

## Prevalence of *Cryptosporidium* in children referred to oncology center of Imam Khomeini hospital in Urmia, Iran

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### ABSTRACT

**Objective:** To determine the cryptosporidiosis in immunocompromised and cancerous children referred to oncology center of Imam Khomeini hospital in Urmia city, West Azerbaijan province, Northwest Iran.

**Methodology:** This case - control study was performed on 72 children (case) with cancer who were referred to oncology clinic of Urmia Imam Hospital. Another 30 children with normal immune system were selected as controls. To determine the amount of contamination with *Cryptosporidium*, two fecal specimens were collected from each patient and control group. After being concentrated with Formalin-Ether, these specimens were examined using modified acid fast method.

**Results:** Three cases of cryptosporidiosis were seen in the patients (4.16%). Of these, there were two patients from the rural area and one from urban region. There was no significant relationship between the presence of cryptosporidiosis and living in rural or urban areas. No oocystic form of *Cryptosporidium* was detected in the control group.

**Conclusions:** Since children suffering from cancer are at risk of to acquiring many infections, general preventive measures against infection must be taken and patients must be screened for opportunistic parasites during chemotherapy.

**KEY WORDS:** *Cryptosporidium*, Paediatric cancer, Immunodeficiency.

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### INTRODUCTION

*Cryptosporidium* spp. is a protozoon that can cause diarrhea in farm animals and children. Diarrhea in immunocompetent children is self-limiting while it causes chronic gastroenteritis in immunocompromised individuals.<sup>1</sup>

Infection with *Cryptosporidium* can occur by various routes. Although primarily a zoonosis, with some cases traceable to infected livestock or domestic pets, person to person spread within families, daycare centers and hospital are well documented.<sup>2,3</sup>

Different studies have investigated the prevalence of *Cryptosporidium* in children with cancer. For example, Tanyuksel et al in 1995, investigated the prevalence of *Cryptosporidium* spp. in fecal specimens from 106 patients with neoplasia and diarrhea by using Ziehl-Neelsen. Oocysts of *Cryptosporidium* spp. were found in 17% of these patients.<sup>4</sup> The

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second study, by Aksoy et al in 2003, found *Cryptosporidium* in 5.2% patients receiving chemotherapy.<sup>5</sup>

The third study was performed in Malaysia, where *Cryptosporidium* was found in 2% of children with cancer.<sup>6</sup> In different parts of Iran, there are several studies which have documented the prevalence of *Cryptosporidium* spp. from 1 to 7% in human, mainly based on microscopic examination.<sup>7</sup>

*Cryptosporidiosis* does seem to cause unusually severe infection in children with leukemia. Stine et al. described severe diarrhea in a child with acute lymphocytic leukemia, although the child recovered.<sup>8</sup> Lewis et al. described a relapsing course of infection in a child with acute lymphoblastic leukemia.<sup>9</sup>

*Cryptosporidium* is a xenous coccidian protozoa parasite found in at least 170 different species of animals such as mammalians, birds, etc.<sup>10</sup> By early 1980s and diagnosis of AIDS diseases this parasite was found to be an important agent causing life threatening long term acute diarrhea in afflicted patients.<sup>10</sup> In view of the transfer cycle of the parasite from animals to human beings or human to human, by means of feces-contaminated water or food,<sup>1,2</sup> and since West Azerbaijan province is an important animal husbandry region, the aim of this study was to compare the presence of cryptosporidiosis in the stool specimens of children with malignancy to that observed in healthy children and to investigate the connection between malignancy and *Cryptosporidium* infections.

## METHODOLOGY

This case-control study was carried out for five months in Oncology Ward of Imam Khomeini hospital in Urmia city, West Azerbaijan province, Northwest Iran. The patients included in this study were residents of different areas from all over the province who had between one to five year of their chemotherapy. Samples consisted of 72 children with cancer in the case group and 30 immunocompetent children in the control group. Data about name, age,

Table-I: Distribution of cryptosporidiosis according to study group.

Study Group Results	Control		Case	
	No.	%	No.	%
Positive	-	-	3	4.16
Negative	30	100	69	95.83
Total	30	100	72	100

sex, place of residence (city or village), history of contact with animals, clinical history of diarrhea and the type of malignancy was obtained by a questionnaire filled by the parents.

Two sample of stool was taken from each patient and control group in special container and transferred to laboratory of Parasitology department. All specimens were concentrated with formalin-ether<sup>11</sup> and then stained with modified Ziehl-Neelsen staining method. By this method of staining the parasite is seen as a 5-6 micron red object in a blue field.<sup>12</sup> Finally, the data was analyzed to determine the rate of contamination and the cases were divided depending on age, sex, immunity status, history of contact with animals, and place of residence. Difference in the prevalence of *Cryptosporidium* between the two groups was investigated using the chi-square.

## RESULTS

In this study 102 cases were examined 72 in the case group (70.58%) and 30 in the control group (29.42%). From the total of 72 patients in the case group, 32 resided in the city, and the rest (40 cases) were villagers, in the control group this number was 12, and 18 respectively. In both groups the majority of cases was villagers (56.86%) and had experienced contact with animals. The average age of patients was 9 years. Three cases of parasite contamination (4.16%) were observed in the case group. None of positive cases had clinical manifestations of the disease at the time of examination in the hospital. No positive cases were present in the control group (Table-I). 2.77% of contaminated patients had a history of contact with animals, and 1.38% reported no previous contact. (Table-II).

## DISCUSSION

*Cryptosporidium* is a xenosis coccidian protozoa parasite and is a compulsive epithelial cell parasite, which sometimes contaminates respiratory organs,

Table-II: Distribution of cryptosporidiosis according to history of contact with animals.

Contact with animals Results	Contact with animals		Not Contact with animals	
	No.	%	No.	%
Positive	2	3.45	1	2.28
Negative	56	96.55	42	97.72
Total	58	100	43	100

bile ducts and pancreas.<sup>13</sup> This parasite is commonly settled in the border zones of epithelial microvillus of the intestine,<sup>1</sup> and has two types of clinical manifestation, a self-limiting acute diarrhea in immunocompetent cases. In immunocompromised patients, AIDS, or in individuals who experience chemotherapy the parasite has manifestations including chronic gastro-enteritis, life threatening acute and continuous cholera-like diarrhea. The amount of water loss is reported to be between 12-17 liters daily.<sup>1,14</sup>

The parasite causes an acute diarrhea in pets, and livestock like cow and sheep. It's believed that in rural regions animals are important sources of disease transfer to human beings, while in urban regions the disease is most likely to transfer from one individual to the other.<sup>15,16</sup>

Because of the importance of this organism among pathologic parasites, various studies have been carried out worldwide. Eight hundred ninety six cases of cryptosporidiosis have been reported to center for disease control (CDC) in immunodeficient patients from 1981 to 1986.<sup>17</sup> The prevalence of cryptosporidiosis was reported 35% among AIDS-afflicted patients in Haiti.<sup>1</sup> Epidemiological studies in the past decades have reported the rate of cryptosporidiosis in diarrhea cases, 0.6% -20% in developed countries and a percentage of 4-32 in non-developed areas.<sup>15</sup> In Iran the prevalence of contamination with the parasite is as the following: Tehran 5.2%,<sup>18</sup> Mashhad 3%,<sup>19</sup> Zanjan 2.6%,<sup>20</sup> and Kermanshah 3.3%.<sup>21</sup>

In a study by Talari et al. the prevalence of *Cryptosporidium* in patients referred to central laboratory of Kashan with diarrhea was reported to be 3.75% in 240 patients.<sup>22</sup> In a study by Maleki in primary schools of west of Tehran, 500 students were examined by their feces specimen. Results revealed a prevalence of 1% of cryptosporidiosis in that society.<sup>23</sup>

Mossoyebi et al. reported a rate of 7.7% of cryptosporidiosis infection from the total of 405 children referred or hospitalized in Amirkabir hospital of Arak. The highest rate of contamination was observed in children who had pets at home.<sup>24</sup>

In a study by Hazrati Tappeh the prevalence of *Cryptosporidium* was evaluated in kidney transplant & hemodialysis patients in Urmia. In that study 87 cases that had undergone kidney transplant surgery and 103 patients who were under dialysis were placed in the case group and the controls consisted of 60 patients without any known systemic condition. Feces analysis revealed an 11.5% rate of

parasitic infection in kidney transplant cases and 3.88% in hemodialysis individuals, no cases of infection was observed in the control group.<sup>25</sup>

Shahabi et al. studied the rate of cryptosporidiosis infection in children under 10 year from 431 cases with diarrhea 14 (3.25%) were positive.<sup>26</sup> In the study by Naserifar 3% of the cases were positive from a total of 979 children, that 0.8% of them were in the control group and 3.6% in the case group (with diarrhea manifestation).<sup>27</sup>

In another study the rate of cryptosporidiosis was evaluated in kidney transplant patients. In this study 69 feces specimens of patients with kidney transplant (case) and 42 healthy individuals (control) were examined. 18.8% of the patients in the case group were positive for cryptosporidiosis and 7.1% of the control group. There was a statistically significant difference between kidney transplant and this infection.<sup>28</sup>

The cases in our study (72 individuals) were on chemotherapy because of cancer. Among them only three patients were contaminated and didn't show clinical signs and symptoms of cryptosporidiosis and only the feces specimens' revealed infection, and in the control group no infected case was present. Since the parasite is a zoonosis, of the infected cases were villagers who had contact with vets. We found higher incidence of cryptosporidiosis in the study group compared with the control group. Our results indicated that zoonotic pattern is the main mode of cryptosporidiosis transmission in Iran and it is indicating that direct or indirect contact with animals is the main route of spread of infection.

## CONCLUSION

As *Cryptosporidium* can threaten the health of individuals and the society, and because it is one of the causative agent for diarrhea and a life threatening infection in immunodeficient cases and since specific diagnostic tests are not carried out in the laboratories to detect *Cryptosporidium*, the following measures are suggested;

- \* Health care personnel especially physicians and laboratory workers should get awareness about this parasite, its path of transfer and consequences of infection.
- \* Physicians are suggested to ask for parasite detection in feces specimens of immunodeficient patients.
- \* Modified Ziehl-Neelsen staining is suggested to be applied for detection of this parasite in laboratories.

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