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Detection of Cryptosporidium canis in dog in Mosul city, Iraq

Eman D. Hadi [1], Israa A. Al- Robaiee[2]

[1] *Department of Internal and Preventive Medicine, College of Veterinary Medicine, University of Mosul, Mosul, Iraq.*

[2] *Department of Internal and Preventive Medicine, College of Veterinary Medicine, University of Mosul, Mosul, Iraq.*

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Corresponding Author:
Name:
Israa A. Al- Robaiee
E-mail:
alrubaye_israa@yahoo.com
Tel:

ABSTRACT

The current study aimed to detect Cryptosporidium canis in dogs in Mosul, Iraq. To achieve this objective, fecal samples from a total of 95 local dogs located in Mosul city were collected between September 2023 and April 2024. Direct, flotation, and fluorescent techniques were used for identifying the parasite. Iodin and Giemsa stains used as basic protocols for fecal smear samples, alongside acridine orange stain was used for fluorescence microscopy monitoring. For Cryptosporidium species, 45 specimens (47.4%) had been confirmed. Dogs younger than one year old (59.6%), Male dogs (78.6%), stray dogs (56%) reported the most rates of Cryptosporidiosis. This study concluded that detection of Cryptosporidium canis with the fluorescent using (acridine orange)was the most effective technique that showed positive results.

1. Introduction

Cryptosporidiosis is a parasitic zoonotic disease linked to Cryptosporidium spp. This parasite is considered a gut protozoan, distributed around the world, and affects humans, pets, and dogs in both subclinical and clinical forms [1,2]. Canine can be infested with four spp. of cryptosporidium including: C. canis, C. anderson, C. parvum and C.ubiquitum [3], but the two prevalent species in dogs are C. canis and C. parvum [4]. Since 1981, over one hundred research projects studied Cryptosporidium infections in dogs from 27 countries globally. [2, 5].

When this protozoon infects the gastrointestinal tract, mostly in the ileal region, it can cause epithelial cell devastation, intestinal villi shrinking, poor absorption in the digestive system, with decreased gastric acid secretion and a deficiency in vitamin B12 [6,7] The majority of prominent clinical manifestations are anemia, Anorexia, loss of body weight and frequent diarrhea]7].

One of the two modes of how this protozoon could possibly transmitted: directly by fecal-oral rout or indirectly through ingestion contaminated food or water Furthermore, this protozoan may spore oocysts in the host's cell, promote self-infected among several hosts and be active when excretion via feces and survive in extreme conditions [7,8].

Plenty of GIT protozoa in dogs have been identified throughout Iraq in different places, such as Baghdad [9], Mosul [10,11], Sulaimani [12], Basra [13,14], Dohuk [15], and Erbil [16]. In Baghdad, the two prevalent species of infected dogs are C. canis and C. parvum [9]. In Mosul city, 42% of dogs and 52% of cats were infected with Cryptosporidium spp.[11]. As far as we are aware, there is limited information about the description of Cryptosporidium canis in dogs in Mosul. Therefore, detecting and identifying Cryptosporidium canis in dogs in Mosul, Iraq was the goal of this study.

2. Materials and Methods

2.1 Animal's sampling:

Fecal samples from 95 dogs (20 domesticated dogs and 75 stray dogs) were collected, including both sexes and diverse ages between September 2023 and April 2024 from the University Veterinary Hospital at the University of Mosul, the Veterinary Hospital in Al-Rashidiya, and other locations of Mosul city.

2.2 Laboratory examination:

Coprological Qualitative methods included the direct and the flotation using zinc sulphate solution. Fecal films were prepared and examined using a fluorescent microscope with acridine orange stain as well as Iodine and Giemsa stains, which was further investigated using an optical microscope at 10X and 40X resolution [17].

2.3 Statistical analysis:

Analysis of the data was conducted on SPSS (Version 17; SPSS Inc., Chicago, USA). $P<0.05$ has been taken into account when calculating statistical importance.

3.Results and Discussion:

The existence of Cryptosporidium spp. was observed by microscopy of the oocyst's size and morphological appearance using direct method, flotation with zinc sulphate solution in addition to Giemsa and Iodine stains (Fig. 1). The identified oocysts have oval to spherical appearance containing four sporozoites with a blue backdrop (Fig. 1), but when observed under a fluorescent microscope, these protozoa appeared as greenish with acridine orange stain (Fig. 2)

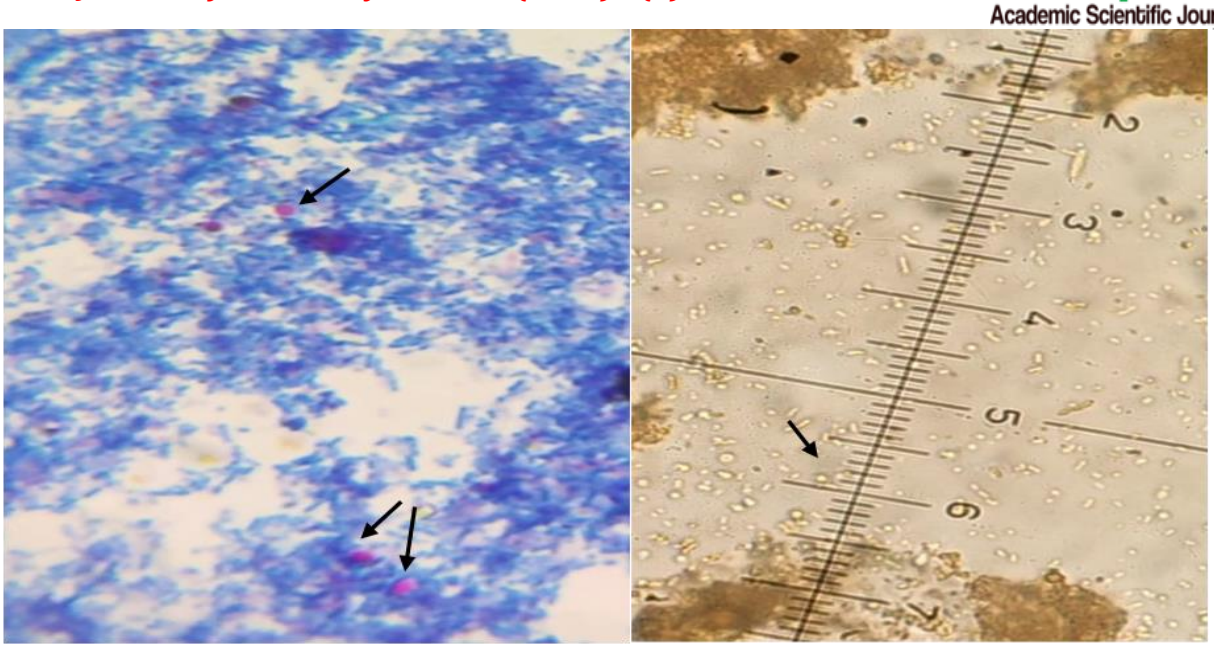

Figure1: *Cryptosporidium* Spp. With Giemsa stain, Iodine using ocular micrometer under light Microscope 10X.

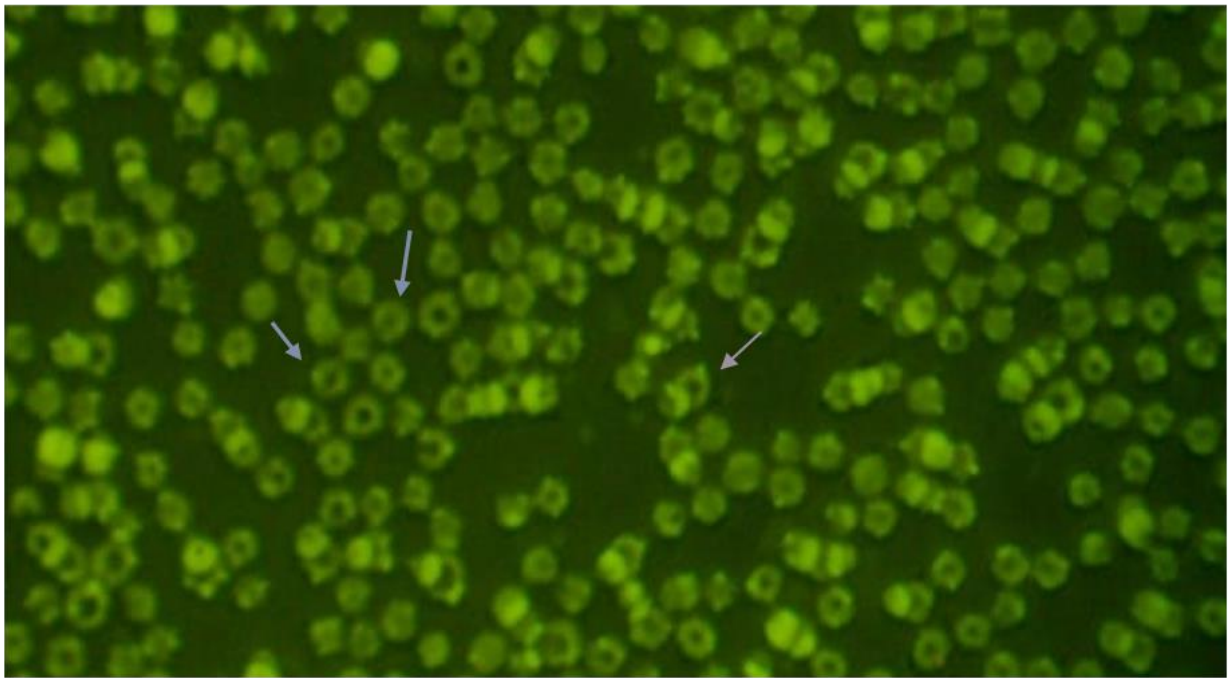

Figure 2: Fluorescing *Cryptosporidium Spp.* using acridine orange stain, examined under fluorescent microscope 20X.

A total of 45 dogs (47.4%) were positive for cryptosporidium oocysts, Puppies recorded a higher infection rate (52.9%) than older animals (Table.1). There were significant ($P<0.05$) variations in the percentage of positive samples for the cryptosporidiosis according to the age (puppies 52.9%), the gender (males 78.6%), and stray dogs (56%, Table 1).

Table (1): Total infection rate of Cryptosporidium spp. in dogs according to age, gender and housing

Variable	No. of examined sample	No. of Positive	Percentage (%)
Age			
≤ 1 year (young)	34	18	52.9[a]
>1 year (adult)	61	27	44.3[b]
Gender			
Females	53	12	22.6[b]
Males	42	33	78.6[a]
Housing			
Stray	75	42	56[a]
Domestic	20	3	15[b]
Total	95	45	47.4

The different small letters refer to the presence of significantly different at ($P<0.05$).

4. Discussion

This study demonstrated that *Cryptosporidium canis* total infection rate was 47.4% (45/95) in canine, and that's identical to a previous study published in Mosul city which concluded that 42% of dogs were infected with *Cryptosporidium* spp. [11], while this ratio was not in line with the data obtained in Baghdad [9]. In addition to documentation in Iran [18]. The outcomes opposed those of ours, with prevalence rates of 8%. The elevation in infection rate may be attributed to heavy contamination of water and food with oocyst as well as suitable environment for oocysts to persist for long periods, furthermore variation in methods of sampling and diagnostic techniques[19].

Major variations occurred across the researched dogs in the present research. The most frequently documented infection rate was 52.9% in young dogs in contrast to the ratio reported in adult animals. These outcomes line up with many research investigations published in Iraq by researchers [20] who documented that infection rate in puppies (69%) was higher than adults (31%). Conversely, in South Africa an elevated infection rate of *Cryptosporidium canis*. was seen in adults (19%) than in puppies (6%) [21], which disagrees with our study. There is a potential relationship between age and danger of infection with Cryptosporidium which may be attributed to the fact that young dogs have an incomplete immune system, in addition to malnutrition following weaning which makes them more susceptible to being infected [11].

The majority of male dogs appeared to have the highest percentage (78.6%) for cryptosporidiosis, while the minor percentage (22.6%) reported in the females which agrees with another research in Iraq [11,20]. In contrast, it disagreed with a documentation in Karbala province in Iraq which recorded the higher infection rate in female dogs 48.27% compared to male dogs 23.89% [22]. The present and previous research illustrates that both sex of dogs has an equal probability to be infected when exposed to contaminated substances [23]. Furthermore, the high prevalence of this protozoa documented in stray dogs was more common.

Conclusion:

The present deduced that examine of *Cryptosporidium canis* with the fluorescent technique using (acridine orange) showed positive results. This technique is beneficial for examine *Cryptosporidium* spp. in various animals.

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Conflict of Interest:

It was approved by the authors and there was no conflict of interest.

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الكشف عن طفيلي الخبيئات البوغية الكلبية في الكلاب في الموصل، العراق

ايمان دحام هادي[1]، اسراء عبد الغني[2]

[1]جامعة الموصل ، كلية الطب البيطري، فرع الطب الباطني والوقائي، الموصل، العراق
[2]جامعة الموصل ، كلية الطب البيطري، فرع الطب الباطني والوقائي، الموصل، العراق

الملخص

هدفت الدراسة الحالية إلى الكشف عن طفيلي الخبيئات البوغية الكلبية في الكلاب في مدينة الموصل /العراق. ولتحقيق هذا الهدف، تم جمع عينات براز من إجمالي 95 كلبًا محليًا خلال الفترة من ايلول 2023 الى نيسان 2024. وتم استخدام الطريقة المباشرة وطريقة الطفو والتألق المناعي لتحديد الطفيلي فضلا عن استخدام صبغة اليود وصبغة كيمزا كبروتوكولات أساسية لمسحات البراز، إلى جانب استخدام صبغة البرتقالي الأكريدين للفحص بالمجهر المتألق. اذ تم تأكيد 45 عينة على انها موجبة لطفيل الخبيئات البوغية الكلبية وبنسبة إصابة كلية (47.4٪). وسجلت أعلى معدلات الإصابة في كل من الكلاب التي يقل عمرها عن عام واحد (59.6٪)، وجنس الكلاب من الذكور (78.6%) والكلاب السائبة (56٪). نستنتج من هذه الدراسة بأن الكشف عن طفيلي *Cryptosporidium canis* بتقنية التألق المناعي باستخدام صبغة الاكردين البرتقالية كان أكثر التقنيات فعالية التي أظهرت نتائج إيجابية.

الكلمات الدلالية: الخبيئات البوغية الكلبية، التألق المناعي