

BRIEF COMMUNICATION

RELATIONSHIP OF CRYPTOSPORIDIOSIS TO ABDOMINAL PAIN AND DIARRHEA IN MAYAN INDIANS

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SUMMARY

Demonstration of cryptosporidiosis in Mayan Indians living around Lake Atitlan provided an opportunity to correlate infection with abdominal pain and/or diarrhea in different age groups of children. 94 subjects experiencing abdominal pain and/or diarrhea, between the ages of 2 and 13 were studied in towns around Lake Atitlan, Guatemala, over a two-year period. *Cryptosporidium* oocysts were found in the feces of 29% of children who presented with abdominal pain and 21% with diarrhea. Of the 60 infected subjects, 45% were experiencing abdominal pain and 33% diarrhea, 22% had abdominal pain and diarrhea. Both abdominal pain and diarrhea were significantly higher in children under 10 years of age and were most prevalent in the 6-9 year old age group but the correlation of symptoms to infection was not significantly different as the ages of the children increased. The high frequency of abdominal pain and/or diarrhea with infection in children was consistent with cryptosporidiosis, a disease considered as one of several common intestinal infections that produce these symptoms.

KEYWORDS: *Cryptosporidium*; Abdominal pain; Diarrhea.

INTRODUCTION

Diarrhea and abdominal pain are symptoms associated with parasitic infections of the gastrointestinal tract^{13,14} and are commonly associated with parasitic diseases in Guatemala³. Intestinal problems are caused by a variety of pathogens that can be acquired by ingestion of contaminated food or water^{5,6,7}. Because gastrointestinal disease has many other symptoms associated with it, along with different types of infectious agents, a clinical diagnosis is problematic and identification of the causative agent is required.

One of the diseases in Guatemala that results in diarrhea and abdominal pain is cryptosporidiosis, characterized as an endemic, gastrointestinal, coccidian infection found in food or waterborne outbreaks^{5,6,9}. It is most evident in susceptible young children and in immunodeficient adults^{1,8,10}. Our study addressed the types of symptoms associated with a high prevalence of *Cryptosporidium* infections in residents of villages around Lake Atitlan, Guatemala. The data suggests a significant relationship between infections with *Cryptosporidium* and the presence of diarrhea and/or abdominal pain.

MATERIALS AND METHODS

The study was carried out in San Antonio Palopo and Santa Catarina Palopo in the highlands of central Guatemala, on the shores of Lake

Atitlan, a large, fresh-water reservoir. Data were obtained during four visits in 2001 and 2002. Children between the ages of 2 and 13 with symptoms of abdominal pain and/or diarrhea were studied. History of infections with or without *Cryptosporidium* and the immune status of each patient were not known. 52 of the 94 children were male and 42 were female. The Nova Southeastern University Institutional Review Board approved the study and informed consents were obtained from subjects, parents or guardians.

Fecal smears were prepared from children with symptoms of diarrhea and/or abdominal pain by smearing fecal material on glass slides, mixing with PVA and drying at room temperature. *Cryptosporidium* oocysts were identified using Kinyoun's modified acid-fast stain². Samples were considered negative if oocysts were not detected after 10 minutes of scanning using oil immersion (1000x) light microscopy.

The numbers of infected children within or between age groups were used to determine the differences in the prevalence of abdominal pain and/or diarrhea using McNemar's test. $p < 0.05$ was considered significant.

RESULTS AND DISCUSSION

Comparisons of the prevalence rates of infection between different age groups of children with abdominal pain and/or diarrhea were

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Table 1

Prevalence of *Cryptosporidium* in children with abdominal pain, diarrhea and/or abdominal pain and diarrhea

Age group	n ¹	Number/(%) infected		
		Abdominal pain	Diarrhea	Abdominal pain and diarrhea
2-5	44	10 (23)	9 (20)	6 (14) ²
6-9	25	10 (40) ²	6 (24)	5 (20) ²
10-13	25	7 (28) ³	5 (20) ⁴	2 (8) ^{2,5}
Total	94	27 (29)	20 (21)	13 (14) ⁶

¹n is the number of all infected patients in each age group with abdominal pain only and diarrhea only; ²Children presented with less abdominal pain and diarrhea ($p < 0.05$) than abdominal pain only or diarrhea only; ³Children in age group 10-13 had less abdominal pain ($p < 0.05$) than age group 6-9; ⁴Children in age group 10-13 had less diarrhea ($p < 0.05$) than age groups 2-5 or 6-9; ⁵Children in age group 10-13 had less abdominal pain and diarrhea ($p < 0.05$) than age groups 2-5 or 6-9; ⁶Children presented with less abdominal pain and diarrhea ($p < 0.05$) than abdominal pain only or diarrhea only.

evaluated. 20 to 40% of the groups of children who presented with abdominal pain or with diarrhea were infected with *Cryptosporidium* (Table 1). Abdominal pain and diarrhea were most prevalent in the 6 to 9 year-old age group.

23 to 40% of the groups of children infected with *Cryptosporidium* had abdominal pain and 20 to 24% had diarrhea; 8 to 20% had both symptoms present at the same time (Table 2). The correlation of symptoms to infection was similar between age groups and was not affected by the age of the children. However, symptoms of both abdominal pain and diarrhea were significantly higher in children under 10 years of age.

As previously noted, there is a high frequency of community-acquired infections of children with *Cryptosporidium*^{4,11,12}. In our study, children of Mayan Indians were found to have diarrhea and abdominal pain associated with Cryptosporidiosis. Our analysis confirms that children infected with *Cryptosporidium* consistently develop abdominal pain or diarrhea unrelated to their ages. Abdominal pain and diarrhea, together, were mainly present in the children under 10 years of age but were also present in older children. The prevalence of infection in young children could have been a result of direct exposure to the infectious agent or as a result of a lack of immunity to *Cryptosporidium*. Other infectious agents capable of causing abdominal pain and/or diarrhea were not identified but could have played a role in the symptoms displayed by the children carrying *Cryptosporidium*.

In conclusion, our data demonstrate that abdominal pain and diarrhea are frequently associated with infections of *Cryptosporidium* in Guatemalan children. Findings contrast with previous studies where observations of symptoms varied^{3,4} suggesting that differences in environmental risk factors or different genetic types of *Cryptosporidium* as infectious agents may have presented the contrasting disease patterns. The observations of symptoms were not found to be a reliable method for the clinical diagnosis of cryptosporidiosis but along with laboratory diagnosis, merit further study to help determine the risk factors that result in this disease.

Table 2

Presence of abdominal pain and diarrhea in different age groups of children infected with *Cryptosporidium*

Age group	n ¹	Number/(%) infected		
		Abdominal pain	Diarrhea	Abdominal pain and diarrhea
2-5	25	10 (40)	9 (36)	6 (24) ²
6-9	21	10 (48)	6 (29)	5 (24) ²
10-13	14	7 (50)	5 (36)	2 (14) ^{2,3,4}
Total	60	27 (45)	20 (33)	13 (22) ^{2,5}

¹n is the group that contains the number of patients with abdominal pain only, diarrhea only, and those with both abdominal pain and diarrhea; ²Children had less abdominal pain and diarrhea ($p < 0.05$) than abdominal pain or diarrhea only; ³Children in age group 10-13 had less abdominal pain ($p < 0.05$) than age groups 2-5 or 6-9; ⁴Children in age group 10-13 had less abdominal pain and diarrhea ($p < 0.05$) than age groups 2-5 or 6-9; ⁵All children had less abdominal pain and diarrhea ($p < 0.05$) than abdominal pain or diarrhea only.

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RESUMO

Relação da criptosporidiose à dor abdominal e diarreia nos índios Maias

Demonstração da criptosporidiose entre índios Maias que vivem ao redor do lago Atitlan deu oportunidade de correlacionar a infecção com dor abdominal e/ou diarreia em crianças de diferentes grupos etários. 94 indivíduos com dor abdominal e/ou diarreia, entre as idades de 2 e 13 anos foram estudados em cidades ao redor do lago Atitlan, Guatemala, durante período de 2 anos. Oocistos de *Cryptosporidium* foram encontrados nas fezes de 29% das crianças que apresentaram dor abdominal e 21% daquelas com diarreia. Dos 60 infectados, 45% apresentavam dor abdominal e 33% diarreia, 22% tinham dor abdominal e diarreia. Ambos, dor abdominal e diarreia foram significativamente mais elevados em crianças abaixo de 10 anos e mais prevalentes no grupo de 6-9 anos de idade mas a correlação de sintomas à infecção não foi significativamente diferente quando as idades das crianças aumentava. A alta frequência de dor abdominal e/ou diarreia com infecção nas crianças foi compatível com criptosporidiose, doença considerada como uma das muitas infecções intestinais comuns que produzem este sintoma.

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