PREVALENCE OF ENTEROBIASIS AND ITS INCIDENCE AFTER BLANKET CHEMOTHERAPY IN A MALE ORPHANAGE

Chukiat Sirivichayakul[1], Chanathep Pojjaroen-anant[1], Pataraporn Wisetsing[1], Areewan Lalitphiphat[2], Pornthep Chanthavanich[1] and Krisana Kabkaew[3]

[1]Department of Tropical Pediatrics, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; [2]Mahamek Home for Boys, Bangkok, Thailand; [3]Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University, Thailand

Abstract. A prospective observational study was conducted in a male orphanage to find out the prevalence of enterobiasis and its incidence after blanket chemotherapy using mebendazole. We found that the prevalence of enterobiasis was 28.9%. The incidence density of enterobiasis after blanket chemotherapy was 379.82 per 1,000 person-years which was quite high. We suggest that blanket chemotherapy should be repeated at every 6 months interval to control enterobiasis in orphanages.

INTRODUCTION

Enterobiasis is one of the common helminthic infections in children. It is common in both developed and developing countries throughout the world (Norhayati *et al*, 1994; Nunez *et al*, 1996; Yang *et al*, 1997). It is easily transmitted by contaminated hands and fomites as well as through inhalation. It is therefore highly endemic in overcrowded children living together such as in schools and orphanages (Haswell - Elkins *et al*, 1987; Yang *et al*, 1997). Although it generally does not cause serious effects to health, there have been reports of its adverse effects on intelligence (Bahader *et al*, 1995) as well as other rare manifestations (Mattia, 1992; Patterson *et al*, 1993; Dahlstrom and Macarthur, 1994). Mebendazole is highly effective for treatment of enterobiasis (Liu and Weller, 1996). However the recurrence of infection after treatment is high especially in high risk populations such as day care center attendees and school children (Nunez *et al*, 1996; Yang *et al*, 1997). Knowledge on epidemiology of enterobiasis is essential for control of this disease. We therefore studied the prevalence of enterobiasis in a male orphanage in Bangkok and its incidence after blanket chemotherapy using mebendazole.

MATERIALS AND METHODS

This was a prospective observational study. The study was carried out in a male orphanage in Bangkok during April 1997 to April 1998. There were 135 children living in the orphanage at the time the study started. None of them had a history of taking antiparasitic drugs within the previous year. On three consecutive days, perianal swabs using the scotch tape technique were done in the morning on every child. These specimens were examined thoroughly under the light microscope. Diagnosis of *Enterobius* infection was made if *Enterobius* eggs were detected in at least one out of the three specimens. The blanket chemo therapy consisted of two times of single dose mebendazole 100 mg at a two weeks interval. The drug was prescribed to all orphans and staff of the orphanage. It was taken orally under direct observation. Side effects of mebendazole were recorded. All possible contaminated underwear, night-wear and bed clothes were washed and left sun-dried to destroy the eggs. Repeated three consecutive days of perianal swab examinations were done at 1, 6 and 12 months after chemotherapy. Children who were persistently positive for *Enterobius* eggs at a 1 month were retreated individually with the same dose of mebendazole. These children were followed monthly until perianal swab examination showed negative results. Then they were followed at 6 and 12 months after the blanket chemotherapy as previously mentioned.

Because some of the study population moved out from the orphanage, we used incidence density to calculate the re-occurrence of enterobiasis. New-comers in the orphanage were not included in the study.

RESULTS

The age distribution of all children and the

Correspondance: Dr Chukiat Sirivichayakul, Department of Tropical Pediatrics, Faculty of Troupical Medicine, Mahidol University 420/6 Rajvithi Road, Bangkok 10400 Thailand.

Table 1
Age distribution of all children and age-specific prevalence of enterobiasis.

Age (years)	Total population	No. infected	Age-specific prevalence(%)
8	6	1	16.7
9	12	7	58.3
10	13	4	30.8
11	19	8	42.1
12	22	7	31.8
13	21	5	23.8
14	12	0	0
15	16	3	18.8
16	14	4	28.6
Total	135	39	28.9

Table 2
Number of children who became infected by *Enterobius* at 6 months after blanket chemotherapy.

	Infected	Non-infected	Total
Status before chemotherapy			
Infected	9	28	37
Non-infected	10	55	65
Total	19	83	102

Table 3
Number of children who became infected by *Enterobius* at 12 months after blanket chemotherapy.

	Infected	Non-infected	Total
Status before chemotherapy			
Infected	14	17	31
Non-infected	18	32	50
Total	32	49	81

age-specific prevalence of enterobiasis are shown in Table 1. The overall prevalence of enterobiasis was 28.9%. There was no correlation between age and prevalence of enterobiasis ($r = -0.42$, $p = 0.26$). All children and staff completed the regimen of blanket chemotherapy. None of them reported side effects of chemotherapy.

At 1 month after chemotherapy, there were only two children who had persistent *Enterobius* infection. Retreatment was given to these two children. Follow-up perianal swabs examination after 1 month showed negative results.

At 6 months after chemotherapy, 19 out of 102 children (18.6%) became infected. The number of infected cases increased to 32 out of 81 children (39.5%) at 12 months. The overall incidence density was 379.82 per 1,000 person-years. Previously infected children had a higher risk of becoming re-infected than those who were not infected (relative risk 1.58 and 1.25 at 6 and 12 months after chemotherapy, respectively) (Tables 2, 3). However, this higher risk did not reach statistical significance ($p>0.05$).

DISCUSSION

Although there was a high drop-out rate in our study; it is a common feature that membership of orphanages is highly dynamic. Our study showed some findings that have potential application for control of enterobiasis in orphanages.

We found that the prevalence of enterobiasis among 8 to 16 year-old orphans was not markedly different from other studies in different parts of the world and in different populations (Norhayati *et al*, 1994; Bahader *et al*, 1995; Nunez *et al*, 1996; Yang *et al*, 1997). The prevalence did not have correlation with age. It reflects the fact that the risk of becoming infected depends on the presence of infectious eggs in the enviroment rather than age-specific behavior of the hosts. This supports the fact that *Enterobius* infection in adults is not uncommon (Miyazaki, 1991).

Our study also confirms that mebendazole is safe and effective in treatment of enterobiasis. As we know that *Enterobius vermicularis* takes about 50 days from ingestion of a mature egg until it lays eggs (Miyazaki, 1991); the persistence of its eggs at 1 month after blanket chemotherapy can be used to calculate the effectiveness of mebendazole. There were 2 out of 39 cases who had persistent infection. Therefore the cure rate after treatment with mebendazole was 94.9%. However eradication of enterobiasis could not be achieved. The incidence was quite high even only after 6 months of blanket chemotherapy. It was markedly higher than in the study by Yang *et al* (1997). The rea-

sons might be that our orphanage was more crowded than schools and contacts at night, the time the worm laying eggs should have more influence on infection. We therefore suggest that in orphanages, chemotherapy should be repeated every 6 months.

Infected new-comers may be the sources of infection because we found that the infection rate in new-comers was 33.3% at the time when the infection rate among old residents was 18.6% (at 6 months after chemotherapy). However some small orphans might also acquire the infection from their schools and spread it to other orphans later. The finding that the re-infection rate was higher than the new infection rate (although it was not statistically significant) might be because those who were previously infected had poorer hygiene or had same untoward behavior that predisposed the infection. However the difference became less as the time passed. This again suggested that contaminated environment had more impact on infection than hygiene or behavior.

In conclusion, we found that enterobiasis was highly prevalent among orphans. Mebendazole is highly effective in treatment of enterobiasis but repeated treatment is necessary for control infection in high risk populations such as residents of orphanages or other crowded population.

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