PARASITIC INFECTIONS AMONG ORANG ASLI (ABORIGINE) IN THE CAMERON HIGHLANDS, MALAYSIA

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Abstract. In April 2004, an outbreak of acute diarrheal illness occurred among the Orang Asli (aborigine) in the Cameron Highlands, Pahang State, Peninsular Malaysia, where rotavirus was later implicated as the cause. In the course of the epidemic investigation, stool samples were collected and examined for infectious agents including parasites. Soil transmitted helminthes (STH), namely *Ascaris lumbricoides* (25.7%), *Trichuris trichiura* (31.1%) and hookworm (8.1%), and intestinal protozoa, which included *Giardia lamblia* (17.6%), *Entamoeba histolytica/E. dispar* (9.4%), *Blastocystis hominis* (8.1%) and *Cryptosporidium parvum* (2.7%), were detected. Forty-four (59.5%) were infected with at least one parasite, 24 (32.4%), 12 (16.2%) and 8 (10.8%) had single, double and triple parasitic infections, respectively. STH were prevalent with infections occurring as early as in infancy. *Giardia lamblia*, though the most commonly found parasite in samples from symptomatic subjects, was within the normally reported rate of giardiasis among the various communities in Malaysia, and was an unlikely cause of the outbreak. However, heavy pre-existing parasitic infections could have contributed to the severity of the rotavirus diarrheal outbreak.

INTRODUCTION

Parasitic infections are endemic among the Orang Asli (OA) (aborigines) of Peninsular Malaysia (Norhayati, 2003). In an effort to encourage the OA to have a more settled lifestyle, Resettlement Posts were established by the government where proper houses and basic amenities were provided, such as roads, water supply, latrines and even electricity. Although vector-borne diseases, such as malaria and filariasis, have declined significantly over the years in these aboriginal posts (VBDCP, 2003), food and waterborne diseases which are closely associated with environmental and personal hygiene practices, are still among the major health problems among them. A severe outbreak of diarrheal disease occurred among this community in Cameron Highlands in the state of Pahang, Peninsular Malaysia beginning in April 2004, which resulted in 4 deaths involving very young children between the ages of 1 and 1.5 years old. The outbreak apparently started in Terisu Post, the Cameron Highlands, and because the Orang Asli are a highly mobile group, the problem quickly spread to involve other posts, namely Mensun and Lemoi Post in the Cameron Highlands and Brooke Post in the adjacent state of Kelantan.

The main presenting symptoms in the affected individuals were diarrhea, fever, nausea and vomiting. The diarrhea was described as watery with mucus but no blood. Most of

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the cases were children. As the presenting symptoms were infectious in nature involving the gastrointestinal system, the focus of laboratory investigations was on stool specimens for virological, bacteriological and parasitological infections. Of the 68 stool samples tested, 12 were positive for rotavirus by at least one method: antigen detection (Rotalex® agglutination), reverse transcriptase polymerase chain reaction (RT-PCR) or electron microscopy. Based on other epidemiological data, the virus was implicated as the cause of this particular diarrhea outbreak. This paper describes the findings of the parasitological investigations and discusses their significance in relation to the occurrence of the outbreak.

MATERIALS AND METHODS

Stool sample collection

In the course of the outbreak investigation, stool specimens were collected from patients admitted to the Cameron Highlands hospital as well as from symptomatic individuals from the villages in the Resettlement Posts. Stool samples were also collected from asymptomatic individuals, particularly the contacts of symptomatic cases and individuals. The stool samples were collected in sterile, screw-capped containers. In the field (and at the hospital), the stool was divided into 3 portions, a part transferred into a container containing polyvinyl alcohol (PVA) and sodium acetate-acetic acid-formaldehyde (SAF) preservative, a portion into transport culture media for bacteriological investigation and the remaining fresh sample kept in an ice-box for virological investigation and transported to the Institute for Medical Research, Kuala Lumpur.

Detection of intestinal parasites

For parasitological investigation, direct fecal smear examinations were performed on the fresh stool samples received. The fresh samples were also tested for the presence of *Giardia* and *Cryptosporidium* antigen by using RIDA® QUICK *Cryptosporidium/Giardia* Combi kit. The formalin-ether concentration technique was performed on SAF-preserved stool and the sediment was examined microscopically for ova and cysts. For PVA-preserved stool, trichome staining was performed and smears were examined under the microscope.

RESULTS

Between 22 April and 11 May, 2004, a total of 79 stool samples were received by the Parasitology Unit laboratory, Institute for Medical Research (IMR). Twenty-seven samples were from in-patients and the remaining samples were collected in the field. Five samples were found to be duplicate samples and therefore excluded from analysis.

Intestinal parasites detected

Seven different intestinal parasites were detected in the stool samples. They were the soil transmitted helminthes (STH) namely *Ascaris lumbricoides* (25.7%), *Trichuris Trichiura* (31.1%) and hookworm (8.1%), and intestinal protozoa, which included *Giardia lamblia* (17.6%), *Entamoeba histolytica/E. dispar* (9.4%), *Blastocystis hominis* (8.1%) and *Cryptosporidium parvum* (2.7%). Forty-four (59.5%) were infected with at least one parasite and 24 (32.4%), 12 (16.2%) and 8 (10.8%) had single, double and triple parasitic infections, respectively.

Intestinal parasites in relation to diarrhea, gender and age-group

Table 1 summarizes the findings of protozoan infections found that may cause diarrhea. Of 51 stool samples from symptomatic subjects with a history of diarrhea (both hospitalized and non-hospitalized), 10 (19.6%) were positive for *Giardia lamblia* and only 1 and 3 was/were positive for *E. histolytical dispar* and *B. hominis,* respectively. Of the 13 samples positive for *G. lamblia*, 7 were detected by both the commercial antigen detec-

Table 1
Intestinal protozoa, that can cause diarrhea, detected in stool samples, in relation to clinical status. There were only 2 positive cases for *Cryptosporidium* and therefore were not tabulated.

Clinical status	N	*E. histolytica/E. dispar*		*B. hominis*		*G. lamblia*	
		+ve (%)	-ve	+ve (%)	-ve	+ve (%)	-ve
Acute diarrhea and hospitalized	27	0	27	1 (3.7)	26	6 (22.2)	21
Diarrhea but not hospitalized	24	3 (12.5)	23	2 (8.3)	22	4 (16.7)	20
Asymptomatic	24	4 (16.7)	18	3 (12.5)	21	3 (12.5)	21
Total	74	7 (9.4)		6 (8.1)		13 (17.6)	

tion kit (RIDA® QUICK *Cryptosporidium/Giardia* Combi kit) and microscopic examination of the trichome stained smears, whereas 6 others were detected by microscopy only.

Most of the *G. lamblia* infected individuals were children below 12 years old (Fig 1) but the difference from adults was not significant (p=0.834). The *Giardia* infection rates were not significantly different (p=0.388) between the males (20%) and females (14.7%). Three (25%) of 12 cases positive for rotavirus were also positive for *G. lamblia*.

Fig 2 shows the distribution of positive stool samples for ova of STH by age group. Infections were detected in all ages except for hookworm which was not found among infants. All three helminths showed a general increasing trend with increasing age to young adult and a decline thereafter. It is interesting to note that quite a significant proportion of infants were already infected with *A. lumbricoides* and *T. trichiura*. Nine (75%) of the cases positive for rotavirus were also infected with *T. trichiura*.

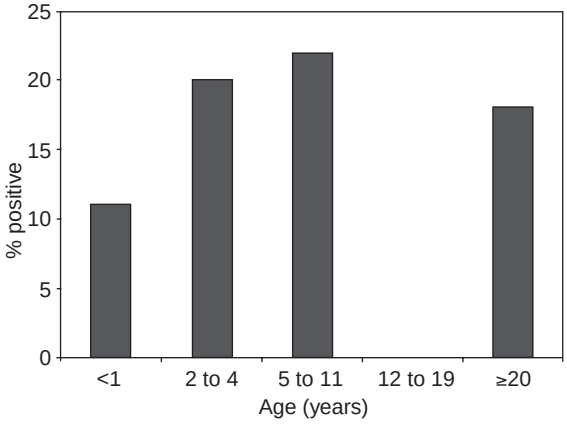

Fig 1–Percentage of positive stool samples for *Giardia lamblia* by age group.

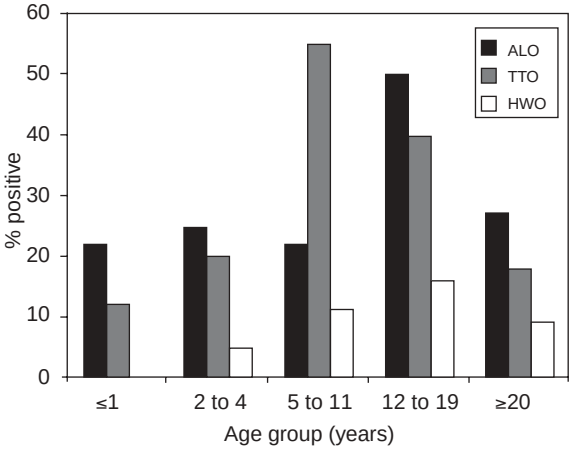

Fig 2–Distribution of positive stool samples for ova of *Ascaris lumbricoides* (ALO), *Trichuris trichiura* (TTO) and hookworm (HWO) according to age group.

DISCUSSION

Intestinal parasitic infections are still a major public health problem among the poor and underprivileged communities of Malaysia, especially among children. Several studies carried out among rural communities and urban poor in Malaysia, revealed a high preva-

lence of intestinal parasitic infections in these communities (Che Ghani *et al*, 1987; Hanjeet *et al*, 1991; Rajeswari *et al*, 1994; Shekkar *et al*, 1996; Norhayati *et al*, 1997). Although the stool samples in this study were purposely collected from symptomatic individuals and their contacts in the course of investigating the epidemic and may not represent the whole community, the high positivity rates of intestinal parasitic infections, particularly STH, may indicate the high endemicity of the infection in this population. Almost all of the major intestinal parasites infecting man could be found in the stool samples.

All the parasites detected in this investigation were fecal-borne infections and transmission occured either directly from hand-to-mouth or through contaminated food or water. The main source of infection was human and transmission within a community was predominantly related to human habits in regard to eating, defecation, personal hygiene and environmental sanitation (Henry, 1981; Norhayati *et al*, 1998a). The significantly high positivity rates of more than 10% for *Giardia* and *Trichuris* and more than 20% for *Ascaris* among infants less than 1 year of age indicate the high level of environmental contamination with human feces and the poor state of personal hygiene and feeding practices of this community. The infants were most probably infected through contaminated food or water prepared by their care-takers, since infants are generally not expected to be in direct contact with the soil. For the same reason, hookworm infection, which is acquired through direct invasion of the larvae through the skin, was negative in these samples but the positivity rate progressively increased with increasing age.

Among the parasites detected in the stool samples in this investigation with relatively high positive rates that may be implicated as the cause of the outbreak was *Giardia lamblia*. However, the overall positivity rates of 17.6% and 19.6% among the symptomatic subjects for this parasite detected in these samples were within the range normally reported among various ethnic groups in this country (14-19.4%) (Hamimah *et al*, 1982; Che Ghani *et al*, 1987; Norhayati *et al*, 1998b). Most infected persons with *Giardia* in endemic areas were asymptomatic. Acute symptoms of diarrhea were encountered most commonly by travellers to endemic areas. Furthermore, the associated clinical features of fever and vomiting in patients admitted to the ward made giardiasis as a very unlikely cause of this particular outbreak. The diarrhea in giardiasis usually progressed to chronic foul-smelling steatorrhea, alternating with constipation or normal bowel movements. The higher percentage of *G. lamblia* detected in stool samples from subjects with diarrhea (19.6%) may be the result of the purging effect of diarrhea caused by other agent(s) which expelled the attached parasite in the stool. *E. histolytica* was also an unlikely cause of the outbreak as 4 of the 7 positive samples were collected from the field from asymptomatic subjects. However, the high prevalence of parasitic infections and the problem of polyparasitism, may have affected the nutritional status and general well-being of the aboriginal children and may have contributed to the severity of the rotavirus diarrheal outbreak experienced by this community.

With regards to the detection method for *G. lamblia*, our findings showed that the commercial antigen detection kit was less sensitive than microscopy. The problem of transportation of samples from the field to the laboratory where the test was performed could have contributed to the problem. A higher sensitivity (80%) was reported by others using a similar kit (Weitzel *et al*, 2006). However, since the assay is less time-consuming and easier to perform, it may be a useful addition for rapid testing of large numbers of specimens, such as in an outbreak situation, but is not a sub-

stitute for microscopy.

High infection rates and polyparasitism as indicated by this investigation reflect the difficulties and challenges faced by health program managers in addressing intestinal parasitosis among aborigines. Provision of good housing, safe water supply and latrine facilities, as was the case in this particular community, are not good enough if the communities themselves do not appreciate, understand or choose to ignore the importance of environmental sanitation and personal hygiene and clean practices in the prevention of these diseases. Mass chemotherapy alone may not be useful for STH. In highly endemic areas, reinfection can occur as early as 2 months post-treatment and by 4 months, half of the treated population may be re-infected (Norhayati *et al*, 1997). The way forward is through an integrated approach with community participation. How this can be achieved with this special community, remains a challenge.

ACKNOWLEDGEMENTS

The authors wish to thank Dr Ng Kok Han, Director, Institute for Medical Research, Kuala Lumpur for permission to publish this paper. We would also like to thank MN Maslawaty, M Nurhafizah, AT Mohd Sufian and H Shamsuddin from the Parasitology Unit, IMR and all the medical and health staff of the Cameron Highlands Health Office involved in the collection and transportation of the stool specimens from the field and the hospital to the IMR, for their dedication and hard work during the outbreak investigation.

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