UNIVERSITY OF GONDAR
FACULTY OF VETERNARIY MEDICINE

PREVALENCE OF COCCIDIOSIS IN SHEEP AT ADIS ZEMEN DISTRICT
DVM THESIS

By
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A thesis submitted to Faculty of veterinary Medicine, University of Gondar in partial fulfillment of the requirements for the degree of Doctor of Veterinary Medicine

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CSA	Central Stastical Agency
Masl	Meters Above Sea level
LWAO	Libokemkem Woreda Agricultural Office

ACKNOWLEDGEMENT

ABSTRACT

Across-sectional study was conducted at Addis-Zemen district from November 2014 to April 2015 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. Faecal 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 this district in future as the increasing scarcity of land for grazing is forcing people to adopt more intensive management systems.

Kew words: *Adiszemen, Simple and Centrifugal Fecal Floatation, Coccidiosis, Oocyst, Prevalence*

1. INTRODUCTION

Parasitic infestations in sheep are among serious problem in the developing countries, particularly where nutrition and sanitation standards are generally poor. In Ethiopia, sheep were the second most important livestock species next to cattle and ranks second in Africa and sixth in the world in sheep population. These sheep population have become adapted to a range of environments from the cool alpine climate of the mountains to the hot and arid pastoral areas of the lowlands.Sheep play an important economic role and make a significant contribution to both domestic and export markets through provision of food (meat and milk) and non-food (manure, skin and wool) products. They also play a major role in the food security and social well-being of rural populations living under conditions of extreme poverty which is particularly the case for eastern parts of Ethiopia(Ayele et al., 2014). 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 (Christophe, 2011).

Coccidiosisis an intestinal disease caused by coccidian protozoa of the genus *Eimeria*, which is a unicellular microorganism naturally found in the soil (Leite, 2009). 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 occur universally, most commonly in animals housed or confined in small areas contaminated with oocysts (Radostitis *et al.,* 2007)

These protozoa are invasive pathogens that colonize the mucosal surface of the intestine, causing major economic losses in farm animals (Elshekiha, 2009).

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

2. LITERATURE REVIEW

2.1. Coccidiosis

- Coccidiosis is an intestinal disease caused by coccidian parasite, called protozoa that live inside the cells of an infected animal's intestinal tract(Pence, 2011). 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 faecal-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 faeces (Elshekiha, 2009). Coccidiosis is most often seen in young lambs of about 4-7 weeks of age that have been exposed to a high level of oocyst challenge. The disease occurs most often in intensive husbandry systems and where there are high stocking densities and/or lambs under stress (Bartley, 2010).

2.2. Etiology

Coccidia are microscopic parasites known as protozoa. They develop in the intestinal tract of the sheep and produce oocysts that pass in the dung onto the pasture and then take several days to develop ('sporulate'), then after they can infect grazing sheep. Several species of *Eimeria* are the main Coccidia to affect sheep. These parasites are acquired as lambs and are carried by most sheep, usually causing no ill-effects. However, with stress and overcrowding, particularly under damp conditions, disease may occur.Ruminants serve as host to many species of the coccidian parasite Eimeria. It is often difficult to identify the individual species of Eimeria because their oocysts are similar in size and shape (Hednrex, 1998). Coccidia (*Eimeria*) are highly host specific so infection can only originate from other lambs and sheep. Although there are a number of different sheep Eimerians, disease is usually caused by either *Eimeriaovinoidalis* and/or *Eimeria crandallis:* the two most pathogenic species capable of producing disease (Bartley, 2010).

2.3. Epidemiology

All domestic animal species are susceptible to coccidial infections. Although coccidia are host specific, each host may be infected with several species of coccidia at the same time (Quigley, 2001). Coccidiosis occurs universally, most commonly in animals housed or confined in small areas contaminated with oocysts (Radostitis *et al*., 2007, Kaufmann, 1996 & Taylor 2007). Coccidia are ubiquitous and unlikely to be destroyed in nature, because the oocysts have a protective carbohydrate wall that makes them resistant to environmental destruction and provides protection against a wide range of chemical disinfectants (Ayele, *etal 2014).*

2.4. Risk factors

. High infection pressure increases the individual risk to acquire clinical coccidiosis, and factors that impose stress on the lamps, such as weaning, weather condition, transport, frequent regrouping, inadequate feeding or other infectious diseases, may exacerbate the condition. Therefore, it is not feasible to manage the condition by treating only the external environment (Ayele, *et al* 2014).

2.5. Method of transmission

Coccidiosis is transmitted from animal to animal by the fecal–oral route. Infected fecal material contaminating feed, water, or soil serves as carrier of the oocyst; therefore, the susceptible animal contracts the disease by eating and drinking, or by licking itself. The severity of clinical disease depends on the number of oocysts ingested. The more oocysts ingested, the more severe the disease (Kirkpatrick and Selk, 2011). Oocysts passed in the feces require suitable environmental condition to sporulate. (Radostitis *et al.,* 2007).Oocyst do not survive well at temperature below -30°c or above 40°c; within this range, they may survive up to one year or more (Merck, 2005).

2.6.Life cycle

Coccidia have a direct, yet complex life cycle (from ingestion of the oocysts, to passage from the host in the faeces) that can be completed in roughly 18 to 21 days in sheep. The life cycle of

coccidia is complex with both sexual and asexual stages in the intestines of sheep (see figure 1) which is divided in to three phases: sporulation, infection and merogony (schizogony) and finally gametogony (Taylor *et al*., 2007). Sheep ingest the infective oocyst liberating an infective form called sporozoites. This form penetrates the cells of the intestine, and goes through a cycle of rapid growth and reproduction known as the asexual phase. One infective oocyst can produce up to 900 asexual forms, each invading a cell in the intestine. The asexual phase is repeated several times during a 21 to 28 day cycle. Eventually the asexual form becomes a precursor of a sex cell that results in an oocyst that is passed in the feces (Pence, 2011).Thus, coccidian harm the host by destroying the cells and tissues in the lower intestines, cecum and the colon. The loss of intestinal lining may lead to blood and fluid loss and may alter food absorption. Secondary bacterial invasion of the intestine may follow. Coccidia are extremely prolific, one ingested oocyst is capable of producing 27, 648, 000 oocysts destroying an equal number of intestinal cells (Pence, 2011).
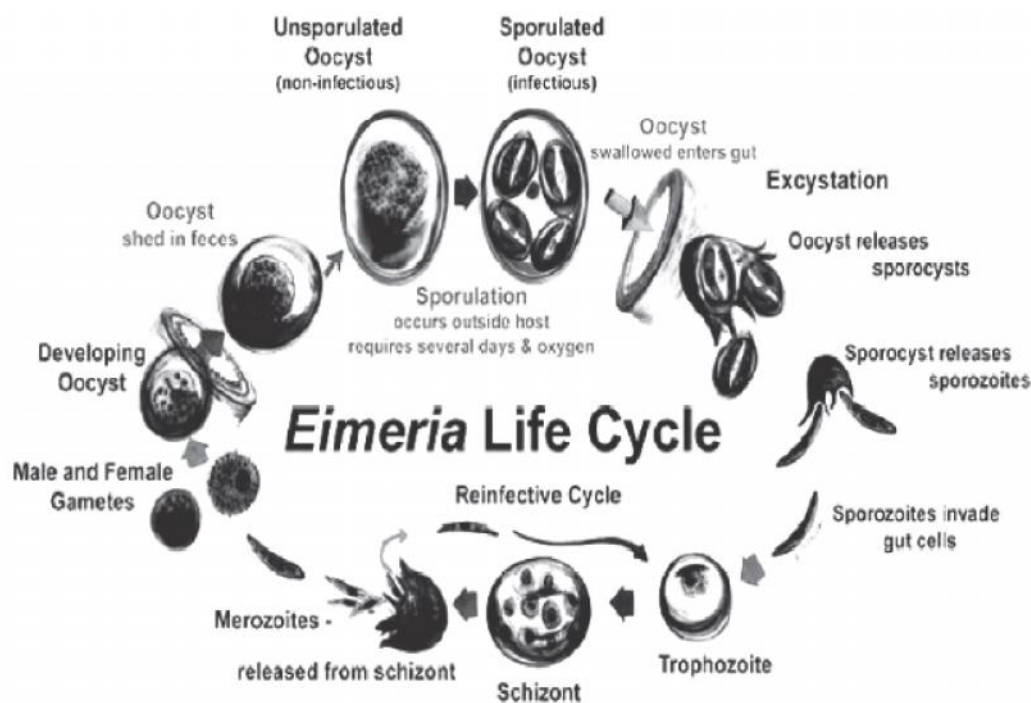

Figure 1: Life cycle of Eimeria species (Source: Lassen, 2009)

When a sporulated oocyst enters the gut intestinal grinding of the gizzard and enzymes release the 8 sporozoites encapsulated in the 4 sporocysts. The asexual reproduction (schizogony) is repeated several times inside the invaded intestinal lining, followed by a sexual phase where penetrating merozoites form gametes (gametogony). A microgamete and macrogamete fuse and develop into unsporulated oocysts that leave with the faeces. Outside the animal the oocyst sporulate into its infective form (Lassen, 2009).

2.7. Pathogenesis

The most pathogenic species of coccidian are those that infect and destroy the crypt cells of the large intestine mucosa. This is because the ruminant small intestine is very long, providing a large number of host cells and the potential for enormous parasite replication with minimal damage (Taylor, 2007) The coccidia of domestic animals pass through all stages of their life cycle in the alimentary mucosa and do not invade other organs, although schizonts have been found in the mesenteric lymphnodes of sheep and goats. The different species of coccidian localize in different part of the intestine. *E.Zuernii* and *E.bovis* occur primarily in the cecum, colon and the distal ileum, whereas *E.ellipsoidalis* and *E.arloingi* affect the small intestine. E.gilruthi localizes in the abomasum and occasionally the duodenum (Radostitis *et al.,* 2007).

The severity of clinical disease depends on the number of oocysts ingested. The more oocysts ingested, the more severe the disease (Kirkpatrick and Selk, 2011). The major damage is due to the rapid multiplication of the parasite in the intestinal wall, and the subsequent rupture of the cells of the intestinal lining. Several stages of multiplication occur before the final stage, the oocyst, is passed in the feces (Stokka, 1996).

2.8. Clinical sign

The severity of the disease depends on several factors including the number of oocysts ingested, the species of coccidia present, and the age and condition of the animal. Under crowded conditions large numbers of oocysts are ingested causing severe or fatal infection, particularly in lambs (Kennedy,

2011). The incubation period can be between 16-30 days. Common signs are: loss of appetite, weight loss, diarrhea, dysentery (passing blood stained faces), tensmus (straining to defecate), (Veterinary Laboratory Agency, 2009 & Kaufman, 1996), rough hair coat, dramatic drop in milk production, dehydration and death sometimes 2-4 days preceded by convulsion (Schipper, 2000).

2.9. Diagnosis

Veterinary diagnosis is based upon typical clinical findings affecting a large number of sheepin the group. Interpretation of faecal examinations is not simple, because the stage of infestation also greatly influences the number of oocysts present in faeces. So, the demonstration of large numbers oocysts in faecal samples is helpful but speciation to determine whether they are pathogenic (capable of causing disease) is rarely undertaken in field outbreaks. There is a good response to specific anticoccidial therapy. Diagnosis is made from a combination of herd history, clinical signs, physical examination of the animal and microscopic examination of manure taken from the rectum. Diarrhea usually precedes heavy oocyst discharge by one or two days but may continue after oocyst discharge (Kennedy, 2001).

The clinical signs of scour may or may not be accompanied by large numbers of oocysts shed in the faeces. This makes clinical diagnosis more difficult and, where opportunities exist, postmortem examination of freshly dead carcasses yields more meaningful results (Paul, 2012).

Faecal oocyst counts are of limited value as, without knowing the species, the oocysts may be from a non-pathogenic species commonly found in the gut and that cause no disease. Specialist laboratories are needed to speciate the oocysts. It is likely that there is an over diagnosis of coccidiosis as a cause of disease; as high faecal oocyst counts alone do not confirm a diagnosis (Paul, 2012).

2.10. Treatment

Agents are either coccidiocidal (cidal), which means they kill the parasite, or coccidiostatic (static), which do not kill the parasites, but arrest their development. With coccidiostatic treatment, the live parasites will still be present in the sheep intestines (Pertfied, 2010).

There are several treatment options including sulfa drugs, tetracyclines, and amprolium. Conventional anthelmintics (dewormers) have no effect on coccidiosis. Amprolium can be used as both a treatment and preventative for coccidiosis. It is sold in liquid or powder form. When coccidia they experience a thiamine deficiency and die from malnourishment. Many sulfonamide medications can be used to treat coccidiosis. Sulfa medications are sold in liquid or powder form. Sulfa medication can be bitter tasting, so products may include flavoring, or jello can be added to reduce the bitter taste and promote adequate consumption by the animals(Schoenian, 2015).

2.11. Control and prevention

There are many management techniques that can help to prevent outbreaks of coccidiosis and minimize the effects of subclinical coccidiosis. Management should be aimed at reducing the fecal-to-oral transmission of the pathogen. Good sanitation and hygiene are essential. Maternity areas should be kept clean and dry. Lambing and kidding jugs should be cleaned between litters ((Schoenian, 2015).

The most acceptable method of control is prevention achieved by timely medication (Pence, 2011). Limit fecal-to-oral transmission of the coccidiosis parasite through environmental management, minimizing exposure of animals to fecal-contaminated feed, water, and soil, routinely clean maternity pens for early prevention, Minimize contact between sheep, People in contact with sheep should routinely wash boots, clothing, Prevent overgrazing of pastures, and isolation of animals with severe clinical signs (severe diarrhea, dehydration), (Perfield, 2010).The approved drugs for prevention of coccidiosis in sheep are Sulfa drugs, Amprolium and tetracycline's. Amprolium is a coccidiostat used as a feed additive or in the drinking water and is best used as a treatment of clinically infected sheep. , Baycox® (Toltrazuril), Deccox and Vecoxan® (diclazuril) are treatment options. A single dose of Baycox® is reported to be very effective at reducing oocyte shedding, as the drug is effective at all intracellular developmental stages (unlike coccidiostat) [1]. However, it's meat withdrawal is 42 days for lambs. Vecoxan® is also a single dose treatment [11]. It has a zero day meat withdrawal period. Deccox is a feed additive that is effectively used as a preventative treatment in confined sheep. It can also be used as treatment to reduce the effects of an acute outbreak (Pence, 2011).

3. MATERIALS AND METHODES

3.1.Study area

The study was conducted at Adiszemendistrict which is a town in northern-central Ethiopia Located in the Amhara Region, on the road connecting betweenGondar and Bahir Dar. It is the administrative center of libokemkem woreda in which visceral leishmaniasiswas first observed in 2005. Addis Zemen has a latitude and longitude of 12°07 N 37°47 E/ 12.117^{0}N 37.783^{o}E/ 12.117; 37.783.and an elevation of 1975 meters above sea level. It is the administrative center of Kemekemworeda.Based on figures from the Central Statistical Agency in 2005, this town has an estimated total population of 24,849, of whom 12,245 were males and were 12,604 females.. The mean annual minimum and maximum temperatures are 18°c and 25°c respectively. Soil types encountered are Red soil (36.25%), Black soil (34.37%) and Brown soil (29.38%). The area receives a bimodal rainfall with mean annual rainfall of 2500ml, in which the long rainy season extends from June to September, while the short rainy season occurs from March to May. There are about 229,812 cattle, 35,512 sheep, 29,942 goat, 142,454 poultry, 22,579 bee hives, 21,126 donkeys, and 399 mules in the Woreda (Lwao, 2007).

3.2. Study animal

The study was conducted on indigenous sheep breeds by dividing in to three age categories. from Birth up to 7weeks (lamp) from 6- 12month (young) and above 12 months (adult) . This range of age is selected because the disease is more common in lamps than Youngs and adults (Radostitis *et al.,* 2007). Animal Epidemiological information with respect to their age, sex, breed, fecal consistency, production system, body condition and, hygienic statusboth on the animal and environmental hygienewas 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 awarenessthe importance of this research for the farmers.

3. 3.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 become 384. Thus, the sample size is calculated according to Thrusfield (2007).

3.4. 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 statuswas recorded for each sampled animal. Samples were soon taken to the Adis zemen 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.

3.5. Study design

A cross-sectional study was conducted from November 2014 to April 2015 at Libokemkem district. 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.

3.6. 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 (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 0.05 will be considered statistically significant.

4. 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 Bura, 21.7% in Yfag, 22.4% in Angot and 23% in Silkisa. However, there was no significant differences (^{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	N. sheep examined	N. of positive cases	Prevalence %	95% CI	^{2}	*P*-value
Bura	143	34	23.8	19.54-28.06	0.117	0.99
Yfag	46	10	21.7	17.58-25.82		
Angot	134	30	22.4	18.23-26.57		
Silkisa	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 (^{2} = 25.78, *P*<0.05) was observed in the prevalence of coccidiosis among the various age groups (Table 1). Similarly, significantly (^{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 (^{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 (^{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 (x^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		N. examined sheep	N. positive cases	Pre (%)	95% CI	x^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	41.2	36.28-46.12	19.22 (0.00)
	Good	304	55	18.1	14.25- 21.95	
Faecal Consistency	Normal	201	21	10.4	7.35- 13.45	51.94 (0.00)
	Soft	106	28	26.4	21.99 -30.81	
	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	x^2 (*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**	**22.92**	**18.72-27.12**	

5. 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 iscomparable with the reports of Yakhchali *et al*. (2010)and Ntonitor *et al.* (2013) in Iran and Cameron with 23.3% and 28.8% infection rate, respectively. However, the current finding is lower than previous findings in Ethiopiaby Dinka et al. (2007) with 59.6% rate of infection in small ruminant population. Similarly, Altaf *et al*. (2014) and Kanyari, *et al.* (2009) also reported an *Eimeria* infection with a prevalence rate of 54.68% and 35% in Iran andKenya, respectively.According to Radostits *et al*. (2006), this variation might be attributed to the differences in agro-ecology, management types and husbandry practices of the study animals in different areas.In addition to this, sample size may also be played a role for this difference (Abebe *et al.,* 2008).

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 (Altaf *et al,* 2014)*.*

A statistically significant association was also observed between coccidia infection and production system of sheep.As Lughano (1996) noted that clinical coccidiosis is frequently encountered in semi-intensively managed animals than extensively managed ones. 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 oocystin 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 (Daugschies and Najdrowski 2005) which makes them relatively resistant than housed animals.

The prevalence of coccidia infection showed no significance difference between male and femalesheep. This is consistent with the finding of Maingi & Munyua 1994 and Craig *et al.* (2007). 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 lambs thanYoungs and adults animals. This is in line with the reports of Radostits *et al.* (2007) and Khan *et al.* (2011) who described that lambs are more susceptible than ewes or yearlings. 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 *et al.* (1987, Maingi & Munyua (1994), Arslan *et al.* (1999) and Craige *et al.* (2007) elsewhere in the world.

A strong significant interaction was recorded between body condition score and *Eimeria* infection in my study. This finding agrees with Khan*et al.*(2011) who explained higher infection rate in sheep with poor body condition score than good score animal. This might be due to that 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 (Radostitis *et al*., 2007).

Association between *Eimeria* infection rate and feeding type was not evidenced in this attempt. This finding disagrees with the report of Altaf *et al* (2014). 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 sourceat 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 *et al* (2007), Yakhchali*et al*. (2010) 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.

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, *etal* 2010).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 (Bartley, 2010).

6.CONCLUSION AND RECOMMENDATIONS

This study revealed that the prevalence of coccidia infection in sheep of Addis-Zemen 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 asgreat significant diseases for the farmers around Addis-Zemen 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
- ❖ Further researches should be done to identify the most pathogenic species of Eimeria.

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8. ANNEXES

8.1. Laboratory procedure

Faecal samples were processed using floatation method according to the procedure described in Hansen and Perry, 1994. The procedure in brief is:

i.   3grams of faecal sample was suspended in 20-50 ml of water. The mixture then strained through a metallic sieve in to centrifuge test tube

ii. The mixture was centrifuged to sediment at 2000 revolution per minutes for 2 minutes

    The supernatant fluid was discarded

iii. Floatation fluid was added into the test tube until slight convex meniscus formed at the top

iv. Then cover slip was placed on the top of the tube, making sure no air bubbles were present and allowed to stand for 10 minutes

v.   The cover slip was remove and placed on the slide and examined under the microscope starting with lower magnification power (4x and 10x)

Source (Hansen and Perry, 1994).

Data collection sheet

No	Date	Origin				Sex		Age			Faecal consistency			Hygienic states		Production system		Body condition		Result	
	D/M/Y	B	Y	A	S	M1	F	L	Y	A	N	S	D	P	G	E	SI	P	G	po	ne
1																					
2																					
3																					
4																					
5																					
6																					

D=day, M=month,Y=year,
B=bura,Y=yfag,A=angot,S=silkisa,M1=male,F=female,L=lamb,Y=young,A=adult,N=normal,S=soft,D=diarrhic,P=poor,G=good,E=extensive,SI=semi-intensive,po=positive,ne=negative

DECLARATIONS

I, the under signed, declare that the information presented here in my thesis is my original work, has not been presented for degree in any other university and that all sources of materials used for the thesis has been duly acknowledged.

Name: Abinet Lakew

Signature:

Data of submission:June 12, 2015

This thesis has been submitted for examination with my approval as university advisor

Name: Zewdu Seyuom (DVM, MSc)

Signature…