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University of Zimbabwe

Cryptosporidiosis in Harare, Zimbabwe

C SIMANGO, S MUTIKANI

Abstract

Objective: To determine the prevalence of *Cryptosporidium parvum* in diarrhoeal patients.

Design: This was a laboratory-based cross sectional study on cryptosporidiosis in diarrhoeal patients.

Setting: Department of Medical Laboratory Sciences, College of Health Sciences in Harare, Zimbabwe.

Subjects: People of all ages with diarrhoea presenting at primary level health centres in Harare.

Main Outcome Measures: Patient's age, laboratory results.

Results: *Cryptosporidium parvum* was the commonest enteric pathogen and was detected in 5.8% of the 500 diarrhoeal patients of all ages followed by *Shigella* species (3.8%) and *Salmonella* species (2.0%). The highest detection rate of *C.parvum* oocysts was observed in children less than five years old (11.2%) followed by children between six and 10 years old (6.3%) and then the 31 to 40 year age group (5.9%).

Conclusions: Cryptosporidiosis affects people of all ages in Harare but is more common in children, particularly those under five years. The *C.parvum* oocysts should be looked for routinely in diarrhoeal stool specimens particularly those from children less than five years since *C.parvum* may be one of the causative agents of diarrhoea in this age group.

Cent Afr J Med 2004;50(5/6):52-4

Introduction

Coccidia of the genus *Cryptosporidia* are small protozoan parasites found in many animals such as chickens, turkeys, mice, guinea pigs, calves, sheep and rhesus monkeys.¹ Many human infections are zoonotic but person to person spread through the faecal-oral route in cryptosporidiosis is common especially in crowded environments. Epidemiological studies have indicated a higher prevalence of cryptosporidiosis in developing countries than in developed countries.² A study carried out during the rainy season at Baragwanath Hospital in South Africa showed that 17 of the 92 (18.4%) children less than two years old with diarrhoea and one of the 29 (3.4%) children without diarrhoea excreted *C. parvum* oocysts in their faeces.³ In a study conducted over a period of one year in South Africa, Moodley *et al.*⁴ showed that *Cryptosporidium parvum* infections were detected in 9.0% of children under 10 years who presented with diarrhoea, and were significantly more prevalent during the rainy season. A study on cryptosporidiosis in Zambian children, carried out during the rainy season, showed a high prevalence rate of 18% of 222 children with diarrhoea.⁵ The detection rates of *C.parvum* in diarrhoeal patients in other African countries were 7.8% in Rwanda,⁶ 6.1% in Sudan⁷ and 3.8% in Kenya.⁸

C.parvum is recognised as an important enteropathogen in children and in immunocompromised persons. Cryptosporidiosis has been strongly linked to Human Immunodeficiency Virus (HIV) infection, especially in the advanced stages. In immunocompetent people, *C. parvum* infection causes acute self-limiting diarrhoea⁹ but chronic cryptosporidiosis is common in immunosuppressed patients such as those with HIV/AIDS¹⁰ as well as those receiving chemotherapy. In a study carried out in Lusaka, Zambia, cryptosporidiosis was found more frequently in HIV-seropositive (14%) than in HIV-seronegative (8%) children.¹¹ *C.parvum* has also been shown to be an important aetiological agent of acute diarrhoea in HIV seropositive patients in Zaire.^{10,12} The aim of this study was to determine the prevalence of *C.parvum* oocysts in patients with diarrhoea presenting at health centres in Harare.

Materials and Methods

The present study was conducted over a period of four months (November to February) during the hot and wet season. Cryptosporidiosis has been shown to occur more frequently during the rainy season.⁴ Five hundred stool specimens were collected in sterile containers from people of all ages and sexes with all forms of diarrhoea, presenting as outpatients at primary level health centres in Harare. No information was available on the HIV status of the patients

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and the duration of the diarrhoeal illness. Names, ages and sex of all patients were checked in order to avoid multiple specimens from the same patients. All the samples were processed on the same day of collection from the patients.

For the detection of *C. parvum*, the stool specimens were concentrated for the *C. parvum* oocysts using the formol-ether concentration technique.¹³ The sediments of the concentrated stool specimens were used to prepare smears on standard glass microscope slides. The slides were allowed to air dry before being fixed in absolute methanol for three minutes. The faecal smears were stained for *C. parvum* oocysts using the modified Ziehl-Neelsen technique.¹³ The smears were stained with cold carbol fuchsin for 15 minutes and then rinsed in distilled water. The smears were decolourised with 1% acid alcohol for 10 to 15 seconds, then rinsed with distilled water. The smears were then counterstained with methylene blue for 30 seconds, rinsed with distilled water and allowed to air dry. The stained slides were examined microscopically for *C. parvum* oocysts at 1 000X magnification. A stool specimen was considered positive for *C. parvum* oocysts if the stained smear had brightly red or pink stained round or oval oocysts.¹³

Other parasitic pathogens were sought using the formol-ether concentration technique.¹³ All the specimens processed during this study were also cultured for *Shigella* species, *Salmonella* species, *Campylobacter* species and enteropathogenic *Escherichia coli* using standard procedures.¹⁴ Viruses were not looked for in the diarrhoeal stools.

Results

The distribution of enteric pathogens detected in the stool samples is shown in Table I. *C. parvum* oocysts were detected in 5.8% of the patients and it was the most common enteric parasitic pathogen isolated followed by *G. lamblia*, and then *Entamoeba histolytica*. *Shigella* species were the most common bacterial enteric pathogens isolated followed by *Salmonella* species, then *Campylobacter* species and enteropathogenic *Escherichia coli*.

Table I: Enteric pathogens detected in the diarrhoeal stools.

Pathogen	Number of isolates (n = 500)	Percentage
<i>Shigella</i> species	19	3.8
<i>Salmonella</i> species	10	2.0
<i>Campylobacter</i> species	6	1.2
Enteropathogenic <i>Escherichia coli</i>	5	1.0
<i>Cryptosporidium parvum</i>	29	5.8
<i>Giardia lamblia</i>	3	0.6
<i>Entamoeba histolytica</i>	1	0.2
No pathogen	429	85.8

The distribution of *C. parvum* infection by age group is shown in Table II. The highest percentage of *C. parvum*

infection was observed in patients of the zero to five year age group (11.2%), followed by the six to 10 year age group (6.3%). The lowest percentage was observed in the 11 to 20 year age group (1.4%). The occurrence of co-infection by *C. parvum* and pathogenic bacteria was observed in two patients. In one patient, *C. parvum* was detected together with *Campylobacter* species and in another patient the parasite was detected together with *Salmonella* species.

Table II: Age distribution of patients with diarrhoea due to *C. parvum* infection.

Age group in years	Number of specimens processed	Number of specimens positive for <i>C. parvum</i>	%
0 - 5	134	15	11.2
6 - 10	32	2	6.3
11-20	71	1	1.4
21-30	85	3	3.5
31-40	85	5	5.9
> 40	93	3	3.2

Discussion

Epidemiological studies have demonstrated that cryptosporidiosis is more prevalent in developing countries than in developed countries where prevalence is low.² In the present study, it was observed that 5.8% of the people of all ages with diarrhoea excreted *C. parvum* oocysts in their faeces. The present study was carried out during the rainy season, when transmission of cryptosporidiosis was likely to be high.⁴ The prevalence of *C. parvum* associated diarrhoea which was observed in the present study is higher than those which were observed in previous surveys for enteropathogens in Harare urban area.^{15,16}

This may be due to the fact that the present study was carried out during the hot and wet months which has been associated with a high prevalence of *C. parvum* infection whereas the other studies included the dry months.

The 5.8% prevalence of *C. parvum* infection noted in the present study is almost similar to other cryptosporidiosis prevalence rates of some of the developing African countries such as Rwanda (7.8%), Sudan (6.1%), and South Africa (4.1%).² In the present study the highest prevalence of cryptosporidiosis (11.3%) was in the zero to five year age group and similar observations were made by Moodley *et al.*⁴ in South Africa where prevalence of *C. parvum* in children was 9.0%. A high detection rate of *C. parvum* oocysts was observed in four crowded townships of Lusaka, Zambia, where the prevalence of cryptosporidiosis in 222 children with diarrhoea was 18%.⁵ The observed high prevalence of *C. parvum* infection in children aged less than 10 years strongly implicates *C. parvum* infection as an important cause of diarrhoea in children, especially those aged less than five years. However, asymptomatic infection with *C. parvum* occurs in some people, as is the case with

many enteric parasites. Viruses such as rotaviruses, which have been shown to be important causative agents of diarrhoea in young children,¹⁷ were not looked for in the present study.

The HIV status of the patients in the present study was not known. The 31 to 40 year age group also had a high prevalence of *C. parvum* infection (5,9%). Although the HIV status of the patients was not known in the present study, the high prevalence of cryptosporidiosis in this age group could be due to HIV related immunosuppression since these persons are at high risk of acquiring HIV infection. Sub-Saharan Africa has the highest HIV infection prevalence in the whole world, and AIDS related cryptosporidiosis could as well be very high in Zimbabwe. Zimbabwe is a country in southern Africa with a very high prevalence of HIV infected people.

The present study has shown that cyptosporidiosis affects outpatients of all ages in Harare but the infection occurs mainly in children less than 10 years old, with the peak prevalence in children aged under five years. *C. parvum* is a parasite which should be looked for routinely in diarrhoeal stool specimens in clinical laboratories particularly those specimens from children under five years old.

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