

Coprological Study of *Eimeria* spp. in Cattle and Buffaloes in Mosul City, Iraq

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Abstract

Background: Eimeriosis is a common parasitic disease of cattle and buffaloes caused by protozoa of the genus *Eimeria*. The disease can lead to diarrhea, poor growth, and economic losses. **Aims and Objectives:** The aim of this study was to determine the prevalence of *Eimeria* spp. in cattle and buffaloes in Mosul city. **Materials and Methods:** A total of 127 fecal samples including 62 samples from cattle and 65 samples from buffaloes, were collected from various areas of the city and examined for the presence of *Eimeria* spp. oocysts. All fecal samples were examined using both the direct method and the flotation technique with a sugar solution of specific gravity 1.2, for the detection and identification of *Eimeria* spp. oocysts. The animals ranged in age from less than 6 months to over 2 years. **Results:** The study revealed that the prevalence rate of *Eimeria* spp. infection was 46.7% in cattle and 56.9% in buffaloes. The highest infection rate was recorded in animals less than 6 months of age (66.6%), whereas animals older than 2 years exhibited a prevalence of 41.6%; however, this difference was not significantly ($P > 0.05$). Furthermore, no significant association was found between sexes and infection rate ($P > 0.05$) as the prevalence rate in males and females were 52.9% and 44.4% in cattle and 75.0 % and 51.0 % in buffaloes, respectively. Moreover, no significant effect ($P > 0.05$) of the examined risk including fecal consistency, on the prevalence of *Eimeria* spp. infection was observed in either cattle and buffaloes. Morphological examination of the recovered oocysts revealed the presence of eleven species of *Eimeria* can be identified in cattle and buffaloes, which are as follows: *E. bovis*, *E. zuernii*, *E. auburnensis*, *E. cylindrica*, *E. brasiliensis*, *E. wyomingensis*, *E. bukidnonensis*, *E. illinoensis*, and *E. ellipsoidalis*, *E. subspherica*, *E. ildefonsoi*. **Conclusion:** *Eimeria* spp. infection was highly prevalent among cattle and buffaloes in Mosul city, with animals buffaloes showing a higher prevalence than cattle. Although younger animals exhibited higher infection rates. Morphological examination revealed the presence of eleven *Eimeria* species, indicating considerable species diversity in the study area. These findings highlight the widespread occurrence of eimeriosis and emphasize the need for effective management and control measures to reduce the prevalence of *Eimeria* parasite among the livestock.

Keywords: Buffaloes, cattle, *Eimeria* spp., Mosul, prevalence

INTRODUCTION

Apicomplexa Eimeriidae family includes genus *Eimeria* is obligate intracellular protozoa and single-celled parasitic organisms (1,2). According to Tenter *et al.* (3), Coccidia have been found in almost all animals, including cattle and buffaloes. Young cattle may die from acute diarrhoea due to *Eimeria* spp. that causes intestinal damage in animals (4,5).

Eimeriosis is more common in fields with poorly managed animal husbandry systems. The disease is transmitted directly through food, drinking water and other contaminated materials with oocysts, eimeriosis can lead to decreased output and financial losses, as well as susceptibility to contracting various illnesses is increasing (6). Twenty species have been found

in cattle, but only three of them are risky and frequently result in symptoms clinically: *Eimeria bovis*, *Eimeria zuernii* and *Eimeria auburnensis* (7,8). *E. bovis* and *E. zuernii* are the world's most prevalent pathogenic species, of *Eimeria*, causing morbidity and mortality in cattle due to the damage of the intestine, with clinical signs including bloody diarrhoea with fibrin (8,9). Clinical coccidiosis in cattle development

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depends primarily on several components, for example, the type of *Eimeria*, infected animal age, the quantity of oocysts consumed and the system of breeding, as well as strategies for management (10,11). The high rate of *Eimeria* infection is affected by poor management. Other disease agents can enter through *Eimeria* infection. The importance of control methods for coccidiosis lies in the inappropriate methods for accurate identification for *Eimeria* species. Oocytes can be spread widely and continuously pollute the environment, leading to increasing number of coccidiosis cases (12,13).

In Iraq, Al-Bakry (14) referred that the total infection rate with *Eimeria* spp. in cattle was 25.71% and AL-Lahaibi *et al.* (15) recorded 38% in buffaloes in the city of Mosul.

MATERIALS AND METHODS

This study was conducted from different geographical localities of Mosul City in Iraq, from September 2025 to November 2025. A total of 62 fecal samples (45 females and 17 males) from cattle and 65 fecal samples from buffaloes including 49 females and 16 males age animals (<6 months of age to more than 2 years of age).

All fecal samples were collected directly from the rectum and then put the samples in plastic containers.

According to their consistency of faeces, all faecal samples were classified as diarrhoeal faeces and non-diarrhoeal faecal samples and transported to the laboratory of parasitology for examination. Before being processed, all faecal samples were kept in a refrigerator. Each faecal sample was examined to identify the oocysts of *Eimeria* spp. Using the direct technique and flotation technique using Sheather's sugar solution with a specific gravity 1.2, according to Soulsby and Haryadi *et al.* (16,17).

Using a 2.5% potassium dichromate solution, the oocysts in all positive samples were sporulated, regularly ventilated using a pipette and allowed to sit at ambient temperature (17,18). Using a light microscope equipped with eye piece micrometer after calibration (17). The dimensions of both sporulated and non-sporulated oocysts were measured using an ocular micrometer (in the eyepiece) to identify *Eimeria* spp. based on the size and shape of oocysts (16,17).

Statistical analysis

To determine the impact of different aspects in the research parameters, in this study, Chi-square (Jandel SigmaStat Scientific Software V3.1, Jandel Corporation, San Rafael, California, USA) was used to statistically evaluate the data.

Comparing ratios based on probability.

Ethical approval

Ethical approval for this study was provided by the (UM. VET.2025.062) Institutional Animal Care and Use Committee, University of Mosul, College of Veterinary Medicine, on 20 July 2025.

RESULTS AND DISCUSSION

The results of this study indicated that the rate of prevalence of infection with *Eimeria* species was 46.7% and 59.9% in cattle and buffaloes, respectively [Table 1].

The infection rates in this study were higher than those recorded in other studies in neighboring countries. A research throughout Al-Baha area, Saudi Arabia, recorded a prevalence rate of 31.27% of eight species of *Eimeria* in cattle (19). The study In Egypt, recorded infection rate 46.7% of *Eimeria* spp. in fecal samples of diarrheic calves (9). However, in different regions of Hama city in Syria recorded the percentage (26.26%) in cattle (20).

The percentage of infection was (26.26%) in cattle in different regions of Hama city in Syria (20). The infection rates were 25.92% and 19.04% in cattle and buffalo calves, respectively, in Alexandria Governorate of Egypt (21). While, in Pakistan, the study indicated infection rates in the cattle and buffaloes were 2.3% and 4.3%, respectively (22). Ninety per cent were recorded for infection with *Eimeria* species in Murrah buffalo calves in India (23). *Eimeria* spp. infection in cattle (58.33%) in Indonesia can cause high economic losses and increase the susceptibility to infection with other infectious diseases (24).

In Iran, the percentage of infection with *Eimeria* species was 8.25% in cattle (25). Furthermore, in Iraq, previous studies recorded the prevalence of *Eimeria* infection were higher than

Table 1: Prevalence rates of *Eimeria* species in cattle and buffaloes

Species of animals	Number of examined samples	Number of positive samples	Prevalence rate (%)
Cattle	62	29	46.7
Buffaloes	65	37	56.9

Table 2: Prevalence rates of *Eimeria* species in cattle based on ages

Ages of animals	Number of examined samples	Number of positive samples (%)
<6 months	15 ^a	10 (66.6)
6 months to 2 years	23 ^a	9 (39.1)
>2 years	24 ^a	10 (41.6)
Total	62	29 (46.7)

Similar letters show no significant differences at level $P>0.05$

Table 3: Prevalence rates of *Eimeria* species in buffaloes based on ages

Ages of animals	Number of examined samples	Number of positive samples (%)
<6 months	21 ^a	12 (57.1)
6 months to 2 years	14 ^a	8 (57.1)
>2 years	30 ^a	17 (54.8)
Total	65	37 (56.9)

Similar letters show no significant differences at level $P>0.05$

38.% in buffaloes in Mosul City (15). 35.2% was recorded in cattle in Al Najaf province (26), and the infection rate of *Eimeria* species was low 9.50% in cattle in Baghdad city (27). Aram (28) who recorded infection rate with *Eimeria* spp. 29.07% in dairy cattle in Sulaymaniyah province.

Table 4: Prevalence rates of *Eimeria* species in cattle and buffaloes based on sex

Sex of animal	Cattle		Buffaloes	
	Number of examined samples	Number of positive samples (%)	Number of examined samples	Number of positive samples (%)
Male	17a	9 (52.9)	16a	12 (75)
Female	45a	20 (44.4)	49a	25 (51)
Total	62	29 (46.7)	65	37 (56.9)

Similar letters show no significant differences at level $P>0.05$

Table 5: Infection rate of *Eimeria* spp. in cattle based on faecal consistency

Faecal consistency	Number of samples examined	Number of positive samples (%)	Percentage
Normal	23 ^a	9	39.1
Soft	18 ^a	8	44.4
Diarrhoea	21 ^a	12	57.1
Total	62	29	46.7

Similar letters show no significant differences at level $P>0.05$

Table 6: Infection rate of *Eimeria* spp. in buffaloes according to faecal consistency

Faecal consistency	Number of sample examined	Number of positive samples	Percentage
Normal	16 ^a	7	43.7
Soft	23 ^a	13	56.5
Diarrhoea	26 ^a	17	65.3
Total	65	37	56.9

Similar letters show no significant differences at level $P>0.05$

The variations in rates of prevalence could be credited to numerous components, including the quantity of oocysts consumed, the existence of a concurrent microbial infection, season of samples sampling, immunity level in animals and management and diagnostic techniques (29,30).

The research showed that the prevalence rate of *Eimeria* spp. in cattle according to age was higher in cattle calves of <6 months of age (66.6%) than in calves more than 6 months of age 41.9%. There was no significant difference in the infection rates with *Eimeria* spp. in the 3 groups of ages ($P>0.005$) in cattle and buffaloes [Tables 2 and 3]. However, previous studies in other countries indicated that percentage of infection with coccidiosis in cattle was 83.33% for those under 1 year old, 55% for those between 1 and 2 years old and 10% for those over 2 years old. Because their immune systems are not functioning at their best, cattle under a year old have the highest percentage of illness (17). Another study also showed that the infection rate varies significantly between different age groups of animals in cattle (20).

This study recorded that a higher infection rate was 52.9% and 75% in males of cattle and buffaloes, respectively, and in females was 44.4% and 51% of cattle and buffaloes, respectively, with no significantly at $P>0.05$ [Table 4]. This result is close to Hussain *et al.* and Warurin *et al.* (22,31), which mentioned that the infection rate is similar for both sexes. Several studies have indicated that coccidiosis is more common in male animals than in female because of poorer hygiene in male animals compared to females, which are often cleaned before milking (8).

This study showed that there is no significant difference between the prevalence rate of *Eimeria* spp. and fecal consistency; in cattle, recorded 57.1 % in diarrhea fecal and 39.1% in normal fecal samples [Table 5]. In buffaloes, the study recorded the prevalence rate of 65.3% in diarrhoea faecal samples and 43.7% in normal faecal samples [Table 6]. These results differ from those of earlier investigations which confirmed that found the correlation between the diarrhea and infection with *Eimeria* spp. in animals (32).

Table 7: Identification of *Eimeria* spp. in cattle and buffalo faecal samples

<i>Eimeria</i> species	Oocysts			
	Shape	Micropyle	Length, mean (range) SD	Width, mean (range) SD
<i>Eimeria brasiliensis</i>	Ovoid	Present	37 (39–35) 1.46	25 (24–26) 0.84
<i>Eimeria auburnensis</i>	Ovoid	Present	34 (29–36) 2.49	21 (20–22) 0.84
<i>Eimeria bukidnonensis</i>	Pyriiform	Present	46 (42–54) 3.41	35 (30–40) 3.03
<i>Eimeria bovis</i>	Ovoid	Present	29 (28–30) 0.84	23 (22–24) 0.84
<i>Eimeria wyomingensis</i>	Ovoid	Present	41 (39–45) 2.03	28 (26–31) 1.72
<i>Eimeria subspherica</i>	Spherical	Absent	15 (13.5–16) 1.04	15 (13.5–16) 1.04
<i>Eimeria zuernii</i>	Spherical	Absent	19 (16–22) 1.80	16.5 (14–20) 2.09
<i>Eimeria ildefonsoi</i>	Ovoid or cylindrical	Present	43 (43–44) 0.48	24 (24–25) 0.51
<i>Eimeria illinoiensis</i>	Ellipsoidal or ovoid	Absent	26 (24–29) 1.57	20 (19–22) 1.11
<i>Eimeria cylindrica</i>	Ellipsoidal or elongated	Absent	21.7 (20–23) 1.16	15 (13–17) 1.50
<i>Eimeria ellipsoidal</i>	Ellipsoidal	Absent	23.5 (20–27) 2.55	17 (14–22) 2.87

SD: Standard deviation

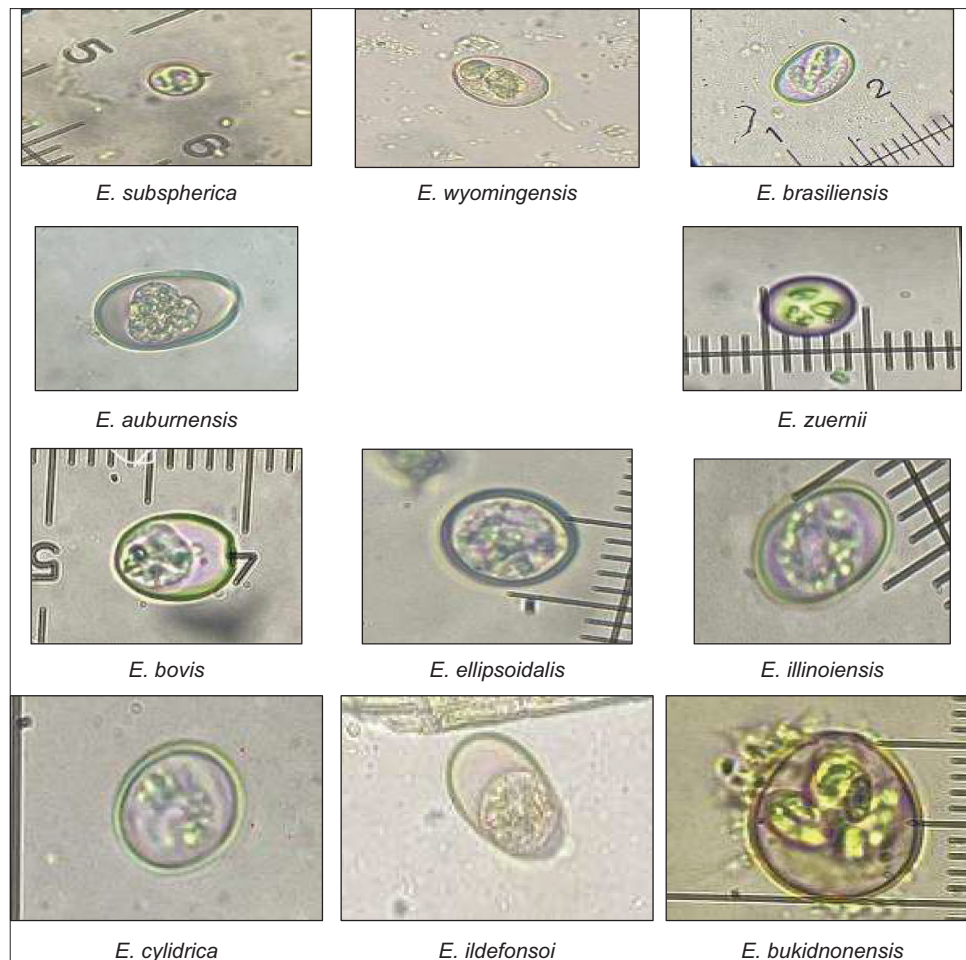


Figure 1: Oocysts of *Eimeria* spp. in cattle and buffalo faecal samples

The results of laboratory examination of faecal samples of cattle and buffaloes revealed differences in morphological traits of *Eimeria* spp. oocysts. A namely 11 *Eimeria* spp. depending on their morphological characteristics are *E. bovis*, *E. zuernii*, *Eimeria brasiliensis*, *Eimeria auburnensis*, *Eimeria bukidnonensis*, *Eimeria wyomingensis*, *Eimeria subspherica*, *Eimeria illinoiensis*, *Eimeria ildefonsoi*, *E. cylindrical*, *Eimeria ellipsoidal* could be recognised in Mosul City.

Figure 1 and Table 7, the infection rates which obtained in cattle fall within the same range reported in earlier researchs and surveys conducted in several nations: eight *Eimeria* species in cattle reported in Al Baha Area, Saudi Arabia (19), 11 species of *Eimeria* infected the cattle in Egypt (9). Seven species recorded in India (33). In Iraq, was recorded 6 species of *Eimeria* in cattle with different rates in each species in Al Najaf province the most common species was *E. zuernii* at percentage 53.1%, followed by *E. cylindrica* making up 49.3% and *E. ellipsoidal* accounting for 34.6% then *E. bovis* at 28.0% and *E. auburnensis* at 22.7%. *E. alabamensis* making up 19.4%(26). In buffaloes in Al-Qadisiyah province according to morphological characterisation of oocysts four species of *Eimeria* were detected the following (*E. bovis*, *Eimeria zuernii*, *E. subspherica* and *E. cylindrica*)(34).

While in Mosul City, five species of *Eimeria* were diagnosed in buffaloes; they are *E. bovis* 32%, *E. subspherica* 22.7%, *E. zuernii* 18.7%, *E. ellipsoidal* 16.7%, *E. auburnensis* 6.7%(15) and (14) who recorded 8 species of *Eimeria* in cattle in Mosul City with different rates

who recorded 8 species of *Eimeria* in cattle in Mosul city as following: *E. subspherica*, *E. zuernii*, *E. bovis*, *E. alabamensis*, *E. canadensis*, *E. bukidnonensis*, *E. ellipsoidal*, *E. cylindrica*. The various localities and management system of animal husbandry may be the cause of this species variance (19,35).

CONCLUSIONS

This research found that the infection rate with *Eimeria* spp. in males and females in cattle and buffaloes, as well as between age groups of animals with no significant differences. *Eimeria* species are known to have a greater likelihood of pathogenicity and to need to be controlled in cattle and buffalo. Although the current research's findings indicated that *Eimeria* spp. were common in cattle and buffaloes, more epidemiological research on *Eimeria* species is required to examine the impact of additional variables' risk factors, such as breeding and management. Despite the disease's enormous potential, the

lack of clinical symptoms causes many to ignore it. Therefore, in order to prevent and control *Eimeria* spp. infection, comprehensive measures should be used.

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Conflicts of interest

There are no conflicts of interest.

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