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EPIDEMIOLOGICAL CHARECTRIZATION ON EIMERIOSIS IN SMALL RUMINANTS IN BASRAH CITY OF SOUTHERN IRAQ

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Abstract

Coccidiosis, caused by *Eimeria* spp. which was an obligatory enteric intracellular apicomplexan protozoan parasite. This study focused an epidemiological characterization of *Eimeria* spp. infecting small ruminants in Basrah city in the southern of Iraq. The result with prevalence of Eimeriosis from the faecal samples totally 70.7% divided into sheep, goats, and grounds showed that 45.6; 38.9; 75.0% respectively. The analysis of variance with significant differences in occurrence of Eimeriosis among small ruminants that based on three categories; animal sex, age and faecal consistency showed no significant differences. Samples were collected from different region from Basrah city (North, East, West, South and from city center), and showed a high prevalence in sheep and on ground found in Al-Zubair region (23.0 and 25.0 %) respectively, while, the high prevalence in goats found in Al-Basrah region (27.78%), without significant differences among different regions under study. A high prevalence of Eimeriosis in sheep and goats according to the months study showed that the high prevalence found on December (30%) and the low prevalence found on October (2%). Finally, according to the morphological features *Eimeria faurei* with high prevalence 11.6 in sheep, while in goats *Eimeria ninakohlyakimova*e 28.6%, but on ground *Eimeria ovinoidalis* showed a high prevalence 19.0%.

Key words : Coccidiosis, Small Ruminants, *Eimeria*spp, Shee, Goats, Grounds.

Introduction

Coccidiosis, caused by *Eimeria* spp. which was an obligatory enteric intracellular apicomplexan protozoan parasite (Shirley *et al.,* 2005; Yakhchali, and Rezaei, 2010), and infected different species of animals with a worldwide distribution, and severe economic losses to individual farmers and industry (Reeg *et al.,* 2005) and the sites of infection are intestine and other organs such as liver and kidney (Levine, 1973), So, the consequences of infection with Eimeriosis leads to drop off animal welfare and their productivity (Chartier and Paraud, 2012).

Taxonomically, *Eimeria* spp. has been classified under the family of Eimeriidae, with more than 1000 species are identified as a genus *Eimeria* spp. which dominated to be the largest group in infected domestic animals and birds. In sheep approximately 15 species have been recognized with more importantly, *Eimeria ovinoidalis* and *Eimeria crandallis* that considered more pathogenic species (Catchpole, Norton, and Joyne, 1976). While 17 species were reported in goats (Silva and Lima 1998) and *E. arloingi* and *E. ninakohlyakimovae* is highly prevalent pathogenic species identified.

The causative agent of Emeriosis was oocysts that are passed out in the faeces, and with suitable environments conditions, with temperature > 15 C0, relative humidity of > 80%, these oocysts will be develop to Sporulated oocysts that capable of infecting other animals (Daugschies and Najdrowski, 2005). So, ingestion of contaminated food and water by oocysts are the main source of distribute the parasite (Fitzgerald, 1980), and a young animals with up 4 month of age could be affected, while, adult animals can be diagnosed the infection and acting as reservoir of Eimeriosis (Lopes *et al.,* 2013).

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The clinical signs of infection with Eimeriosis are vary through reducing weight, anorexia and bloody diarrhoea or not, and a high level of infection is more likely associated with animal husbandry and management practices such as keeping animal in overcrowded condition, ignore maintaining cleaning of barnyard, intermingle different species and ages of animal in the one place (Odden *et al.,* 2017).

Taxonomy genus of *Eimeria* could be classify according to the morphological feature of Sporulatedoocysts and host identify from which the oocysts have been recovered (Ogedengbe *et al.,* 2015).

As matter of fact, a few or lacking studies on Eimeriosis in small ruminant, with few information reported in Basrah city led to do this study as an epidemiological characterization to investigate the *Eimeria* spp. that infecting sheep and goat in Basrah city in the southern of Iraq.

Materials and Methods

Sample Collection

According to the small ruminant population site and size in study area, from September 2019 to February 2020, fresh faecal samples totally (n=423) were collected from sheep (n=273) and goats (n=18) and from ground (n= 132) using clean plastic container according to the method by (Al-Sadoon, 2018).

Laboratory Examination

After collection, samples were stored in ice boxes ($4C^0$) until laboratory processing, all samples were individually processed using flotation method in sugar solution (Iseki,1986). An accurate morphometric analysis was performed, with oocyst morphologically identified at species level, afterward in order to allow the sporulation of oocyst; each sample was individually processed according to the method (Gordon and Whitlock,1939).

Some positive sample were stored in Petri dish containing 2.5 %potassium dichromate ($K_2Cr_2O_7$) according to the method of (Menezes and lopes,1995).The material was transferred into plastic tubes and identification of oocyst was based by the method (Eckert *et al.,*1995).

Results

Out of sample analyzed, the prevalence of Eimeriosis from the faecal samples of sheep, goats, and grounds showed that 45.6; 38.9; 75.0% respectively, with totally 70.7%, the analysis of variance showed a significant differences under $P \leq 0.05$ (Table1). The occurrence of Eimeriosis among small ruminants based on three categories; animal sex, age and faecal consistency showed no significant differences (Table 2).

Table 1: Prevalence of eimeriosis from the faecal samples of sheep, goats, and grounds.

Categories	Total number sampled	Prevalence (95% Cl)	P. value
Sheep	273	45.6 (39.1, 52.2)	0.006
Goats	18	38.9 (17.3, 64.3)	
Grounds	132	75.0 (66.7, 82.1)	
Total	423	70.7 (66.1, 75.0)	

Samples were collected from different region from Basrah city (North,East, West, South and from city center), and the prevalence of Eimeriosis in sheep, goats, and ground based on region showed a high prevalence eimeriosis in sheep and on ground found in Al-Zubair region (23.0 and 25.0 %) respectively, while, the high prevalence of eimeriosis in goats found in Al-Basrah region (27.78%), typically, no significant differences among different regions under study (Table 3).

A high prevalence of Eimeriosis in sheep and goats according to the months study showed that the high prevalence found on December (30%) and the low prevalence found on October (2%) (Fig. 1).

Different type of *Eimeria* infection were identified in sheep samples as single, double and multiple infection; 40.41, 30.56, 29.01% respectively. By the other hand, no single infection in goats, but in double and multiple infection with prevalence 57.14 and 42.85% respectively.

In ground the prevalence with high number in all type of infection 34.34%, 43.43%, 22.22% for single, double

Table 2: Occurrence ofEimeriosis in sheep and Goatsbased on three categories (animal sex, animal age, faecal consistency).

Category	Sheep			Goats		
	Total No. (%)	Positive (%)	P. value	Total number	Positive (%)	P. Value (fisher exact test)
Animal sex Female Male	140133	97 (35.5)96 (35.7)	3.1	126	6 (33.3) 1 (5.5)	0.19
Age group< 1 year 1–2 years> 2	1536357	110 (40.3) 40 (14.6)43 (15.7)	0.24	459	1 (5.5) 2 (11.1) 3 (16.7)	0.8
Faecal consistency PelletsSemi-soldDiarrhoea (watery)	2311230	166 (60.8) 6 (2.2) 21 (7.7)	0.26	1242	4 (22.2) 3 (16.7) 0 (0.0)	0.16

Table 3: Prevalence of Eimeriosis in sheep, goats, and ground based on region (districts).

Districts name	Prevalence of eimeriosis in sheep (95%CI)	Prevalence of eimeriosis in goats (95%CI)	Prevalence of eimeriosis on ground (95%CI)
Karmat Ali	8.7 (5.7, 12.8)	0.0 (0.0, 18.5)	14.3 (8.9, 21.6)
Al-Basrah	15.0 (11.0, 19.8)	27.78 (9.7, 53.5)	12.8 (7.7, 19.8)
Safwan	12.0 (8.5, 16.6)	0.0 (0.0, 18.5)	6.8 (3.2, 12.5)
Al-Zubair	23.0 (18.2, 28.5)	0.0 (0.0, 18.5)	25.0 (17.9, 33.3)
Al-Deir	11.3 (7.8, 15.7)	5.5 (0.1, 27.3)	17.4 (11.4, 25.0)
Abukhassib	0.3 (0.0, 2.0)	5.5 (0.1, 27.3)	4.5 (1.7, 9.6)

and multiple infection respectively. A statistical analysis showed no significant differences (Table 4).

Identified *Eimeria* spp. in faeces samples in sheep, goats and ground according to the morphological features showed that *Eimeria faurei* with high prevalence11.6 in sheep, while in goats *Eimeria ninakohlyakimova*e 28.6%, but on ground *Eimeria ovinoidalis* showed a high prevalence 19.0% (Table 5).

Discussion

This study assessed the diversity of *Eimeria* spp. infecting sheep and goats at Basrah city, southern Iraq. Results indicate that sheep and goats living in this region are parasitized by a wide range of *Eimeria* spp. with single, double and multiple infection, and the overall prevalence (70.7%). this high positivity observed in the present study is reflecting to the poor hygienic sanitary conditions, which may be considered an aggravating factor for spreading Eimeriosis, and grazing in open contaminated areas it is known that this condition allows a high burden of infecting *Eimeria* spp. to be present on the environment contaminating food and water, and exposing animals to the infection. Mohamaden *et al.,* (2018) referred a prevalence of Eimeriosis among sheep and goats in Suez / EgyptInfections were 54.5, 60.5, 45 and 72% for lambs, adult sheep, kids and adult goats respectively.

Different authors reported that infection by *Eimeria* species usually occur by more than one species at the same host (Kheirandish *et al.,* 2014; Mohamaden *et al.,* 2018) because of high contamination and open grazing and this explain why the grounds with high prevalence of Eimeriosis as compared with faecal examination. Also, Al-Sadoon (2018) showed that *Eimeria*was not detected as pure species infection, but found as a mixed infection of different species, two or more in study on sheep at Wasit province.

The current study showed no significant differences on animal sex, age and faecal consistency and the prevalence of Eimeriosis infection, this could be explain that presence of sheep and goats in different ages in one

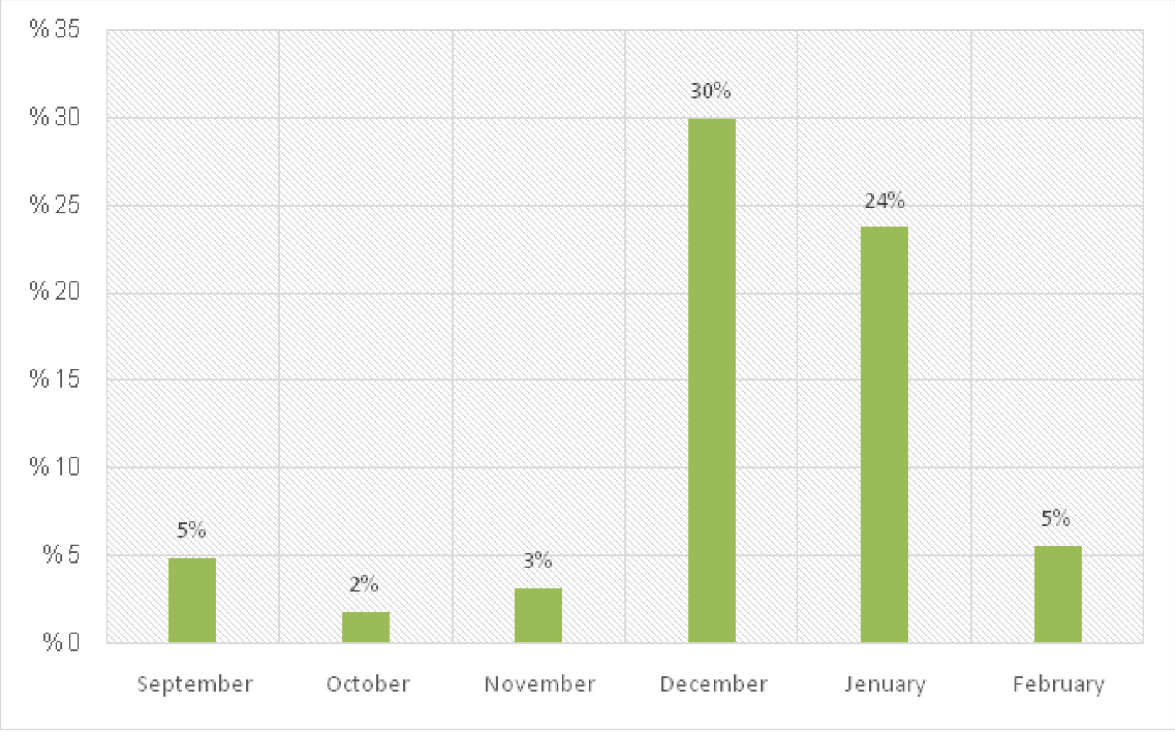

Fig. 1: The infection with Eimeriosis in sheep and goats by months study.

Table 4: Type of infection one or more species were of *Eimeria* in the faecal samples of sheep, goats, and ground (classified as single, double, and multiple infection with *Eimeria* spp.)

Samples type	Single infection	Double infection	Multiple- infection	Total number	P. Value
Sheep	78 (40.41%)	59 (30.56%)	56 (29.01%)	193	1.9
Goats	0	4 (57.14%)	3 (42.85%)	7	
Ground	34 (34.34%)	43 (43.43%)	22 (22.22%)	99	
Total number	112	106	81	299	

Table 5: *Eimeria* species identified in sheep, goats and ground and their prevalence in faeces samples.

Eimeria species	Sheep	Goats	Ground
E. granulosa	9.0	0	2.6
E. parva	7.2	0	9.3
E. ovinoidalis	16.	0	19.0
E. crandallis	8.5	0	14.4
E. ahsata	10.8	0	11.3
E. bakuensis	15.7	0	8.2
E. pallida	7.5	0	7.4
E. weybridgensis	3.9	0	3.6
E. marsica	6.7	0	9.8
E. intricata	2.7	0	2.6
E. faurei	11.6	0	9.8
E. arloingi	0	14.2	0
E. hirci	0	14.2	0
E. ninakohlyakimovae	0	28.6	1.0
E. capralis	0	14.2	0
E. christenseni	0	9.5	1.0
E. aspheronica	0	19.0	1.0

home and their mixing with each other led to spread the infection with one frequency among all. This result agree with Al-Sadoon (2018) who found highest infection rates of all age groups, but no significant differences were recorded, and effect of seasons on the infection rate of *Eimeria spp* by PCR but no significant difference were shown.

A high prevalence eimeriosis in sheep and on ground in Al-Zubair region and in goats found in Al-Basrah region related to the soil texture and suitable environmental factors.Also, A high prevalence found on December and the low prevalence found on October. This can be explain that a rain and humidity can distribution the infection because of acceleration the sporulation. Singh*et. al.,* (2017) found that a higher incidence rate of coccidian oocystsby the mean OPG value for Barbarigoats in autumn (November, December)season while, in spring season (March, April), higher values were recorded in Jamunaparigoats, by the other hand no significant seasonal variation observed in study on goats in Egypt by (El-Shahawy, 2016). While, Al-Sadoon (2018) found that Effect of seasons on the infection rate of *Eimeria spp* by PCR and a high infection rate but no significant difference were shown, while microscopically *E. ovina*, *E.intricata***,** *E.faurei*and *E.pallida* showed a significant increase between the seasons of spring and autumn in the infection rate.

Identified *Eimeria* spp. in faeces samples under this study showed that *Eimeria faurei* with high prevalencein sheep, while in goats *Eimeria ninakohlyakimova*e, on ground *Eimeria ovinoidalis* showed a high prevalence. This variation on species depending on distribution each species according to geographical distribution, strain of animals and environmental factors. Al-Sadoon (2018) recorded that The PCR total infection rate of *Eimeria spp* was recorded a significant increase between the species, and showed a high positive samples which included the highest infection rate of *E. ahsata* than *E. ovinoidalis and* low infection rate were recorded in *E. weybridgensis* and *E.crandallis*. Tauseef-ur-Rehman *et al.,* (2010) found in study of goats coccidiosis that *E. ninakohlyakimovae* was the commonest one followed were *E. arloingi, E. caprina*and *E. hirci*with prevalence of 49.25, 44.78, 25.37 and 19.40%. While, The *Eimeria* spp. were identified as *E. crandallis, E. granulosa, E. ovina, E. parva, E. faurei, E. ovinoidalis, E intricate, E. pallida, E. arloingi, and E. ahsata* in sheep, and *E. ninakohlyakimovae, E. hirci, E. caprina, E. christenseni, E. jolchijevi, E. apsheronica and E. arloingi* in goats. were recorded by (Mohamaden *et al.,* 2018).

In Antakya Province Ten different *Eimeria* species were identified in lambs;*E. ahsata, E. bakuensis, E. crandallis, E. faurei, E. intricata, E. marsica, E. ovinoidalis, E. pallida, E. parva*, and *E. weybridgensis* (Kaya, 2002).

In conclusion the current study showed a moderate prevalence of *Eimeria* spp. infected small ruminants in Basrah province/ southern Iraq and need a modern prevention programs for control and stop open habitat grazing with more studies about Eimeriosis.

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