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# Investigation of some intestinal protozoan in the water used for household purposes in the city of Al- Diwaniyah, Iraq.

**Khadeeja Abees Hmood[1*], Nihad Khalawe Tektook[2], Zina Anwer Jaffar[3]**

[1]Department of Environmental Science, College of Science, University of Al-Qadisiyah, Iraq

[2]Collage of Medical & Health Technology, Middle Technical University, Iraq

[3]Medical College, Diyala University, Iraq

## Abstract

**The current study was carried out to detect parasitic contamination depending on presence some intestinal protozoan such as *Giardia lambila* parasite (in cysts phase) and *Cryptosporidium parvium* (in oocysts phase) in the water used for household purposes in some neighborhoods in the city of Al-Diwaniyah (Al-Sadr, Al-Nahdah, Al-Zahra, Al-Orouba, A-Zaytoon, Al-Furat) in the Al- Qadisiyah province, 36 samples of water collected (6 samples from each neighborhood), one sample each month at the period from the beginning of January/2017 to the end of July/2018, method was used concentration and modified Ziehl-Neelsen. The results of the study indicate that the total percentage of water contamination was 5/36 (13.88), also indicated that the highest percentage was recorded (33.33%) of *Giardia lamblia* cysts in Al-Nahdah neighborhood, while the lower percentage was (16.66%) in Al-Sadr, Al-Zahra, Al-Orouba neighborhoods, the statistical analysis indicated to significant differences in the percentage of contamination between Al-Nahda and the other neighborhoods at the probability ($P \leq 0.05$).**

**Keywords:** *Cryptosporidium parvium* oocyst, *Giardia lamblia* cysts, Concentration, Modified Ziehl-Neelsen, Sheather's sugar solution.

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## Introduction

*Giardia lamblia* is a primary whip that multiplies in the small intestine, forming colonies, a common human-animal pathogen (zoonotic agent) [1,2]. It causes Giardiasis disease which considers a major disease affecting more than 200 million people a year in developing countries. It usually affects the decimal area and the upper part of the small intestine in humans and some animals such as sheep, cows, goats, birds, horses and dogs [3]. *G lambila* parasite adheres to the epithelial layer of the intestine by means of a ventral disc, and multiplies by a simple bilateral split. It does not spread through the bloodstream nor does it spread to the other gastrointestinal tract but is confined to the small intestine cavity. Thus the active phase of *G. lambila* can absorb its own nutrients from the small intestine cavity [4]. It spreads from person to person and from animals to humans through fecal-oral transmission. Giardiasis occurs when cysts are ingested through person-to-person transmission or ingestion of fecally contaminated food or water [5]. The most common symptoms that can be observed on the affected person include diarrheal, which is fat, diarrhea, flatulence, loss of appetite, anorexia and nausea [6].

Also there was other protozoan parasite that can cause an infection called cryptosporidiosis in humans or animals trough indigestion of *Cryptosporidium* oocysts, via for example contaminated food or drinking water, pollution of public drinking water can cause a simultaneous infection in a big part of the population. Why it is important to make sure that the drinking water does not contain infectious oocysts? [7]. *Cryptosporidium parvium* is one of the most widely distributed intestinal parasites in the world. It belongs to the genus *Cryptosporidium*. This parasite is called hidden spores, because it is difficult to distinguish spores in the oocyst [8]. This parasite is considered to be an important cause of diarrhea in humans and various animals. This parasite affects a wide range in vertebrates such as humans, domestic and wild animals [9]. The risk of *Cryptosporidium* lies in the multiplicity of transmission methods. This disease was transmitted by direct contact with infected animals. The contamination of water and food sources in oocyst of parasite also plays an important role in the transmission of infection, and it is also transmitted through the inhalation of oocyst in the respiratory tract [4].

### *The Aim*

The aim of this study was to determine if contamination of water used for household purposes by intestinal protozoan in some neighborhoods in the city of Al-Diwaniyah, Iraq.

## Material and Methods

### *Collection of samples*

The water samples were collected by 100 milliliters of the water residential neighborhoods such as Al-Sadr, Al-Nahdah, Al-Zahra, Al-Orouba, Al-Zaytoon, Al-Furat, these neighborhoods were in the province of Al-Qadisiyah, Al-Diwaniyah Iraq.

Samples were placed in sterilized bottles with sealed for the purpose of detecting some of the contaminated water parasites, the date of the collection and the collection site were recorded on all collection bottles and transferred to the laboratories of Al-Qadisiyah University/College of Science/Department of environment for the purpose of searching for the presence of some intestinal protozoan in them.

### *Examination samples by concentration, flotation and modified Ziehl-Neelsen stain*

In search of some intestinal protozoan in the water samples, the method of concentration was used according to Mohsen et al. [10], which included the filtration of the collected water samples and directly upon arrival to the laboratory using filtration filters. In order to increase the concentration of the parasite on the filters, 5 filters and put in the suppression of filtration with the continuous replacement of the upper filter with a new filter at the bottom when you notice the low rate of filtering speed resulting from the clogging of the holes so that always remain filter layer consisting of five filters. The filters were then washed with 200 ml of distilled water. The parasites were then isolated by the method of dilution with the graduated sugar solution by placing 9 ml in a test tube and 2 ml of Sheathers solution (SG 1.27) were added. The tubes were then placed in the centrifuge and 3000 cycles/minutes later, the floating part was placed on a glass slide. Then the slide cover was placed and the sediment was transferred to the microscope slide and smear made and fixed with 70% methanol and stained using the modified Ziehl-Neelsen staining technique [11]. Then, all these slides were examined under the microscope with 10x and 40x magnification force for diagnosis of cysts, oocysts of *G. lamblia* and *C. parvium*.

### *Statistical analysis*

Data was analyzed using the statistical software Spss version 10.5 software where the chi-square test under probability level $p<0.05$, was used to determine the significant differences as mentioned in Statistical analysis [12].

## Results and Discussion

*Giardia spp*. and *Cryptosporidium spp*. were water-borne pathogenic protozoan's spread through fecal-oral transmission which cause several health problems, to include gastrointestinal diseases associated with the consumption of contaminated water, the results indicated in Table 1 to the contamination of the water residential neighborhoods in Al-Diwaniyah city with intestinal parasites. It was noted that the total pollution rate was (13.88%) (five positive samples of the total of 36 samples) where the presence of cyst of *G. lamblia* in one sample in Al- Sadr and Al-Zahra in rate (16.66%), two samples in Al-Nahda with (33.33%) and one sample in Al-Orouba, which is contaminated with oocyst, cyst of *Cryptosporidium parvium* and *Giardia lamblia* in rate (16.66%), while the parasites mentioned in Al-Zaytoun and Al-Furat neighborhoods were not recorded.

The percentage (13.88%) in our study it was less than [13] in Al-Diwaniyah city when she recorded (22.85%) in drinking water that contaminated with Giardia during the examination of 140 sample water by using a flotation method, and less than the percentage in the study [14] which recorded the percentage recovery of oocysts in water ranging from (82.3 to 86.3%) by using IMS procedure.

The presence of *Cryptosporidium parvium* oocysts, *Giardia lamblia* cysts (Figures 1 and 2) in the water samples in this study may be due to the extension of the old basins of water near the heavy water basins. In addition to the fact that these foundations were very old, which caused them to eat, leak and mix their water with heavy water.

Giardia-cysts are ubiquitous in surface waters worldwide, their concentrations were reported to be in the range of 0.01 to 100 cysts per litre [15] and they survive for up to 2 months in water at 8 [16]. They were reported to be strongly resistant to disinfection, including chlorination and difficult to remove by standard filtration [15] in contrast to the case for other water borne pathogens.

*Cryptosporidium* oocysts that can be found in treated wastewater could have been inactivated, and lost their ability to infect humans [17], also the climate change may be affect the concentration of oocysts in source water and the risk for pollution of drinking water [18].

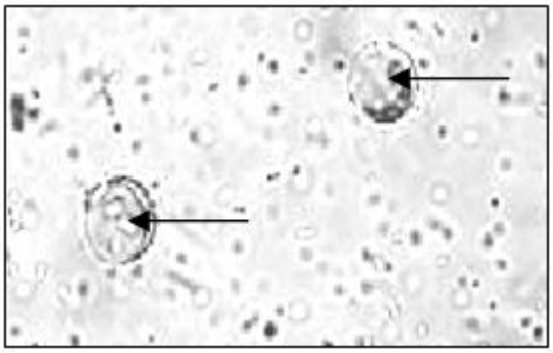

*Figure 1. Giardia cysts recovered in water using Sheather's sugar solution (400x).*

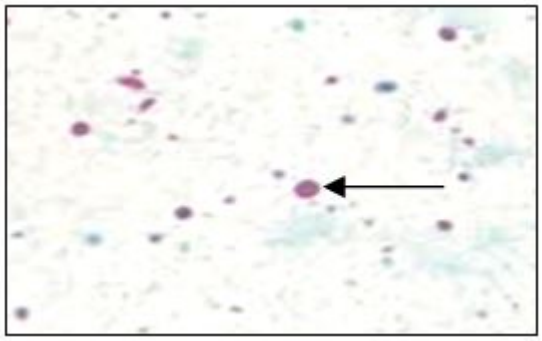

*Figure 2. Cryptosporidium oocysts in water stained with Ziehl-Neelsen modified acid-fast (400x).*

*Table 1. Shows the numbers and percentages of Cryptosporidium parvium, Giardia lamblia in the water of residential neighborhoods in the city of Diwaniyah.*

| Neighborhoods | N examined | N positive | Registered parasites | % | N negative | % |
|---|---|---|---|---|---|---|
| Al-Sadr | 6 | 1 | *Giardia lamblia* | 16.66 | 5 | 83.33 |
| Al-Nahda | 6 | 2 | *Giardia lamblia* | 33.33* | 4 | 66.66 |
| Al-Zahra | 6 | 1 | *Giardia lamblia* | 16.66 | 5 | 83.33 |
| Al-Orouba | 6 | 1 | *Cryptosporidium parvium+Giardia lamblia* | 16.66 | 5 | 83.33 |
| Al-Zaytoon | 6 | 0 | - | 0 | 6 | 100 |
| Al-Furat | 6 | 0 | - | 0 | 6 | 100 |
| Total | 36 | 5 | - | 13.88 | 31 | 86.11 |

*Refer to significant from other at P ≤ 0.05

## Conclusion

Through the current study, we found that water used for household purposes in some neighborhoods in the city of Al-Diwaniyah, Iraq was contaminated with two types of intestinal parasites were *Giardia lamblia* cyst and *Cryptosporidium parvium* oocyst.

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## *Correspondence to

Khadeeja **A**bees Hmood

Department of Environmental Science

College of Science

University of Al-Qadisiyah

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