

## A LONGITUDINAL STUDY OF ENTEROBIASIS IN THREE DAY CARE CENTERS OF HAVANA CITY

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### SUMMARY

Pinworm infection was prospectively studied during one year in 469 children attending three day care centers. Each child was examined at six months intervals using up to three perianal swabs with adhesive tape. Those found infected were treated with mebendazole. At the beginning of the study we found a prevalence of 28% that dropped to 13% and 12% in the following study periods. The reinfection rate was twice the incidence rate in both study periods. We also found a small percentage (10%) of the children reinfected in most or all study periods. There was a high correlation between reinfection and perianal itching. Our results add further knowledge to the epidemiology of intestinal parasites in day care centers.

**KEYWORDS:** Pinworm infection; *Enterobius vermicularis*; Day care centers; Longitudinal study; Predisposition.

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### INTRODUCTION

The pinworm, *Enterobius vermicularis*, is a cosmopolitan specie in its global distribution and the most common human helminth parasite reported in Europe and North America<sup>4,16</sup>. In Cuba the reported prevalence in day care centers (DCC) is high, between 20 and 30%<sup>15</sup>. Although most pinworm infections are asymptomatic, heavy infections in children can produce symptoms that contribute to emotional instability, decrease learning capabilities and even cause complications such as appendicitis or vulvovaginitis<sup>1,12</sup>.

Most of the published papers on pinworm infection are cross-sectional studies concerning therapeutic response, prevalence of symptoms and its association with infection, diagnostic value of different procedures, distribution and abundance of the parasite in a given human population. Few studies examine the same children more than twice<sup>13</sup>. It is important for control purposes to follow a given child population, studying it at various time periods including the distribution of the infection

and its association with symptoms that are relevant for transmission. In the present paper we report the results of a longitudinal study of three DCC. The children were examined three times within a year. We used perianal swabs, employing adhesive cellophane tape<sup>8</sup>. It is well known that the true prevalence of pinworm infection is grossly underestimated in intestinal parasites surveys when the Graham procedure is not employed<sup>14</sup>.

### MATERIALS AND METHODS

#### Population studied

Three DCC from Havana City were randomly selected. All children attending the DCC were studied. The age and sex distribution of those that completed the protocole is described in Table 1. Less than 5% of the children that started the study withdraw for various reasons. They had no difference in sex and age distribution with the study group. We gave to each mother a questionnaire relating to the child's clinical symptoms occurring during the last three months of the study as well

**TABLE 1**

Sex and age of children that completed the study period

	Sex		Age (years)				
	Male	Female	<1	1	2	3	4
Number	254	215	87	97	108	130	47
(%)	(54)	(46)	(18)	(21)	(23)	(28)	(10)

as demographic and socioeconomic data. Before the initiation of the research project informed consent was obtained from the directors of the DCC and the mothers of all children. The protocol was approved by the ethical committee of Institute of Tropical Medicine "Pedro Kouri".

#### Parasitological Technique and Treatment

At six months intervals up to three perianal swabs, using adhesive tape, were taken from each child, when pinworm eggs were observed a single oral dose (200 mg) of mebendazole was administered to the child. Three perianal swabs were performed 7, 14 and 21 days after treatment to corroborate cure. In case of treatment failure they received another course of mebendazole, but this time 100 mg twice daily during three consecutive days. The delivery of the drug was supervised by one of the authors.

#### Definitions

The terms, prevalence and incidence were defined according to MARGOLIS et al.<sup>13</sup>. Reinfection was defined as the percentage of those children infected in the previous study period and cured that were found infected in the following one.

#### Statistical Analysis

Statistical analysis was carried out using proportion tests to compare independent groups, or two proportions from one group. The differences were considered to be statistically significant when the *p* value obtained was less than 0.05. The Spearman correlation test was applied to compare prevalence of symptoms and number of positive cross sectional surveys. All analysis were performed using a Microstat statistical package.

#### RESULTS

The results of the perianal swabs in each cross-sectional survey are shown in Table 2. The studied children fell into three groups. The largest one integrated by children that were found in all three surveys free of pinworm infection (58%). In the second group pinworm was found in only one survey (31%). In the third group pinworm infection was found in most of the surveys, two or three (10%). Children in this last group were found reinfected after been successfully treated. The cure rate after a single dose was 84%. Those not cured were successfully treated when given another course of mebendazole as described above. In almost each group of study there were more males than females infected with pinworm. This difference was higher in the third group ( $p < 0.01$ ). The highest prevalence in pinworm infection was found in children aged 3 and 4 years old. We found no difference in the prevalence associated to race (data not shown).

The only symptom that shows a strong correlation with the number of times infected with pinworm was perianal itching (Table 3) ( $p < 0.001$ ). Although some of the studied children complain of abdominal pain, we did not found a high correlation between this symptom and the number of positive surveys.

**TABLE 2**  
Results of cellulose tape examinations in each study period

Months	No. children	Male No. (%)	Female No. (%)
0 6 12			
+ + +	7	6 (85.7)	1 (14.3)
+ + -	20	14 (70.0)	6 (30.0)
+ - +	15	13 (86.7)	2 (13.3)
- + +	7	4 (57.1)	3 (42.8)
- + -	26	15 (57.7)	11 (42.3)
- - +	29	18 (62.0)	11 (37.9)
+ - -	91	48 (52.7)	43 (47.3)
- - -	274	136 (49.6)	138 (50.4)
Total	469	254 (54.1)	215 (45.8)

+ positive pinworm infection  
- negative for pinworm infection

The rate of prevalence (Table 4) sharply declined after the first study period ( $p < 0.01$ ) and remained stable in the two other surveys (13 and 12%) ( $p > 0.05$ ). We were able to study the rate of incidence and the rate of reinfection in the last cross sectional surveys. In both sets of examinations the rate of reinfection (20 and 23%) was twice the rate of incidence (10 and 11%).

## DISCUSSION

We have studied during one year the behaviour of pinworm infection on 469 children attending three DCC in Havana City. To each child, three sets of perianal swabs were performed at six month intervals. We were therefore able to study the kinetics of pinworm infection in each child of our study population. Our findings could contribute to the control of pinworm infection in DCC, because we were able to identify a small group of children that frequently reinfected after a successful treatment. Although we did not count after treatment the number of pinworm expelled by those children, it is well known that the adhesive cellophane tape method detects pinworm only when the intensity of infection is moderate or heavy<sup>6,7</sup>. This pattern of infection suggests that those children are predisposed to pinworm infection. Predisposition to intestinal helminths was first described by ANDERSON et al.<sup>2</sup> and have been reported for other helminths<sup>3,5</sup> including pinworm<sup>9,10</sup>. The three characteristics of predisposed individual are: they constitute a small fraction of the study population, they carry a heavy infection and they reinfected after successful treatment with a similar parasite burden. Our group of predisposed children fulfill two of the three conditions and possibly the third one.

Although limited to one year, our results suggest that in the prevalence of pinworm infection in day care centers, reinfection rate is more important than incidence rate. Reinfection probably occur at home, as in each study period we treated till cured all infected children but we did not examine other household members, some of them probably infected with pinworm and this may explain why after a sharp decline the prevalence of pinworm remain constant. We also found that there was a high correlation of perianal itching and pinworm reinfection. We therefore may find predisposed children to pinworm infection among those that had perianal itching and were often reinfected, avoid the need to count expelled worm after treatment. The identification and the treatment of predisposed children within a study population is of epidemiological relevance as they are the main spreaders of infective parasites stages in the environment, and their selective treatment is an important alternative to mass-chemotherapy in community-level helminth control programs.

TABLE 3

Prevalence of symptoms in children infected with pinworm

No. of positive cross sectional surveys	No. of children studied	Symptoms present	
		perianal itching No. (%)	abdom. pain No. (%)
0	274	0 (0)	2 (0.7)
1	146	33 (22.6)	4 (2.7)
2	42	13 (30.9)	1 (2.3)
3	7	5 (71.4)	2 (28.5)

TABLE 4

Rates of pinworm prevalence, incidence and reinfection in each study period.

Cross Sectional Study (Months)	Prevalence (%)	Incidence (%)	Reinfection (%)
0	133/469 (28)	-	-
6	60/469 (13)	33/336 (10)	27/133 (20)
12	58/469 (12)	44/409 (11)	14/60 (23)

## RESUMO

### Estudo longitudinal de enterobíase em três creches da cidade de Havana, Cuba.

Infecção por oxiúros foi estudada prospectivamente durante um ano em 469 crianças de três creches. Cada criança foi examinada com intervalos de 6 meses usando até 3 esfregaços perianais com fita adesiva. As que estavam infectadas foram tratadas com mebendazole. No início do estudo foi encontrada prevalência de 28% que caiu para 13% e 12% nos períodos de estudo posteriores.

A frequência de reinfeção foi 2 vezes a incidência em ambos os períodos de estudo. Foi encontrada, também, pequena porcentagem (10%) de crianças reinfetadas na maioria ou em todos os períodos de estudo.

Existiu elevada correlação entre reinfeção e coceira perianal. Nossos resultados adicionam outros conhecimentos à epidemiologia dos parasitos intestinais em creches.

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