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**PERCENTAGE PREVALENCE OF EIMERIAN SPECIES IN AWASSI SHEEP  
IN NORTHERN OF PALESTINE**

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**Abstract**

The prevalence and the species of *Eimeria* oocysts in 180 fecal samples of immature and adult domestic Awassi sheep were screened in 16 farms in four provinces northern Palestine, the overall incidence of the all types of coccidian oocysts was 68.75%. The prevalence of the oocysts in was significantly higher ( $p < 0.05$ ) in farms in Tubas (mean 100%) compared to Jenin (mean 75%), Nablus (mean 50%) and Tulkarem (mean 50%). The prevalence of the oocysts was significantly higher ( $p < 0.05$ ) in immature sheep (less than one year) with mean of 60% compared to adult sheep (more than a year) with mean of 40%. Eight species of *Eimeria* were indentified, they (and their prevalence) were *E. Crandalis* (18.88%), *E. Parva* (14.44%), *E. Intricata* (12.77%), *E. Ovina* (10%), *E. Ahsata* (8.88%), *E. Ovinoidalis* (8.33%), *E. Pallida* (7.22%) and *E. Faurei* (%6.66), a single infection was not observed, all of the infected sheep had mixed infections with two to five species.

**Key words:** *Prevalence, Eimeria, Awassi sheep, north Palestine.*

**Introduction:**

Coccidiosis are generally regarded as one of the primary widespread parasitic diseases in various countries around the world. It is of great economic importance as well as serious cause of lowered productivity and ill-health in all animals' species including sheep, goats, cows, and others. The disease occurs in clinical and subclinical forms due to the infection with different species of *Eimeria*. Identification of *Eimeria* species may be important because of differences in pathogenicity [13, 16, 17, 18, 19, 23]. The prevalence of coccidia has been recorded in sheep in many countries of the world. Fifteen *Eimeria* species has been reported that infect sheep, including fourteen species found in the intestines of infected sheep and one in abomasums [17].

As the importance of coccidian infection in sheep lies in the possibility of infects lambs before weaning, lambs after weaning and all ages are also susceptible to this disease. In many cases infected animal shows no symptoms and subclinical infection occur. The form and severity of the disease depends on the *Eimeria* species that infect the animal. *E. ovinoidalis*, *E. ovina*, *E. ahsata* and *E. crandalis* are pathogenic species while *E. faure*, *E. parva*, *E. pallida*, *E. intricata*, *E. granulosa*, *E. gilruthi* and *E. punctata* are considered as nonpathogenic [10, 21]. The infection also depends on the number of oocysts taken by animal as well as the age of the animal and immunity status. The incidence and spread of the disease in animals varies from one region to another, depending breeding system, stresses in the herd (e.g. crowded environment or weather stresses: cold, hot, high humidity). When the oocyst is not infective, it must undergo a period of development called sporulation which requires oxygen and moisture in order to become infectious [10, 16, and 20].

The objectives of this study were to determine the prevalence of infection with coccidia in different age groups of Awassi sheep in Palestine and to identify the occurrence of *Eimeria* species in these animals. This effort is an initial survey to gain information that have not been previously reported from Palestine.

## MATERIALS AND METHODS

### *Study area*

The survey was conducted during the period from January to end of May 2013 in four major provinces in the north of Palestine: Nablus, Jenin, Tubas and Tulkarem. The province of Nablus and Jenin mediates the territory of the Palestinian highlands and mountains. The province of Tulkarem is located in central of plains and mountains, whereas Tubas is located within the Jordan Valley. The sheep population in the study area is almost 328,677 heads [24].

### *Sample size*

A total of 180 fecal samples (5 gram per animal) were collected directly from the rectum of Awassi sheep from four flocks of each province. A total of 68 samples were collected from immature sheep and 112 from adults. Collected samples were placed in labeled airtight plastic container and stored at 4°C for later examination.

### *Parasitological examination.*

Sample analysis was performed at parasitological laboratory of the Faculty of Veterinary Medicine at An-Najah National University. Part of each sample (3g) was mixed with 42ml tap water, then the mixture was subjected to centrifugal sedimentation and flotation technique by using saturated salt solution. The oocysts were then identified on the basis of the morphological characteristics and size. The sporulated oocysts were detected by oil immersion and measured by calibrated ocular micrometer [8,19].

### *Statistical analysis.*

Statistical analysis was undertaken using the ANOVA test with a confidence interval of 95% (SPSS 11.5, Inc., Chicago).

## Results

The percent of infected farms was 68.75%. Tubas province ranked first, followed by Jenin, Nablus and Tulkarem, where incidence rates were 100, 75, 50 and 50% in these provinces, respectively (Table 1).

Among the 180 sheep examined, 86 samples (47.7%) were found to harbor the oocysts of *Eimeria* spp. Out of 68 immature sheep, 60% of them were positive for coccidia. The infection in young sheep was higher ( $p < 0.05$ ) compared to that in adult sheep (Table 2).

The prevalence percentage of different identified species of *Eimeria* is presented in Table (3).

It is worth to mention that no single infection was observed, and all of the infected sheep had mixed infections with two to five species (Table 3).

## Discussion

Since coccidiosis has a great impact on sheep industry, identification of the prevalence and current *Eimeria* species will help to minimize the economic losses in the sheep industry. The prevalence of *Eimeria* species as identified in this study was 68%. It is within the infection range in different countries. The prevalence rate of *Eimeria* species in Saudi Arabia, was 41% [21], Iran 16.7% [23], India 24.12% [13], Tanzania 93% [11], Senegal 94% [22], Pakistan 51.61% [2], 80% in South Australia [15] and 85% in goats at north of Jordan [1]. The variation in the incidence of *Eimeria* from one region to another might be due to several factors, including the animal factors such as the immunity, age and degree of exposure to the stress factors. Environmental factors such as climate include temperature and humidity, extent of contaminated pasture with *Eimeria* oocysts,

the appropriate environmental conditions for the occurrence of sporulation, as also due to the different management systems in the examined farms at different locations.

The highest ( $p < 0.05$ ) infection rate observed was in Tubas where the infection rate reached 100% compared to that in Jenin, Nablus and Tulkarem. The infection rates in these three locations was 75, 50 and 50%, respectively (**Table 1**). This has been attributed to location of Tubas which is close to the Jordan valley area which characterized by the high temperature during the study, the large sheep population, the wide spread rangelands. These characters of Tubas province provided more opportunities for contamination with *Eimeria* oocysts, since this nature is not available in Nablus and Tulkarm districts and some areas Jenin and predominantly mountain. Many studies have indicated that plain and pastoral areas are more polluted and likely to spread *Eimeria* oocysts [16, 21].

The prevalence of coccidian oocysts was higher in the immature than adult sheep ( $p < 0.05$ ), this is consistent with several studies which indicated that the largest spread of infection *Eimeria* at ages ranging from 6 to 12 months compared to animals with ages more than one year [1, 3, 16, 20, 23]. This has been attributed to lower resistance to coccidia in immature compared to adult animals. In addition, keeping different ages of sheep at the same farm, a common practice in sheep farms in Palestine, enhances the *Eimeria* oocyst contamination especially lambs that are grazing for the first time. Some studies indicated the seriousness of coccidiosis in sheep before and after weaning due to not fully developed immune systems in these animals [23].

In present study eight species of *Eimeria* oocyte were identified (**Table 3**). *E. crandalis* ranked first with 18.88% followed by *E. parva* with 14.44%, then *E. intricata* 12.77%, then *E. ovina* 10%, *E. ahsata* 8.88%, *E. ovinoidealalis* 8.33%, *E. pallida* 7.22% and finally *E. faurei* 6.66%. A single infection was not observed, and all of the infected sheep had mixed infections with 2 to 5 species.

Similar observations have been reported in sheep and goat in various studies over the world. In Tanzania 7 species of *Eimeria* were discovered in sheep [11], 9 in Egypt [14], 11 species in South Australia [15] and in Belgium [4], 8 in Senegal [22] and 10 species north-west Germany [3]. In goat 10 species of *Eimeria* were reported in South Africa [9] and 8 species in the north Jordan [1]. Infection with more than two species of *Eimeria* is a common pattern in various countries around the world. In Turkey, Toulah (2007) reported 3 to 5 different species of *Eimeria* per sample [10], in Iran 3 species of *Eimeria* in per sample [23] and in Saudi Arabia 3 to 5 species of *Eimeria* in per sample [21].

### **Recommendations:**

This study shows that the sheep coccidiosis exists and spread in farms in northern Palestine. Some special procedures should be considered to decrease the infection. Providing model farms to maintain sanitation and to get rid of excess moisture should be considered. Animal density in farms and in pastures, and age groups should be also properly managed as well as taking into account the use of anti-coccidiosis prevention and when the recurrence of the disease in the herd.

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**TABLE 1**

The prevalence of *Eimeria* oocyte in faecal samples from Awassi sheep in 16 farms from four provinces northern Palestine.

Province	No. of examined farm	No. and percentage of farm diagnosed positive
Tulkarem	4	2(50%)b
Nablus	4	2(50%)b
Tubas	4	4(100%)a
Jenin	4	3(75%)b
<b>Total</b>	<b>16</b>	<b>11 (68.75%)</b>

Data with the same letter are significantly differ ( $p < 0.05$ )

**TABLE 2**

The prevalence of *Eimeria* oocyte in faecal samples from immature (under a year) and adult (over a year) Awassi sheep in 16 farms from four provinces northern Palestine.

Age	No. of examined sheep	No. and percentage of diagnosed positive
Immature	68	41(60%)a
Adult	112	45(40%)b
<b>Total</b>	<b>180</b>	<b>86 (47.77%)</b>

Data with the same letter are significantly differ ( $p < 0.05$ )

**TABLE 3**

Percentage of different *Eimeria* species exhibited by oocysts in 180 samples in Awassi sheep in northern Palestine

<i>Eimeria species</i>	Number and prevalence percentage
<i>E. ovina</i>	18 (10%)
<i>E. parva</i>	26 (14.44%)
<i>E. intricata</i>	23 (12.77%)
<i>E. ahsata</i>	16 (8.88%)
<i>E. faurei</i>	12 (6.66%)
<i>E. pallid</i>	13 (7.22%)
<i>E. crandalis</i>	34 (18.88%)
<i>E. ovinoidalis</i>	15 (8.33%)