

Parasitological examination

The stools were processed for examination by the Formal Ether sedimentation technique. Stool samples that looked suspect were further investigated by making direct smears and examining with special stains viz. Trichrome, Zehl-Neelsen and Chromotrope. At least three smears were examined for each stool specimen. All specimens were examined under x 100 magnification.

Results

Table I shows the positivity rate of *Giardia intestinalis*. The results show that *G. intestinalis* was not prevalent in the subjects screened. The overall infection rate was only 0.21%. Table II shows the other parasites encountered during the screening.

Table I
Prevalence of *Giardia intestinalis* in school children

Areas	Stools examined	Stools positive	Infection rate (%)
Kuala Selangor (Fishing village, estates)	2349	8	0.34
Port Dickson, N.S. (Estates, rural)	1823	6	0.32
Bentong, Pahang (new village, town)	2558	2	0.07
Mersing, Johor (Orang Asli settlement)	558	0	0
Segamat, Johor (Estate)	269	0	0
Total	7557	16	0.21

Discussion

A major obstacle to generalizations on the impact of giardial infection in humans is its wide expression of disease from asymptomatic phase to severe debilitating diarrhoea with malabsorption. Most subjects remain asymptomatic or are diagnosed incidentally on routine stool examination. The disease is recognised in two settings: (a) when community water supplies contaminated with *G. intestinalis* pass through inadequate filtration system which leads to dissemination of the organism and (b) when travellers from areas of low prevalence of *G. intestinalis* return ill from endemic areas[10]. The contribution of giardiasis to malnutrition and mortality caused by diarrhoeal diseases in developing countries has been incompletely assessed. Prevalence rates of up to 20% have been reported in the tropics and subtropics and rates of 1-6% are common in temperate countries[11].

Table II
Other parasites encountered in the survey

Parasite	Infection rate (%)
Entamoeba coli	3.2
Cryptosporidium	4.1
Iodamoeba butschlii	0.2
Chilomastix mesnili	0.01
Ascaris lumbricoides	8.2
Trichuris trichiura	9.7
Enterobius vermicularis	3.8

In Malaysia, surveys had been carried out from 1970 to detect the extent of *G. intestinalis* infection in the population particularly among children. Most of the faecal surveys had been targeted at detecting all intestinal parasites and not specifically at *Giardia.* This study was specifically undertaken to determine the prevalence of *Giardia* infection within the school children community. Table III shows the surveys carried out by various investigators from 1970-1994. The infection rates range from 2.6% to 25%. Most of the targeted areas had electricity, piped water supply and toilets while those from slum and squatter areas had unsatisfactory sanitation facilities. Sinniah *et al*[8] found the infection rate of *G. lamblia* to be 9.1% in Kuang estate and Bukit Raja estate. It is surprising to note that no differences in the infection rates were observed between these two areas especially as Kuang residents obtained their water from wells while the residents of the other area had piped water supply. In the fishing village of Pulau Ketam where people used rain water as a source of water supply, the infection

Table III
Giardiasis in Malaysia – Published papers

Author & Year	Numbers screened	% infected	Description of subjects
Bisseru & Aziz,1970	678	5.6	M,C,I (7-12 years) 3
Bisseru & Aziz,1970	100	25.0	Aborigines (1-12 years) 3
Hamimah *et al* 1982	305	2.6	M,C,I (infants – 7 years) 4
Sinniah, 1984	271	8.5	M (7-12 years) 5
Che Ghani *et al* 1987			
urban slums	26	9.6	M,C,I (0-12 years) 6
rural village	22	16.8	M (0-12 years)
Sinniah *et al* 1988	297	9.3	1 (6-13 years) 7
1992	319	9.1	1 (1-13 years) 8
Sinniah & Rajeswari, 1994	729	8.4	M,C,I (6-12 years) 9

M = Malays C = Chinese I = Indians

rate was 9.3%[7]. The incriminating source of infection in this village is unknown. Ghani *et al*[6] found 16.8% of the rural village children and 9.7% of children from an urban village to be positive for *G. intestinalis.* The point to note in their study was that the sources of water supply were open wells and streams. It is conceivable that these children had acquired the infection from contaminated streams.

Karen Lai[2] compared *G. intestinali* rates in five categories according to type of toilet facilities in a survey carried out in various parts of Malaysia from 1982-1992. The prevalence of *Giardia* was significantly lower in communities with both safe water supply and proper toilets as compared to those with only one or no such amenity. Her findings seem to concur with our results as all the children in our study were from homes that had treated water and sanitation facilities. Her study also revealed that primary school children between 7-12 years of age had an infection rate of 21.9% and pre-school children a rate of 17.3%. All the children studied by her were from rural areas and of low socio-economic status. In our study, a prevalence rate of 0.21% was observed in children selected from semi-urban and rural areas, who were from the lower socio-economic group. The overall prevalence of giardiasis in the surveys carried out by Karen Lai[2] was 11.7% with the highest in Tembeling (19.1%) and lowest in Kuala Selangor (5.2%). In Sarawak, the prevalence was 8.8%.

The rate of soil transmitted helminthiasis among primary school children from both urban and rural schools have been reported to be as high as 84%[12] and among children from kindergartens in urban slums to be 91%[13]. This study confirmed the existence of *Ascaris lumbricoides* (8.2%) and *Trichuris trichiura* (9.7%) among the rural school children. Other nematodes reported include *Enterobius vermicularis* (3.8%). A parasite discovered to be highly prevalent among rural children from Batang Berjuntai was *Cryptosporidium.* This is considered a zoonotic parasite because the Indian families here are engaged in cow grazing and are in constant contact with these domestic animals. Some authors are of the opinion that low intensity infections with *Giardia* tend to be missed using the concentration techniques because searching for cysts is tedious, time consuming and requires skills and experience. Furthermore, *G. intestinalis* cysts are passed out sporadically and so ideally stool samples have to be collected and examined consecutively for three days. This is impractical and logistically difficult. Other field diagnostic methods (antigen detection in stools) need to be introduced to ease the burden of detecting cysts by the traditional method. In this survey, all stools were thoroughly examined by the microscopists and the first author.

The prevalence of giardiasis in rural communities in Malaysia have been found to be between 1.4-22.8% while in the urban communities it is between 3.1-9.6%[2]. This cross-sectional study carried out over a extended period of time reinforces the previously reported findings:

a. *Giardia intestinalis* is more common in areas where basic sanitation such as toilet facilities are not available and where a large number of people depend upon a source of water supply for their usage e.g. wells, streams etc. The results obtained by Karen Lai[2] confirms this. The children from our study were from areas where adequate sanitation and water supply were available.

b. Being a waterborne infection, faecal contamination of sources of water supply has to occur and this has been seen to be common in disadvantaged rural and urban communities as well as in Orang Asli villages. However, the Orang Asli children selected for this study were from resettled villages where adequate water supply and sanitation were available.

Possible reasons for the low prevalence of *Giardia* among school children include the impact of the programme implemented by the Ministry of Health to provide a good and safe water supply and toilets to 93% of urban and 79% of rural communities[14]. The ongoing school health programme, initiated at the district level, has probably brought down the level of transmission of food-borne, water-borne and soil-borne parasitic infections by the six monthly use of anti-protozoal and anti-helminthic drugs.

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