

Strongyloides stercoralis Infestation in Indigenous Tapirapé Ethnic Group from Mato Grosso State, Brazil

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Abstract *Strongyloides stercoralis* is an intestinal helminth, which infects millions of people worldwide. In the present study, 542 individuals from six indigenous villages were enrolled of whom 24 (4.43 %) were positive for *S. stercoralis* based on analysis by microscopy of fecal concentrates. *S. stercoralis* was more prevalent in males (5.32 %, 14/263) than females (3.58 %, 10/279), though without a significant statistic difference ($P = 0.66$). Likewise, the infection by *S. stercoralis* could not be related to age of the indigenous ($P > 0.05$). This study is the first report of the prevalence of *S. stercoralis* in members of the indigenous Tapirapé ethnic group from the Brazilian Amazon. The results suggest a contamination by infective forms of *S. stercoralis* in the environment where these indigenous live.

Keywords: *Strongyloides stercoralis*, prevalence, indigenous people, Brazilian Amazon

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1. Introduction

Strongyloides stercoralis is a widespread transmitted intestinal helminth, which infects millions of people worldwide [1]. It was first described from a fecal sample of a French soldier with diarrhea. It is a nematode parasite that can maintain long-term infestation by means of an auto infective life cycle [2]. Human infestation occurs in endemic areas when the infective filariform larvae is contaminating the soil and actively penetrates the intact skin of the human feet sole or hand palm; or when the rhabditiform larva are ingested with contaminated food [3].

Several studies of the health conditions among indigenous people in Brazil have proven to be a growing challenge. The processes of colonization and expansion of the economic frontiers has been accompanied by significant deterioration of the health conditions of the indigenous people, thereby leading to degrees of depopulation. Within the epidemiological profile of these processes, strong presence of parasitic diseases has historically been seen [4,5]. However, to our knowledge, nothing is known about *S. stercoralis* infection in indigenous Tapirapé. The aim of this study was to determine the prevalence of *S. stercoralis* in 542 indigenous of the Tapirapé ethnic group from Confresa,

State of Mato Grosso (western Brazil), which is the region with the highest number of indigenous groups in Brazil.

2. Materials and Methods

The study was carried out in the Tapirapé community, situated 30 km from the Confresa municipality, State of Mato Grosso, Brazil. The indigenous reserve is located in Legal Amazonia and inhabited by 542 members of the Tapirapé ethnic group. The members of this tribe have many free roaming animals including dogs, cats, chickens, and pigs. The principal source of protein for this population is derived from fishing and hunting animals such as the paca, agouti, anteater, tortoise, capuchin monkey, deer, armadillo, tapir, mallard, and curassow. Piped water is drawn from nearby rivers and is delivered to every household, but it is neither filtered nor chlorinated. There is a general lack of adequate sanitation; only one public latrine is available for the entire village; however, this latrine is not used by all the villagers.

A total of 1.528 stool specimens (279 from females and 263 from males) were collected during July 2008 to January 2010. The specimens were collected in four occasions at intervals of six months [July/2008 (382 stool samples), January/2009 (382 stool), July/2009 (stool samples) and January 2010 (382 stool samples)]. These

collection times thus occurred in each of the two main climatic seasons in the Amazon region (dry and raining season). The diagnosis of strongyloidiasis was confirmed by direct microscopic visualization of the rhabditiform and filariform larvae in the stool [6]. The specimens were collected in sterile receptacles and transferred to the laboratory. Diagnostic staining was conducted using the Lugol iodine method [7]. The consistency (form, softness, loose, and watery) of all fecal samples was noted on collection. Demographic data and clinical information were recorded for all members of the tribe. At the end of each collection, the indigenous received medication by health workers.

The association of presence of *S. stercoralis* with age (young or adult), gender (male or female) was analyzed using Pearson's chi-square test and Fisher's exact tests. Differences were considered statistically significant when $P < 0.05$. Statistical analyses were performed using SPSS 15.0 (Statistical Package for Social Science (SPSS) Inc.).

3. Results and Discussion

Strongyloides stercoralis is an important intestinal helminthic infestation. It is endemic mainly in rural areas in Brazil. Previous studies have shown widespread

distribution of *S. stercoralis* in indigenous groups in the Brazilian Amazon region [8,9,10,11]. However, to our knowledge, this is the first epidemiological study of prevalence in indigenous Tapirapé from Brazil. The results showed that *S. stercoralis* is moderately widespread in the members of the indigenous Tapirapé ethnic group in Western Brazil. In the present study, around 24 (4.43%) of 542 individuals from six indigenous villages were positive for *S. stercoralis* larvae (Figure 1) which is roughly similar to results reported in other studies in indigenous communities in Brazil, for instance in Parakanã Indians (5.6%) from State of Pará, in Maxakali Indians, from State of Minas Gerais (5.4%), in members of the ethnic group Terena from State of Mato Grosso do Sul (3.8 %) and in Suruí Indians (0.5 %) [8,10,11,12]. Our results are also in agreement with studies performed in other regions worldwide [13,14]. The rate of infestation, in the present study, could be related to a number of factors such as poor hygiene, inadequate sanitation, water intake that was neither filtered nor chlorinated, low education, low socioeconomic status [15,16,17,18]. Another important factor which affects the prevalence of *S. stercoralis* is the habit of defecating in and around the habitation.



Figure 1. Filariform larva of *Strongyloides stercoralis* examined in fecal samples and observed by light microscopy (x400) (Scale bar spans 20 μ m)

Male gender has been attributed with higher prevalence of *S. stercoralis*. Strongyloidiasis was more common in males (5.32 %, 14/263) than females (3.58 %, 10/279), though without a statistically significant difference ($P = 0.66$) (Table 1). In our study, most of the male infested with *S. stercoralis* were farmers. This may be related to occupational exposure allowing greater contact with soil containing infective forms. Likewise, it was not possible to significantly relate the age of the indigenous with infestation by *S. stercoralis* (Table 1). However, infestation was more common in children (8.49 %) than in adults (2.82 %) and was often found within family. It is known that children are more susceptible to infestation by parasites if compared to young and elderly humans. Noteworthy, studies in indigenous populations have highlighted a possibly factor involved in greater transmission of intestinal parasites in children, that is the absence of the use of footwear for most of them allowing greater contact with soil containing the infective forms [9,19].

Table 1. Prevalence of *Strongyloides stercoralis* in indigenous Tapirapé from the Brazilian Amazon

Variable	Individuals examined	Strongyloides stercoralis		
		Positive	%	P-value
Gender				0.66
Females	279	10	3.58	
Males	263	14	5.32	
Age (years)				0.48
3-16	153	13	8.49	
≥ 17	389	11	2.82	
Total	542	24	4.43	

Most of the cases of infestation by *S. stercoralis* occur in tropical, subtropical, and temperate regions [15]. The climate in the region where the present study was undertaken is tropical humid, with average annual temperature of 28.6°C and furthermore, the sandy soil of the region favors the development and maintenance of the infective stages of these parasites. From the collected samples, *S. stercoralis* was highly prevalent in the rainy season (70.21%), than in the dry season (29.79%). *S.*

stercoralis was detected during each sampling throughout the study period which is in accordance with previous studies that reported presence of *S. stercoralis* and other intestinal parasites throughout all seasons [9,20].

For a total of 24 individuals infested with strongyloidiasis, symptoms such as diarrhea and abdominal pain were reported. Other symptoms associated with *S. stercoralis* infestation were fever, headache and vomiting (Table 2). Several studies have shown that chronic alcoholism is an important factor that predisposes to the infestation severity of *S. stercoralis*. It is argued that the regular ethanol intake modulates immune response, favoring survival and reproduction of the larvae in the duodenum [21,22]. In the present study, indigenous with chronic alcoholism were not observed. Even so, the rate of infestation and symptoms was moderately high in the indigenous Tapirapé.

Table 2. Symptoms associated with *Strongyloides stercoralis* infestation in indigenous Tapirapé from the Brazilian Amazon

Symptoms	Individual infected (n=24)	Percentage (%)
Diarrhea (%)	8/24	33.3
Abdominal pain (%)	7/24	29.2
Headache (%)	4/24	16.7
Vomiting (%)	3/24	12.5
Fever	2/24	8.3

4. Conclusion

As a concluding remark, *Strongyloides stercoralis* is a frequent intestinal parasite in members of the indigenous Tapirapé and the transmission of the parasites is related with impoverished living conditions, difficult access to clinics and medicines, low education and low socioeconomic status. Likewise, a lack of fecal hygiene and the habit of walking barefoot are widespread in the unchanging Amazonian environment and contribute to this phenomenon.

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