ARTIGO

ENTEROBIASIS AND OTHER INTESTINAL PARASITOSES IN CHILDREN ATTENDING EDUCATIONAL INSTITUTIONS IN UBERLÂNDIA, STATE OF MINAS GERAIS, BRAZIL

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ABSTRACT

In order to search for *Enterobius vermicularis* and other intestinal parasitoses, children living in a developmental center as well as those attending four day care centers and elementary schools in Uberlândia were examined by the Graham and Sedimentation techniques. Out of 187 children examined, 53 (28.3%) were infected. The parasite prevalence rates according to institutions varied from 0% to 60%. The parasites and commensals encountered and their respective prevalence rates were, *Giardia duodenalis* (38.3%), *E. vermicularis* (13.9%), *Hymenolepis nana* (9.6%), *Ascaris lumbricoides* (4.3%), *Entamoeba coli* (8.5%) and *Entamoeba hartmanni* (1.1%). Repeating the Graham technique and the examination of two homogenized stool samples by the Sedimentation method increased the sensitivity of both techniques. Children between two and seven years old presented greater prevalence rates. The rates observed in boys and girls were not different from each other. The results reinforce the relationship of prevalence of intestinal parasites and social-economical aspects, as well as reveals *E. vermicularis* as one of the most prevalent helminths in children attending day care centers and elementary schools in Uberlândia.

KEYWORDS: *Enterobius vermicularis*. Children. Intestinal parasites. Graham technique.

INTRODUCTION

Commonly, surveys for human intestinal parasites are based on the Sedimentation method (18). This is probably due to the fact that this test is easily performed and yields good sensitivity for many intestinal parasites. Nevertheless, reliable inferences on prevalence rates for some intestinal parasites demand use of specific and/or more sensitive techniques (11).

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Enterobius vermicularis (Linnaeus, 1758) is one of the widest distributed human helminths around the world (6, 8, 16, 21, 26). As enterobiasis generally cause few relevant health problems and its laboratorial diagnosis is performed using a specific technique (13), its distribution has been ignored in many surveys for human intestinal parasitoses. The main hosts of this specific human parasite are children and institutionalized persons. Particularities in its biologic cycle allow auto-infections and intra-domiciliary transmissions, resulting many times in high infection rates (2, 15, 16, 26).

In the last few years, many studies on the prevalence of intestinal parasitoses in children have been conducted in Uberlândia and vicinities (3, 4, 9, 19). Nevertheless, in all of the conducted studies the diagnostic techniques did not permit accurate Enterobiasis prevalence rates. In order to obtain a more reliable inference on *E. vermicularis* distribution in children living in a developmental center as well as in children frequenting day care centers and primary schools in Uberlândia, a survey using the Graham technique (13) was performed. The Sedimentation method (18) was also applied to search for other intestinal parasites and as a control procedure to permit comparisons to preceding studies carried out in Uberlândia and vicinities.

MATERIALS AND METHODS

Children from five urban institutions: two day-care centers, a developmental center (an orphanage for children presenting physical and mental disabilities) and two mixed institutions (a combination of a preschool and elementary school) in Uberlândia (18°55'23''S and 48°17'19''W), State of Minas Gerais, were examined using Lutz and Graham techniques for intestinal parasites. The study was performed between June 1997 and April 1998.

Previous to study initiation, the children's parents or legal guardians signed a consent form. The samples collected by the Graham technique were done at the beginning of the morning. One stool sample was obtained from each child and placed into flasks containing 10% formol until it could be examined by Lutz technique. Using the same procedure, a second stool sample was obtained from part of the children, between a week and 10 days after the first one. Thereafter, the two stool samples belonging to the same child were placed into a recipient, homogenized and examined as one. Part of those children, who were negative for *E. vermicularis* in the first exam by the Graham technique, were also submitted to a second exam from a week, up to 10 days after the first one. Six slides obtained from each stool sample (Lutz technique) and the samples obtained using the Graham technique were examined under light microscope at the Laboratory of Parasitology, Institute of Biomedical Sciences, Uberlândia Federal University (UFU).

The social-economical status of the clientele of each institution was inferred in regard to their parents or legal guardian's professions. Institutions I, II are day-care centers and the institution III is a developmental center (an orphanage for children presenting physical and mental disabilities) (see Table I in Results). All of them are free institutions. The majority of the children who attended these institutions were from families of lower social-economical background (labor workers). Institutions IV and V are two mixed institutions (a combination of a preschool and elementary school) in which tuition is paid and their clientele belonged to the upper social-economical level (middle class workers, liberal professionals, small business owners etc.). The examined children were also separated in five aged groups and by sex.

The percentages of children positive to *E. vermicularis* and to other parasites were calculated considering the total children submitted to each one of the techniques, Graham' and Lutz', respectively. To compare proportions of parasitism between age groups, sexes, institutions and diagnostic techniques, the x^2 test was applied. In cases in which, using x^2 test, significant differences between more than two proportions were found, data were then submitted to angular transformation and afterward to Tukey type multiple comparison test (27). For all statistical analyses, a significance level of 5% was applied.

RESULTS

Out of the total of 187 children examined, 93 were examined only by the Graham technique, 14 only by Lutz technique and 80 children were submitted to both methods. The children from institution III were submitted only to the Graham technique. Approximately 30% of the examined children that had a second stool sample collected, were submitted to a second exam by the Graham technique and almost all of them belonged to institution II. A total of 53 (28.3%) children were positive for enteroparasites and commensals. The prevalence rates according to institutions varied from 0% to 60% (Table I). The parasites and commensal species encountered and their respective distribution were, *Giardia duodenalis* Stiles, 1915 (synonymous: *Giardia lamblia* and *Giardia intestinalis*) (38.3%), *E. vermicularis* (13.9%), *Hymenolepis nana* (Siebold, 1852) (9.6%), *Ascaris lumbricoides* Linnaeus 1758 (4.3%), *Entamoeba coli* (Grassi, 1879) (8.5%) and *Entamoeba hartmanni* (Prowazek, 1912) (1.1%) (Table I). More then half of the positive children (52.2%) presented only one parasite. The most common parasite association observed were: *E. vermicularis* + *G. duodenalis* (13.%) and *H. nana* + *E. vermicularis* + *G. duodenalis* (6.5%). Both boys and girls presented almost the same prevalence rates (30.2% and 29.2%) ($x^2_{0.05,1} = 0.168$). The prevalence rates of *E. vermicularis* observed in boys (14.6%) and

girls (11.63%) were not statistically different from each other ($x^2_{0.05}$, 1 = 0.386). The age groups that presented greater rates were those between two and seven years old, including those of *E. vermicularis* ($x^2_{0.05}$, 4 =11.3915) (Table II).

Table I. Intestinal parasites and commensal species in children attending five educational institutions in Uberlândia, State of Minas Gerais between July and April of 1998.

Species	Institution (number examined)					
	I (27)	II (55)	III (79)	IV (12)	V (14)	Total
Giardia duodenalis	9[a] (39.1)[b]	25 (52.1)	-	2 (22.2)	0 (0.0)	36 (38.3)
Enterobius vermicularis	2 (8.7)	15 (29.4)	7 (8.9)	0 (0.0)	0 (0.0)	24 (13.9)
Hymenolepis nana	2 (8.7)	7 (14.6)	-	0 (0.0)	0 (0.0)	9 (9.6)
Entamoeba coli	1 (4.3)	7 (14.6)	-	0 (0.0)	0 (0.0)	8 (8.5)
Ascaris lumbricoides	0 (0.0)	4 (8.3)		0 (0.0)	0 (0.0)	4 (4.2)
Entamoeba hartmanni	1 (4.3)	0 (0.0)	-	0 (0.0)	0 (0.0)	1 (1.1)
Total	11 (40.7) A[c]	33 (60.0) A	7 (8.9)	2 (16.7) B	0 (0.0) B	53 (28.3)

a: positive children; b: percentage of positive children; c: percentages with different letters are statistically different from each others. Institution III was a developmental center and its children were submitted only to Graham technique. The percentages of children positive to *E. vermicularis* and to other intestinal parasites were calculated considering the children submitted respectively to Graham's and Lutz's techniques. The majority of the children from institution II were sampled twice.

Table II. Intestinal parasites and commensal species in different age groups of children attending five educational institutions in Uberlândia, State of Minas Gerais.

Species	Distribution by age groups					
	0 - 1	2 - 3	4 - 5	6 - 7	≥ 8	Total
Giardia duodenalis	3[a] (33.3)[b]	15 (41.7)	14 (40.0)	3 (33.3)	1 (25.0)	36 (38.3)
Enterobius vermicularis	2 (8.0)	10 (15.9)	8 (14.3)	3 (17.6)	1 (8.3)	24 (13.9)
Hymenolepis nana	0 (0.0)	1 (2.8)	7 (20.0)	1 (11.1)	0 (0.0)	9 (9.6)
Entamoeba coli	1 (11.1)	4 (11.1)	3 (8.6)	0 (0.0)	0 (0.0)	8 (8.5)
Ascaris lumbricoides	1 (11.1)	2 (8.3)	1 (2.8)	0 (0.0)	0 (0.0)	4 (4.2)
Entamoeba hartmanni	0 (0.0)	1 (2.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.1)
Total	3 (11.5) B[c]	20 (29.9) A	23 (37.7) A	5(26.3) AB	2 (14.3) B	53 (28.3)

a: number of positive children; b: percentage of positive children; c: percentages with different letters are statistically different from each other. The percentages of children positives for *E. vermicularis* and for other intestinal parasites were calculated considering the number of children submitted to Graham's and Lutz's techniques.

Repeating the Graham technique and the examination of two homogenized stool samples by Lutz's technique increased the sensitivity of both methods to diagnose *E. vermicularis* and other intestinal parasites (Tables I and III). Significant greater prevalence rates of intestinal parasites in institutions whose children came from lower social-economical background were verified ($x^2_{0.05,4}$ = 15.711) (Table I).

Table III. Prevalence rates of intestinal parasites and commensal species in children in Uberlândia using Graham and Lutz techniques

Species	Graham test			Lutz technique		
	First sample	Second sample	Total	One stool sample	Two stool samples	Total
Giardia duodenalis	-	-	-	13[a] (26.5)[b]	23 (51.1)	36 (38.3)
Enterobius vermicularis	16 (9.2)	8 (21.5)	24 (13.9)	1 (2.0)	1 (2.2)	2 (2.1)
Hymenolepis nana	-	-	-	5 (10.2)	4 (8.9)	9 (9.6)
Entamoeba coli	-	-	-	1 (2.0)	7 (11.1)	8 (8.5)
Ascaris lumbricoides	1 (0.6)	-	1 (0.6)	1 (2.0)	2 (4.4)	3 (4.2)
Entamoeba hartmanni	-	-	-	1 (2.0)	0 (0.0)	1 (1.1)
Total	17 (9.8)	8 (21.5)	25 (14.4)	19 (38.8)	25 (55.6)	44 (46.8)

a: number of positive children; b: percentage of positive children. Children that had stools sampled once were not the same ones whose stools were sampled twice.

DISCUSSION

The present results indicate *G. duodenalis* as the most prevalent intestinal parasite in this population, corroborating preceding studies performed in children from this city and vicinities (3, 4, 9, 19) as well as in other localities of this country (5, 17, 20, 25). On the other hand, results indicating *E. vermicularis* as one of the most prevalent intestinal helminths in children in Uberlândia had not been shown by any other study until today. This could be due to the fact that methods adopted in those studies were not as sensitive to diagnose this parasite as the Graham's is (Table III).

Many studies have observed greater prevalence rates of many intestinal parasites in children from families of low social-economical levels in Brazil (1, 12, 14, 22). Despite the low number of children examined in institutions IV and V, it may be observed that the children belonging to those institutions were less infected by intestinal parasites than the other ones (Table I). This may be associated to better care they could be having in their homes and educational institutions, including meals and drinking water (1, 7). On the other hand, the greatest prevalence rates observed in the institution II could be due to their children social background and to the fact that almost all of them were sampled twice. It is assumed that Enterobiasis occurs in people of all classes, mainly in children and institutionalized persons (2, 16). It seems that, in Uberlândia, the prevalence of *E. vermicularis* in children is also influenced by social-economical factors. It was expected to find a greater prevalence rate of *E. vermicularis* in children from institution III because communal living conditions and difficulties in maintaining good personal hygiene make its transmission easier (16). The fact that the prevalence rate of *E. vermicularis* encountered in this institution was not as large as initially

expected might be partially explained by the health care those children have and, one more time, by the fact that only part of its children was submitted to a second exam.

Repeating exams in negative patients is recommended to both techniques here adopted (9, 18, 23). The repetition of the Graham test and the obtainment of two stool samples to perform the Lutz' technique on part of the children increased the sensitivity of both techniques (Table III). On the other hand, it could be affirmed that the distribution of intestinal parasitoses observed in those institutions, where the majority of children had been sampled only once, were underestimated. Consequently, the use of the former procedures in all the sampled children could increase the prevalence rates of several parasite species here presented. The applying of other than Lutz's technique, seen as more sensitive to diagnose some of these intestinal parasites, would also increase the prevalence rates here encountered and/or would diagnose other species not encountered here using this technique (5, 10, 11, 19). Using Baerman-Moraes' technique, Machado & Costa-Cruz (1998) (19) showed that 13% of pre-school age children were positive for *Strongyloides stercoralis* in Uberlândia. On the other hand, the absence of *E. histolytica/dispar* in the present study, a very important intestinal parasite in many Brazilian localities (1, 5, 24), corroborates preceding studies which also did not encountered or observed low prevalence rates of this parasite in children in Uberlândia and vicinities (3, 4, 9, 19).

In conclusion, because the Graham technique was also applied in this study, *E. vermicularis* is revealed here as one of the most prevalent intestinal helminths in children attending day care centers and primary schools in Uberlândia.

RESUMO

Enterobiose e outras parasitoses intestinais em crianças de instituições educacionais de Uberlândia, estado de Minas Gerais.

Para diagnosticar *Enterobius vermicularis* e outros parasitos intestinais, examinaram-se, pelas técnicas de Lutz e Graham, as fezes de crianças de um centro de desenvolvimento físico e mental infantil, de duas creches e de duas instituições pré-escolares e de ensino primário. De um total de 187 crianças examinadas, 53 encontravam-se positivas (28,3%). As taxas de prevalência variaram de 0 a 60%, de acordo com a instituição. Os parasitos e comensais encontrados e suas respectivas taxas de infecção foram: *Giardia duodenalis* (38,3%), *E. vermicularis* (13,9%), *Hymenolepis nana* (9,6%), *Ascaris lumbricoides* (4,3%), *Entamoeba coli* (8,5%) e *Entamoeba hartmanni* (1,1%). A repetição da técnica de Graham e a obtenção de duas amostras fecais em parte das crianças amostradas aumentaram a sensibilidade de

ambos os métodos. Crianças entre dois e sete anos apresentaram as maiores taxas de prevalência. Não houve diferença entre as taxas observadas em cada sexo. Os resultados reforçam evidências da relação entre parasitoses intestinais e aspectos socioeconômicos, assim como apontam *E. vermicularis* como um dos helmintos intestinais mais prevalentes em crianças de creches, pré-escolas e de ensino primário em Uberlândia (MG).

DESCRITORES: *Enterobius vermicularis*. Crianças. Parasitos intestinais. Técnica de Graham.

REFERENCES

1. Alves MS, Vilela MAP, Barbosa NR, Alves RMS, Rezende MC. Incidência de parasitoses em escolares da Escola Municipal de Educação Infantil "Sant'Ana Itatiaia", Juiz de Fora - MG e sua possível correlação com a qualidade da água para consumo. *Rev Bras Anál Clín 30*: 185-187, 1998.
2. Amato Neto V, Levi GC, Vilela E, Gomes MCO, Campos R. Sintomatologia atribuível à Enterobíase, analisada entre crianças residentes em habitação coletiva. *Rev Inst Med Trop São Paulo 11*: 343-347, 1969.
3. Bebert-Ferreira M, Costa-Cruz JM. Parasitas intestinais em lactentes de 4 a 12 meses, usuários das chreches da Universidade Federal de Uberlândia, Minas Gerais. *J Pediatr 71*: 219-222, 1995.
4. Bebert-Ferreira M, Costa-Cruz JM, Moraes MMAR, Cardoso MLG, Oliveira AM. Parasitas intestinais em Pré-escolares da Escola de Educação Básica da Universidade Federal de Uberlândia, Minas Gerais no ano de 1989. *Rev Cent Ciênc Biomed Univ Fed Uberlândia 6*: 15-19, 1990.
5. Cardoso GS, Santana ADC, Aguiar CP. Prevalência e aspectos epidemiológicos da Giardíase em creches no município de Aracaju, SE, Brasil. *Rev Soc Bras Med Trop 28*: 25-31, 1995.
6. Castro VM, Chacón RA, Romero BEP, Chío MW. 1985. Prurito anal, nasal, bruxismo y sialorrea en niños con enterobiasis o ascariasis. *Acta Pediátr Méx 6*: 122-124, 1985.
7. Coelho LMP, Oliveira SM, Milman MHSA, Karasawa KA, Santos RP. *Rev Soc Bras Med Trop 34*: 479-482, 2001.
8. Fan PC. Review of enterobiasis in Taiwan and offshore islands. *J Microbiol Immunol Infect 31*: 203-210, 1998.
9. Ferreira CB, Marçal Junior O. Enteroparasitoses em Escolares do Distrito de Martinésia, Uberlândia, MG. Um Estudo-Piloto. *Rev Soc Bras Med Trop 30*: 373-377, 1997.
10. Genari-Cardoso ML, Costa-Cruz JM, Castro E, Lima LMFS, Prudente DV. *Cryptosporidium* sp. In children suffering from acute diarrhea at Uberlândia city, State of Minas Gerais, Brazil. *Mem Inst Oswaldo Cruz 97*: 551-554, 1996.
11. Gillespie SH & Hawkey PM. *Medical Parasitology. A Practical Approach*. Oxford University Press. Oxford, 1995.
12. Gioia I. Prevalência de parasitoses intestinais entre os usuários do Centro de Saúde do Distrito de Sousas, Campinas, SP (1986-1990). *Rev Soc Bras Med Trop 25*:177-182, 1992.
13. Graham CF 1941. A device for the diagnosis of *Enterobius* infection. *Am J Trop Med Hyg 21*:159-161, 1941.
14. Grencis R, Cooper E. Enterobiasis, *Trichiuris*, *Capillaria*, and Hookworm. *Gastroenterol Clin North Am 25*: 579-596, 1996.
15. Herrstom P, Fristrom A, Karlsson A, Hogstedt B. *Enterobius vermicularis* and finger sucking in young Swedish children. *Scand J Prim Health Care 15*: 146-148, 1997.

16. Lohiya GS, Tan-Figueroa, Crinella FM, Lohiya S. Epidemiology and control of enterobiasis in a developmental center. *West J Med 172*: 308-309, 2000.
17. Ludwig KM, Frei F, Filho FA Ribeiro-Paes JT. Correlação entre condições de saneamento básico e parasitoses intestinais na população de Assis, Estado de São Paulo. *Rev Soc Bras Med Trop 32*: 547-555, 1999.
18. Lutz AV. *Schistosoma mansoni* e a Schistossomose, segundo observações feitas no Brasil. *Mem Inst Oswaldo Cruz 11*: 121-125, 1919.
19. Machado ER, Costa-Cruz JM. *Strongyloides stercoralis* and other Enteroparasites in Children at Uberlândia City, State of Minas Gerais, Brazil. *Mem Inst Oswaldo Cruz 93*: 161-164, 1998.
20. Machado RC, Marcari EL, Cristante SFV Carareto CMA. Giardíase e Helmintíases em crianças de creches e escolas de 1° e 2° graus (públicas e privadas) da cidade de Mirassol (SP, Brasil). *Rev Soc Bras Med Trop 32*: 697-704, 1999.
21. Mahdi NK, Al-Khfaji AA. Prevalence and Seazonal Variation of Enterobiasis in Children of Iraq. *Southeast Asian J Trop Med Public Health 21*: 135-138, 1990.
22. Melo ALV, Bohland AK. Parasitoses intestinais em uma amostra de escolares do povoado Santana dos Frades, Bacatuba – SE. *Rev Bras Anál Clin 31*: 41-43, 1999.
23. Oliveira Rocha M. Exame Parasitológico de Fezes. In: Neves DP. *Parasitologia Humana*, 10ª ed., Atheneu, Belo Horizonte, 2000. p. 403-411.
24. Prado MS, Barreto ML, Strina A, Faria JAS, Nobre AA, Jesus SR. Prevalência e intensidade da infecção por parasitas intestinais em crianças na idade escolar na Cidade de Salvador (Bahia, Brasil). *Rev Soc Bras Med Trop 34*: 99-101, 2001.
25. Rocha RS, Silva JG, Peixoto SV, Caldeira RL, Firmo JOA, Carvalho OS, Katz N. Avaliação da esquistossomose e de outras parasitoses intestinais, em escolares do município de Bambuí, Brasil. *Rev Soc Bras Med Trop 33*: 431-436, 2000.
26. Soruco AAB, Tsing-Sung C, Jockymann F, Silva JMF, Scroferneker ML. Prevalência de Enterobiose numa População Escolar da Periferia de Porto Alegre – Rio Grande do Sul. *Revista AMRIGS 31*: 304-306, 1987.
27. Zar JH. *Bioestatistical analysis*, 4th edition. New Jersey, Prentice Hall INC, 1999.