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# Prevalence of Cryptosporidiosis Among Selected Group of Sudanese Patients



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## Abstract

*Cryptosporidium parvum* was firstly identified in 1912 in murine intestines. The first human cases were described only in 1976. In the early 1980s, large numbers of cases were noted to be associated with the emerging epidemic of acquired immunodeficiency syndrome (AIDS).

This was a cross-sectional hospital-based study. It was conducted in Alribat University hospital, Khartoum State and aimed to estimate the distribution of *Cryptosporidium parvum* among the patients in the study area. 120 stool samples were collected and analyzed by Modified Ziehl-Neelsen (Zn) Technique. Results shows that, *C. parvum* was more prevalent among the female patients (50.8%) than the males (27.3%). It was more prevalent among the age group >50 years old (62.5%). Furthermore, the parasite was more prevalent among HIV/AIDS patients (100%). The study concludes that *C. parvum* was more prevalent among the female patients and among the age group >50 years old and HIV/AIDS patients. The study recommends the routine examination of HIV/AIDS patients for *C. parvum* infection.

**Keywords:** *Cryptosporidium parvum*; Sudanese patients; Diarrhea

## Introduction

Cryptosporidiosis is an opportunistic infection caused by *Cryptosporidium* species. *Cryptosporidium parvum* is a protozoan parasite that causes gastrointestinal illness and is transmitted by ingestion of Oocysts excreted in human or animal faeces and modes of transmission include person to person, animal to person, by exposure to contaminated surfaces, and by ingestion of contaminated food or water [1]. Protozoan parasites of genus *Cryptosporidium* were first identified in the stomach of mice. The species name *Cryptosporidium parvum* was proposed in 1912 to describe parasites identified in murine intestines. The first human cases were described only in 1976.5 In the early 1980s, large numbers of cases were noted to be associated with the emerging epidemic of acquired immunodeficiency syndrome (AIDS). *Cryptosporidium parvum*, although, a common parasite in animals, was relatively unknown as a human pathogen before the Milwaukee outbreak in 1993, where an estimated 403,000 residents of the greater Milwaukee, Wisconsin, area with population of approximately 1.61 million people became ill when an ineffective filtration process led to the inadequate removal of *Cryptosporidium* oocysts in one of two municipal water treatment plants. The signs and symptoms of the disease in both patients are the same but the course and severity of the disease in these groups of patients are largely different. It causes a self-limited diarrhea syndrome in immunocompetent persons while in immunocompromised patients, it causes much more serious clinical signs, being manifested as prolonged debilitating

diarrhea, weight loss, fever, and abdominal pain, with occasional spread to the trachea [2].

*Cryptosporidium* species are recognized globally as important causes of diarrhoea in children 8 and adults and is a leading cause of persistent diarrhoea in developing countries.9 In Nigeria; it is a significant cause of diarrhoea. In a study by 10 where total of 354 patients were examined for the presence of *C. parvum* infection, diarrhoea was present in 129 of the patients and with 225 of these patients having no diarrhoea. Among those with diarrhoea, 21 had *C. parvum* while 11 who had no diarrhoea but had *C. parvum* [3].

## Literature Review

In Abuja [4], Nigeria, stools of a total of 354 patients were examined for the presence of *C. parvum* infection. The females were more infected than the males, 18 (10.84%) versus 14 (7.45%). In the individuals with diarrhea, the age group of 41-50 years had the highest prevalence of *C. parvum* infection (3, 33.33%), followed by those that >50 years of age (2, 20.0%), and 31-40 years (3, 18.75%). In non-diarrhea individuals, those that were aged 31-40 years had the highest prevalence of *C. parvum* infection, (4, 10.53%), followed by those that were aged >50 years, (1, 7.69%). The mean age of the patients was 22.96±0.1 years (range 1-90 years; SD 0.93), with 188 males and 166 females. Diarrhea was present in 129 patients, and 225 had no diarrhea. In 16.28% (21/129) of the patients with diarrhoea, *Cryptosporidium parvum* was found, while in the control

group 4.89% (11/225) was found to have the parasite. Among those with diarrhea, 21 had *C. parvum*, while 11 did not have diarrhea but had *C. parvum*. Yunusa, (2015) in a Tertiary Health Institution, Nigeria found that, out of the 74 males investigated for *C. parvum* 21 (28.3%) were positive for the parasite representing 36% of the total seropositive population sampled. Thirty-seven (37, 34.2%) females tested positive with the parasite representing 63.7%. Fifty-six (56, 56.5%) of the fifty-eight *C. parvum* ELISA seropositive were obtained from subjects who presented with mucoid diarrhoea.

## Rationale

Cryptosporidium is a leading cause of persistent diarrhoea in Developing countries. Cryptosporidiosis is widespread and affects all ages, and documented evidence indicated the parasite as a cause of Diarrhoea in 95 countries. Cryptosporidium is recognized as a significant and widespread cause of diarrheal illness in both immunocompetent and immunosuppressed hosts. Cryptosporidium may cause severe symptoms in persons with weak immune systems. Cryptosporidium transmission occurs at a high frequency in day care centers where children are clustered within classrooms, share toilets and common play areas [5].

## Objectives

### General objective

To estimate the distribution of *C. parvum* among patients attending Alribat University hospital, Khartoum State, Sudan.

### Specific objectives

- To compare the distribution of *C. parvum* among patients according to gender.
- To compare the distribution of *C. parvum* among patients according to age.
- To compare the distribution of *C. parvum* among patients according to immune suppressive factor.

## Materials & Methods

### Study design

This was a cross-sectional hospital-based study to estimate the distribution of *C. parvum* among patients attending Alribat University hospital, Khartoum State, Sudan.

### Study area

The study was conducted in Alribat University hospital, Khartoum State, Sudan.

### Study duration

The present study was conducted throughout the period from 1/1/2017 to 1/4/2017.

### Study population

Male and female patients (of different ages) attending Alribat University hospital, Khartoum State, Sudan.

## Sample size

Stool samples were obtained from 120 samples were randomly selected.

## Specimen collection

Stool specimens were collected from all participants. The specimens were collected following the quality control procedures. They were fixed with 10% Formol water v/v. for Z.N. staining technique, (Elsenga, 1992).

## Stool Examination

### Macroscopical examination of stool

Faeces were examined macroscopically for faecal consistency and color. These may vary with diet, but certain clinical conditions associated with the parasite presence may show wet or loose stool consistency or even diarrhea. The faeces were also examined for the presence of tapeworm segments or other helminthes (Fox, 1992).

## Modified Ziehl-Neelsen (Zn) Method

### Reagents

- Carbol fuchsin stain
- Malachite green stain
- Acid alcohol 1%v/v

### Method

A smear was Prepared from the feacal specimen it was air-dried. Then the smear was fixed with methanol for 2 minutes, it was stained with unheated carbol fuchsin for 15 minutes. the stain was washed off with water. The smear was decolorized with 1% acid alcohol for 10 seconds. And washed off with water. Thereafter, the smear was counterstained with 0.5% malachite green for 30 seconds and washed off with water and the slide was stand in a draining rack to dry. The smear was examined microscopically for Oocysts, using the oil immersion objective lens to detect and identify them [3].

### Statistical analysis

After gathering the data including sex, age and parasite species, the data were analyzed by SPSS 11.0 based on the study purposes. Chi-square test was used and t-test was used to compare quantitative variables [6].

### Ethical consideration

All participants were informed about the objectives of the study and they were consenting to be involved in it.

## Results

The distribution of *C. parvum* among patients attending Alribat University hospital according to the gender:

By using Modified Ziehl-Neelsen (Zn) method Table 1, the total distribution of *C. parvum* was 40%. The study found that *C. parvum*

was more prevalent among the females (50.8%) than the males (27.3%) Figure 1.



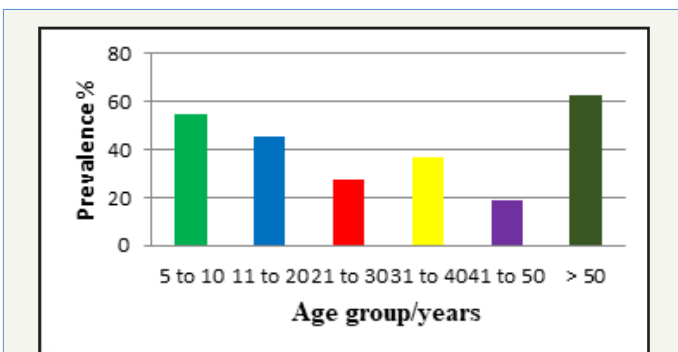
**Figure 1:** Showing The distribution of *C. parvum* among patients attending Alribat University hospital according to the gender.

**Table 1:** Showing The distribution of *C. parvum* among patients attending Alribat University hospital according to the gender.

Gender	Number	Positive	Percentage
Male	55	15	27.30%
Female	65	33	50.80%

The distribution of *C. parvum* among patients attending Alribat University hospital according to the age:

The study found that *C. parvum* was more prevalent among the age group >50 years old (62.5%) followed by age group 5-10 years old (55%) Table 2. While it was less prevalent in age group 41 -50 years old (12.5%) Figure 2.



**Figure 2:** Showing The distribution of *C. parvum* among patients attending Alribat University hospital according to the age.

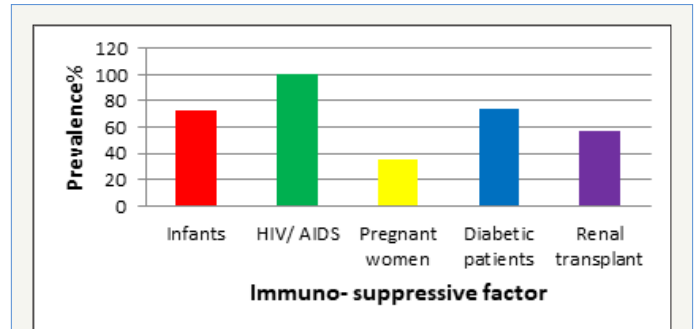
**Table 2:** Showing the distribution of *C. parvum* among patients attending Alribat University hospital according to the age.

Age group/year	Number	Positive	Percentage
05-Oct	20	11	55%
Nov-20	22	10	45.50%

21-30	22	6	27.30%
31-40	19	7	36.8
41-50	21	4	19%
>50	16	10	62.50%

The distribution of *C. parvum* among patients attending Alribat University hospital according to the immuno- suppressive factor:

The study found that *C. parvum* was more prevalent among HIV/ AIDS patients (100%) followed by diabetic patients (73.7%) and infants (73.3%) Table 3. While it was less prevalent among pregnant women (35.7%) Figure 3.



**Figure 3:** Showing the distribution of *C. parvum* among patients attending Alribat University hospital according to the immuno- suppressive factor.

**Table 3:** The distribution of *C. parvum* among patients attending Alribat University hospital according to the immuno- suppressive factor.

Factor	Number	Positive	Percentage
Infants	30	22	73.30%
HIV/AIDS	4	4	100%

## Discussion

The pathogen *Cryptosporidium parvum* has contributed significantly to diarrheal disease particularly in countries of the world where a declining in hygiene can be a persistent problem, considering *Cryptosporidium* an emerging protozoan and a leading cause for hospital admission at Alribat University hospital, Khartoum State, Sudan. The acid fast was easily and cheaply carried out in a laboratory setting. In this study, *Cryptosporidium* are identified among patients attended Alribat University hospital, Khartoum State to find that the total prevalence was 40%. it was more than the findings of [7], who found that the total prevalence in Keffi, Nasarawa State, Nigeria. Was only 15%. Our study found that *C. parvum* was more prevalent among the females (50.8%) than the males (27.3%). This agreed with the findings of Abrahamsen et al. [8], In kenia who reported that females were more affected (15.3%), this may be explained by the fact that, large numbers of females attend the hospitals than males. The study found that *C. parvum* was more prevalent among the age group >50 years old (62.5%) followed by age group 5-10 years old (55%). Contrary [9] reported that *Cryptosporidium parvum* was observed to be a threat

within the ages 10-19 years old and in the sexually active age group of 30-39 years. The study found that *C. parvum* was more prevalent among HIV/ AIDS patients (100%). *Cryptosporidium parvum* in immunocompromised patients, such as those with HIV or those undergoing immunosuppressive therapy, may not be self-limiting, leading to dehydration, emaciation and, in severe cases, death. This was in agreement with the finding of Srisuphanunt in Thailand who found that the highest prevalence of *C. parvum* was among HIV patients 18.4%.

### Conclusion

This study concludes that the total prevalence of *C. parvum* was 40%. The parasite was more prevalent among the females than the males [10]. The parasite was more prevalent among the age group >50 years old followed by age group 5-10 years old. The parasite was more prevalent among HIV patients.

### Recommendations


A. Improvement of the family and child knowledge about the mode of transmission of *C. parvum*.

B. Chlorination of drinking water to prevent the transmission of the parasite.

All individuals living with HIV should have a routine examination for *C. parvum* infection.

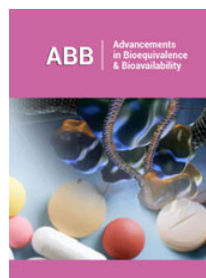
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