

Intestinal parasites prevalence among indigenous people of Potiguar ethnic group in the city of Baía da Traição, Province of Paraíba, Brazil

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Abstract- Intestinal parasites infect a large parcel of the world population and are prevalent in poor communities. In indigenous communities, the environment is highly favourable to the spread of these parasitic agents due to poor sanitation, unhealthy eating habits, lack of personal hygiene among other factors. **Objective:** perform an investigation about the incidence of parasites in three communities of the Potiguar ethnic group located in the city of Baía da Traição, Province of Paraíba, Brazil. **Methods:** the raw material consisted by 109 feces samples from people of Coqueirinho, São Miguel and Forte communities. The feces were preserved in 10% formalin solution. Coproscopies were performed by the techniques of Hoffman, Pons and Janer and by the technique of Ritchie and stained with the Kinyoun method in the Research Laboratory on Parasitic Diseases of the UNIABEU University Center, in the city of Belford Roxo, Province of Rio de Janeiro, Brazil. **Results:** the overall parasitism rate was 80.73%, which were geographically distributed: Coqueirinho community 78.13%, São Miguel community 93.75% and Forte community 73.33%. **Conclusion:** the knowledge of the parasitic agents in the indigenous community of the Potiguar ethnic group was the basis for an adequate drug intervention. It also reveals the requirement for the implementation of governmental and socio-educational measures in order to improve the living conditions of these communities.

Index Terms- enteroparasitoses, indigenous people, Potiguar, Paraíba, Brazil

I. INTRODUCTION

Intestinal parasitoses are one of the most worrying public health problems in the world, especially for the inhabitants of the tropical and subtropical regions. These diseases affect humans at any stage of their lives. Children represent the most susceptible group to parasitic infections due to hygiene habits not yet developed and immature immune system to prevent or fight these infections. Other factors that influences the parasitism are poor sanitation, poverty, lack of sanitary control and preventive

measures (Silva *et al.*, 2007). The World Health Organization estimates that more than two billion people worldwide are parasited, especially in developing countries. It is estimated that between 20% and 30% of the Latin American population is infected by intestinal parasites, and incidence in the poorest regions reaches a frequency between 50% and 95%, as in some indigenous groups (WHO, 2005; FAO, 2007). The prevalence of infectious and parasitic diseases is often high in indigenous populations. Even with the implementation of sanitation actions, these parasitoses often escape the control of the health service due to the high transmission rates favored by the environmental, socio-cultural conditions, inherent issues to the infrastructure, poor or absent basic sanitation, difficulty in obtaining drinking water, deficient or unbalanced nutritional status, among other factors (Santos & Coimbra, 2003, Marucci, 2004, Toledo *et al.*, 2009; Firmo-Oliveira & Amor, 2012). Moreover, enteroparasitoses are considered by some governments as a low priority public health problem (Holveck *et al.*, 2007, Luna-Monrroy *et al.*, 2007). Epidemiological surveys indicate that the highest rates of parasitic diseases are recorded in rural areas as a consequence of the precarious living conditions of their inhabitants. The continuous contact with the polluted environment eases the infection by a great diversity of parasitic elements, considering that near 300 species of helminths and about 70 species of protozoa may be found in the environment as a source of infection. Humans can host about 90 species of parasites, and some of them cause the world's most important diseases, such as amebiasis, giardiasis, hookworms, and ascariasis (Bórguez *et al.*, 2004; Coura, 2013; Veronesi & Focaccia, 2015; Andrade *et al.*, 2013). The status of the health conditions of Brazilian indigenous populations even represented a great challenge. The processes of colonization and expansion of the economic frontiers, still in progress in the Amazon region, have been accompanied by an important deterioration of the living conditions of the indigenous populations. In the epidemiological role of these processes, a strong presence of infectious and parasitic diseases has been historically observed (Bóia *et al.*, 2009; Escobar-Pardo *et al.*, 2010). A large number of researchers who have performed parasitological surveys among indigenous peoples have reported the precarious sanitary conditions observed in indigenous areas,

associated with some degree of sedentarism associated with unsatisfactory cultural habits, food and hygiene for the maintenance of an adequate health. These factors are mainly responsible for the high prevalence of intestinal parasitoses in these communities (Andrade *et al.*, 2013, Chacin-Bonilla & Sanchez-Chaves, 2000). After evaluating the risky conditions of the indigenous people of the Potiguar ethnic group established in the city of Baía da Traição, Province of Paraíba, Brazil, and the frequent reports of gastroenteritis in children, this research had as objective to study the diversity and prevalence of intestinal parasitoses in that population in order to treat and design preventive measures against these diseases.

II. MATERIAL AND METHODS

A. Studied population

The Potiguar ethnic group is the only indigenous population remaining in the Province of Paraíba. According to Palitot (2005), it was composed in 2005 by 13790 individuals, which 11,729 were residents in rural villages of the cities of Baía da Traição, Marcação and Rio Tinto. Historical references shows that this ethnic group was known by the Portuguese colonizers since 1501. A 1601 document estimates a total of 14,000 Potiguar population under the custody of catholic Franciscan missionaries (Moonen and Maia, 2008). According to Oliveira *et al.* (2012), the contact with Portuguese and French exploring the region from the earliest days of colonization promoted relevant changes in their epidemiological, demographic, cultural profile, miscegenation, changing the environment and their way of life. The production system is currently based on agriculture, fishing and handicrafts (Oliveira *et al.*, 2012). According to Silva and Leite (2018), the progressive occupation of ancestral lands by colonizers was a recurrent problem since the first contacts with non-indigenous society and persists until nowadays. Most of the traditional land are occupied by non-indigenous farms producing sugar cane where indigenous Potiguar work.

B. Design and field of study

The research is a prevalence survey, with descriptive and observational design, supported by laboratory tests. Through random and suspicious clinical manifestations of enteroparasitoses, after the expressed informed consent of the people or their parents, in case of children, indigenous people of both genders with ages ranging from 1 to 72 years participated as volunteers in this research. The research was guided by all ethical procedures, cultural respect, preservation of health and patient integrity, as well as the maintenance of anonymity, based on the precepts of the Helsinki Declaration, the XVIII World Medical Assembly, Convention 169 of the of the International Labor Organization (ILO) about Indigenous and Tribal Peoples, and all applicable norms adopted by the Brazilian Ministry of Health. The procedures, objectives and results of the research were informed to the community leader and to all the individual participants, who voluntarily consented to the research.

C. Sample, instruments and laboratorial procedures

The research used a convenience sampling, compound by 109 sample units. The collection of each faecal aliquot was guided

regarding the procedure and preservation, donated voluntarily by the adults and with the authorization of the parents for children. The samples were preserved in 10% formalin solution and sent to the Laboratory of Parasitology of the UNIABEU University Center, in the city of Belford Roxo, Province of Rio de Janeiro, where the coproscopies were processed by Hoffman, Pons & Janer technique (1934), and Ritchie technique (Neves *et al.*, 2016). With the sediment of each sample, two slides were covered with coverslips and observed in a light microscope with a magnification of 100X and 400X for the identification of eggs and larvae of helminths and protozoa cysts. With the sediment obtained by the technique of Ritchie, two slips were prepared and stained by the staining method of Kinyoun and observed in light microscopy with magnification of 1000X for the research of oocysts of protozoa.

III. RESULTS

Among the 32 examined samples from the community Coqueirinho, 16 (50.0%) were positive for infections by parasitic agents, which eight (25%) presented more than one parasite. In the village São Miguel Village, of 31 individuals examined, 21 (67.74%) were infected, being 10 (31.25%) with more than one parasite. In the village Forte, 24 (55.33%) of the 45 individuals examined were infected, and seven (15.55%) had more than one parasite. Considering the total of 109 people examined from the three villages, 62 (56.88%) were infected, 25 (22.94%) with more than one parasite.

Table 1 - Distribution of the examined population of the indigenous people of the Potiguar ethnic group distributed by age classes and gender in the Coqueirinho village.

Age class	Coqueirinho village			
	Male		Female	
	N	%	N	%
0 a 10	03	9,4	03	9,4
11 a 20	03	9,4	01	3,1
21 a 30	03	9,4	01	3,1
31 a 40	01	3,12	01	3,1
41 a 50	02	6,2	02	6,2
51 a 60	03	9,4	02	6,2
61 a 70	03	9,4	03	9,4
71 a 72	01	3,12	00	00
Total	19	59,44	13	40,56
		32/100,0%		

Table 2 - Distribution of the examined population of the indigenous people of the Potiguar ethnic group distributed by age classes and gender in the São Miguel village.

Age class	São Miguel village			
	Male		Female	
	N	%	N	%
0 a 10	06	19,32	05	16,1
11 a 20	05	16,1	02	6,51
21 a 30	04	12,88	01	3,22
31 a 40	00	00	01	3,22
41 a 50	00	00	02	6,51
51 a 60	01	3,22	03	9,7
61 a 70	00	00	01	3,22
71 a 72	00	00	00	00
Total	16	51,52	15	48,48
		31/100,0%		

Table 3 - Distribution of the examined population of the indigenous people of the Potiguar ethnic group distributed by age classes and gender in the Forte village.

Age class	Forte village			
	Male		Female	
	N	%	N	%
0 a 10	09	20,0	05	11,1
11 a 20	03	6,66	01	2,22
21 a 30	02	4,44	03	6,7
31 a 40	03	6,66	04	8,88
41 a 50	02	4,44	04	8,88
51 a 60	02	4,44	01	2,22
61 a 70	02	4,44	03	6,7
71 a 72	00	00	01	2,22
Total	23	51,08	22	48,92
		45/100,0%		

Table 04. Total numbers and percentual of the total of parasites found among indigenous people of the Potiguar ethnic group

Parasites species	Coqueirinho village		São Miguel village		Forte village	
	N	%	N	%	N	%
Ancylostomatidae	02	8,0	03	10,0	01	3,3
<i>Strongyloides stercoralis</i>	01	4,0	01	3,34	00	00
<i>Trichuris trichiura</i>	02	8,0	04	13,34	05	15,0
<i>Ascaris lumbricoides</i>	01	4,0	03	10,0	00	00
<i>Hymenolepis nana</i>	02	8,0	02	6,66	04	12,0
<i>Blastocystis hominis</i>	01	4,0	03	10,0	04	12,0
<i>Cryptosporidium</i> spp	03	12,0	02	6,66	05	15,0
<i>Cyclospora cayetanensis</i>	00	00	01	3,34	00	00
<i>Giardia lamblia</i>	04	16,0	01	3,34	02	6,1
<i>Endolimax nana</i>	02	8,0	02	6,66	01	3,3
<i>Entamoeba coli</i>	03	12,0	05	16,66	08	24,0
<i>E. histolytica/dispar</i>	01	4,0	03	10,0	03	9,3
<i>Iodamoeba butschilii</i>	03	12,0	00	00	00	00
Total	25	100	30	100	33	100

IV. DISCUSSION

Natasi-Miranda *et al.* (2017) investigated *Ascaris lumbricoides* and other enteroparasites in children from a community in Venezuela. The study area is located in the Pemón indigenous area of the Canaima National Park, in the city of Gran Sabaná, Province of Bolívar. The sample consisted of 127 children of both genders. The authors found a general prevalence of intestinal parasitoses of 85%, being *Ascaris lumbricoides* the most incident helminth with 60.2% of positivity. The Chromista *Blastocystis* spp. was found in 46.2%, and *Entamoeba coli* in 35.4% among the examined samples. The highest incidence of *Entamoeba coli* was also observed in our research, with 24.0% of positivity in the three Villages of the Potiguar ethnic group.

Borges *et al.* (2009) investigated the occurrence of intestinal parasitoses among Oriximiná ethnic people in the Province of Pará, Brazil. Coproscopies of 86 people were examined through four methods and the authors considered that the techniques had reasonable amplitude to establish diagnoses. They found Chromista *Blastocystis* spp. in 48 (57.8%) of the samples. The found species of protozoa were: *Entamoeba coli* 49 (59.0%), *Endolimax nana* 40 (38.2%), *Entamoeba histolytica / dispar* 36 (43.4%), *Iodamoeba butschilii* 27 (32.5%), *Chilomastix mesneli* 22 (26.5%), *Giardia lamblia* 10 (12.0%), *Cyclospora cayetanensis* 9 (10.8%) and *Cryptosporidium* spp 3 (3.6%). The identified species of helminths were: *Hymenolepis nana* 17 (20.5%), *Ascaris lumbricoides* 6 (7.2%) and *Enterobius vermicularis* 1 (1.2%). Among the pathogenic protozoa diagnosed by the researchers, they highlight the cysts of *Entamoeba histolytica/dispar* and among the helminths the cestoda *Hymenolepis nana*. The authors affirm that the high frequency of *Hymenolepis nana* and cysts of protozoa indicates an insufficient sanitary situation, with faecal material as an environmental pollutant. We corroborate with the assertion of these authors when we found similar situations in the Potiguar community. We emphasize that 8,0% of the people of Coqueirinho village, 6,66% of São Miguel village and 6,66% of the Forte village (12.0%) were parasited with *Hymenolepis nana*.

Confalonieri *et al.* (1989) studied the diversity of enteroparasites that affected the Yanomami indigenous community in the Province of Roraima, Brazil. The researchers recognized that this population group have continuous contact with non-indigenous populations, a fact that influenced the prevalence and calculation coefficient in 67% with diversity of species and varied prevalence. Among the identified parasites were *Trichuris trichiura* (CP=43,3), *Entamoeba histolytica/dispar* (CP=40,0), Ancylostomatidae (CP=30,0), *Enterobius vermicularis* (CP=13,3), two infection cases of *Ascaris lumbricoides*, two of *Capillaria* spp., one of *Strongyloides stercoralis* and one of *Giardia lamblia*. Different results were found by Andrade *et al.* (2013) among Kayapós indigenous people of the Province of Pará, where these researchers recorded rates of 85.6% of parasitismo by helminths and nematodes of the species: *Ascaris lumbricoides*, *Trichuris trichiura*, Ancylostomatidae, *Enterobius vermicularis*, Cestodes of the species *Hymenolepis nana*, and Protozoa of the species *Entamoeba coli*, *Entamoeba histolytica/dispar*, *Endolimax nana*, *Giardia lamblia* and *Cryptosporidium* spp. The authors commented that the Kayapós ethnic group were contacted by the non-indigenous Society in the 60's of the XX century and live in precarious conditions of hygiene and health, and concluded that there is and urgency in

taking governmental and sociocultural measures to improve the quality of life of this ethnic group. Among the indigenous people of Potiguar Ethnic, we observed a larger parasitic variety of species than that found among Yanomami and Kayapós populations, as *A. lumbricoides*, *B. hominis*, *C. cayetanensis*, *I. butschillii* and *S. stercoralis* species were not found by Confalonieri *et al.*, (1989) and Andrade *et al.*, (2013). We reinforce the recommendations of these authors about preventive measures as the most probable is that precarious sanitary conditions potentiates a greater diversity of parasites.

Epidemiological aspects of intestinal parasitism in the Parakanã ethnic group in southeastern of the Province of Pará, Brazil, were studied by Miranda *et al.* (1998). These authors recorded coefficient of prevalence of 82.2% to parasitism among 126 samples with at least one parasite species and the prevalence coefficients for helminths in the studied community were: Ancylostomatidae (CP=33.3), *Ascaris lumbricoides* (CP=42.8), *Trichuris trichiura* (CP=0.8) and *Strongyloides stercoralis* (CP=5.6). The protozoa species found were: *Entamoeba histolytica/dispar* (CP=65), *Giardia lamblia* (CP=46.8). Similar results were found among the Kayapós in the city of Ourilândia do Norte, in the Province of Pará, Brazil, by Andrade *et al.* (2013), but with a predominance of *Trichuris trichiura*. This protozoan, however, was not found among the Pankararé ethnic group, in the city of Glória, Province of Bahia (Oliveira *et al.*, 2013), revealing how the parasite diversity is different from each indigenous studied community. In our research, *T. trichiura* was frequent in the three villages: Coquerinho with two cases (8.0%), São Miguel, four (13.34%) and Forte, five (15.0%).

The researcher Garda, cited by Giglio *et al.* (2006) reported that in 2001, 88,000 cases of intestinal infections and 87,000 cases of parasitic infections were registered among 374,000 Brazilian indigenous people, with a child mortality rate in 3,000 indigenous villages in Brazil of 56 deaths for each thousand births, higher than the Brazilian average, which is 29 per thousand. These data could not be verified for the Potiguar indigenous people specifically, but according to Potiguar people the infant mortality rate is not high in this group. The low infant mortality rate reported for this group can be inferred to the better living conditions and the health care in that community.

The enteroparasitoses affecting of the Xavante ethnic group, in a population established in the city of Pimentel Barbosa, Province of Mato Grosso, Brazil, were studied by Vieira-Silva (2010). This author examined 196 fecal samples and found parasitism by *Ascaris lumbricoides* (CP=23.5), *Hymenolepis nana* (CP=20.4), *Entamoeba coli* (CP=31.6) and *Entamoeba histolytica/dispar* (CP=7.7). The author characterized the parasitic status as endemism. In the same way, it may be admitted to the Potiguar community, even with continuous health assistance, intestinal parasitism by helminths and protozoa can also be considered endemic.

A research performed by Ribeiro (2010) about the social-historical characteristics of the Jaraguá-Ytu village in the Province of São Paulo, associated aspects as traditions, customs, hygiene habits and the absence of continued sanitary education. This researcher reported that this indigenous population lived in poor housing and hygiene conditions, factors that are associated with the transmission of parasitic agents. In coproscopies of 55 natives, 41.8% were positive for one or more parasites, being *Giardia*

lamblia the most frequent (CP=56.5), followed by *Entamoeba coli* (CP=52.1), *Hymenolepis nana* CP=39.1), *Endolimax nana* (CP=34.7) and *Ascaris lumbricoides* (CP=4.3). The author considered that the high incidence of parasitism by *G. lamblia* is consequence of the drinking of contaminated water. The inverse relationship can be verified among the Potiguar Indians, since the water used comes from uncontaminated sources, which explains the lower rate of *G. lamblia*, as well as other parasitic elements.

Siqueira *et al.* (2017) investigated the prevalence of parasitoses among children of the Xakriabá ethnic group. Fecal samples were collected from 2973 children up to 13 years and the results demonstrated a high prevalence of protozoa in contrast to a low prevalence of helminths. The coefficients of prevalence to each parasite were: *Entamoeba histolytica/dispar* 16.9% and *Giardia duodenalis* 18.4%. As for helminths, the species found were: *Schistosoma mansoni* 1.2%, *Hymenolepis nana* 2.2%, Ancylostomatidae 3.7%, *Strongyloides stercoralis* 1.4%, *Ascaris lumbricoides* 0.4%, *Enterobius vermicularis* 1%. The authors attributed the high prevalence of protozoa to a poor sanitary infrastructure, and suggests that water sources are contaminated with fecal matter.

V. CONCLUSION

It can be concluded that there is a high incidence of intestinal parasitoses in the studied group. The knowledge of the parasitic agents which affects the indigenous community of the Potiguar ethnic group was the basis for orientation and adequate drug intervention. It also reveals the need for the implementation of governmental and socio-educational measures in order to improve the living conditions of that community.

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