Strongyloides stercoralis and other Enteroparasites in Children at Uberlândia City, State of Minas Gerais, Brazil

Eleuza Rodrigues Machado, Julia Maria Costa-Cruz+

Laboratório de Parasitologia, Departamento de Patologia, Universidade Federal de Uberlândia, Av. Pará 1720, 38400-902, Uberlândia, MG, Brasil

To evaluate the rate of infection by Strongyloides stercoralis and other enteroparasites a survey was conducted in the city of Uberlândia, State of Minas Gerais, Brazil. A total of 900 stool samples from 300 children aging from four months to seven years, randomly selected in ten nursery schools from September 1994 to December 1995, were examined, both by the Baermann-Moraes and Lutz methods. Thirty nine children (13%) were found to be infected by S. stercoralis, 64.1% were boys and 35.9% were girls. Taking all the enteroparasites as a whole the results of the survey pointed out that 265 (88.4%) of the 300 children were infected by the following: Giardia lamblia, 78.3%; Ascaris lumbricoides, 15.3%; S. stercoralis, 13%; Hymenolepis nana, 6.7%; hookworms, 6%; Enterobius vermicularis, 4%; Hymenolepis diminuta, 4% and Trichuris trichiura, 0.7%. From 265 infected children 64.5% were mono-infected, 27.2% were infected by two parasites and 8.3% had a poly-specific parasite burden. It was concluded that strongyloidiasis is hyperendemic in this area.

Key words: Strongyloides stercoralis - intestinal parasites - children - Brazil

Strongyloidiasis has heterogenic worldwide distribution, with three world regions, according to the predominance of the infection by Strongyloides stercoralis (Bavay, 1876): sporadic (<1%), endemic (1-5%) and hyperendemic (>5%) (Stuerchler 1981 apud Pires & Dreyer 1993).

The occurrence of S. stercoralis in children aged from 0-14 years in some Brazilian states is summarized in Table I.

This study aimed at surveying the prevalence of S. stercoralis and other enteroparasites in nursery school children aging from four months to seven years, in Uberlândia, State of Minas Gerais, Brazil, from September 1994 to December 1995.

MATERIALS AND METHODS

In 1994 Uberlândia had 49 nursery schools, from these ten were taken at random. The size of the sample was calculated according to the formula: n = Z² x P x Q/d² (Rodrigues 1986) considering (Z) of 95%; (d) of 5%; (P) of 10%, obtained in a pilot study in three nursery schools, and a non-observed value (Q) of 90%; with the size of the sample (n) evaluated at 138 persons. This sample was amplified and 300 children were selected at random, 30 at each of the pre-determined school; these children were later identified according to sex and age following the agreement of their parents or tutors for their participation.

Three fecal samples from each child were collected in plastic vials without preservatives with intervals of four to six days. The samples were stored in boxes with ice and analyzed at the Laboratory of Parasitology of the Universidade Federal de Uberlândia by the methods of Baermann and Moraes (BM) (Baermann 1917, Moraes 1948) and Lutz (Lutz 1919). For more adequate reading of the slides the larvae were fixed using 0.2 ml of a 10% solution of formalin applied to the residue of the first method. Five slides were prepared for the BM analysis and six for the Lutz analysis for each of the 900 samples. The total number of slides examination was thus 9900.

All the families of the children received the results of the laboratory diagnosis. The positive cases were referred to the Pediatric Polyclinic, where they received specific treatment.

The data were processed using the analysis of variance (Anova) and the Students’ t according to Malleta (1992).

RESULTS

S. stercoralis infection - From the 300 children studied 39 (13%) were infected with larvae of S. stercoralis in one of the three periods sampled. Of these cases, 28 cases were detected only by BM method (71.8%), nine of them only by the Lutz’ method (23.1%) and two by both methods (5.1%). These differences were statistically significant by Anova, GL 2 and 6. Of these 39 cases nine (23%)
were diagnosed only in the first sample; one (2.6%) in the first and third; one (2.6%) in all three samples; 14 cases (35.9%) in the second sample and 14 (35.9%) only in the third sample. These variations were not statistically significant by Anova GL 2 and 6. Regarding sex 25 (64.1%) cases of \textit{S. stercoralis} were detected in boys and 14 (35.9%) in girls. Children in all ages were infected, except in those from zero up to one year. Table II has the number of children studied and test results by age category. There was no statistically significant difference in rates of infection by sex or age. Positive cases of \textit{S. stercoralis} varied from 3.3% to 23.3% in the ten nursery schools.

\textit{Other enteroparasites} - Of the 300 children studied 149 (49.7%) were boys and 151, girls (50.3%). Of these 265 (88.4%) were infected: 132 (49.8%) were boys and 133 (50.2%) were girls. The distribution of parasites, (excluding the positive children from the other sample) is represented in Table III. There were 171 (64.5%) children mono-infected; 72 (27.2%) bi-infected and 22 (8.3%) poly-infected. From the bi and poly-infected children there were 32 associated infections of \textit{S. stercoralis}: \textit{Giardia lamblia}, Stiles, 1915, in 17 cases (53.1%); \textit{Ascaris lumbricoides}, Linnaeus, 1758, in four (12.5%); hookworms either \textit{Ancylostoma duodenale} (Dubini, 1843) or \textit{Necator americanus}, Stiles, 1903, in one (3.1%); \textit{Hymenolepis nana} (Siebold, 1852) in one (3.1%); together with \textit{G. lamblia} and \textit{A. lumbricoides} in five (15.6%); \textit{G. lamblia} and hookworms in two (6.2%); \textit{G. lamblia} and \textit{H. nana} in one (3.1%) and \textit{G. lamblia} and \textit{Enterobius vermicularis} (Linnaeus, 1771) in one (3.1%).

\begin{table}[h]
\centering
\caption{Distribution of the 39 cases of \textit{Strongyloides stercoralis} by age category of the children studied in Uberlândia between September 1994 and December 1995}
\begin{tabular}{|c|c|c|c|c|c|}
\hline
Age category (year) & No. of children examined (n=300) & No. of positive cases (n=39) & \% by positive cases & \% by age category \\
\hline
0 – 1 & 8 & 0 & 0 & 0 \\
1 – 2 & 55 & 6 & 15.4 & 10.9 \\
2 – 3 & 61 & 8 & 20.5 & 13.1 \\
3 – 4 & 48 & 6 & 15.4 & 12.5 \\
4 – 5 & 55 & 7 & 17.9 & 12.7 \\
5 – 6 & 42 & 8 & 20.5 & 19.0 \\
6 – 7 & 31 & 4 & 10.3 & 12.9 \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Frequency of enteroparasites among children aged from four months to seven years from ten nursery schools in Uberlândia, from September 1994 to December 1995}
\begin{tabular}{|c|c|c|}
\hline
Parasites & No. of positive children & \% \\
\hline
\textit{Giardia lamblia} & 235 & 78.3 \\
\textit{Ascaris lumbricoides} & 46 & 15.3 \\
\textit{Strongyloides stercoralis} & 39 & 13 \\
\textit{Hymenolepis nana} & 20 & 6.7 \\
Hookworms & 18 & 6 \\
\textit{Enterobius vermicularis} & 12 & 4 \\
\textit{Hymenolepis diminuta} & 12 & 4 \\
\textit{Trichuris trichiura} & 2 & 0.7 \\
\hline
\end{tabular}
\end{table}

\begin{table}[h]
\centering
\caption{Occurrence of strongyloidiasis in children in different states of Brazil}
\begin{tabular}{|c|c|c|c|c|}
\hline
State & No. of children & Age category & No. of positive (\%) & Parasitological methods & Authors (year) \\
\hline
Minas Gerais & 1021 & 0-14 years old & 82 (8) & Direct & Alonso (1967) \\
Amazonas & 240 & 0-12 years old & 4 (1.7) & Faust & Ferraroni et al. (1979) \\
Pernambuco & 4312 & 0-14 years old & 102 (2.4) & Lutz & Alves et al. (1982) \\
Maranhão & 2634 & 0-14 years old & 758 (28.8) & Direct, Rugai, Faust, Lutz & Cutrim-Jr et al. (1985) \\
Rio Grande do Norte & 4441 & 0-14 years old & 159 (2.9) & Lutz, Graham, BM & Cavalcanti-Jr et al. (1987) \\
Mato Grosso & 149 & 3-72 months & 5 (3.3) & Lutz & Latorraca et al. (1988) \\
Pernambuco & 459 & 0-13 years old & 44 (9.6) & Ritchie, Brumpt & Okazaki et al. (1988) \\
Goiás & 1296 & 3-23 months & 79 (6.1) & Lutz, Faust & Santos et al. (1990) \\
Rio Grande do Norte & 134 & 1-14 years old & 32 (23.9) & Lutz, BM & Albuquerque et al. (1990) \\
Distrito Federal & 298 & 1-12 years old & 9 (3) & Ritchie & Almeida (1992) \\
Minas Gerais & 94 & 0-12 years old & 2 (2.1) & Lutz & Gennari-Cardoso et al. (1996) \\
\hline
BM: Baermann and Moraes.
\end{tabular}
\end{table}
DISCUSSION

To the present time the records of children infected with *S. stercoralis* in the city of Uberlândia varied from zero (Berbert-Ferreira & Costa-Cruz 1995) and 2.1% (Gennari-Cardoso et al. 1996). Both of these studies were conducted using only one sample per case and using only the Lutz’ method.

Using the procedure of three samples per child and two methods for diagnosis the rate of infection was found to be considerably increased, 13%. It is recommended that for effective diagnosis three samples are necessary: 71.8% of the cases in the present research were identified only in second and third samples. Additionally, the BM method was able to identify the infection in 30 (76.9%) of children studied.

No children of the 0-1 age category were found to be infected with *S. stercoralis* compatible with other research previously published: Marzochi and Carvalheiro (1978), Almeida and Costa-Cruz (1988), Berbert-Ferreira and Costa-Cruz (1995), Guimarães and Sogayar (1995). In the other age categories the rate of positive cases varied from 10.3% to 20.5% for *S. stercoralis* involving, 10.9% to 19% of children, indicating that this parasite is hyperendemic in the city.

In terms of other detected enteroparasites the rate of infection (88.4%) was classified as severe considering the damage that these etiologic entities may inflict on their hosts. This rate of infection is the highest found so far in this city, even when other age categories have been included (Costa-Cruz et al. 1991, Sá & Costa-Cruz 1991, Berbert-Ferreira & Costa-Cruz 1995, Costa-Cruz et al. 1996, Gennari-Cardoso et al. 1996). *G. lamblia* was the only pathogenic protozoon detected (235 cases). Seven species of helminthes were identified, of which *A. lumbricoides* presented the highest rate: 15.3%. The occurrence of 35.5% of children infected by more than one parasite demonstrated that enteroparasites represent a serious problem to the public health of Uberlândia.

ACKNOWLEDGMENTS

To Maria Cristina Mouta Rink for statistical analysis, to Prof. Dr Uriel Franco Rocha and Dr David G Francis for suggestions.

REFERENCES


Marzochi MC, Carvalheiro JR 1978. Estudos dos fatores...


