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Prevalence of Eimeria Species in Sheep in Sulaimaniya Province, Iraq

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Abstract

The aim of this study is to determine the prevalence of Eimeria species in sheep in Sulaimaniya province, Iraq-region, between August-2012 - March 2013. The material collected for the present study was comprised of 150 sheep at nine different locations. The faecal samples consist of 28 lambs (0-6 month-old), 55sheep (6-12 month-old) and 67 sheep (>12 month old). The faecal samples were taken directly from the rectum. Oocysts of Eimeria species were found in 108 (72%) of sheep and were infected with a total of 11 species. According to the age groups 0-6 month-old lambs were recorded with highest rate. In this study 150 sheep were examined, among them 28% was not infected, 6.48 %infected with single species of Eimeria, and 67.33 %were mixed infection, and highest rate of mixed infection include 6 Eimeria species. As a result this study was to determine the prevalence of coccidiosis in sheep in Sulaimaniya province.

Keywords: Sulaimaniya (Iraq), Sheep, Eimeria, Prevalence.

1. Introduction

Coccidiosis is a series of specific infectious parasitological diseases caused by a protozoan parasite Eimeria species. Which affect the intestine of domestic animals [1, 2]. Coccidiosis has a worldwide distribution and cause a huge economical burden. Coccidia (Eimeria) are highly host specific and the disease is usually caused by either *Eimeria ovinoidalis*, *Eimeria parva* or *Eimeria ahsata* [3, 4]. The disease was mostly seen in young animals but in severe case it was also found in adult animals [5-10].

The parasite has two phases of life cycle endogenous phase and exogenous phase. During the endogenous phase the parasite undergoes numerous divisions in the intestinal cells. The sheep ingests the sporulated oocysts with contaminated feed or water. The sporulated oocysts release sporozoites in intestinal lumen (excystation). The exogenous phase takes place outside of body in the environment. Unsporulated oocysts which are passed out in the faecal material of the sheep sporulate under optimal environmental conditions [16, 19, 20].

Ingestion of infected food and water are the main source of spreading the parasite, so the symptoms of infection begin with faeces that turn to a liquid state (diarrhea; sometimes containing blood or mucus) and then continue to affecting animal's health as loss of appetite, weight loss, anemia, fatigue, wool breaking and death (10-40% morbidity and 10% mortality) [15]. Diarrhea may take several days to 2 weeks, and in rare cases animals may suffer from heavy bloody diarrhea, which mostly ends in the death of the animal [16, 17]. Once coccidiosis has been diagnosed, the treatment of affected sheep may not be effective, but the severity can be reduced with the early treatment by the drugs like Toltrazuril, Diclazuril and Sulfaquinoxaline.

2. Material and Method

2.1 Sampling

In the present study, from August 2012 to March 2013, nine different locations were selected randomly, which were: (Berashka, Qlirkh, Away Qadir Marf, Shatwan, Nawgrdan, Tasluja, Bakrajo, Kani goma and Tanjaro). Fresh faecal samples were directly taken (about 5g) from the rectum of each sheep, by wearing different gloves for each sample and with inserting middle finger in to the rectum of animals, put sample in screw-cupped and labeled plastic containers, and then transported to the clinical laboratory for examination at the laboratory of Shahid Shawkat Hospital and laboratory of Salahaddin Ayyubi College.

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Fig 1: Locations of the sites for collection of samples in Sulaimaniya province.

2.2 Laboratory Techniques

Faeces were examined according to Flotation Method in which standard Sheather saturated sugar solution was used for the Grinding of faeces samples. Addition of 2.5% Potassium dichromate to the solution for later sieving, and then left for 3-5 days for sporulation at 25±3 °C (67).

2.3 Microscopic diagnosis

Identification of the species was done with respect to the morphology of sporulated oocysts under the light microscope. Morphological characteristics: Size, shape color and wall thickness of oocyst, size and shape of sporocyst and sporozoit, presence and absence of stedia, granular pole, micropile and cap [53, 68, 69].

2.4 Statistical analysis

The results of *Eimeria* species detection for each assay were compared by Chi-square analysis using SPSS version 20 (IBM, US). Results were considered significant at $p < 0.05$.

3. Results

Table 1: Ratio of infection and number of sample animals in Sulaimaniya province based on location:

Locations of samples	Number of animals.		
	Number of samples	Number of infected	(%)
Qlirkh	5	1	(20)
Away Qadirimarf	15	7	(46.66)
Berashka	19	15	(78.94)
Nawgrdan	6	5	(83.33)
Shatwan	21	10	(47.61)
Tasluja	16	14	(87.5)
Kani goma	21	18	(85.71)
Bakrajo	24	21	(87.5)
Tanjaro	23	17	(73.91)
Total	150	108	(72)

Table 2: Ratios of infected animals according to the types of *Eimeria* species.

<i>Eimeria</i> species	Number of infected animal	(%)
<i>E. parva</i>	58	(53.70)
<i>E. pallida</i>	55	(50.92)
<i>E. ovinoidalis</i>	38	(35.18)
<i>E. bakuensis</i> (Syn: <i>ovina</i>)	36	(33.33)
<i>E. intricata</i>	35	(32.40)
<i>E. weybridgensis</i>	29	(26.85)
<i>E. marsica</i>	28	(25.92)
<i>E. crandallis</i>	27	(25)
<i>E. ahsata</i>	25	(23.14)
<i>E. faurei</i>	25	(23.14)
<i>E. granulosa</i>	16	(14.81)

Table 3: Ratios of infection in lambs and sheep according to their age and gender.

Lambs and Sheep	Female			Male			p
	Number of examined	Number of infected	%	Number of examined	Number of infected	%	
0-6 month	20	19	95	8	7	87.5	0.49
6-12 month	39	28	71.79	16	13	81.25	0.73
older than 12 month	62	39	62.9	5	2	40	0.37
Total	121	86	71.07	29	22	75.86	

(p>0.05)

P: Chi- square.

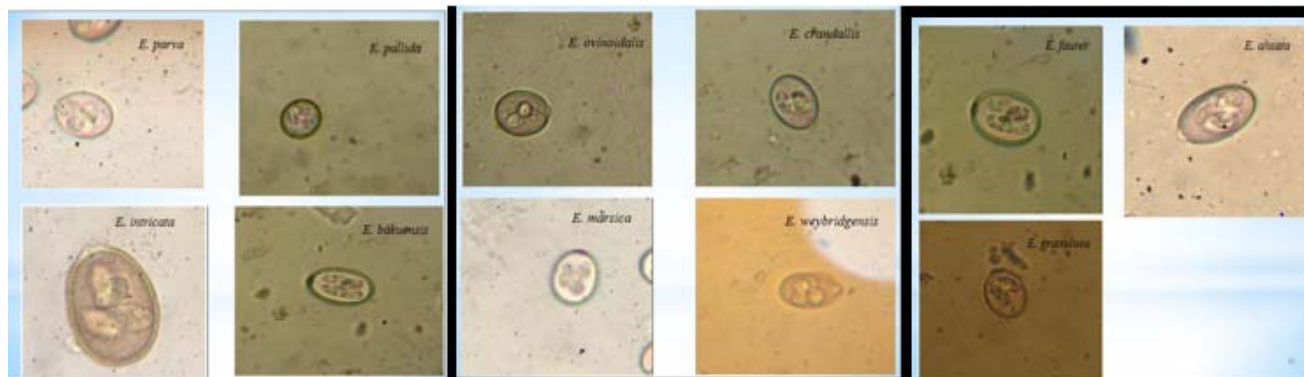
Table 4: Shows the infection of lambs and sheep with *Eimeria* species based on gender.

<i>Eimeria</i> species	Female		Male	
	Number of infected	%	Number of infected	%
<i>E. ahsata</i>	19	22.09	6	24
<i>E. bakuensis</i> (Syn: <i>ovina</i>)	30	34.88	6	16.66
<i>E. crandallis</i>	19	22.09	8	33.33
<i>E. faurei</i>	18	20.93	6	25
<i>E. intricata</i>	28	32.55	7	20
<i>E. granulosa</i>	13	15.11	3	18.75
<i>E. marsica</i>	24	27.90	4	14.28
<i>E. ovinoidalis</i>	31	36.04	7	18.42
<i>E. pallida</i>	44	51.16	11	20
<i>E. parva</i>	45	52.32	13	22.41
<i>E. weybridgeensis</i>	23	26.74	6	20.68

Table 5: Single and mixed infection among the samples.

Number of existed species	0-6 month		6-12 month		Older than 12 month		Total	
	Number of samples	%	Number of samples	%	Number of samples	%	Number of samples	%
None	2	7.14	14	25.45	26	38.80	42	28
infected with one species	0	0	4	7.27	3	4.47	7	4.66
infected with two species	6	21.42	9	16.36	10	14.92	25	16.66
infected with three species	4	13.79	16	29.09	14	20.89	34	22.66
infected with four species	5	17.85	4	7.27	6	8.95	15	10
infected with five species	2	7.14	5	9.09	6	8.95	13	12.03
infected with six species	5	17.85	5	9.09	4	5.97	14	8.66
Total mixed infection	22	78.57	39	70.90	40	59.70	101	67.33

Picture of *Eimeria* that were observer:



4. Discussion

Table 1 showed that among 150 samples collected randomly in Sulaimaniya province, 108 samples were positive for *Eimeria* species in both males and females, which make 72% of the total samples. While research data around the world shows different ratios as compared to Sulaimaniya, as under:

- Iran 19.2% (21)
- Germany 18.3% (22)
- Jordon 93.4% (23)
- Spain (Cordobaa) 83.1% (24)
- North Australia 80% (25)

- Kenya 91.02% (26),
- India (Maharashtra) 70.44% (27)
- Turkey 30.9 -100% (28)
- Iraq (Mosul province) 63.3% (29).
- In the present study, the rate of infection of *Eimeria* species among sheep in Sulaimaniya was 72 %, which is close to the result of infection in India (70.44%), higher than the results in Iran (19.2%) and Germany (18.3%), and lower as compared with Jordon (93.4%) and Kenya (91.02%).

Table 2

Researches indicated that there are 14 species of *Eimeria* that infected sheep & lambs [11, 12, 13, 14], they are *E. parva*, *E. ovinoidalis*, *E. ahsata*, *E. ovina*, *E. crandallis*, *E. pallida*, *E. granulosa*, *E. faurei*, *E. intricata*, *E. weybridgensis*, *E. punctata*, *E. marsica*, *E. gonzalezi* and *E. gilruthi*.

Different researches recorded different numbers of *E. species*, for example:

- 5 species in Italy (30)
- 6 sp. in Algeria and Poland (31,32)
- 7 sp. in Senegal (33)
- 8 sp. in Kenya, South Australia, Brazil, Spain and India (34,35,26,25,27)
- 9 sp. in Mosul (Iraq), Spain and Zimbabwe (29,36,35)
- 10 sp. in Jordan, Iceland and Kenya (23,37,38,39)
- 11 sp. in North Australia and Nigeria (40,25)
- 12 sp. in Mauritania (41).

Also in different region of Turkey different number of species were recorded, such as:

- 7 sp. in Ege region (44)
- 8 sp. in Aksaray (48)
- 9 sp. in Elazığ (49)
- 9 Bursa and Van regions (47,53)
- 10 sp. in Kars and Antakya (10, 46)

But in present study 11 species of *Eimeria* were observed. Out of these, 3 species (*E. bakuensis*, *E. weybridgensis*, *E. marsica*) were reported for the first time in Sulaimaniya, Iraq, and the others are (*E. ovina*, *E. ovinoidalis*, *E. ahsata*, *E. parva*, *E. pallida*, *E. crandallis*, *E. faurei*, *E. intricata* ve *E. granulosa*).

Table 3

All age-group of animals could be infected by *Eimeria* especially young animals (0-6 month old) are more sensitive (27, 51, 52). Infection rate based on their ages:

Study location	0-6 month old (%)	6-12 month old (%)	>12 month old (%)
India	79.2	76.6	59.2
Poland	96	39	
Egypt	79.7	79.1	66.4
Iran	74.3	70	66.4
Kenya	85.3	40.2	32.15
Turkey (Elazığ)	96.5	90.7	80.2

Research proved that female animals were more sensitive than males against infection.

For example:

In Spain: females infected at 49.26%, and males at 28.27% (53)

In Iran: females infected at 54.34%, and males at 45.65% (21)

In India: females infected at 64.3%, and males at 27.5% (5)

In Turkey: females infected at 91.4%, and males at 86% (49)

Our results

Age group	Female (%)	Male (%)
0-6 month	95	87.5
6-12 month	71.79	81.25
Older than 12 month	62.9	40

Similar result were obtained in India, Spain, Kenya and Turkey (Elazığ).

Table 4**The most common species among different countries**

E. crandallis North Avustralya (76%) (45)

E. ahsata (83.1%) in Spain (35)

E. crandallis (18.18%) in India (5)

E. ovinoidalis (31%) in Iran (21)

E. pallida (37.1%) in Jordon (23)

E. bakuensis (43.6%) in Kenya (38)

E. parva (98.3%) in Zimbabwe (36)

E. ovina ve *E. ahsata* (47.3%) Bursa (47)

E. ovina (86.7%) in Iraq (Mosul) (29).

The less common species

E. pallida (0.67%) Spain (24).

E. punctata (1%) North Australia (25).

E. ahsata (9.25%) India (27).

E. granulosa (4.4%) Jordon (23).

E. intricata (10%) in Iran (21).

E. pallida (0.67%) in Kenya and Spain (42, 35).

E. granulosa (4.4%) in Jordon (23).

E. ovinoidalis (19.34%) in Zimbabwe (23).

E. crandallis, *E. ovinoidalis* (11.7%) in Turkey (Antakya province) (3)

E. granulosa (16.2%) Iraq (Mosul) (17).

In our results the most common species are *E. parva* and *E. pallida*, and the less common is *E. granulosa*.

Table 5

Coccidiosis rarely could be found with single species of *Eimeria*, mostly seen as mixed infection. The studies that show the rate of single species infection such as:

- Jordon: (22.2%) (11)
- Saudi: (12.20%) (39)
- Turkey: Elazığ (9.6%) (32) and Kars (22.5%) (34)
- But mixed infections always higher such as studies in:
- England: (65-90%) (40)
- Egypt: (79.7%) (36)
- Poland: (59-86%) (35)
- New Zeland: (77%) (41)
- U.S.A: (62%) (42)
- Senegal: (94%) (43)
- India: (58%) (44)
- Saudi: (87%) (39).

In our results from 150 samples 28% was not infected with any *Eimeria* species 6.48% was infected with single species and 67.33% was with mixed infection.

5. Conclusion

This was the first ever study conducted in Sulaimaniya province on *Eimeria species*, which comprised 150 samples from 9 different locations. It was found in the present study that 72% of samples were infected, with a total of 11 species and 3 of them were observed in Kurdistan and Iraq for the first time (*E. bakuensis*, *E. weybridgensis*, *E. marsica*). The faecal samples were of 28 lambs (0-6 month-old), 55 sheep (6-12 month-old) and 67 sheep (>12 month old).

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