Occurrence of Cryptosporidium spp. Among Indigenous People of the Potiguar Ethnic Group Established in the City of Baía da Traição, Province of Paraíba, Brasil

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ABSTRACT

Introduction: Cryptosporidium spp. is a protozoan with worldwide distribution, included in the phylum Apicomplexa, which implants itself in the borders of the intestinal microvilli and causes clinical manifestations characterized by abdominal pains, vomits and diarrhea, mainly affecting children and immunocompromised individuals. Objective: investigate oocysts of Cryptosporidium spp. in the feces of indigenous people of the Potiguar ethnic group of three villages in Baía da Traição, Bahia, Brazil. Materials and Methods: 109 fecal samples of people of both genders from 1 to 72 years processed by the Richter technique were examined. From the sediment, two slides were prepared for each sample per sample and stained by the Kinyoun method. The slides were examined under light microscopy at 1000X magnification. Results: From the 109 fecal samples examined, nine samples with oocysts of Cryptosporidium spp. were found, corresponding to a prevalence coefficient (PC) of 8.26%. Only children under eight years old were infected. Conclusion: The results of this research were the basis for sanitation orientation and adequate drug intervention. The results revealed the need to adapt health services in order to improve the living conditions of the Potiguar community.

Keywords: Cryptosporidium spp., enteroparasitosis, indigenous people

1. INTRODUCTION

The World Health Organization (WHO, 2005) estimated that over two billion people worldwide are parasited, especially in developing countries. About Latin American population, it is estimated that between 20% and 30% are infected by intestinal parasites and the incidence in the poorest areas, with lack of health care facilities, reaches a variable frequency between 50% and 90%, including some indigenous groups (PAHO, 2007). The prevalence of infectious and parasitic diseases is higher in indigenous populations when compared to non-indigenous brazilian society (Santos & Coimbra, 2003). However, it was not possible to achieve the desired parasitic...
control due to the high rates of transmission of these diseases, associated with environmental conditions and sociocultural variables (Andrade et al.\(^4\), 2013; Coura\(^5\), 2013).

Enteroparasitoses are considered as a low priority public health problem. These diseases are identified as overlooked because of the lack of importance attributed to them by public health administrators and governments. The greater frequency of enteropathogenic diseases is observed in rural areas as a consequence of the living conditions of these population. Pollution of the environment leads to infection by a variety of parasitic elements, considering that about 300 species of helminths and about 70 species of pathogenic protozoa may be in the environment, which is an important source of contamination. Man can host about 90 species of parasites and, among them, those that cause some of the most important diseases that afflict the world's population, such as amebiasis, giardiasis, hookworms and ascariasis (Luna-Monroy et al\(^6\), 2007; Veronesi & Focaccia\(^7\), 2013, Assis et al.\(^8\), 2013).

Among the intestinal protozooses, species of the genus Cryptosporidium, included in the Apicomplexa phylum, implants itself in the borders of the intestinal microvilli evolving to abdominal pains, vomits and diarrhea, mainly affecting children and immunocompromised individuals (Coura\(^5\), 2013; Veronesi & Focaccia\(^7\), 2013).

The health conditions of the Brazilian indigenous populations plays an important role and challenge since the processes of colonization and expansion of the economic frontiers is still in progress in the Amazon region, which have been characterized by the deterioration of the health conditions of the indigenous populations. In the epidemiological profile of these processes, it has been observed that there is an increasing incidence of infectious-parasitic diseases (Bóia et al.\(^8\), 2009; Escobar-Pardo et al.\(^10\), 2010). Remarkably intestinal parasitic diseases are widespread in indigenous peoples due to deficiencies in the socioeconomic conditions, hygiene habits, and neglect of public health authorities (Assis et al.\(^8\), 2013; Santos et al.\(^11\), 1985; Souza-Oliveira et al.\(^12\), 2013).

The peculiarities of each indigenous group indicate the need for performing new studies over diverse cultural aspects of the different human societies, urbanized or not (Casas et al.\(^13\), 2001).

Ethnobiology can establish an analysis by combining cultural aspects to the health situation of a certain group, and offer scientific support to conduct socially responsible political and ecological actions, with a perspective of developing strategies and mechanisms for regulating the use of resources in extractive reserves and equivalent ones, without destroying preexisting cultures (Phillips et al.\(^14\), 1994; Lawrence et al.\(^15\), 2015). This is the same vision of researchers aligned with sustainable development philosophy, while grows the concept that all human groups, regardless of their main culture or geographical location, interact in some way with natural resources, exploiting their potentialities, accumulating knowledge and developing feelings towards living beings (Vlaenderen\(^16\), 2000).

In northeastern region of Brazil, indigenous groups are distributed along various provinces, classified by ethnic groups as of 1970: in the province of Bahia there are ten ethnic groups; in Alagoas and Ceará, eight ethnic groups each; in Pernambuco, six ethnic groups; Paraiba and Sergipe, one ethnicity each (Hoffnagel\(^17\), 1984; Reesink\(^18\), 2002). This broad ethnic diversity in the northeast needs to be studied from ethno-biological, ethno-ecological and ethological points of view to support local and regional development programs suited to the different conditions of each community, in order to design policies for the conservation of the environment and cultures of each ethnic group. In the epidemiological profile of these processes there is a strong presence of infectious and parasitic diseases. Intestinal parasites are widespread among indigenous populations due to the socioeconomic and cultural conditions that they experience and reflect straight on the public health problems of these populations.

From the contact of the researchers with the indigenous population of the Potiguar ethnic group established in the city of Baia da Traição, province of Bahia, Brazil, it was observed that there are risky conditions in relation to parasitic diseases and reports of frequent gastroenteritis in children. Based on the verified situation, this research had as objective to detect Cryptosporidium spp. in that population and determine the prevalence of this parasite.

2. MATERIAL AND METHODS

Design and study delimitations

The research had a cross-sectional, descriptive and observational design, with a representative sample of people from Potiguar ethnic group, located in Porteirinha, Coqueirinho and São Francisco de Assis communities, at the city of Baía da Traição, province of Paraíba, Brazil. The research was accompanied by all ethical
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procedures, cultural respect, preservation of health and patient integrity, as well as the maintenance of anonymity, based on the precepts of the Helsinki Declaration of the XVIII World Medical Assembly, also Convention 169 for the Indigenous and Tribal Peoples, of the International Labor Organization (ILO), the United Nations Declaration on the Rights of Indigenous Peoples and all norms adopted by the Brazilian Ministry of Health. The procedures, objectives and results of the research were informed to the community leader (Cacique) and to all the participants who voluntarily consented to the research.

**Samples, research instruments and laboratory procedures**

The exam for Cryptosporidium spp. was performed in January 2017 among 109 natives of both genders in the age group between 1 and 72 years. Aliquots of feces of each voluntary, or authorized by those responsible when children, were preserved in 10% formaldehyde solution and sent to the Laboratory of Research in Parasitic Diseases of the Medicine School of Souza Marques Technical-Educational Foundation - FTESM. Samples were processed by the Richter technique and from the obtained sediment two slides were prepared for each sample. The slides were stained by the Kinyoun method to search for oocysts of Cryptosporidium spp. and examined under light microscopy at 1000X magnification. The results were analysed using the total numbers and respective frequencies.

**3. RESULTS**

Regarding the distribution of the occurrence by gender, it was observed that men (55.6%) predominated over the women (44.4%) but there was no significance. The distribution among age classes was equilibrated.

**Table 1: Occurrence of Cryptosporidium spp. distributed by gender and age class among 109 fecal samples analyzed from Potiguar ethnic group.**

<table>
<thead>
<tr>
<th>Gender</th>
<th>N°</th>
<th>%</th>
<th>Age class</th>
<th>N°</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>05</td>
<td>55.6</td>
<td>1 year</td>
<td>01</td>
<td>11.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 years</td>
<td>03</td>
<td>33.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3 years</td>
<td>01</td>
<td>11.11</td>
</tr>
<tr>
<td>Female</td>
<td>04</td>
<td>44.4</td>
<td>4 years</td>
<td>02</td>
<td>22.22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 years</td>
<td>01</td>
<td>11.11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 years</td>
<td>01</td>
<td>11.11</td>
</tr>
<tr>
<td>Total</td>
<td>09</td>
<td>100.0</td>
<td>Total</td>
<td>09</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**4. DISCUSSION**

In our research, is remarkably that the incidence of Cryptosporidium affects only children under eight years of these communities. The Potiguar ethnic group is the only indigenous population established in the province of Paraíba and is distributed in three villages located in the city of Baía da Traição. An increasing number of people migrate to cities to live out of their communities. Those who live in the villages produce goods such as corn, beans, manioc, fruits, vegetables and traditional handicrafts, which are traded in the city's street market or in tents along the highways of the region. The transmission of microbial and parasitic elements between the indigenous and non-indigenous communities occurs with ease considering that indigenous people carry to the cities the pathogens incident on the indigenous community as when they return to the communities they introduce other pathogens that were previously not incident on this population.

Regarding to intestinal infections diagnosed in Brazilian natives, the researcher Garda, quoted by Gílio et al. (19) 2006) reported that during the year of 2001, 88,000 cases of intestinal infections and 87,000 of enteroparasitoses among 374,000 Brazilian natives in that year. The infant mortality rate in 3,000 villages located in several Brazilian states was 56 deaths per 1,000 births, higher than the Brazilian average, which was 29 per 1000. There are no specific records for the Potiguar ethnic group, but we believe that due to the infrastructure and better living conditions of this group in relation to other Brazilian indigenous population, mortality rates are lower than of the another ethnic groups.
The comparative analysis of the intestinal parasitism of Pankarare ethnic group in three villages in the province of Bahia, Brazil, was performed by Souza-Oliveira et al.\textsuperscript{(12)} (2013). This researchers studied 134 feces aliquots and identified helminth and protozoal infections. Among the parasites species found, they registered a 3.0% rate of parasitism caused by Cryptosporidium spp., a prevalence coefficient lower than the results found in our study among the Potiguar, which was 8.26%.

Norberg et al.\textsuperscript{(20)} (2014) investigated the parasitic diseases occurring in Terena indigenous group in the Moreira community in the city of Miranda, Mato Grosso do Sul, Brazil. As parasite diversity, seven nematode and cestode helminth species were found, and five species of protozoa, including Cryptosporidium spp. with the rate of 0.97%, lower than that found in our research.

Pawar et al.\textsuperscript{(21)} (2016) considered that considered that parasitic infections caused by species of Cryptosporidium and Cyclospora are emerging diseases and cause diarrhea especially in immunocompromised children. These authors examined fecal samples from 100 children treated at Solapur Hospital, India, with abdominal diseases and diarrhea, to detect Cryptosporidium, Isospora and Cyclospora. The results of the coproscopies revealed positivity for 64 children: seven (10.4%) were positive only for Cyclospora species and 34 (53.13%) were positive for Cryptosporidium and Cyclospora association. They concluded that these two identified protozoa were the most frequent etiological agents causing diarrhea among the studied children. The rate of Cryptosporidium infection found by these authors was higher than the cases diagnosed in our research among Potiguar indigenous people, which was 8.26%.

The prevalence of diarrhea caused by Cryptosporidium spp. in patients treated at Cachar Hospital in the district of Assam, India, was researched by Hussain et al.\textsuperscript{(22)} (2016), when they analysed diarrheal samples of 220 patients and registered a prevalence of 16.3% for Cryptosporidium, a rate higher than those found in our study.

An epidemiological research about the incidence of cryptosporidiosis was performed by Dabirzadeh et al.\textsuperscript{(23)} (2017) among children under four years in the city of Zabol, Iran. Fecal samples were stained by the Ziehl-Neelsen technique for coccidia oocysts. The results showed the positivity of Cryptosporidium in 9.0% of the samples and the researchers concluded that there was a significant relationship between low quality water supply and diarrhea in children with Cryptosporidium. We corroborate with the citation of these authors when we observed sanitary conditions and the poor water supply in the indigenous community of Potiguar. The rate of cryptosporidiosis found by these authors approached that found in our research.

Borges et al.\textsuperscript{(24)} (2009) performed an epidemiological survey of the intestinal parasites of Wai Wai Indians in the Mapuera indigenous community, Oriximiná, province of Pará. The parasitological examination of 83 individuals revealed a diversity of helminths and intestinal protozoa, finding Cryptosporidium in rate of 3.66% (3/83), a lower rate than we found among the Potiguar indigenous group.

Carmeño et al.\textsuperscript{(25)} (2005) researched the prevalence of cryptosporidiosis in 121 children under 13 years old hospitalized with oncotic or neoplastic diseases at the University Hospital Ramón Gonzáles Valencia, in the city of Bucaramanga, Colombia. The prevalence for Cryptosporidium spp. among children with cancer was 42%, and the clinical complaint of abdominal pain was associated as the most aggressive factor. We believe that the incompetence of the immune system of children with cancer has been the predisposing factor for the development of the high rate of cryptosporidiosis, considering the rates in immunocompetent individuals are considerably lower.

Scopel & Santos\textsuperscript{(26)} (2016) investigated Cryptosporidium in feces of children with gastrointestinal problems in the city of Lajes, province of Santa Catarina, Brazil. Among the 26 analyzed samples, 38.46% (10 samples) were positive, a rate higher than that found among the Potiguar and higher than the world average population groups.

5. CONCLUSIONS

From the analysis of the results it was concluded that cryptosporidiosis is one of the parasitoses incident in the indigenous population studied. Among the 109 fecal samples examined, in 9 of them Cryptosporidium spp. oocysts were found, corresponding to the coefficient (CP) of 8.26%. Only children with less than eight years were infected. Based on the obtained results, we consider that public health measures must be adopted to improve the living conditions of the members of the ethnic group Potiguar.
REFERENCES


