

## Epidemiological Study of *Cryptosporidium* Infection in Al-Najaf City

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### ABSTRACT

This study was aimed to investigate the infection caused by the parasite *Cryptosporidium* for patients complained from diarrhea and abdominal discomfort in Najaf city during the period from November 2017 to March 2018. Fifty stool samples were collected from patients their age ranging from 1-60 years obtained from Al-Sader Medical City, Al-Hakeem hospital, Al-Furat Al-Awsat Hospital and Al-Zahraa hospital. Diagnosis of the parasite was done by using Modified Kinyoun Acid-Fast stain (cold method). The total percentage of positive result was 58%. There was no significant difference ( $P > 0.5$ ) between male and female infection 16 (55.2%) and 13(44.8%) respectively, also high infection rate was recorded among ages between 1-10 years 11(22%) with significance difference ( $P < 0.5$ ). The highest rates of infection in this study were 7(24.1%) in March and lower rate of infection was in January 4(13.8%).

**Keywords:** Cryptosporidiosis, Prevalence, Gender and Seasonal Variation.

### INTRODUCTION

Cryptosporidiosis is a worldwide zoonotic disease caused by various genotypically and phenotypically diverse species of *Cryptosporidium*. Protozoan parasite in the Apicomplexa phylum. Cryptosporidiosis is considered as emerging by Centers of Disease Control (CDC), the disease is mostly asymptomatic and not noticed but might be presented with fever and mild to severe diarrhea which is self-limiting in immunocompetent individuals and life threatening in immunocompromised individuals like AIDS patients. It is estimated that about 6% of diarrhea in immunocompetent individuals and 24% of diarrhea in AIDS patients are caused by *Cryptosporidium*<sup>1</sup>. *Cryptosporidium Parvum* is the most common species in humans, *C. felis*, *C. muri* and *C. meleagridis* have also been identified in immunocompromised persons. *Cryptosporidium* is capable of completing all stages of its development (asexual and sexual) within a single host, humans are infected when they ingest oocysts<sup>2</sup>. Infections occur mostly in children younger than 5 years<sup>3</sup>. The oocyst is the stage transmitted from an infected host to a susceptible host by the faecal-oral route, person-to-person through direct or indirect contact, animal-to-animal, animal-to-human<sup>4</sup>. The pathogenesis and sequel of the infection depend on the immune status of the host. The fate may range from severe but self-limiting diarrhea in immunocompetent individuals to a debilitating, life-threatening, prolonged infection in immunocompromised individuals, such as AIDS patients<sup>5</sup>. *C. parvum* resides preferentially on the apical surface of epithelial cells of the intestine and normally does not invade deeper layers of the gastrointestinal mucosa in humans. Nonetheless, the infection is characterized by an inflammation of mucosal

tissues, with the presence of neutrophils and macrophages in the underlying lamina propria<sup>6</sup>. The reported prevalence of *Cryptosporidium* spp was 1-4% in Europe and North America while it was 3-20% in Africa, Asia, Australia, south and central America<sup>7</sup>. The prevalence of the disease in Egypt 17.0%<sup>8</sup>, 10% in Palestine children 13.6%<sup>9</sup>, but different from report in Al-Saudi Arabia where the prevalence rate of *Cryptosporidium* was 37.0%<sup>10</sup>. This result differed from other study in North Baghdad, the percentage of infection was 14.78%<sup>11</sup>, the total infectivity rate 12.4% in Baghdad<sup>12</sup>, while it was greatly different from the result that said the total infectivity rate 2.7% in DIALA<sup>13</sup>. The aim of the study to investigate the epidemiology of *Cryptosporidium* in Al-Najaf city.

### MATERIALS AND METHODS

Fifty samples of stool were collected from patients of both genders with different ages attended the four teaching hospitals (Al-Sader, Al-Hakeem, Al-Zahraa and Al-Furat Al-Awsat) complaining from diarrhea in Al-Najaf city /Iraq, from November 2017 to March 2018. The samples were collected from each individual in clean dry container. All samples were transported to the parasite Medical Laboratory Technique department of the college, processed according to Modified Acid-Fast Stain method which is a sensitive and specific method to identify *Cryptosporidium* spp oocyst. Microscopic examination show the parasite as pink to red, spherical to ovoid bodies fig(1) on a blue or purple back ground<sup>1</sup>. The procedure of modified acid-fast stain was done according to Beaver, 1983<sup>14</sup>.

### RESULTS

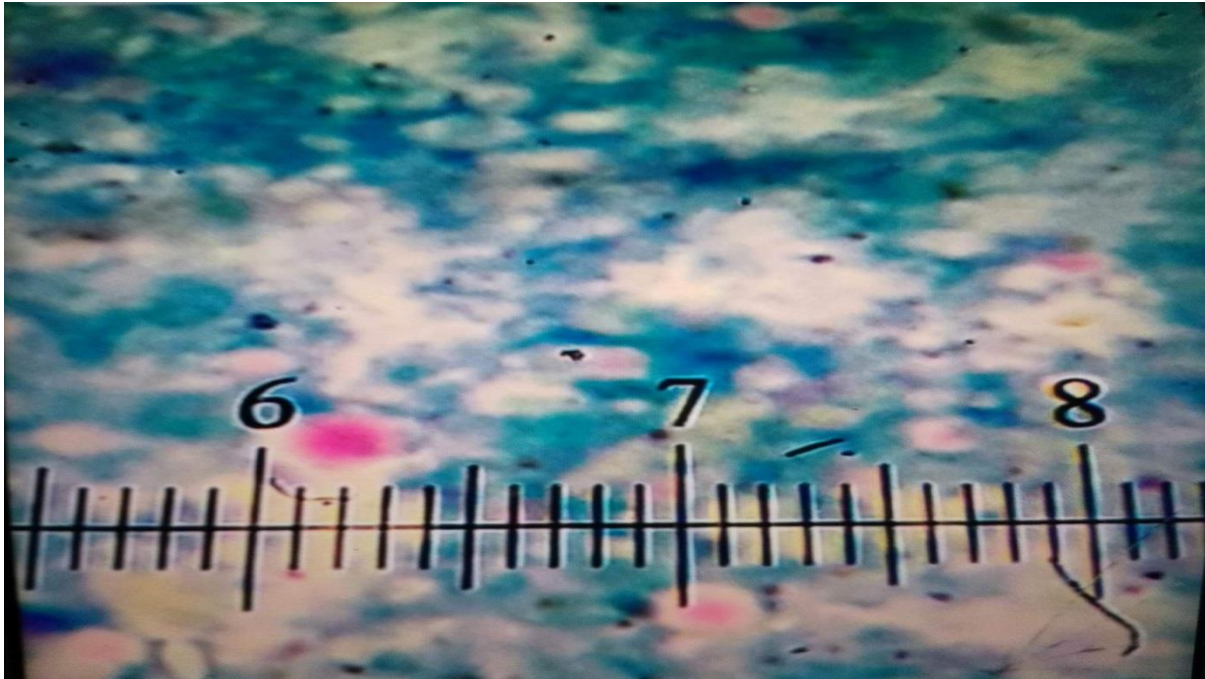


Figure 1: Oocyst of *Cryptosporidium* spp by modified acid-fast stain method. The color range (2 μm) at 100x.

Table 1: Percentage of *Cryptosporidium* infection in Al-Najaf city.

Total samples	Positive	Negative	Total percentage of positive result
50	29	21	58 %

Table 2: Relationship between gender and infection with *Cryptosporidium*.

Female (%)	Male (%)	Ratio Male:Female	Total	P-value
13(44.8)	16(55.2)	1.3:1	29	0.5

Table 3: Distribution of cryptosporidiosis according to age and gender.

Age (year)	Male (%)	Female(%)	Total
1-10	6(37.5)	5(38.49)	11
11-20	4(25.0)	3(23.0)	7
21-30	3(18.75)	2(15.41)	5
31-40	1(6.25)	1(7.70)	2
41-50	1(6.25)	1(7.70)	2
51-60	1(6.25)	1(7.70)	2
Total	16	13	29

The result presented in this study were based on analysis of 50 samples from patients suffering from diarrhea from which 29 (58%) samples positive for cryptosporidiosis. The study started from November 2017 to March 2018 as shown in table (1).

*Gender and age distribution*

From 50 patients 23(46%) females and 27(54%) males. The result showed 13(44.8%) females from total 23 were positive while 16(55.2%) males from total 27 were

positive to infection with cryptosporidiosis, with male to female ratio 1.3:1 as shown in table (2).

The age groups were from 1 year to 60 years infected with cryptosporidiosis as shown in table (3):

Group (1), age between (1-10 years), include 11 patients with cryptosporidiosis, 6(37.5) males and 5(38.49) females.

Group (2), age between (11-20), include 7 patients, 4(25.0) males and 3(23.0) female.

Group (3), age between (21-30), include 5 patients, 3(18.75) males and 2(15.41) females.

Group (4), age between (31-40), include 2 patients, 1(6.25) males and 1(7.70) female.

Group (5), age between (41-50), include 2 patients, 1(6.25) males and 1(7.70) females.

Group (6), age between (51-60), include 2 patients, 1(6.25) males and 1(7.70) females.

*Variation of months during the study period*

To know the effect of the seasonal variation on the infection with cryptosporidiosis, the samples were classified to six groups according to the months where the samples were collected. In November, 6 samples, in December 5, in January 4 samples, in February 7 samples, and in March 7 samples.

The percentage of infection with cryptosporidiosis were in November (20.7%), December (17.3%), January (13.8%), February and March (24.1%), table (4).

**DISCUSSION**

*Cryptosporidium* spp is intracytoplasmic protozoan parasite responsible for acute gastroenteritis that is self-limiting, for otherwise healthy people, but prolonged and threatening for immunocompromised population<sup>15</sup>. The result of this study showed that the diarrheal stool is essential character for infection of cryptosporidiosis. High percentage of infection of protozoan 29(58%) was

Table 4: The relationship between seasonal variation and infection with cryptosporidiosis.

Months	Frequency	Percentage	P-value
November	6	20.7	
December	5	17.3	
January	4	13.8	0.5
February	7	24.1	
March	7	24.1	
Total	29	100	

investigated when compared with other researchers in Hilla city<sup>16</sup>, and in Baghdad<sup>17</sup>. This may be attributed to a zoonosis, may be acquired from domestic animals, feeding bottle infant have more cryptosporidiosis than breast-fed infants<sup>18</sup>. Environmental studies indicate that *Cryptosporidium* oocyst are present in surface water tested and is highly resistant to the chemicals process can guarantee complete removal of oocyst<sup>19</sup>. The result indicated that there is no relationship between the infection with cryptosporidiosis and gender of the patients, this result in agreement with other study in Iraq reported by Al-Warid<sup>11</sup>, and Ibrahim<sup>17</sup>, that showed the infectivity rate was approximately equal between male and female and disagreement with other study in Yemen that reported by Al-Shamari<sup>20</sup>, which indicate the higher incidence in male when compared with female.

The result according to the age of patients showed that the age group (1-10) year had high percentage of infection, this may be explained that the children in age before school do not recognized the stuff that may be harmful thing and play with anything without realize that thing may be contaminated with oocyst of the parasite even other organisms that cause illness to children and difficult to control the behavior in all times, the cryptosporidiosis could transmitted by food, water and soil<sup>21</sup>.

The effect of seasonal variation showed the highest rate of infection was in February and March and lowest in January, this may be due to host season which is more suitable for parasite activity and as a factors that affect oocysts concentration in the environment such as humidity, temperature, rainfall and agricultural practice<sup>22</sup>. One seasonal peak does not necessarily in the same locality each year but tend to occur in different region and it is presumed that infection does not of *Cryptosporidium* are available under all weather conditions every year<sup>23</sup>. Warmer seasons in temperate and tropical climates especially when associated with rain during rainy seasons, the run off from cattle farms contaminate surface water feeding into treatment plants as happened during March-April<sup>24</sup>.

## CONCLUSIONS

High percentage of cryptosporidiosis infection was detected (58%) in Najaf city. The result showed that *Cryptosporidium* is one of the most common enteric parasite associated with diarrhea in Al-Najaf city. The prevalence of cryptosporidiosis is not related to gender. The high percentage of infection was appeared in the age distribution 1-10 years. Seasonal variation was the

important factor in cryptosporidiosis infection. February - March represent high percentage of infection.

## RECOMMENDATION

Routine microscopically diagnostic method is recommended and technical medical staff must be trained to diagnose *Cryptosporidium* in our hospital and primary health care center in our country.

Further study for detection of *Cryptosporidium* spp in stool of all ages, and in the contamination of food and water in Al-Najaf city

Study the sero-prevalence of anti-*Cryptosporidium* antibodies in our country.

Try to completed cultivation of *Cryptosporidium* spp in host free cell culture.

Study effect drugs on enzyme activity of *Cryptosporidium* spp oocyste.

Comparison enzymes activity between oocyst stage and other of *Cryptosporidium* spp.

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