

Prevalence and Associated Risk Factors of Ovine Oestrosis in Dendi District of Central Ethiopia

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Background: Ovine oestrosis is an economically important and widely distributed parasitic disease of sheep that is caused by *Oestrus ovis* larvae across the world. Despite the fact that *Oestrus ovis* is a common parasite in Ethiopia and that there are many sheep in the study area, there is no information on the prevalence, larval burden, predilection sites, and risk factors associated with *Oestrus ovis* infestation in sheep in the Dendi district of West Shewa Zone, Ethiopia.

Methods: A cross-sectional study was conducted from November 2017 to April 2018, to estimate the prevalence, risk factors, and larval burden, and identify common predilection sites for *Oestrus ovis* larvae. A total of 180 sheep heads were randomly selected from five purposely selected restaurants in Ginchi town, Dendi district, transported to the laboratory, opened with a hand saw, and visually examined for infestations. The larvae were collected from positive sheep heads and counted. The sites where the larvae were obtained were recorded. The data were analyzed using SPSS version 20 software.

Results: Of the total of 180 examined sheep heads, 104 (57.8%) were infested with larvae of *Oestrus ovis*. In the study, a statistically significant difference ($p > 0.05$) was not observed in the prevalence of *Oestrus ovis* in relation to all considered risk factors such as sex, age, and origin of sheep. From 104 infested sheep, a total of 664 larvae were detected in different parts of sheep heads. The mean larval intensity per infested animal with *Oestrus ovis* was 6.38. In this study, the minimum and maximum numbers of larvae recovered were 1 and 26, respectively. The nasal cavity, nasal sinus and frontal sinus were the predilection sites of *Oestrus ovis* larvae identified in this study.

Conclusion: Oestrosis is an important and common parasitic disease of sheep in the study area.

Keywords: Dendi, Ethiopia, *Oestrus ovis*, ovine, prevalence, risk factors

Introduction

Myiasis is an infestation of tissue and organs of animals or man with dipteran fly larvae.^{1–3} Oestrosis is a myiasis caused by dipteran flies of the family Oestridae, genus *Oestrus*, and species of *Oestrus ovis*. *O. ovis*, the sheep bot fly, is an economically important, obligatory parasite of the nasal cavities and adjoining sinuses of sheep and goats.^{3,4} Oestrosis is primarily a disease of sheep, which are widely distributed across the world. Goats are less affected than sheep. Other animals, including humans, are also affected.^{2,5}

The *O. ovis* infestation phase arises when the adult fly starts to deposit the larvae. Larvae pass through three stages or instars.⁶ The female *O. ovis* fly is viviparous and deposits L1 in or around the nostrils. Inside the nasal cavities, the first instar larvae attach to the mucous membrane, change to second instars, move up to the sinuses and molt to L3. Finally, mature third instar larvae return to the nasal passage, are expelled out by the sneezing action of the host, and pupate in the soil to give rise to further generations of adults.^{2,5}

Oestrus ovis is a problem for sheep and goats worldwide.⁶ Both adult and larval stages have an effect on the host. The activities of adult flies during the deposition of larvae cause annoyance, which results in loss of body condition.^{2,5} Infestation by larvae of *O. ovis* causes great irritation to the host which results from mechanical activity of the mouth

hooks and larval spines as well as the effect of proteolytic enzymes excreted or secreted by *O. ovis* larvae. The damage caused by the larval stage depends on the number of larvae and the site of infestation.² The activities of larvae in sheep cause nasal discharge, sneezing and dyspnea. Death of larvae inside the sinus predisposes sheep to secondary bacterial infection. Larvae sometimes migrate into the brain of sheep and cause in coordination called “false gid”.^{4,6}

Oestrosis in small ruminants causes substantial economic losses to sheep and goat producers.^{6,7} The pathogenic effects cause a reduction in production and serious economic losses, which have been estimated at 1.1–4.6 kg of meat, 200–500 g of wool, and up to 10% of milk per animal.² Mozaffari et al⁷ also reported a 10% mortality rate of sheep with *O. ovis* infestation. Besides, oestrosis has public health significance. In humans, *O. ovis* larvae infestation causes ocular myiasis (ophthalmomyiasis)⁸ and, rarely, nasal myiasis.^{9,10}

In Ethiopia, a few studies were conducted on ovine oestrosis. Prevalence of 77.42% in Debre Zeit area, Central Ethiopia,¹¹ 94.6% in Central Oromia¹² and 69.8% in Ambo were reported in sheep.¹³ These shows, *O. ovis* are a common and important parasite of sheep in the country. Moreover, presence of large number of sheep population, conducive climatic conditions for the parasite to complete its life cycle, extensive grazing system used in which the animal on pasture throughout all months of the year and increased production systems in the country create ideal conditions for the spreading out of this type of parasitism in small ruminants. Although, the impact of *O. ovis* on sheep producer is known, larval burden, prevalence and risk factors associated with parasite distribution are not known in Dendi district. An assessment of the current situation of ovine oestrosis in the study area will provide baseline information against the diseases and plays a significant role in designing strategic control toward the parasites. Therefore, the objectives of this study were to estimate the prevalence, larval burden, risk factors associated with *O. ovis* infestation and predilection site of the larvae in sheep slaughtered at Ginchi town, Dendi district of West Shoa Zone, Ethiopia.

Materials and Methods

Study Area

The study was conducted from November 2017 to April 2018 in the Dendi district of the West Shewa Zone, Oromia regional state, Ethiopia. Dendi district is located 79 km from Addis Ababa with an elevation ranging from 2000 to 3288 meters above sea level. Geographically, the district lies within the coordinates of 8°43'N-9°17'N and 37°47'E-38°20'E. Dendi is bordered on the west by Ambo, on the east by Ejerie, on the north by Jeldu and on the south by the Southwest Shewa Zone. The administrative town of Dendi district is Ginchi. The temperature ranges from 9.3–23.8°C and the annual rainfall of the Dendi district ranges from 750–1170 mm. The number of sheep in the West Shewa Zone was estimated to be around 1,028,162.¹⁴

Study Animal

The study was carried out in sheep bought for slaughter by restaurant owners of Ginchi town, Dendi district, West Shewa Zone, Oromia regional state, Ethiopia. The sheep slaughtered here came from surrounding kebeles of the district. For the prevalence study, only apparently healthy animals able to be slaughtered and both female and male with the age reached for slaughter (approximately 6 months and above) were included in the study. Dentation was used to estimate the age of each sheep,¹⁵ which was then divided into two groups: adult (> 1 year) and young (1 year) to determine the presence of age-related *O. ovis* larvae infestation.¹² Information on the origin and sex of the sheep was obtained from restaurant owners.

Study Design

A cross-sectional study was conducted to estimate the prevalence and risk factors associated with *O. ovis* in sheep in the study area, as well as to determine the larvae burden and preferred site of *O. ovis* larvae.

Sampling Technique

Five restaurants found in Ginchi town, Dendi district, West Shewa were selected purposively. Weekly visits to selected restaurants private slaughter slabs were made to collect the samples. Slaughtered sheep heads were randomly selected from each of the selected restaurants.

Collection and Examination of Sheep Heads

Heads of selected sheep were put into separate plastic bags, labeled, stored in the icebox and transported to the laboratory of Veterinary Laboratory Technology, Guder Mamo Mezemir Campus, Ambo University, for examination. In the laboratory, the skin was removed and the head was parted longitudinally into two symmetrical parts by using a hand saw,^{11–13} and inspected visually for infestation. From positive sheep heads, all existing larvae were collected using forceps and counted. The site in which the larvae were found was recorded.

Data Analysis

The collected data were entered into a Microsoft Excel spread sheet. The Statistical Package for the Social Sciences (SPSS) version 20 software was used to analyze the data. A Chi-square test (χ^2) was used to determine the statistical significance of the association of *O. ovis* infection with sex, age, and origin of sheep. The statistical analysis was considered significant at $p < 0.05$.

Results

From the total of 180 examined sheep heads, 104 (57.8%) were infested with larvae of *O. ovis*. The prevalence of *O. ovis* larvae infestation based on the sex, age, and origin of sheep were summarized in Table 1. In the present study, there was no significant variation ($p > 0.05$) of *O. ovis* infection between sexes, age, and origin of sheep.

Larvae Burden of *Oestrus ovis*

The larvae found in all positive sheep heads were counted and recorded. From 104 infested sheep, a total of 664 larvae were detected in different parts of sheep heads. The mean larval intensity per infected sheep was 6.38. In this study, the number of recovered larvae ranged from 1 to 26. The maximum and minimum numbers of larvae detected in this study were 26 and 1, respectively (Table 2).

Predilection Sites of *Oestrus ovis* Larvae

The nasal cavity, frontal sinus, and nasal sinus were the predilection sites of the detected *O. ovis* larvae in the current study. Smaller numbers of larvae were recovered from the nasal cavities of sheep (Table 3).

Discussions

This study revealed that *O. ovis* is a common and important parasite of sheep in the study area. In the current study, an overall 57.8% prevalence of *O. ovis* infestation was recorded in sheep. On the contrary, higher prevalence were reported by Yilma, Genet¹¹ in Debre Zeit, Central Ethiopia; Gebremedhin¹³ in Ambo; and Alem et al¹² in Central Oromia,

Table 1 Prevalence of *Oestrus ovis* Infection on Basis of Sex, Age and Origin of Sheep

Variables	Category	Total Number	No Examined	No. Positive	Prevalence (%)	P - value	χ^2
Sex	Female	180	118	66	55.9	0.489	0.478
	Male		62	38	61.3		
Age	Young	180	79	49	62	0.308	1.041
	Adult		101	55	54.5		
Origin	Galesa	180	56	33	58.9	0.589	1.902
	Asgori		44	23	52.3		
	Dano		41	27	65.8		
	Wamura		39	21	53.8		

Table 2 Mean Larval Burdens in the Heads of Examined Sheep

No. Examined	No. Positive	Mean Larval Count per Positive	Min. Larvae per Head	Max. Larvae per Head	Total Larvae Count
180	104	6.38	1	26	664

Table 3 Common Predilection Sites of Recovered *Oestrus ovis* Larvae

Predilection Site	No. Positive	The No. of Recovered Larvae	Percent per Total Examined Animal (%)
Frontal sinus	13	116	12.5
Nasal sinus	10	51	9.6
Nasal cavity	5	10	4.8
Frontal sinus and nasal sinus	23	194	22.1
Nasal cavity, nasal sinus and frontal sinus	53	293	51
Total	104	664	

Ethiopia. The difference in prevalence may be attributed to differences in sample size, study periods, and agroecology like moisture, temperatures, and altitude that create a suitable environment for the nasal bot fly to exist, the absence of treatments against this parasite, and the absence of community awareness of the effect and controlling methods of the parasite in the area.⁵

This study revealed a higher prevalence of ovine oestrosis in relation to the studies conducted in some other countries, which reported 13.7% in Brazil,¹⁶ 40.3% in North Eastern Turkey,¹⁷ 40.83% in Iraq,¹⁸ 19% in Ecuador,¹⁹ 38.71% in Eastern Turkey.²⁰ This might be due to the breed of sheep in other parts of the world being more resistant to oestrosis than the sheep in the study area. The climatic and geographical variations of the study area and other parts of the world might also have created differences in prevalence.

In the current study, a statistically significant difference ($p > 0.05$) was not observed in the prevalence of *O. ovis* in relation to all considered risk factors such as sex, age, and origin of sheep in the study. This finding is similar to previous reports by Arslan et al¹⁷ and Özdal et al.²⁰ This might be due to the ability of the *O. ovis* fly to feed on any available animal.² This contradicts previous findings by Abo-Shehada et al,²¹ Shoorijeh et al,²² and Gebremedhin¹³ who found a significant difference in *O. ovis* infestation between males and females. Significant variation in *O. ovis* infestation among young and adults, which is inconsistent with our findings, was reported by Yilma and Genet¹¹ Horak²³ and Papadopoulos et al²⁴ respectively.

In this study, no statistical difference ($p > 0.05$) was also found between the origins of sheep that were oestrosis positive. This might be due to the similarity of climatic conditions, which are an important factor for the distribution of the fly between the origins of the sheep.^{5,25} This finding agreed with that of Murguía et al²⁶ in the Central Region of Yucatan, Mexico; Negm-Eldin et al²⁷ in the Green Mountain area of Libya, Saleem et al²⁸ in north India, which were insignificant with respect to the origin.

The current study revealed that there is a 6.38 mean larval burden of the *O. ovis* infestation in sheep. This disagrees with previous investigators' findings by Caracappa et al,²⁹ Gebremedhin,¹³ Silva et al,¹⁶ Scala et al,³⁰ Alcaide et al³¹ who reported higher mean larval burdens from infected sheep. The differences might have originated from climatic and seasonal differences between the study areas and the immune state of the sheep. Poor management, presence of internal and external parasite infestation are also factors that aggravate the *O. ovis* infestation. The stocking density of the flock will also influence the infection of *O. ovis*.^{4,5,32}

O. ovis larvae were found in the nasal sinus, frontal sinus, and nasal cavity in the current study. Similar to our finding, the nasal and frontal sinus sites of *O. ovis* larvae was reported by Silva et al.¹⁶ Occurrence of *O. ovis* larvae in the nasal cavity of sheep was reported by Allaie et al.³

Conclusions and Recommendations

The prevalence of ovine oestrosis was identified for the first time in the study area, and the prevalence obtained was high. This indicates oestrosis is a common parasitic disease of sheep found in the Dendi district. Our study revealed that no statistical difference ($p > 0.05$) was found between age, sex, and origins of the animal and *O. ovis* infestation in sheep. The mean larval intensity per infected sheep was 6.38. During this study, the nasal cavity, frontal sinus and nasal sinus of sheep were identified as predilection sites of *O. ovis* larvae. Based on the above conclusions, the following facts are recommended: The seasonal variations in the distribution of *O. ovis* should be studied. Veterinary extension should be expanded to reduce *O. ovis* prevalence using appropriate antihelminthics and insect repellent insecticides.

Farmer's awareness programs on the effects, prevention, and control methods of *O. ovis* infestation should be created.

Data Sharing Statement

All additional data used in the present study are available from the first author and corresponding author.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that there are no conflicts of interest in this work.

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