

# Detection of *Cryptosporidium Parvum* among Cancer Patients by Serological Method in Thi-Qar Province / Southern Iraq

Fadhil Adhab Hameed

[fadhil-a@utq.edu.iq](mailto:fadhil-a@utq.edu.iq)

Amal Khudair Khalaf, Department of Microbiology / College of Medicine / University of Thi-Qar / Iraq

[amal-khalaf@utq.edu.iq](mailto:amal-khalaf@utq.edu.iq)

## Abstract

Cryptosporidium is one of the parasites that is most frequently found in cancer patients receiving chemotherapy and HIV patients. Several epidemiologists indicated that there was a connection between cryptosporidiosis and cancer. Cancer patients with parasitic infections were the targets in the current study. The present study was carried out during the months of July through December 2022 in the governorate of Thi-Qar. The total number was 260 cancer patients, blood samples were collected from them and examined via the ELISA system to detect the infection with intestinal parasites (*C. parvum*). The total number of a positive patients for intestinal parasite *C. parvum* were 2(2.85%), the examination of serum samples for anti-cryptosporidiosis antibodies revealed that (2.85%,1.4%, and 2.85%) of them were positive for IgG, IgM, and IgA respectively. According to the ELISA findings, elevated immunoglobulin IgA level in cancer patients infected with *C. parvum* are evidence of invasive infection.

Key words: Cryptosporidiosis, C. Parvum, cancer, serology

## **Introduction**

Nearly seven million people die from cancer each year, more than 70% of cancer-related fatalities take place in underdeveloped and third-world nations. It's anticipated that there will be 11 million cancer deaths worldwide by 2030 (1). Many physiological and environmental factors can contribute to the development of cancer. Additionally, cancer has been linked to long-term infection with parasites, bacteria, and viruses (2).

Cryptosporidiosis is a disease caused by intracellular obligatory protozoan parasites known as *Cryptosporidium* spp. that also have a global distribution (3). These parasites affect the gastrointestinal tracts of several vertebrates, including humans (4). Transmission occurs via direct

contact with an animal or contaminated water and food (5). *Cryptosporidium* is now significant as a severe pathogen in children and adults with impaired immune systems (6).

In addition to causing watery diarrhea in people, cryptosporidiosis has also been related to colon cancer and can cause headaches, joint discomfort, nausea, malnutrition, failure to thrive, and cognitive deficiencies (7). In newborns, cryptosporidiosis might result in severe diarrhea, loss of weight, and even death (8). Oocysts, the parasite's infectious stage, are consumed to cause infection. The host's gastrointestinal condition, including pH and temperature, activate *Cryptosporidium* oocysts to excystation in the intestine (9). The oocyst releases sporozoites, which adhere to the hosts' epithelial cells. A parasitophorous vacuole is formed at the location of the sporozoite invasion after the invasion attracts epithelial cells there (10).

## Methods:

The total number of cancer patients that were included in the current study was (70) those who entered Al-Haboubi Teaching Hospital in Nasiriya City-Thi-Qar province during the period extended from July 2022 to November 2022. The present study also included 20 healthy individuals as a control group.

Three mL of blood were obtained from each individual. It was collected under sterile conditions through vein puncture using 3 mL plastic disposable syringes. The blood was collected in a gel tube, where it was allowed to coagulate for one hour at room temperature. It was centrifuged for 10 minutes at 4000 rpm after the blood had coagulated. Subsequently, the serum was split evenly into two portions and put into Eppendorf tubes for use in immunological testing. Then store it at -20 C. (11) (12).

All components, including reagents and sera, were permitted to sit at room temperature prior to use and detection of intestinal parasites infection (*C. parvum* IgA, IgG, and IgM) via ELISA method. The reagents used in this study are from the Shanghai Xinyu Company in China.

## Ethical consideration.

A study was conducted based on the ethical standards followed by the Ministry of Health in Iraq, and verbal consent was obtained from all the patients after explaining the purpose of the study.

## Results

The present study were reported a significant difference in the *C.parvum*-IgA antibody level among cancer patients; where the rate of the infection with *C.parvum*-IgA (+) were (2.85%) and *C.parvum*-IgA (-) were (97.1%) as listed in table (1).

**Table (1): Infection with *C. parvum*-Ig Aamong cancer patients**

<i>C.parvum</i> IgA	Case	No.patients(%)	Mean
Patient	Positive	2 (2.85)	1.29
	Negative	68 (97.1)	0.25
Control	Negative	20	0.16
<b>TotalNO. ofpatients = 70</b>			

$\chi^2 = 88.36$  df = 1.0 P-value = 0.00

S: significant differences  $P \leq 0.05$

The findings of this study showed a significant difference between cancer patients and *C. parvum* IgG infection. where the patients with cancer were (2.85 %) positive for *C. parvum*IgG in comparison with (97.1%) of patients were negative for *C. parvum* IgG. The relationship between *C. parvum* IgG and cancer patients is described statistically in table (2) of the present study.

**Table (2): *C. parvum*- IgG infection among cancer patients.**

<i>C.parvum</i> IgG	Case	No.patients (%)	Mean
Patient	Positive	2 (2.85)	-----
	Negative	68 (97.1)	0.39
Control	Negative	20	0.16
<b>TotalNO. ofpatients = 70</b>			

$\chi^2 = 88.36$  df = 1.0 P-value = 0.00

S: significant differences  $P \leq 0.05$

The present study found a significant difference in the infection with *C. parvum* IgM cancer patients where (1.4%) of cancer patients were positive, while (98.5%) of cancer patients were

negative for *C. parvum* IgM. The differences between cancer patients and those with *C. parvum* IgM infection are shown in a table (3).

**Table (3): Infection with *C. parvum*-IgM among cancer patients**

<i>C. parvum</i> IgM	Case	No. of patients (%)	Mean
<b>Patient</b>	<b>Positive</b>	<b>1 (1.4)</b>	<b>1.31</b>
	<b>Negative</b>	<b>69(98.5)</b>	<b>0.27</b>
<b>Control</b>	<b>Negative</b>	<b>20</b>	<b>0.16</b>
<b>TotalNO. ofpatients = 70</b>			

$$\chi^2 = 96.04 \quad df = 1.0 \quad P\text{-value} = 0.00$$

S: significant differences  $P \leq 0.05$

The age of cancer patients who have parasitic infection with *C. parvum* were also checked based on the requirements of the current study and the statistical analysis showed a significant difference as explained in table (4).

Table (4) were explained the age of cancer patients infected with *C. parvum* were ranged between (51-80), when it was reported(50%) rate of infection with *C. parvum* among cancer patients with (51-60) and (71-80) age group respectively.

**Table (4): Age of cancer patients with *C. parvum*.**

Age	Patients %	Control (%)
<b>10 - 20</b>	<b>0.00</b>	<b>2(10)</b>
<b>21 - 30</b>	<b>0.00</b>	<b>2(10)</b>
<b>31 - 40</b>	<b>0.00</b>	<b>4(20)</b>
<b>41 - 50</b>	<b>0.00</b>	<b>2(10)</b>
<b>51 -60</b>	<b>50%</b>	<b>5(25)</b>
<b>61 - 70</b>	<b>0.00</b>	<b>2(10)</b>
<b>71 - 80</b>	<b>50%</b>	<b>3(15)</b>

$$\chi^2 = 135.58 \quad df = 6 \quad P\text{-value} = 0.00$$

S: significant differences  $P \leq 0.05$

There was a significant difference based on the sex of cancer patients and parasitic infection (*C. parvum*).

Table (5) explains the statistical analysis and the distribution of parasitic infection among cancer patients based on their sex where it was reported the rate of infection with parasites among male with cancer were (50%) of *C. parvum*.

**Table (5):sex of cancer patients with *C. parvum*.**

Sex	patients%	Control (%)
Male	50%	12(60)
Female	50%	8(40)

$$\chi^2 = 73.17 \quad df = 1.0 \quad P\text{-value} = 0.00$$

S: significant differences  $P \leq 0.05$

The following table (6) provides a statistical analysis of the findings, which did not reveal a significant difference between the residency of cancer patients and parasitic infections. Cancer patients whom are lived in rural cities showed that the rate of infection with *C. parvum*. were (50%).

**Table (6):Residency of the cancer patients with *C. parvum*.**

Residency	patients%	Control (%)
Urban	50%	15(75)
Rural	50%	5(25)

$$\chi^2 = 3.99 \quad df = 1.0 \quad P\text{-value} = 0.13$$

N.S: Non-Significant differences  $P > 0.05$

## Discussion.

*C. parvum* is an opportunistic intestinal parasite that causes acute gastroenteritis and severe to moderate diarrhea in children and those with impaired immune systems. The risk of death from *C. parvum* infection for patients with impaired immune systems is high (4). In undeveloped and developed countries, 12% and 7%, respectively, of diarrhea cases were caused by *C. parvum*(13).

Human infection severity is correlated with the immunological function of the host. In patients with weakened immune systems, cryptosporidiosis is typically chronic and severe, with the potential for developing extra-intestinal diseases, unlike in immunocompetent individuals when the infection is self-limiting (14).

The results of the analyzing specimens by ELISA test revealed 2/70 from diarrheic and non-diarrheic cancer patients with *C. parvum*. According to the findings of the current study the two positive samples for *C. parvum* from cancer patients, only intestinal cancer was detected at rate (16.6%),The examination of serum samples for anti-cryptosporidiosis antibodies from diarrheic and non-diarrheic cancer patients revealed that (2.85%) of them were positive for IgG. The level of IgM were (1.4%) of the rate of infection with *C. parvum*, This could be associated with a recent pathogen infection (15). Meanwhile, ELISA results showed that both the diarrheic and non-diarrheic patients studied in the current investigation were (2.85%) IgA levels. due to the possibility of invasive infection (16).

The results of the infection with *C. parvum* in the present study were incompatible with the results obtained in the study were conducted in Thi-Qar, Basrah and Sulaimani Province in Iraq, (17) (18) (19). This study is inconsistent with a study conducted in Egyptian and Turkey (20) (21).The present study was supported by another study that was accomplished in Iran (22). The most frequently used method for detecting *C. parvum* in stools is microscopic examination. The modified acid-fast stain (MAF) technique is considered successful because of its simplicity, persistency, low cost, and ability to clearly show the interior detail of oocysts. but it takes time and requires experience (19).

The majority of *C. parvum* infections are found in people between the ages of 51 and 60, according to the results of the present study. The current study is dissimilar to the study conducted Iraq's Thi-Qar Province(23). And was compatible with research in Sulaimani Province in Iraq(19). The results of the following study indicated that female patients had the same rate of infection with *C. parvum* as male patients (50%) of each them. The current studydisagree with study conducted inThi-Qar andBasrah province, Iraq (24). The distribution of *C. parvum* infection according to their residency in the current study showed no significant differences between infection and residency according to the statistical analysis. The result showed an equal infection with *C. parvum* in urban and rural areas, with 50% of each.

**Conclusions:** Patients with cancer had chronic infections with *C. Parvum* and elevated immunoglobulin IgA level in cancer patients infected with intestinal parasites are evidence of invasive infection.

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