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Original Article

Prevalence of intestinal parasitoses in children at the Xingu Indian Reservation

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Abstract

Objective: To evaluate the prevalence of intestinal parasitoses in Native Brazilian children from 2 to 9 years old.

Methods: A search for ova and parasites was conducted in the stools of children between 2 to 9 years old living in six indigenous villages located in the Middle and Lower Xingu River, to wit: Pavuru, Moygu, Tuiararé, Diauarum, Capivara, and Ngojwere. The study utilized the Paratest® kit (Diagnostek, Brazil) to preserve collected stools. Fecal samples were shipped to the Laboratory of the Pediatric Gastroenterology Division of the UNIFESP/EPM, in São Paulo, for analysis. The search for ova and parasites was performed utilizing the Hoffman method, and later through optical microscopic evaluation. Fecal samples were collected one year apart from each other.

Results: There were no significant statistical differences between the mean ages of the children from the six indigenous villages studied. The search for ova and parasites found positive results for the stools of 97.5% (198/202) and 96.1% (98/102) of children in the first and second collections, respectively. There was no statistical association with the children's age. The search performed one year later found no differences in the proportion of parasites identified in the first collection for protozoa (93.3% in 2007 versus 93.3% in 2008, McNemar = 0.01, $p = 0.1$) or for helminths (37.1% in 2007 versus 38.2% in 2008, McNemar = 0.03, $p = 0.85$). There were significant differences in prevalence of *Entamoeba coli* between 2007 (43.8%) and 2008 (61.8%) (McNemar Chi 6.1; $p = 0.0135$). There were no significant differences for other parasites when comparing the results of the two studies.

Conclusion: The high prevalence of intestinal parasitosis matched the elevated rates of environmental contamination in this indigenous community.

J Pediatr (Rio J). 2010;86(6):493-496: Epidemiology, prevalence, ancylostoma, giardia, Schistossoma.

Introduction

Intestinal parasitosis remains one of Brazil's most serious public health problems. In vulnerable communities outside urban centers and in *favelas*, over 50% of stool ova and parasite examinations yield positive results for one or more parasites, in sharp contrast with middle class patients in urban areas with good sanitation conditions, where the percentage falls to 1-5%.[1] According to the Pan American Health Organization,[2] geohelminthosis is very frequent in

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Latin America, with estimated prevalence rates of 30%, but reaching 50% in vulnerable communities and up to 95% in a few indigenous tribes.[3-6]

Native Brazilian populations who experienced violent contact with our society have come to suffer a powerful negative impact on their cultures. In general, they live in socially exclusionary conditions, without any access to basic sanitation or drinking water. Thus, they have very high rates of parasite infestation, diarrhea and malnutrition. Recently founded cities at the headwaters of the Xingu River, outside the borders of the Xingu Indian Reservation (Parque Indígena do Xingu, PIX), with poor sewage and sanitation coverage, severely compromise water supplies traditionally used by indigenous communities. Cultural differences, hygiene habits and the newly sedentary habits of the native population also favor the prevalence of intestinal parasitoses.

The objective of this study was to determine parasite infestation prevalence rates, on two consecutive years, in children living in six villages in PIX. The villages were located on the Middle and Lower Xingu.

Population and methods

The study was conducted in Native Brazilian children ranging from 2 to 9 years old, living in six villages located in PIX.

The study was part of a project investigating the incidence of *Helicobacter pylori* colonization in this population of children during the years 2007 and 2008.

The study collected 202 fecal samples in August 2007, and 102 in the following year. The months of July and August were chosen for the study due to their low rainfall rates, which provides better conditions for river navigation between villages.

PIX Population: PIX inhabitants live in isolated communities, allegedly fixed and preserving their traditions. PIX, established in 1961 by the Brazilian federal government to protect the local Native Brazilian population from our society's occupation, lives in the Brazilian Midwest, distributed along the Xingu river, a tributary of the Amazon. Its 2,900,000 hectares are home to 14 indigenous ethnic groups, with various linguistic and cultural backgrounds. These 14 peoples live in 67 different villages. Universidade Federal de São Paulo Escola Paulista de Medicina (EPM/UNIFESP) has provided medical assistance to this community since 1965. Studies show that over the last four decades, the prevalence of protein-calorie malnutrition among Native Brazilian children has remained low in the PIX community.[7-10]

Six villages from the Middle, Lower and Eastern PIX were selected, to wit: Pavuru, Moygu, Tuiararé, Diauarum, Capivara, and Ngojwere. Village selection criteria were: 1. Villages receiving EPM/UNIFESP healthcare; 2. Villages with the most inhabitants; 3. The sixth village (Ngojwere), located on the Suyá-Missue river, a tributary of the Xingu, was chosen because, as well as having many inhabitants, it is the easiest route out of PIX after samples have been collected.

The 2005 Census estimates there were 365 children ranging from 2 to 9 years old in the villages included in this study. Current estimates of child populations in this range for these villages are as follows: Pavuru (40), Moygu (79), Tuiararé (51), Diauarum (97), Capivara (43), Ngojwere (55).

Child identification (name, sex, age, ethnicity and village) was done before visits, using records from the EPM/UNIFESP files. All children aged 2 to 9 years old in the selected villages were asked to participate in the study. Every day before fecal samples were collected, there was a meeting with the village's health agents, when the project and the sample collection method were explained. Next, researchers visited each home and delivered the stool collection devices to the mothers, while the health agent used the local language to explain how samples should be collected.

Stool ova and parasites exam

Not all children called to the collection provided fecal samples for parasite examination. This was due to various reasons, among which: they were not in the village at the time, but visiting some other site, tending to manioc plantations with their parents or fishing; others did not defecate during the period researchers stayed in the village to collect samples. As for the second collection, researchers were unable to visit the Ngojwere village because a bridge fell. Also, a strike of healthcare workers in PIX stopped us from warning the villages about our visit ahead of time and asking that the children remain on site, and so many were not in their respective villages during the visit. There was one examination for each patient. The study utilized the Paratest® kit (Diagnostek, Brazil) to preserve collected stools. The kit includes a plastic container with a preserver and a plastic spoon to collect the sample. Samples were transported to the EPM/UNIFEST Gastropediatrics Clinical Laboratory, in São Paulo, Brazil. The search for ova and parasites was performed utilizing the Hoffman method, and later through optical microscopic evaluation.

The Research Project was approved by the Native Brazilian leaderships in PIX and later by the EPM/UNIFESP Research Ethics Committee.

Results

First stage of collection (2007)

Demographic data

The mean age of the children from the six villages in this study was 5.2±2.1 years old; 50% of children were younger than 5.0 years old, and there were no significant differences between the mean ages of the children from the various villages ($p = 0.59$).

Parasite examination during first stage

Fecal samples were collected from 202 children. Parasite examination was positive for 197 (97.5%) children, and there was no statistical association with age (p = 0.23).

The following parasites were found: *Ancylostoma* 7 (3.5%), *Ascaris* 17 (8.4%), *Entamoeba coli* 98 (48.5%), *Giardia duodenalis* 62 (30.7%), *Endolimax nana* 103 (50.9%), *Hymenolepis nana* 44 (21.8%), *Schistossoma mansoni* 1 (0.5%), *Entamoeba histolytica* 1 (0.5%), *Iodamoeba butschlii* 13 (6.4%).

Second stage of collection (2008)

Demographic data

During the second stage, the mean age of the children from the five villages in the study was 6.2±2.2 years old. There were no significant differences between the mean ages of children from the various villages (p = 0.6).

Parasite examination during second stage

Fecal samples were collected from 102 children, though researchers recalled every children for new parasite examination. The second sample could not be collected in the Ngojwere village because the bridge leading to it fell, and river transportation was ruled out as unfeasible due to the length of the journey. The river was also too shallow in certain regions at this time of the year.

Among the 102 children in the study, 89 (87.3%) had been part of the first parasite examination, while 13 (12.7%) had not. Parasite examination was positive for presence of parasites in 98 of 102 cases (96.1%).

The following parasites were identified: *E. coli* in 62 (60.8%) samples, *E. nana* in 51 (50.0%), giardia in 39 (38.2%), *H. nana* in 26 (28.5%), Ancylostomide in 11 (10.8%), *Ascaris lumbricoides* in 9 (8.8%) and *Enterobius vermicularis* in 1 (1.0%).

One year later, there were no differences in the proportion of parasites identified in the first collection for protozoa (93.3% in 2007 versus 93.3% in 2008, McNemar = 0.01, p = 0.1) or for helminths (37.1% in 2007 versus 38.2% in 2008, McNemar = 0.03, p = 0.85).

There were significant differences in *E. coli* prevalence among children who had fecal samples available in 2007 (43.8%) and 2008 (61.8%), respectively (Mc Nemar's Chi 6.1, p = 0.0135). There was no significant difference for other parasites when comparing results from the two years. Each fecal sample had 0 to 4 parasites (Median = 2, quartile deviation 1-2).

Discussion

Parasitosis is endemic in these communities, as this study has shown.

Epidemiologic factors for infections in indigenous communities are similar to those of other low socioeconomic status populations, characterized by high rates of childhood parasitoses. Indigenous communities often feature risk factors associated with high rates of parasitosis, such as lack of sanitation, intake of untreated water, and certain personal hygiene, cultural and dietary habits, such as eating with one's hand, defecating in the open, absence of food conservation metods and lack of footwear, among others.[11-13] The population in this study is at high risk for contracting infestations at any point during childhood.

Assessing the geohelminthosis situation in a community requires a survey of infestation intensity (or parasite load) as well as prevalence,[14] since parasite loads are not usually distributed uniformly among all hosts.

Due to the implicit limitations of field work, the search for ova and parasites was performed using a single fecal sample, though it is widely known that multiple samples are recommended for some parasitoses, such as giardia, due to the intermittent manner cysts are eliminated. For protozoa, especially giardiasis and amebiasis, the likelihood of positive results increases with multiple samples (2 to 6) collected within 10 days of each other; however, that method was not feasible in this study. However, when performed accurately, the examination of a single fecal sample is enough when searching for helminths.

Fecal contamination is the key factor for the dissemination of intestinal parasitoses. Fecal contamination of the soil or water is frequent in poor regions lacking basic sanitation and where individuals defecate on the ground, which enables helminth ova and larvae eliminated in the stool to develop and become infectant. Intestinal protozoa are primarily transmitted through fecal contamination of hands, water or food.

Some parasites, with high rates of prevalence in child populations (*Trichiurus trichiura* and *E. vermicularis*) were not found. Recently, studies in Asia have found that *T. trichiura* prevalence depends more on genetic than environmental factors.[15,16] On the other hand, the absence of *E. vermicularis* may be explained by the diagnostic method employed, which is improper for identifying this particular helminth. Also, the parasite is predominantly urban and associated with satisfactory living conditions, and less strongly with poor hygiene conditions due to the peculiar characteristics of its transmission.[17]

The study notified the local health authorities about one schistosomiasis patient, but we were unable to verify the health status of that child on the second year, since she lived in the Ngojwere village. The region in this study, the Xingu River Valley, does not have high or medium rates of schistosomiasis endemicity, since the *Biomphalaria* mollusc is not found in its rivers.[18] In this situation, there may be focal or isolated cases, as well as the possibility of external contamination.

On the other hand, one patient was identified as infested with *E. histolytica*. Differential diagnosis between *E. histolytica* and *Entamoeba dispair* is impossible by simple microscopic examination, even if trophozoites with swallowed erythrocytes are identified. Diagnosis of *E. histolytica* requires researchers to identify specific antigens or to isolate the species' DNA.[19] Serological methods may not be useful, since they are unable to distinguish current from past infections.[20] Other amoebas identified by the study (*E. nana, E. coli, I. butschlii*) are more easily defined as commensal organisms living in the intestinal lumen, and do not cause any harm to the host unless they are mistaken (such as in the case *E. coli*) for *E. histolytica* and lead to unnecessary treatment.[21] There is no information about possible benefits to the host from having said protozoa.

The six villages in this study have deep tubular wells, but the local custom of drinking river water lives on. This is especially true for children, who drink water during moments of leisure in the river, while fishing or when going to other sites. Since the village has had access to well water for five years, lower prevalence rates would be expected for children 5 years old or younger; however, incidence remains high. This supports the theory that infestation takes place at or near the home environment, due to the way foodstuffs are handled and the lack of environmental sanitation. Talking to indigenous villagers and teaching them about contamination and the importance of adopting certain hygiene habits, especially for handling drinking water and water used in cooking, is key. To prevent reinfestation, villages require satisfactory environmental sanitation, the only feasible way to improve the situation. Insisting on these measures with creativity and respect for indigenous cultural specificities is the best path towards improving sanitary conditions in these communities.

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