Prevalence of Cryptosporidiosis in Ostriches from Central and South Parts of Iraq

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ABSTRACT

The prevalence of ostrich's cryptosporidiosis was determined for the first time in central and south parts of Iraq to study the effects of age, sex, and months on the infection rate and to record the morphological characterization of *Cryptosporidium* spp in ostriches. A total of 200 ostriches fecal samples were examined by traditional methods for the detection of the parasite. The total infection rate was 11% (22/200), and the highest infection rate was 12.26% (13/106) in chicks (< 9 months), while the lowest infection rate was 9.57% (9/94) recorded in the adult (> 9 months). The study included seven provinces in the central and south parts of Iraq, Wasit, Baghdad, Babylon, Diyala, Karbala, Al-Najaf, and Al-Qadisiyah. The highest infection rate was reported in Al-Najaf (23.53%) compared with the lowest rate (0%) in Wasit province. March reported an infection rate of 50%, while the lowest rate (0%) was registered during summer months (June, July, and August) with a significant difference (P≤0.05) among months of the study. Morphologically, the study indicated the widespread of *Cryptosporidium* parasites in ostriches in both central and south areas of Iraq.

Keywords: Ostriches, prevalence, *Cryptosporidium*, Iraq

Introduction

Farming ostriches both wild and captive is a new field of birds livestock production. Ostriches can be infected with internal parasites: *Houttuynias truthionis* (cestoda), *Libyostrongylus douglassii* (Nematoda), and intestinal protozoans including *Hexamita*, *Giardia*, *Trichomonas*, *Cryptosporidium, Eimeria* spp. These were isolated from Ostrich chicks causing the most serious economic losses in ratites throughout the world (1, 2).

Avian cryptosporidiosis has been recorded in more than 30 birds species in the world (3). It is an important pathogen with high distribution rate in livestock and wildlife (4). The parasite is found in intestine, respiratory, urinary, pancreatic, and bile tracts of over 30 species of birds, but the important *Cryptosporidium* spp are *C. galli*, *C. meleagridis*, and *C. baileyi*, which infected a wide range of birds (5).

Cryptosporidium parasites are important sanitarily and economically in ratites birds. It has been found that infected ostrich chicks show cloacal and phallus prolapse with enteritis and pancreatic necrosis (2, 6). Cryptosporidiosis in adult ostriches occurs without clinical illness, while young ostriches and other birds infected with secondary bacterial and viral microorganisms or immunocompromised show fatal disease (7). The transmission of *Cryptosporidium* oocysts occurs via fecal-oral route, direct or indirect contact, waterborne, foodborne, and airborne (4, 8). The prevalence of ostriches cryptosporidiosis in southern Iran was 28%, in which 21 out of 75 ostriches examined were infected with *Cryptosporidium* spp (3). The microscopic analysis of ostriches fecal samples showed an infection rate of 10.2% in the ages 16-60 days, and 1.2% in aged birds > 10 years. The isolates identified from gerbil

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were *Cryptosporidium muris*, whereas the isolates from ostriches were *Cryptosporidium baileyi* (9). In China, *Cryptosporidium* infections are present in Zhengzhou ostriches at a rate of 2.48% (10/404), and the pattern of oocysts shedding was different in ostrich, which has multiple peaks (10). The aim of this study was to determine the prevalence of *Cryptosporidium* spp among farming ostriches birds in central and south parts of Iraq.

Materials and Methods

Fecal Samples Collection

Five to 20 grams of samples were collected from 200 ostriches with age groups between < 9 months and > 9 months during the period from the beginning of December 2018 to the end of September 2019 from different provinces in the central and south parts of Iraq (Baghdad, Babylon, Waist, Al-Qadisiyah, Diyala, Karbala, and Al-Najaf. Fecal samples were collected from fresh feces in a clean plastic container and were given sequential numbers, and the age, sex, and date of sampling were documented. The samples were transported in a cool box to Parasitology Laboratory located at the College of Veterinary Medicine, University of Baghdad for examination.

Microscopic Examination

Four tests were used for microscopic examination of faecal samples: direct wet smear, flotation by Sheather's sugar solution (11), and staining by modified Ziehl-Neelsen (mZN) (12) for the detection of *Cryptosporidium* oocysts.

Statistical Analysis

The Chi-square (χ^2) test was used for the comparison between the results. Differences were considered statistically significant at P≤0.05 (13).

Results and Discussion

The total prevalence of *Cryptosporidium* spp. infection in central and south parts of Iraq by using modified Ziehl-Neelsen (mZN) and flotation with sheathers sugar solution was 11% (22/200) (Table 1, Figures 1 and 2). The results of the current study agreed with the results recorded by (10) who stated that the infection in Zhengzhou in China was 11.7%.

The highest infection rate (12.26%) was recorded in young chicks (< 9 months), while the lowest rate (9.57%) was recorded in the adult (> 9 months) without significant difference (Table 2). These results were in accordance with those registered in previous studies, which showed that the prevalence appeared at the age group from 20-40 days was more than that in adult ostriches (12). Also, Qi *et al*. (9) showed a prevalence rate of 10.2% in the ages 16-60 days, and 1.2% in those aged > 10 years.

Table 1. Total prevalence of *Cryptosporidium* infection in ostriches

Host	No. of samples examined	No. of Positive	%
Ostriches	200	22	11

Table 2. Prevalence of *Cryptosporidium* infection relative to age groups of ostriches

Age groups		No. of samples examined	No. of Positive	%
Young (chicks)	< 9 Months	106	13	12.26
Adult	> 9 Months	94	9	9.57
Total		200	22	11

Without significance difference (P≤0.05)

Microscopic examination of ostriches fecal samples from seven provinces in the central and south parts of Iraq, including: Baghdad, Babylon, Wasit, Al-Qadisiyah, Karbala, Diyala and Al-Najaf showed 0%, 4.17%, 15.79%, 3.70%, and 23.53%, respectively, with a significant difference (P≤0.05) among areas of study (Table 3). Al-Najaf showed the highest prevalence rate (23.53%), this could be due to poor husbandry practices, contamination of water sources and drinking water, and breeding of other domestic birds near the ostriches farms (13). The result showed that the highest prevalence was recorded in March (50%) while the lowest prevalence rate was recorded during August (0%) with a significant difference (P≤0.05) among months of the study (Table 4). This result agreed with that of (10) who reported the highest prevalence rate was in spring season (15.6%), and

the finding of the present study is consistent with those of (14, 15) who recorded a high prevalence rate (9%) in spring.

Table 3. Prevalence of *Cryptosporidium* infection relative to areas

Province	No. of samples examined	No. of Positive	%
Wasit	20	0	0
Baghdad	48	2	4.17
Babylon	19	3	15.79
Diyala	27	1	3.70
Karbala	26	3	11.54
Al-Najaf	34	8	23.53**
Al-Qadisiyah	26	5	19.23*
Total	200	22	11

*Significant (P≤0.05)

Table 4. Prevalence of *Cryptosporidium* infection relative to months

Year	Months	No. of samples examined	No. of Positive	%
2018	December	15	1	6.66
2019	January	12	2	16.66
	February	12	5	41.66
	March	18	9	50*
	April	11	3	27.27
	May	23	1	4.34
	June	26	0	0
	July	28	0	0
	August	29	0	0
	September	26	1	3.84
Total		200	22	11

*Significant (P≤0.05)

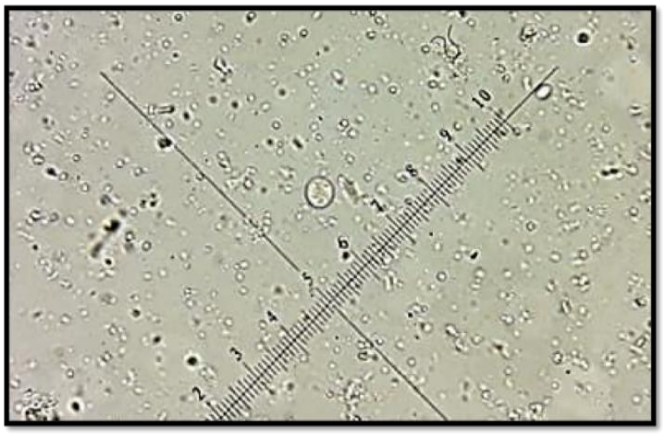

Figure 1. Flotation solution of *Cryptosporidium* spp. oocysts with the measurements 4.3x 4.9 µm (100x)

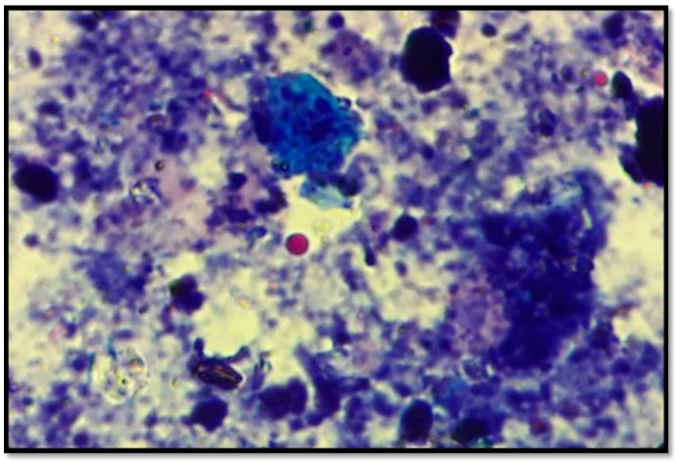

Figure 2. *Cryptosporidium* spp. oocysts stained with Modified Ziehl- Neelsen (100x)

Conflict of Interest

The authors declare that there is no conflict of interest.

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أنتشار طفيلي الابواغ الخبيئة في النعام لمحافظات وسط وجنوب العراق

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الخلاصة

هدفت الدراسة الى تحديد انتشار طفيلي *Cryptosporidium* في طائر النعام لمحافظات وسط وجنوب العراق. فحصت 200 عينة براز نعام بواسطة الطرق التقليدية, وكانت نسبة الاصابة الكلية 11% (200/22). سجلت نسبة الانتشار بين الفئات العمرية أعلى نسبة 12,26% في الافراخ (اقل من 9 اشهر) بينما كانت اوطأ نسبة للإصابة في البالغات (اكبر من 9 اشهر) حيث بلغت 9.57 %. و قد سجلت محافظات الدراسة السبعة في وسط و جنوب العراق و التي شملت (واسط , بغداد , بابل , ديالى , كربلاء , النجف و القادسية) نسبة اصابة (0%، 4,17%، 15,79%, 3,70%, 11,54%, 23,53% و 19,23%) على التوالي، اعتمادا على الصفات الشكلية. بينت الدراسة الشهرية اعلى نسبة اصابة في شهر اذار بلغت 50% بينما سجلت اوطأ نسبة اصابة في أشهر حزيران وتموز واما في شهر اب وقد بلغت 0% مع وجود فروقات معنوية ($P\leq0.05$) بين اشهر الدراسة. واشارت الدراسة الى الانتشار الواسع لطفيلي الكربتوسبوريديم في النعام في المناطق الوسطى والجنوبيه من العراق.

الكلمات المفتاحية: النعام ، انتشار، طفيلي الابواغ الخبيئة ،العراق