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Study on the Prevalence of Coccidiosis in Sheep in Janamora Wereda

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ABSTRACT

A cross-sectional study was conducted from January 2024 to April 2024 on Janamora Wereda with the objective of estimate the prevalence and associated risk factors of coccidiosis in sheep. Fecal samples were collected directly from the rectum of animals using gloved and moistened hand. Detailed information on the origin, age, sex, breed, production system, hygienic status, body condition and fecal consistency were obtained. Centrifugal and simple fecal flotation technique using salt solution was used to detect coccidia oocyst. Fecal samples were collected from a total of 384 sheep for the detection of coccidian oocysts. From the total sheep included only 88 were demonstrated for the presence of coccidian infection. Coccidian oocyst was detected in sheep from lamp, young and adult animals but greater prevalence was observed in lamps. Statistically significant association was observed ($p<0.05$) between coccidia infection and fecal consistency, age, production system, hygienic status and body condition of animals but there was no statistically significant association between origin, sex, and feeding type of animals. Based on this study coccidia infection has a great significance for the sheep producers which needs effective control and prevention program. Coccidiosis is likely to become more important diseases of small ruminants in Janamora Wereda in the future as the increasing scarcity of land for grazing is forcing people to adopt more intensive management system

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Introduction

Coccidiosis is an intestinal disease caused by coccidian parasite, called protozoa that live inside the cells of an infected animal's intestinal tract [1]. These protozoa are invasive pathogens that colonize the mucosal surface of the intestine, causing major economic losses in farm animals. Coccidia have a direct, yet complex life cycle (from ingestion of the oocysts, to passage from the host in the faces), that can be completed in roughly 18 to 21 days in cattle and sheep. Infection is spread through the fecal-oral route, with the ingestion of infectious-stage mature oocysts. Direct transmission through the contamination of barns and/or pasture appears to be the principal mode of infection. The organism reproduces in the host's intestine, and thousands of oocysts are shed into the environment through the feces [2].

Coccidiosis of small ruminants is a protozoal infection caused by coccidia parasites of the Genus Eimeria which develop in the small and large intestine and affect young animals in particular. Several species of Eimeria are involved in different ruminants (bovine, caprine, ovine) but there is no cross infection due to the strict host specificity [3].

Coccidiosisis an intestinal disease caused by coccidian protozoa of the genus Eimeria, which is a unicellular microorganism naturally found in the soil [4]. Coccidiosis is mainly asymptomatic, but may manifest as heavy diarrhea sometimes containing blood, fibrin, and intestinal material. More subtle signs are: weakness, anorexia, fever, dehydration, and tensmus.

Coccidiosis occurs universally, most commonly in animals housed or confined in small areas contaminated with oocysts [5]. These protozoa are invasive pathogens that colonize the mucosal surface of the intestine, causing major economic losses in farm animals [2].

Therefore, the objectives of the study are:

- To estimate the prevalence and degree of severity of coccidiosis in sheep.
- To identify risk factors associated with coccidiosis infection.

Materials and Methods

Study Area

Janamora Wereda is located in North Gondar Zone of Amhara region, at the latitude and longitude of 12°59'N 38°07'E at a distance of about 180km from Gondar town. Janamora Wereda is well-known with Semien Mountain National Park, Ras Dashen i.e. the highest point in Ethiopia and it is a home to a number of endangered species including the Ethiopian Wolf, waliya ibex, and a wild goat which no found in elsewhere in the world. The area has an altitude range of 2900 meters above sea level. The region is marked by numerous mountains, hilly, and sloppy areas, plateaus, rivers, and many streams. Livestock population of the area comprises 100,386 cattle, 32,975 sheep, 131,041 goats, 2,540 horses, 634 mules, 7758 donkeys, 119,347 poultry. The farming system of the study area is characterized by a mixed crop-livestock production system. Transhumance, from the highlands to western lowlands, is practiced as an important strategy to secure grazing resources for the highland livestock during the dry season of the year. In the case of the lowlands, crop farming is not as intensive as high and mid-highland areas and livestock has larger contributions to the farmer's livelihoods [6]. The study animals are sheep which

is found in Janamora Wereda kebeles such as Zakilta, Kilil, Bahir Amba and Maje Kebeles.

Study Animal

The study was conducted on indigenous sheep breeds by dividing in to three age categories from birth up to 7 weeks (lamp) from 6- 12 month (young) and above 12 months (adult). This range of age is selected because the disease is more common in lamps than Young's and adults [5]. Animal Epidemiological information with respect to their age, sex, breed, fecal consistency, production system, body condition and, hygienic status both on the animal and environmental hygiene was collected. Simple random sampling was used to select the study animals. Fresh fecal samples were collected from all age groups of the sheep from the selected kebeles by creating awareness the importance of this research for the farmers.

Sample Size Determination

Since there was no similar work done in the area previously, expected prevalence taken as 50% and the confidence interval taken chosen as 95% and precision 50%. By substituting these values in the formula, the sample size becomes 384. Thus, the sample size is calculated according to Thrusfield [7].

Data Collection

A total of 384 fecal samples was collected during the dry period of the study, directly from the rectum of selected animal using a gloved hand and placed into air tight sample vials. During sampling, data with regard to age, sex, origin, fecal consistency, production system, body condition, hygienic status was recorded for each sampled animal. Samples were soon taken to the Janamora Wereda veterinary clinic as fresh as possible. Fecal sample could be qualitatively examined on the day of collection. Floatation technique is used to float the oocyst using salt solution as a flotation medium and examination of oocyst is under taken with the help of a compound microscope.

Study Design

A cross-sectional study was conducted from January 2018 to April 2018 on Janamora Wereda. Active data was generated from randomly selected sheep with regard to origin, age, body condition, sex, fecal consistency, feeding type, production system, and hygienic states (house and animal) was considered as risk factors to test for the occurrence of coccidiosis.

Data Management and Analysis

The data should be checked, coded and entered in to Microsoft excel work sheet and will be analyzed using SPSS software version 16. Descriptive statistics like percentage will be used to express prevalence while chi-square ($\chi 2$) test will be used to compare the association of coccidiosis with different risk factors. In all the cases, 95% confidence level and 0.05 absolute precision errors will be considered. A p-value$\leq$ 0.05 will be considered statistically significant.

Results

Three hundred eighty-four sheep were sampled during the study period to determine the prevalence of coccidial infection in sheep in the study area. Out of 384 faecal samples examined, 88 were positive for Eimeria oocysts with the overall prevalence of 22.9%. Regarding sampling site, the prevalence of coccidial infection was 23.8% in Zakilta, 21.7% in Kilil, 22.4% in Bahir Amba and 23% in Maje kebele. However, there was no significant differences ($\chi 2$ = 0.117, P> 0.05) among origin and coccidial infection (Table 1).

Table 1: Prevalence of Coccidiosis in Relation to Origin of the Sheep

Origin Of Kebeles	N. sheep examined	N. of positive cases	Prevalence %	95% CI	$\chi 2$	P-value
Zakilta	143	34	23.8	19.54-28.06	0.117	0.9
Kilil	46	10	21.7	17.58-25.82		
Bahir Amba	134	30	22.4	18.23-26.57		
Maje	61	14	23	18.79-27.21		
Overall Prevalence	384	88	22.92	18.72-27.12		

Considered Risk Factors

Hygienic status, production system, age, sex, fecal consistency, body condition and feeding type were the considered factors in this attempt (Table 2 and 3). Accordingly, a statistically significant difference ($\chi 2$ = 25.78, P<0.05) was observed in the prevalence of coccidiosis among the various age groups (Table 1). Similarly, significantly ($\chi 2$ = 51.94, P< 0.001) higher coccidial infection was recorded in diarrheic sheep than in sheep with soft and normal faecal consistency. Moreover, a significant ($\chi 2$ = 19.22, P< 0.001) higher infection rate was observed in poor condition score sheep (39.6%) than in good condition score sheep (9.8%). Likewise, the occurrence of coccidial infection was significantly ($\chi 2$ = 38.273, P< 0.001) associated with production system where higher infection rate was determined in semi-intensive system (36.6%) than extensive type of production (11.8%). Further, the infection rate was also significantly associated ($\chi 2$ =47.816, p<0.05) with hygienic status of the house of the sampled animals. However, feeding type, origin and sex have not showed significant interaction with coccidial infection.

Table 2: Prevalence of Coccidiosis in Relation with Host-Related Factors

Risk factors		Number of examined	N. of positive case	Pre (%)	95% CI	$\chi 2$ (P-value)
Sex	Male	158	37	22.6	18.42-26.78	0.38 (0.47)
	Female	226	51	23.4	19.17-27.63	
Age	Lamb	77	33	42.9	37.95-47.85	25.78 (0.00)
	Young	143	33	23.1	18.88- 27.32	
	Adult	164	22	13.4	9.99 - 16.81	
Body Condition	Poor	80	33	41	36.28-46.12	19.22 (0.00)

	Good	304	55	18.1	14.25- 21.95	
Fecal Consistency	Normal	201	21	10.4	7.35- 13.45	51.94 (0.00)
	Soft	106	28	26.4	21.99 -30.8	
	Diarrheic	77	39	50.6	45.6- 55.6	
Overall Prevalence		**384**	**88**	**22.92**	**18.72-27.12**	

Table 3: Prevalence of Coccidiosis in Relation to Environmental Factor and Feeding Type

Risk factors		N. examined Sheep	N. Positive Cases	Pre (%)	95% CI	χ2 (P-value)
Hygienic status	Poor	169	67	39.6	34.71- 44.49	47.82 (0.000)
	Good	215	21	9.8	6.83- 12.77	
Production system	Semi-intensive	172	63	36.6	31.78- 41.42	38.27 (0.000)
	Extensive	212	25	11.8	8.57- 15.03	
Feeding type	Grazing	255	60	23.5	19.26-27.74	0.162(0.922)
	Grazing with concentrate	74	16	21.6	17.48-25.72	
	Milk with grazing	55	12	21.8	17.67-25.93	
Overall prevalence		**384**	**88**	**22.9**	**18.72-27.12**	

Discussion

Information on the prevalence of coccidiosis is important to implement effective control program. The overall prevalence of coccidiosis in my attempt based on coprological examination was found to be 22.92%. This is comparable with the reports of Yakhchali and Ntonitor in Iran and Cameron with 23.3% and 28.8% infection rate, respectively. However, the current finding is lower than previous findings in Ethiopia by Dinka with 59.6% rate of infection in small ruminant population [8-10]. Similarly, Altaf and Kanyari also reported an Eimeria infection with a prevalence rate of 54.68% and 35% in Iran and Kenya, respectively [11,12]. According to Radostits this variation might be attributed to the differences in agro-ecology, management types and husbandry practices of the study animals in different areas [5]. In addition to this, sample size may also be played a role for this difference [13].

In this attempt, a significant association was observed between Eimeria infection rate and hygienic status of sheep house. Poor hygienic and overcrowding conditions may have resulted in the development of higher level of infection in non-cemented floor, closed housing system and large herd size due to greater contamination of overcrowded animals and, feeding and watering trough [11].

A statistically significant association was also observed between coccidia infection and production system of sheep. As Lughano noted that clinical coccidiosis is frequently encountered in semi-intensively managed animals than extensively managed ones [14]. He also stated that coccidiosis is likely to become more important disease of small ruminants in sub-sahran countries for the future as the increasing scarcity of land is forcing people to adopt more intensive management systems. This might be due to less chance of getting the oocyst in extensive management system because large free and less contaminated area can be available as compared to semi- intensive management system. In extensive system, the degree of stressful condition in relation to overcrowding and ventilation could be lower as compared to semi- intensive system. On the other hand, continuous exposure to low numbers of oocysts which is often the case under field conditions results in endemic stability which makes them relatively resistant than housed animals [15].

The prevalence of coccidia infection showed no significance difference between male and female sheep. This is consistent with the finding of Maingi & Munyua and Craig [16, 17]. This is due to either equal chance of accessing the oocysts or no difference on protective immunity for the disease between sex groups.

In the present study, the prevalence of Eimeria infection was higher in lamb than Young's and adults animals. This is in line with the reports of Radostits and Khan who described that lambs are more susceptible than ewes or yearlings [5-18]. This is due to acquisition of acquired immunity by adults over period of time which therefore suppresses Eimeria infection. The presence of oocysts in the different age groups of sheep indicates that this parasite can infect sheep in every age group. This is in accordance with the findings of O'Callaghan, Maingi & Munyua, Arslan and Craige, elsewhere in the world [16,17,19,20].

A strong significant interaction was recorded between body condition score and Eimeria infection in my study. This finding agrees with Khan, who explained higher infection rate in sheep with poor body condition score than good score animal [18]. This might be due to those weak immune statuses of poor score animals as a result of malnutrition and other parasitic infections which results in immuno-compromising. This condition favors higher infection rate in poor state animals than good score animals [5].

Association between Eimeria infection rate and feeding type was not evidenced in this attempt. This finding disagrees with the report of Altaf [11]. This might be due to the fact that animals are exposed equally for grazing even though some group of the sampled animals had supplementary feed source at morning and evening time. Providing supplementary feed staffs and milk is essential for proper growth of young animals and long-term maintenance of body weight as well as to reduce the incidence of clinical diseases. However, this was not evidenced in this attempt because different groups of animals with different feeding type had almost comparable exposure rate for Eimeria infection. Radiostitis, Yakhchalie also indicated that animals in different feeding system were equally infected with Eimeria from the environment but the severity of coccidiosis could be different depending on the feeding states of animal [5-8].

Lastly, eimerial infection was significantly higher in sheep with diarrhea than sheep with normal and soft faecal consistency. This finding agrees with the report of Yakhchali [8]. A high level of coccidia, especially in lambs, damages the intestinal lining resulting in improper or reduced absorption of nutrients and weight loss. This damage can also result in bloody and dark diarrhea, causing dehydration and death [21].

Conclusion and Recommendations

This study revealed that the prevalence of coccidia infection in sheep of Janamora Wereda was found to be 22.92%. The prevalence of coccidiosis was significantly associated with sex, feeding status and origin of animals examined during the study period. But the disease was significantly influenced ($P<0.05$) with, age, production system, body condition, hygienic status and faecal consistency. Even if coccidian oocyst was detected on all age groups but the highest prevalence was recorded in those lambs than adults and yearlings. Sheep with poor hygiene were more susceptible than sheep which have relatively better hygiene. In general, Eimeria infection is prevalent and considered as great significant diseases for the farmers around Janamora district.

Therefore, based on the above conclusions, the following recommendations are forwarded:

- Stressful conditions such as weaning, overcrowding and poor hygienic conditions
- should be avoided.
- Sick animals should be isolated from the group to avoided further transmission of the
- Disease.
- All sheep must be deworm at least twice a year that is at the beginning and end of winter.
- Further researches should be done to identify the most pathogenic species of Eimeria.

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