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The Prevalence of Intestinal Parasitic Infections among Schoolchildren with Annual Anthelminthic Treatment in Narathiwat Province, Thailand

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Abstract

The objective of this study was to assess the prevalence of intestinal parasites and the impact of annual anthelminthic treatment in rural and urban schools in Narathiwat Province, Thailand. A total of 346 stool specimens were collected from schoolchildren aged 4-12 years, and fecal examinations for parasites performed. *Ascaris lumbricoides* and *Trichuris trichiura* were the most frequently observed helminths. *Blastocystis hominis* was the most frequently observed protozoan, and it was more prevalent in urban schools with better sanitation and hygienic conditions. A half-yearly round of repeated anthelminthic treatment for the schoolchildren is recommended to reduce prevalence. To limit transmission of protozoans in the future, anti-protozoan treatments may be considered for inclusion in any parasite control program in a community with a moderate or high prevalence of protozoan infection.

Keywords: parasite, helminthic infections, protozoan, anthelminthic, schoolchildren, Thailand

Introduction

Over two billion people worldwide are affected by intestinal protozoans and helminths [1]. Intestinal helminthic infections are most common among school-age children and tend to be of high intensity in this age group [2]. These diseases can affect child development, educational achievement, reproductive health, and social and economic development [3]. Efforts to control parasitic infections in developing countries typically focus on periodic anthelminthic treatments targeted at specific risk groups, *eg*, schoolchildren. Nevertheless, re-infection in endemic areas is continuous [4]. Thus, policies and strategies for health program design must be focused and appropriate for each community. The design of such programs requires information on demographic characteristics, the major health burdens of the group, the opportunities for intervention, and the appropriateness of the available infrastructure [5].

The aim of this study was to investigate

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intestinal-parasite infection status, especially protozoan infections, and to assess the impact of annual anthelminthic treatment among schoolchildren in primary schools in different communities in Narathiwat Province, Thailand.

Materials and methods

This cross-sectional study was conducted in February 2003. Five primary schools in Narathiwat Province were recruited into the study, *ie*, Ban Kosaya and Ban Huakao schools, Meuang District, an urban area of Narathiwat Province; and Ban Bankunthong, Ban Prak-pra and Ban Kuba-egor schools in Tak Bai District, a rural area in the province. Two schools in an urban setting—Ban Kosaya and Ban Huakao—had annual school-based de-worming programs. Three schools in a rural setting—Ban Bankunthong, Ban Prak-pra and Ban Kuba-egor—an endemic area for brugian filariasis, received the antifilarial drug albendazole annually from the Filaria Division, Ministry of Public Health.

The school environments and toilet conditions among these schools were different, poor in the rural areas, and better in the urban area.

To study the prevalence of intestinal parasitic infections, stool samples were collected once from 346 schoolchildren aged 4-12 years. Parental informed consent was obtained for all participants. Of the 346, 95, 45, 58, 74 and 74 were from Ban Bankunthong, Ban Kosaya, Ban Huakao, Ban Prak-pra, and Ban Kuba-egor, respectively.

Each stool sample was collected and preserved in 10% formalin and transported to the laboratory of the Department of Parasitology, Faculty of Medicine Siriraj Hospital, Bangkok, for detection of intestinal parasites by simple saline smear and formalin-ether concentration technique. Statistical analyses were performed with SPSS Version 10.0. The data were analyzed by Chi-square test with Bonferroni Correction. P-value < 0.05 was considered significant.

Results

Demographic status

Data from a total of 346 schoolchildren attending five primary schools were analyzed for demographic characteristics (Fig 1). Of the 346 children in the study, 217 (62.7%) were female and 129 (37.3%) male; age distribution was not

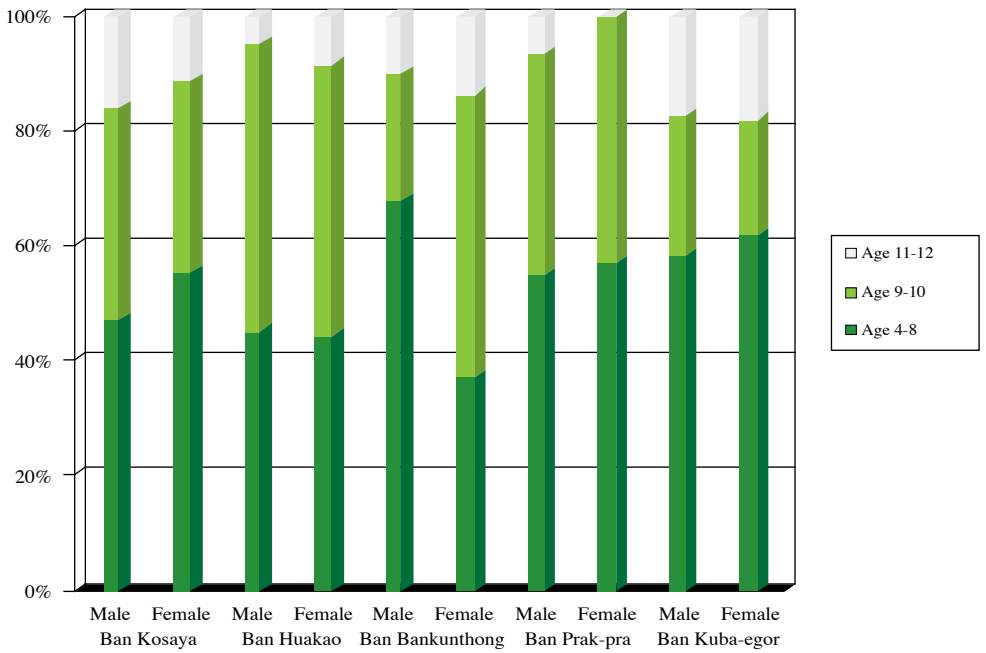

Fig 1 Demographic characteristics of 346 schoolchildren in five schools.

proportional in all schools studied. The number of children decreased as age increased.

Parasitic infections

The prevalence of intestinal parasitic infections varied significantly among schoolchildren in schools in the different areas of the province (Table 1 and Fig 2). Among the 346 children, one or more parasitic infections were identified in 261 (75.1%), double parasitic infections in 80 (23.1%), and triple parasitic infections in 35 (10.1%); infection rates are shown in Fig 3.

Discussion

The present data can serve as base-line prevalence data for intestinal parasitic infections among schoolchildren, which will be useful for the future assessment of the significance of prevalence values of intestinal parasites, especially protozoans, in various cohort groups. The relatively lower prevalence of parasitic infections observed in the first two schools may have been due to better environment, sanitation and access to health services for these schools, related to the annual anti-parasite treatment campaigns.

Table 1 Prevalence of intestinal parasitic infections among 346 schoolchildren in five schools.

	Ban Kosaya	Ban Huakao	Ban Bankunthong	Ban Prak-pra	Ban Kuba-egor	*P*-value
A. lumbricoides	4 (8.8%)	7 (12.1%)	46 (48.4%)	21 (28.8%)	56 (75.7%)	<0.001
T. trichiura	16 (35.5%)	9 (15.5%)	50 (52.6%)	38 (52%)	44 (59.5%)	<0.001
Hookworm	5 (11.1%)	3 (5.2%)	34 (35.8%)	1 (1.4%)	1 (3.4%)	<0.001
S. stercoralis	0 (0)	0 (0)	2 (2.1%)	2 (2.7%)	0 (0)	NA
G. lamblia	1 (2.2 %)	2 (3.4%)	3 (3.1%)	4 (5.5%)	2 (2.7%)	NA
E. histolytica	0 (0)	0 (0)	2 (2.1%)	0 (0)	7 (9.4%)	NA
E. coli	0 (0)	0 (0)	3 (3.1%)	2 (2.7%)	7 (9.4%)	NA
B. hominis	7 (15.5%)	18 (31.0%)	21 (22.1%)	4 (5.5%)	7 (9.4%)	<0.001

NA = not applicable

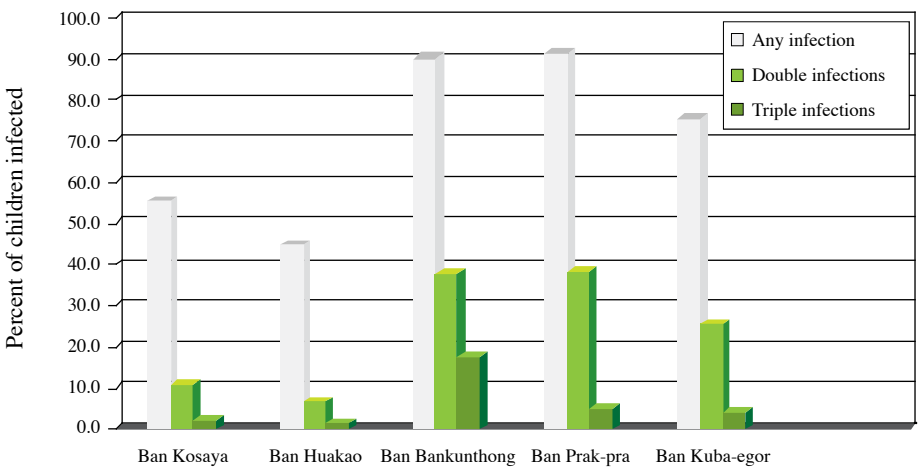

Fig 2 Prevalence of intestinal parasitic infections among 346 schoolchildren in five schools in Narathiwat Province.

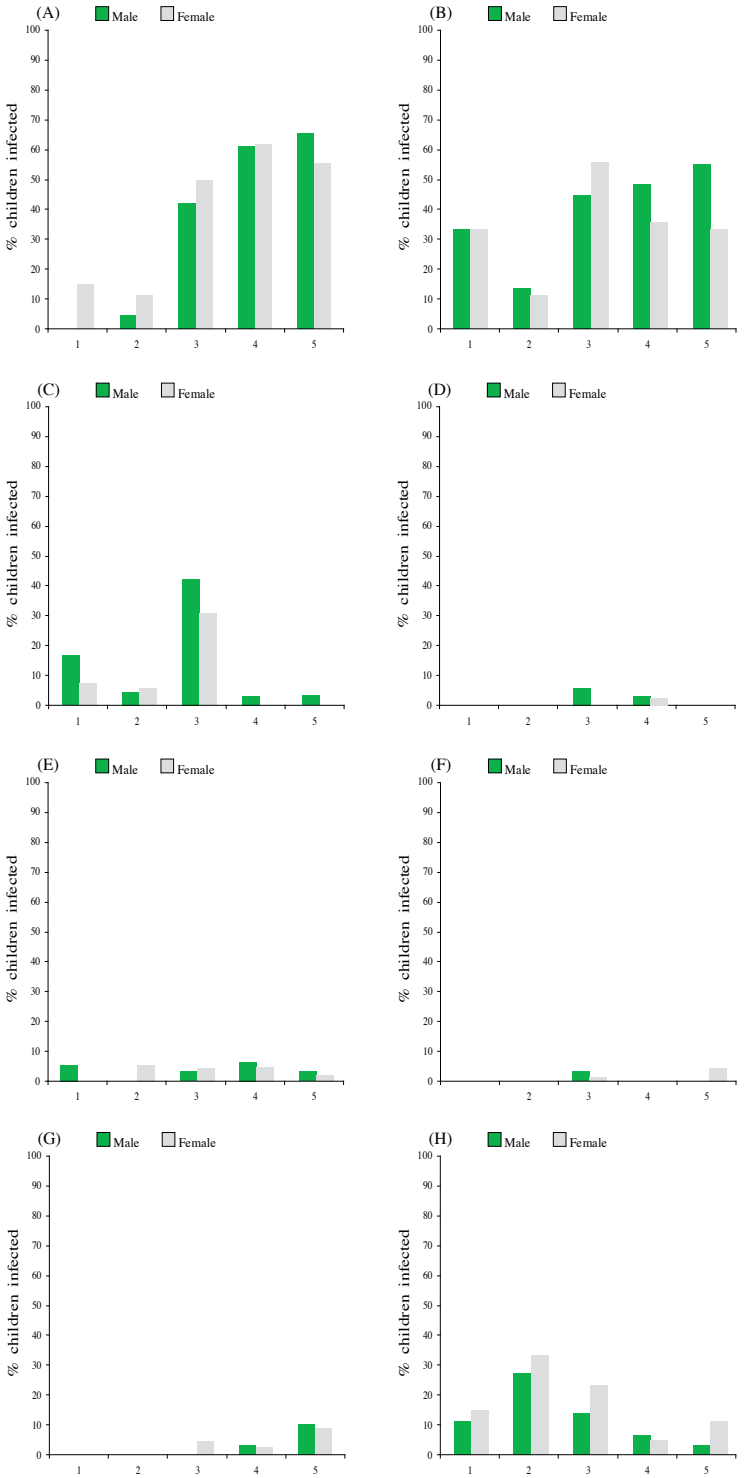

Fig 3 Prevalence of (A) *Ascaris lumbricoides*, (B) *Trichuris trichiura*, (C) Hookworm, (D) *Strongyloides stercoralis*, (E) *Giardia lamblia*, (F) *Entamoeba histolytica*, (G) *Entamoeba coli*, (H) *Blastocystis hominis*, among 346 schoolchildren in five primary schools in Narathiwat Province, Thailand; 1= Ban Kosaya, 2 = Ban Huakao, 3 = Ban Bankunthong, 4 = Ban Prak-pra, 5 = Ban Kuba-egor.

Parasite re-infection may be one reason for the high prevalence of intestinal parasitic infections found in three schools in rural areas, although the schoolchildren received albendazole annually. Poor compliance or poor response to mass treatment may be additional reasons. This study was conducted about nine months after the last mass-treatment for filariasis [6]; thus, the results supported a previous study by Paul & Gnanamani [7], who concluded that by the end of the ninth month, the post-treatment prevalence of helminthic infections exceeded the pre-intervention level. We concluded from our study that the de-worming programs seemed not to be very effective in reducing helminthic infection, partly because once-a-year treatments might not produce long-term reductions in intestinal helminthic infections

A remarkably low prevalence of hookworm infection was observed in our study. By contrast, Ban Bankunthong School had a significantly high prevalence of hookworm infection ($P < 0.001$), which was attributed to the unique geographic characteristics of the school. Our survey found a muddy pond in the school area that the students used for swimming. This pond increased the moisture content of the soil, which is an important factor for the development of hookworm embryos. Thus, it should be noted that designing and developing school health programs requires an appreciation of the appropriateness of the available infrastructure [5].

It is interesting to note that the most prevalent protozoan was *Blastocystis hominis*. Although *B. hominis* is considered a non-pathogenic organism, it can be associated with diarrhea in children when it occurs with a high prevalence and intensity and is associated with deficient sanitation and low hygiene standards [8]. Except for Ban Bankhunthong, which had unique geographic characteristics, the prevalence of *B. hominis* in schools in the urban area was significantly higher than the rural schools ($P < 0.001$); ie urban schools (15.5% of Ban Kosaya and 31.0% of Ban Huakao) versus rural schools (5.5% of Ban Prak-pra and 9.4% of Ban Kuba-egor). The lower prevalence of *B. hominis* in the rural schools was probably associated with the lower density population compared with the urban setting [9]. Suresh *et al* [10] concluded in their study that *B. hominis* can frequently be found in indigenous, asymptomatic city dwellers, despite improvements in sanitation and life-style due to urbanization. One previous study of intestinal parasitic infections among schoolchildren, conducted in rural communities with poor hygiene and poor sanitation in Nan Province, northern Thailand, also found a low prevalence of *B. hominis* (0.8%) [11].

The results of the present study lead us to conclude that annual mass de-worming with albendazole is inadequate for the control of parasitic infections, due to the re-infection rates found. Improvement in habitation, sanitation, access to health services, and appropriate available health infrastructure are also important factors for decreasing the prevalence of parasitic infections, despite a de-worming program. For the control of parasitic infections, a half-yearly repeated anthelminthic treatment is recommended for schoolchildren, to reduce re-infection. To limit the transmission of protozoans in future, anti-protozoan treatments are essential in the parasite-control program in a community with a moderate or high prevalence of protozoan infections.

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