

Original article

# Detection of *Eimeria* Parasites in Sheeps and Goats in Alhamada Area, Libya

Amal Hmaid\*<sup>1</sup>, Juma Ahmed, Hana Dhaw, Ajaweed Aboulqsim, Rokaya Senni

Department of Zoology, Faculty of Science, University of Gharyan, Gharyan, Libya

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Corresponding Email. [Amal.hmaid@gu.edu.ly](mailto:Amal.hmaid@gu.edu.ly)

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## ABSTRACT

Since the Alhamada area is known for its rangelands and most of its inhabitants raise animals, especially sheep and goats, this study was conducted by collecting samples randomly from six herds of sheep distributed randomly from the specific areas of Qurayat and Ghadames. This study was aimed to determine the prevalence of *Eimeria*, which causes coccidian in sheep's and study the effects of many factors such as age, sex, and the breeding system, it is the first study conducted in the Hamada area on this parasite, using microscopic examination, 54 samples of sheep and goat feces were examined, of different ages and of both sexes in the month of May 2022. The result showed that the infection rate was 28% in sheep and 43% in goats. It was noted that there were no significant differences for age in the infection rate, as the highest infection rate was in the age group (>2) years (39%), while the lowest infection rate was in the age group of (1-2) years (7%), it was also shown that there is no significant difference for gender on the infection rate, as the infection rate in males was (22%) and females (48%). The results showed a slight difference in the infection rate between the open and closed breeding systems in the Hamada region, with the closed system averaging 25% compared to 20% in the open system. Clinical signs also appeared on some of the infected animals, including diarrhea, general weakness, and some of them showed plucking of wool/hair.

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## INTRODUCTION

There are many internal parasites that infect sheep and goats, they known as a major threat facing these animals, among these parasites are those that infect the digestive system [1], infection with parasitic protozoa is a widespread disease in the world, causes significant losses in livestock and their products [2]. Coccidiosis is considered one of the most important parasitic diseases that affect sheep and goats. It is caused by protozoa of the genus *Eimeria* that parasitize the intestinal tract of animals [3]. Diarrhea is one of the most prominent symptoms that can be observed in infected animals. It may be mixed with mucus and blood, which causes dehydration as a result of fluid loss. It also causes anemia, general weakness and severe symptoms may lead to death [4]. All ages are susceptible to infection but the disease is more serious in young animals [5]. Animal become infected with this parasite through ingestion mature sporulated oocyst eggs spread in the environment and from infected animals [6-4].

About 13 species of the genus *Eimeria* have been identified in goats in different parts of the world [6], as will there are 11 species infecting sheep [7]. The *Eimeria* parasite is very specialized for the host, meaning that the species that infect sheep may not infect goats, despite their great similarity. The parasite has a direct life cycle that occurs in one host [8].

This parasite lives inside the cells which lining the intestines of all birds and herbivorous animals. despite human direct interaction with most of these animals, there are no species of the *Eimeria* genus that are parasitic on humans [8]. Diagnosis of infection with this parasite is done by visual examination of the animal's feces and observing its color and consistency [9]. To confirm the infection, a microscopic examination of the feces is performed using the direct smear method or the flotation method [10]. The sedimentation method can also be used to detect *Eimeria* parasite egg cysts [1]. In addition, post-mortem examination of carcasses can reveal the presence of gametocytes inside cells. However, molecular testing using the polymerase chain reaction (PCR) is the most recent diagnostic method and can also be used to differentiate between species [6]. The *Eimeria* parasite is widespread throughout the world. Infection is observed throughout the year, but the incidence of infection is higher in the winter and spring seasons due to increased humidity [9]. Due to the economic impact of the disease, it has attracted the attention of many researchers around the world. A study conducted by [11] on goats in the Iğdır region of Turkey showed that the overall infection rate with *Eimeria* parasites was 82%. In Iran, [12] recorded an overall infection rate of 91.5%.

In terms of studies in the Arab world, [13] reported that the infection rate with *Eimeria* parasites in the Suez Governorate of Egypt was 57.70% in sheep and 60% in goats. A study by [14] on sheep and goats in the city of Tikrit in Iraq showed that the overall infection rate in the region was 56.25% in sheep and 69.05% in goats.

As for studies in Libya, the results of the necropsy study conducted by [4] showed that the intestinal mucosa was thickened with the presence of white nodules due to the presence of different stages of *Eimeria* parasites in the intestinal cells.

Due to the scarcity of studies on this topic in Libya and its absence in the AlHamada area, this study was conducted to determine the prevalence of *Eimeria* infection in sheep and goats in the study areas. To investigate the relationship between the prevalence of *Eimeria* infection and the age, sex, and breeding system of the animals.

## METHODS

Samples were collected randomly from the AlHamada area. The current study included 54 fecal samples, 22 from sheep (*Ovis aries*) and 32 from goats (*Capra aegagrus hircus*), with 16 samples from males and 38 samples from females, of different ages ranging from 1 month to 8 years, in May 2022.

*Table 1. A total of 6 flocks were studied*

Flock	N. of animals	N. samples collected	Type of breeding	Health of flock & Nutrition	Notes
F. 1	29	9	Closed breeding system	Good health & Feed, hay and household food leftovers	Closed breeding system (The diet in this system was based mainly on feed consisting of barley, hay and household food leftovers).
F. 2	30	11	Closed breeding system	Good health & Feed, hay and household food leftovers	
F. 3	25	15	Closed breeding system	Good health & Feed, hay, and household food leftovers	Some individuals suffered from some physical weakness and from eating foreign objects such as bones and plastic.
F. 4	45	5	Closed breeding system	Very good health & Feed, hay, and household food leftovers	
F. 5	200	8	Open breeding system	Weak health & Grazing in open areas, eating natural herbs and grasses	Some individuals suffered from emaciation and weakness.
F. 6	500	6	Open breeding system	Very good health & Grazing in open areas, eating natural herbs and grasses	

Fecal samples were examined using both the direct smear method, where a small amount of feces was smeared on a microscope slide, stained, and examined for oocysts, and the flotation method, where feces were suspended in a flotation solution, centrifuged, and the oocysts were collected from the surface of the solution for microscopic examination.

The data was analyzed using the Chi-square test to evaluate the association between *Eimeria* infection prevalence and animal age, sex, and breeding system, and ANOVA to compare mean oocyst counts among different animal groups. Additionally, a questionnaire was used to collect information for each animal, including species, sex, age, location, sample collection date, herd size, and herd health status.

### Collection, preservation and examination of samples

Fecal samples were collected directly from the rectum of each animal after that samples were placed in clean, sealed plastic containers with a capacity of 20 ml then were stored in a refrigerator at 4°C, finally Samples were transported to the Gharyan Veterinary Laboratory for analysis.

The samples were analyzed using the following protocol: Each sample was completely submerged in distilled water and homogenized with a marble pestle. A portion of each sample was then transferred to a clean glass slide using a disposable plastic pipette, covered with a coverslip, and examined under a light microscope. *Eimeria* oocysts were observed using an initial magnification of 10x, followed by 25x. Some samples were further examined at 40x magnification for confirmation. Negative samples were re-analyzed using the sedimentation method described by [15].

### Statistical analysis

The statistical software R (version 4.0.2) was used to calculate the prevalence of infection by sex, age group, and farming system. Additionally, T-tests and ANOVA were employed to investigate potential differences in the outcome based on sex, age group, species, and farming system.

## RESULTS & DISCUSSION

A total of 54 fecal samples from sheep (n=22) and goats (n=32) were examined microscopically for *Eimeria* oocysts. The animals were of varying ages and sexes and were raised in the AlHamada area. The study aimed to determine the prevalence of infection based on age, sex, and farming system. Some infected animals exhibited clinical signs such as diarrhea, emaciation, general weakness, and hair loss.

The results of this study revealed clinical signs in some infected sheep, which aligns with the findings of [16]. This outcome is consistent with parasitic infections, where the presence of *Eimeria* oocysts in the intestines leads to the destruction of the epithelial lining, reducing the surface area for nutrient absorption. Consequently, this can cause diarrhea, general weakness, emaciation, and other clinical signs [17].

### Prevalence of infection

The overall prevalence of infection in this study was 35% (19 out of 54 samples), with a lower prevalence of 28% (15 out of 54 samples) observed in sheep. These rates are significantly lower than those reported in previous studies from Sudan (83.70%) [18], Turkey (100%) [19], Iran (80.48%) [20], and Germany (43.1%) [21]. The variation in infection rates may be attributed to differences in the number of animals examined, health and environmental conditions, and the timing of the studies.

The prevalence of infection in goats was 42% (23 out of 54 samples) which is somewhat high, even though higher rates have been recorded comparing with other studies. For example, *Eimeria* oocysts were found in 187 (89.91 %) out of 208 faecal specimens [22]. 64.2 % of the 81 goats [23]. The variation of infection rate may also be due to the efforts made in the breeding system and the attempt to control the disease or due to the development of herd immunity under field conditions [24].

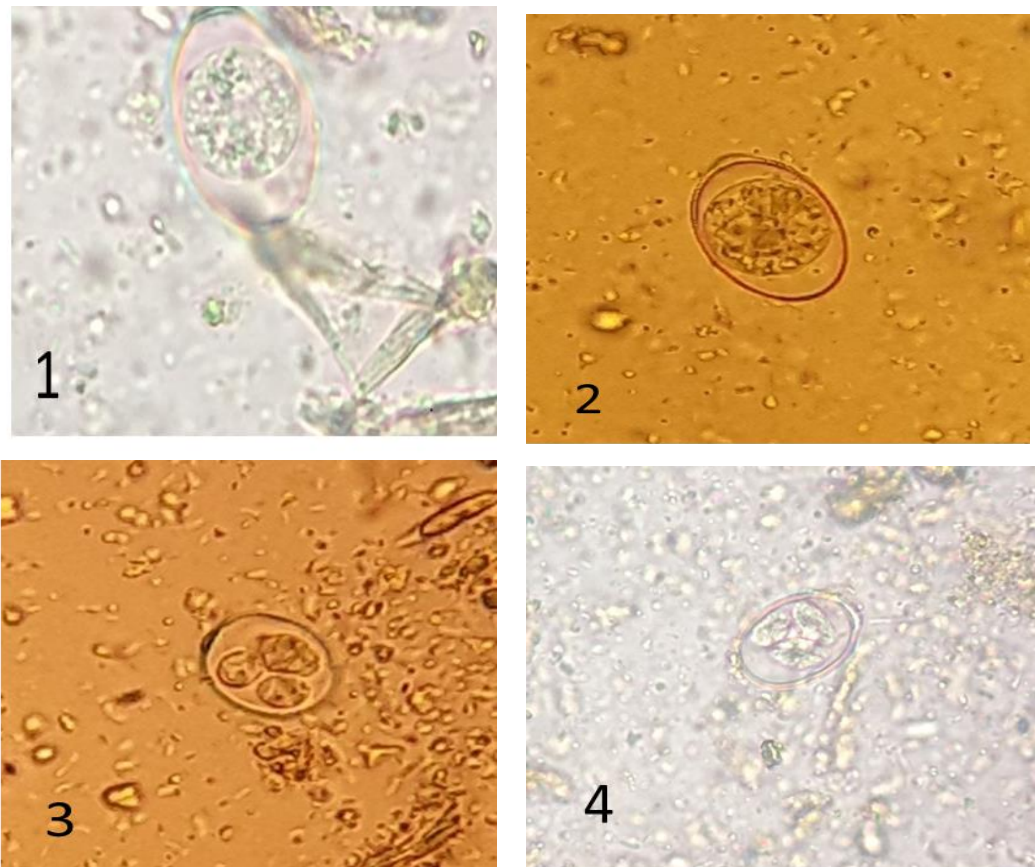
Figure (1) serve as a visual representation of *Eimeria* oocysts, Understanding the morphology and characteristics of *Eimeria* oocysts is crucial for implementing effective coccidiosis prevention and control strategies.

### Effect of age

Age did not significantly affect the prevalence of infection in sheep ( $P > 0.05$ ). The highest prevalence (39%) was observed in sheep older than 2 years, while the lowest (7%) was found in the 1–2-year age group. This may be attributed to the fact that older lambs, who tend to play and interact more, are naturally curious and explore their surroundings, potentially increasing their exposure to pathogens.

Table 2. Prevalence of infection in sheep according to age group

Age group	Number of samples	Number of infected samples	Prevalence (%)
1-2 years	18	1	7
2-3 years	14	6	43
> 3 years	20	8	40



**Figure 1. Eimeria oocysts. 1,2 Unsporulated oocyst; 3,4 sporulated oocyst**

### **Effect of sex and farming system**

#### **Sex**

We found that neither sex nor age influenced the prevalence of coccidiosis in adult sheep. However, in adult goats, females had a significantly higher prevalence of infection than males, which is consistent with the findings of [13]. In contrast, there was no significant difference in the prevalence of infection between male and female sheep, aligning with the results of previous studies [13-25].

While the statistical analysis did not detect a significant difference in infection prevalence between males and females ( $p < 0.05$ ), the observed prevalence was higher in females (48%) compared to males (22%). This finding could be due to biological or behavioral factors and There's a possibility that female hormonal cycles might influence the immune response, making females more susceptible during certain times Further investigations are needed to understand the underlying mechanisms.

**Table 3: Prevalence of infection according to sex**

Sex	Number of samples	Number of infected samples	Prevalence (%)
<b>Male</b>	16	4	25
<b>Female</b>	38	15	39

#### **Farming system**

Statistical analysis did not reveal a significant difference in the prevalence of infection between the two grazing systems ( $P > 0.05$ ). However, the closed grazing system had a slightly higher prevalence (30%) compared to the open grazing system (20%). This finding may be attributed to factors such as increased animal contact rates or the accumulation of pathogens in the closed environment. Further research is needed to elucidate the underlying mechanisms, and a larger sample size might be necessary to detect a statistically significant difference.

**Table 4. Prevalence of infection according to farming system**

Farming system	Number of samples	Number of infected samples	Prevalence (%)
Open grazing	14	3	21
Closed grazing	40	16	40

## CONCLUSION

The results show that there is no statistically significant difference in the prevalence of infection between males and females or between the two farming systems. This may be attributed to the small sample size of the study. Despite not achieving the desired results, the spread of the disease has been observed at this study area, which necessitates more comprehensive studies with a much larger sample size than the one used in this study. Considering factors like age and coccidian species in future studies. Also Investigate potential differences in environmental conditions between the grazing systems and evaluate management practices in both systems (Open and Closed grazing) to identify potential risk factor. Finley By recognizing *Eimeria* oocysts, livestock producers and veterinarians can take proactive measures to protect animal health which include proper sanitation, strategic use of anticoccidial drugs, and maintaining healthy animal nutrition could minimize economic losses.

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## الكشف عن طفيل الأيميريا في الأغنام والماعز بمنطقة الحمادة، ليبيا

آمال احميد\*, جمعة أحمد، هناء ضو، أجويد أبو القاسم، رقية سني

قسم علم الحيوان، كلية العلوم، جامعة غريان، غريان، ليبيا

### المستخلص

نظراً لأن منطقة الحمادة معروفة بمراعيها ويقوم أغلب سكانها بتربية الحيوانات وخاصة الأغنام والماعز، أجريت هذه الدراسة بجمع عينات عشوائياً من ستة قطعان من الأغنام موزعة عشوائياً من مناطق محددة في قريات وغدامس. وهدفت هذه الدراسة إلى تحديد مدى انتشار طفيلي الأيميريا المسبب للكوكسيديا في الأغنام ودراسة تأثير العديد من العوامل مثل العمر والجنس ونظام التربية، وهي أول دراسة تجرى في منطقة الحمادة على هذا الطفيلي، وباستخدام الفحص المجهرى تم فحص 54 عينة من براز الأغنام والماعز من مختلف الأعمار ومن كلا الجنسين في شهر مايو 2022. وأظهرت النتيجة أن نسبة الإصابة كانت 28% في الأغنام و43% في الماعز. وقد لوحظ عدم وجود فروق معنوية للعمر في معدل الإصابة حيث كان أعلى معدل إصابة في الفئة العمرية (<2) سنة (39%) بينما كان أقل معدل إصابة في الفئة العمرية (1-2) سنة (7%)، كما تبين عدم وجود فروق معنوية للجنس في معدل الإصابة حيث بلغ معدل الإصابة في الذكور (22%) والإناث (48%). وأظهرت النتائج وجود فرق طفيف في معدل الإصابة بين نظامي التربية المفتوح والمغلق في منطقة حمادة حيث بلغ متوسط النظام المغلق 25% مقارنة بـ 20% في النظام المفتوح. كما ظهرت علامات سريرية على بعض الحيوانات المصابة منها الإسهال والضعف العام وبعضها ظهر عليها نتف الصوف/الشعر.

**الكلمات المفتاحية:** الكوكسيديا، الأيميريا، الثروة الحيوانية، الكائنات الأولية.