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A STUDY ON PREVALENCE OF CALF COCCIDIOSIS IN DEBRE BIRHAN VETERINARY CLINIC, CENTERAL ETHIOPIA

BY

ERMIAS GEBEYEHU (Dr.)

DEBRE BIRHAN, ETHIOPIA

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AUTHOR*; **ERMIAS GEBEYEHU MEKASHA (Dr.)**

DEPARTMENT OF VETERINARY MEDICINE, GONDAR UNIVERSITY, GONDAR

CONTACT ADRESS; demekegebeyehu5@gmail.com

Mobile No; +251-0920256167

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ABSTRACT

Cross-sectional study was conducted in Debre Birhan veterinary clinic from November 2016 to March 2016 with the objective of determining the prevalence and associated risk factors of infection in calves. Faecal samples were collected from a total of 384 calves less than 24 month of age and examined for the oocysts of coccidian. Detailed information of the origin, age, sex, breed, management system, hygienic status and faecal consistency were obtained. Centrifugal faecal floatation technique using salt solution was used to detect coccidian oocyst. From the total calves included 118 calves were demonstrated for the presence of coccidian infection. Coccidian oocyst was detected in calves from 1 to 2 year of age but greater prevalence was observed in age categories less than 6 month of age. Statistically significant association ($p<0.05$) between prevalence of coccidiosis and origin, age, faecal consistency, hygienic status and management system was observed in the study. However, there was no statistically significant association ($p>0.05$) with sex and breed. Based on this study coccidianinfection has a great significance for the livestock producer so it needs a serious control and preventive programs.

Key words: *Debre Birhan*, *Centrifugal fecal floatation, Coccidiosis, Oocyst, Prevalence*

1. INTRODUCTION

Parasitic diseases are a major constraint in animal health and production throughout the tropic and sub-tropical countries of the world (Juyal and Single, 2011). Parasitic disease caused by helminthes, protozoa and arthropods can cause more economic losses than disease caused by bacteria and viruses but their impact is not clear to animal owners (Shitaye *et al.,* 2007).

Coccidiosis is a parasitic disease caused by a small, single celled parasite, called a protozoa, that lives inside the cells of an infected animal's intestinal tract and is one of the most common and important disease of cattle in the world (Pence, 2011) and more than 13 species of *Eimeria* and one species of *Isospora* have been described to infect cattle. *Eimeria bovis* and *Eimeria zuernii* are considered the most pathogenic species as they are usually associated with clinical coccidiosis under field conditions. Coccidian parasites are generally host-specific parasites, and very specific to a particular region in the intestines (Leite, 2009). Many studies indicated that under natural conditions, mixed species infections are much more common than mono species infection. Coccidiosis occur most commonly in animals housed or confined in small areas contaminated with oocysts (Radostitis *et al.,* 2007) and is usually most common and important in calves younger than 1 year (Abebe *et al*., 2008).

Coccidiosis is mainly asymptomatic, but may manifest as heavy diarrhoea sometimes containing blood, fibrin, and intestinal material. Clinical cases can vary from some loss of appetite and decrease in weight gain and slight, short lived diarrhoea to severe cases involving great amounts of dark, bloody and foul smelling diarrhoea, fluid faeces containing mucous and blood, persistent straining in attempt to pass faeces, loss of weight, rough hair coat, dehydration, and in some cases death (Radostitis *et al.,* 2007).Clinical disease is most prevalent where animals are subjected to overcrowding, unhygienic environments, or when animals are stressed. Economic loss in clinical disease is mostly attributed to mortality, poor performance, and the costs of treatment and prevention and although subclinically infected animals may appear normal, they may have reduced feed consumption, feed conversion and growth performance (Vorster and Mapham, 2012). Climatic factors, age of the host, as well as

management determine the pattern of presentation of coccidiosis in different regions (Rodriguez-Vivas *et al*., 1996).

In Ethiopia a few studies are conducted in calves by Abebe *et al.,* in (2008), Alemayew *et al.,* (2013) and Mihreteab *et al.*, (2012) and also in poultry by Diriba *et al.,* 2012 and other which show the presence of coccidiosis in the country. But no study has been carried in and around Ambo town to determine the presence of the disease in the area. In general, adequate data on the distribution of calf coccidiosis is lacking.

Therefore the objectives of the study are:

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

2. LITERATURE REVIEW

2.1 Coccidiosis

Bovine coccidiosis is considered the most economically important disease of cattle. It is a protozoan disease of many mammalian, and all domestic livestock species, is caused by infection with species of the Genera *Eimeria* or *Isospora*. Clinically it is characterized by enteritis, although subclinical infections are frequent (Pence, 2011).All age groups of cattle are susceptible to infection, but clinical case is most common in young animals (Nagwa *et al.*, 2011).

2.2 Etiology

More than thirteen different species of Eimeria affect cattle and all are intracellular protozoa Parasites of cells lining the intestinal tract (Hednrex, 1998; Taylor, 2007). Of these, 5 species, *E. bovis, E zuernii, E. auburnensis, E. ellipsoidalis*, and *E. alabamensis*, are Considered pathogenic (Dubey *et al.,* 2008) and the most important of this genus for causing disease in cattle are *Eimeria bovis* and *Eimeria zuernii* (Maas, 2007) Ruminants serve as host to many species of the coccidian parasite *Eimeria* (Hednrex, 1998).

2.3 Epidemiology

All domestic animal species are susceptible to coccidian infections. Although coccidian are host specific, each host may be infected with several species of coccidia at the same time (Quigley, 2001). Coccidiosis is mostly a disease of young animals less than one year of age (Ernst *et al*., 1987) raised and kept under intensive management systems although older animals may occasionally be clinically

affected. Disease usually occurs when the resistance of the host is lowered following stress, overcrowding, weaning, transportation, housing under conditions of poor hygiene, food changes, nutritional deficiencies, concomitant infections with other parasitic/infectious agents and adverse weather conditions. High temperatures and humidity encountered in overstocked feedlots, pens containing straw bedding, or in kraals and irrigated pastures, are favourable for the survival of oocysts and therefore higher infection rates compared to extensive farming systems. Sporulated oocysts are very resistant to adverse environmental conditions and may survive on the pastures until climatic conditions become favourable (Vorster and Mapham, 2012). Oocyst do not survive well at temperature below -30oc or above 40oc; within this range, they may survive up to one year or more (Merck, 2005)

2.4 Risk factor

Factors which predispose to an outbreak of coccidiosis include: age which is usually important in calves or weaners (which have no immunity), stress due to weaning, cold weather or inappropriate weaning diets, weaning light-weight calves, confinement in small areas such as yards or small paddocks and feeding on the ground or in troughs which can be contaminated by faces (also applies to water troughs) (Fitzpatrick, 2006).

2.5 Method of transmission

Coccidiosis is transmitted from animal to animal by the faecal–oral route. Infected faecal 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. Oocysts passed in the faeces require suitable environmental condition to sporulate (Radostitis.*et al.,* 2007).

2.6 Life cycle

Bovine coccidia develop both within the host animal as well as outside (Kennedy, 2011). The life cycle of coccidia is complex with both sexual and asexual stages in the intestines of cattle (see figure

1) which is divided in to three phases: sporulation, infection and merogony (schizogony) and finally gametogony (Taylor *et al.,* 2007). Cattle ingest the infective oocyst liberating an infective form called sporozoite. 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 faeces (Pence, 2011).

Coccidia harm the host by destroying the cells and tissues in the lower part of 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. Coccidian are extremely prolific, one ingested oocyst is capable of producing 27, 648, 000 oocysts destroying an equal number of intestinal cells (Pence, 2011).

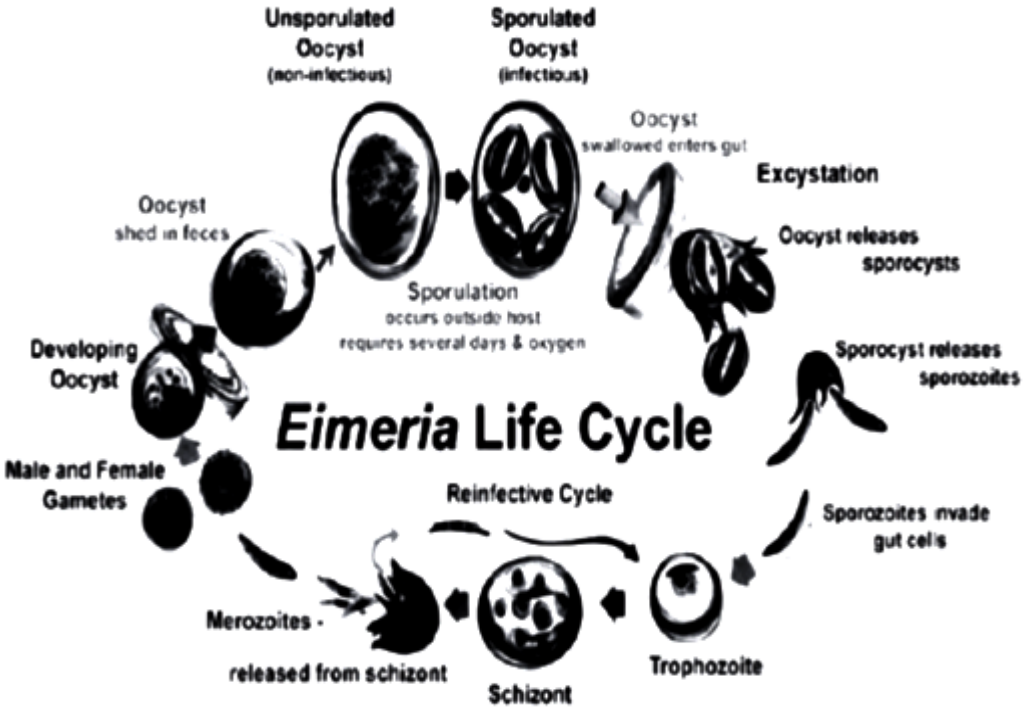

Figure 1. Life cycle of Eimeria species

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 oocystsporulate into its infective form (Lassen, 2009).

2.7 Pathogenesis

The most pathogenic species of coccidia 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 coccidian 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 lymph nodes 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 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 faeces (Stokka, 1996).

2.8 Clinical sign

Clinical coccidiosis in cattle mainly depends on factors like species of Eimeria, age of infected animal, number of oocysts ingested, presence of concurrent infections, type of production system and management practice. Compared to clinical coccidiosis, subclinical coccidiosis is economically more important and may account for over95% of all the losses associated with coccidiosis (Nagwa*et al.*, 2011).Cattle infected by a few oocysts are only mildly affected. Under crowded conditions large numbers of oocysts are ingested causing severe or fatal infection, particularly in calves (Kennedy, 2011).

The incubation period can be between 16-30 days. Common signs of the coccidiosis are: loss of appetite, weight loss, diarrhoea, 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).Cattle that recover from coccidiosis usually become immune to later infections, but they may continue to pass oocysts in the manure, thereby providing a source of infection for susceptible calves (kennedy, 2001).

2.9 Diagnosis

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 (Kennedy, 2001). Interpretation of faecal examinations is not simple because there are low numbers of oocysts present in the faeces of many normal calves. 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. Histopathological finding of coccidiosis in the gut of a dead calf confirms the clinical diagnosis (Scott, 2011). Diarrhoea usually precedes heavy oocyst discharge by one or two days but may continue after oocyst discharge has returned to low levels (Kennedy, 2001).

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 calf's intestines (Pertfied, 2010).

A major difficulty in treating clinical coccidiosis is that signs of the disease do not appear until the life cycle is almost complete. By this time, the gut may be severely damaged. Most anticoccidial drugs are only effective during early stages of a coccidian life cycle. Thus, the difficulty in treating coccidiosis is that by the time signs appear, parasites have already passed through the stage in which anticoccidial drugs are most effective. Infected animals often recover without treatment due to acquired resistance to the disease. However, treatment with anticoccidial drugs should be administered at the earliest clinical signs because it may reduce severity of the disease and decrease mortality. Antibiotics may be administered to reduce secondary infections. Electrolyte solutions and fluids should be administered to control dehydration. During treatment, animals should be isolated in a clean environment to prevent further contamination. Treatments for coccidiosis include sulfonamides in the drinking water and amprolium in the feed. Polyether antibiotics, such as lasalocid and monensin, originally developed as coccidiostats for poultry, have been effective in preventing coccidiosis in cattle (Quigley, 2001).

The approved drugs for prevention of coccidiosis in cattle are Rumensin, Amprolium, Deccox, and Bovatec. Amprolium is a coccidiostat used as a feed additive or in the drinking water and is best used as a treatment of clinically infected cattle. It is administered continuously for 21 days. It is well tolerated and must be withdrawn at least 24 hours before processing cattle. It can also be used as treatment to reduce the effects of an acute outbreak. The clinically affected animals should be treated with sulfa drugs, and then the coexistent cattle should receive Amprolium or Deccox to prevent further cycling of the oocysts. The medication should be fed for 28 to 56 days or longer. All incoming cattle should be given some type of preventative treatment for at least 28 days to prevent coccidiosis. Rumensin and Bovetec are growth-promoting feed additives that are also effective at preventing

coccidiosis. These products should be used only to prevent subclinical and clinical coccidiosis and not for treatment (Pence, 2011).

2.11 Control and prevention

The most acceptable method of control is prevention achieved by timely medication (Pence, 2011). Limit faecal-to-oral transmission of the coccidiosis parasite through environmental management, minimizing exposure of animals to faecal-contaminated feed, water, and soil, routinely clean maternity pens for early prevention. Minimize contact between calves, people in contact with calves should routinely wash boots, clothing, prevent overgrazing of pastures, and isolation of animals with severe clinical signs (severe diarrhoea, dehydration). Include Rumensin in the calf starter to prevent coccidiosis "breaks" (Perfield, 2010). The approved drugs for prevention of coccidiosis in cattle are Rumensin, Amprolium, Deccox, and Bovatec. Deccox is a feed additive that is effectively used as a preventative treatment in confined cattle (Pence, 2011).

Vaccination for control of bovine coccidiosis is currently not practical although research into the development and testing of vaccines is ongoing. In contrast far more attention seems to be given to the production of vaccines in the poultry industry and multiple articles have been published on this subject (Vorster and Mapham, 2012).

3. MATERIALS AND METHODS

3.1 Study area

The study was conducted at Debre Berhan town municipal abattoir from November, 2014 to April, 2015. The town is found in Amhara regional state, situated at 130 km northeast of Addis Ababa. It is geographically located at 09^0 31' N latitude and 39^0 28' E longitude with an altitude of 2780 meter above sea level. The area is mountainous with large plane grazing lands and dissected by two rivers, namely Dalicha and Beriesa (Zerihun, 2006). The rainy season of this area extends June to September

while the dry season extends from November to January. Sporadic rainfall also occurs from February to April, The mean annual temperature of Debre Berhan is 12.9^0c where the minimum and maximum temperature is 6.1 and 19.9^0c, respectively. The average annual rainfall is 905.4 mm and relative humidity is 62.3%. The livestock population in the area comprises of cattle (2984), goat (115), sheep (5912), horse (169) and poultry (5190) (CSA, 2008).

3.2 Study animals

The study was conducted on calves younger than 24 months age by dividing in to three groups: Birth up to 6 months, 6-12 months and 12-24 months which were determined by asking the owner of the animal orally (Mihreteab et al., 2012). This range of age was selected because the disease is more common in young animal. Epidemiological information with respect to their age, sex, breed, faecal consistency (normal, soft and diarrheic), management system, and date of sample collection, hygienic states (house and animal) and kebele or name of the farm was collected. Simple random sampling was used to select the study animals from farms and from small holder. Hygienic status of calf pens and the calves themselves were assessed based on housing system (ventilation, stocking and sanitation) and body parts of the calves and was conveniently categorized as poor and good (Mihreteab et al., 2012).

3.3 Sample size determination

Simple random sampling method was used to select the calves from target population. Since there was no similar work done in the area previously, expected prevalence was taken as 50% and the confidence interval chosen as 95% and precision 5%. By substituting these values in the formula, the sample size founded to be 384. Thus, the sample size is calculated according to Thrusfield (2007) as follows:

$n = 1.962\ pexp\ (1\text{-}pexp)\ d^2$ Where, n=required sample size

Pexp =expected prevalence

d=absolute precision (usually 0.05)

3.4 Data collection

A total of 384 faecal samples was collected during the entire period of the study, directly from the rectum of selected animal using a gloved hand and placed into air tight sample vials and transported to the Ambo University veterinary laboratory technology department laboratory on the same day of collection, and preserved at refrigeration temperature until processing within 48 hours. During sampling, data with regard to age, sex, breed; faecal consistency, management system, date of sample collection, hygienic states (house and animal) and kebele or name of the farm was recorded for each sampled animal. Faecal sample was qualitatively examined by centrifugation flotation technique. Salt solution was used as a flotation fluid for examination of oocyst under microscope.

3.5 Study design

A cross-sectional study was conducted from November 2013 to March 2014 Ambo. Active data was generated from randomly selected calves with regard to origin , age, breed, sex faecal consistency, management system, and hygienic states (house and animal) was considered as risk factors to test for occurrence of coccidiosis.

3.6. Data management and analysis

Data collected from study sites were coded and entered in to a Microsoft excel spread sheet program for analysis. Statistical analysis was done on Statistical Package for Social sciences (SPSS) software version 16. Descriptive statistics like percentage was used to express prevalence while chi-square ($\chi 2$) test was used to compare the association of coccidiosis with different risk factors. In all the cases, 95%

confidence level and 0.05 absolute precision errors were considered. A p-value ≤ 0.05 was considered statistically significant.

4. RESULTS

Out of 384 faecal samples examined, 118 were positive for Eimeria oocysts with the overall prevalence of 30.7%. Even if coccidian oocyst was detected on all age groups the highest prevalence was recorded in those calves found in the range from one to sixth month of age and the lowest prevalence was observed in the age group >12-24 month of age. There was a statistically significant difference (P<0.05) in the prevalence of coccidiosis among the various age group (Table 1). The prevalence of coccidiosis was a bit higher in cross breed calves than in local breed calves. However, the breed of the calves was not significantly associated (P > 0.05) with prevalence of coccidiosis. There was no statistically significant association (P>0.05) between sex and coccidian infection. The prevalence in female calves was similar to that of males in this study (Table 1). A significant association was also observed between prevalence of the disease condition and faecal consistency of the calves. The highest prevalence was observed on calves with diarrheic faecal consistency than soft and normal faecal consistency.

Table 1. Prevalence of coccidiosis in calve in relation to host factors

Risk factor	No of calf examined	No of positive cases	Prevalence (%)	Df	X^2	P-Value
Sex						
Female	240	74	30.8%	1	0.003	0.524
Male	144	44	30.6%			
Age						
1-6 Month	161	92	57.1%	2	91.148	0.000
>6-12 Month	113	15	13.3%			
>12-24 Month	110	11	10.0%			
Breed						
Local	280	84	30.0%	1	0.258	0.348
Cross	104	34	32.7%			
Fecal consistency						
Normal	235	29	12.3%	2	105.610	0.000
Soft	83	41	49.4%			
Diarrheic	66	48	72.7%			

Df: Degree of freedom and x^2:Chi-square

In this study sample was taken from calve that are belongs to different origin and the highest prevalence was recorded in those calves taken from urban small holders and the lowest prevalence was

observed on calve belongs to rural small holders. And the lowest prevalence was recorded on calves with normal faecal consistency (Table 2). There was a statistically significant association (P<0.05) between prevalence of coccidiosis and the hygienic status of the calf. Accordingly, calves with poor hygienic condition showed significantly higher prevalence than calves which have relatively better hygienic condition (Table 2). Coccidian infections according to management system have significant difference with Intensive, semi-Intensive, and extensive management systems with higher prevalence on intensive system than other systems. And the lowest prevalence was observed on calves belongs to extensive system.

Table 2. Prevalence of coccidiosis in calves in relation to management

Risk factor	No of calf examined	No of positive case	Prevalence %	Df	X^2	P-Value
Origin of calf						
Farm 1	17	5	29.4%	5	37.651	0.000
Farm 2	24	11	45.8%			
Farm 3	28	10	35.7%			
Farm 4	32	10	31.2%			
Small holder (R)	188	33	17.6%			
Small holder (U)	95	49	51.6%			
Hygienic status						
Good	300	68	22.7%	1	41.880	0.000
Poor	84	50	59.5%			
Management system						
Extensive	187	33	17.6%	2	32.278	0.000
Semi intensive	117	45	38.5%			
Intensive	80	40	50.0%			

Df: Degree of freedom, x^2:Chi-square; R:Rural, U:Urban

5. DISCUSSION

The overall prevalence of coccidiosis based on coprological examination was 30.7% and this study was in line with the prevalence study of bovine coccidian in kombolcha which is 31.9% (Alemayew *et.al*,2013) and frequency of species of the genus Eimeria in naturally infected cattle in southern Bahia, Northeast Brazil (Almeida*et.al*, 2011). However, the prevalence was lower than previous findings reported in Addis Ababa and Debre Zeit by Abebe *et al*. (2008) (68.1%), in Pakistan by Muhammad *et al.,* (2010) (47.09%), in the coastal plain area of Georgia (USA) by Ernst *et al*. (1987) (82.28%) and in sub-humid tropical climate by Rodriguez-Vivas *et al*. (1996) (87.8%). This variation is most likely attributed to the differences in agro-ecology, management types and husbandry practices of the study animals in different areas (Radostits *et al*., 2006).In addition to this sample size is the other factor for this difference with the report of Abebe *et.al*(2008).

The study has revealed that the prevalence of Eimeria has significant association with origin of calves. Higher prevalence of the disease condition was observed in calves belonging to small holders found in urban areas and lowest in calves belonging to rural smallholders. This might be in relation to management system and from personal observation at the time of sample collection there was unhygienic condition, living of calves with adult and overcrowding in most part of urban small holders while they have small number of animal. This was due to lack of space in urban areas and most of rural smallholder management systems were extensive type. This condition in urban smallholders increase the chance of calve to physical contact with adult animals that favoured higher infection rate from a greater chance of licking each other and ingestion of large number of oocysts (Abebe *et al*., 2008; Rodriguez-Vivas *et al*., 1996). This finding disagrees with the finding of Alemayew *et al.,* in 2013which might be due to difference in husbandry and management system.

There was no statistically significant association (P>0.05) between breed and coccidia infection. This is due to either equal chance of accessing the oocysts or no difference on protective immunity for the disease. This finding agrees with the report of Abebe *et al*. (2008) and Alemayew *etal.,* (2013). There

was also no statistically significant association (P>0.05) between sex and coccidia infection. The prevalence in female calves was similar to that of males in this study. This finding agrees with the report of Abebe *et al*., (2008) and (Alemayew *et al*, 2013).

Age of the calves was significantly associated (P<0.05) with the risk of infection by coccidiosis and the highest prevalence was recorded in those calves with youngest age groups (1 to 6months). This is in contrast to Abebe *et al.,* (2008) who reported that risk of infection by Eimeria species appeared to increase with the age of the examined calves. However, this observation in the current study was in line with Dennis *et al.*, (2012), Perfield (2010) and Mihreteab *et al.*, (2012) who noted that young animal less than 6 months were more susceptible than adults. Stress factors like weaning and change of diet can increase level of infection and incidence of the disease due to stress-induced immunosuppression (Kaufman, 1996; Radostitis *et.al*, 2007). In addition to this, coccidiosis is a self-limiting disease in adult and spontaneous recovery without specific treatment is common when the multiplication stage of the coccidian has passed (Radostitis *et.al*, 2007). Based on this, previous exposure might have a contribution to the development of certain level of immunity of older calves as compared to younger that did not experience previous exposure. While the presence of immature immune system increase the susceptibility of younger calves (Chibuanda *et al.,* 1997; Paul, 2000; Faber *et al.,*. 2002).

There was statistically significant (P<0.005) difference in prevalence rate of coccidian infection and faecal consistency which agrees with the finding of Mihreteab *et.al*, (2012). However, this finding disagrees with the report of Abebe *et al*. (2008).The influence of management system from this study also shows the presence of significant association between prevalence of coccidian infection and different management system which is in agreement with Kennedy and Kralka (1987), but disagrees with the work of Alemayew in Kombolcha on prevalence of bovine coccidiosis (Alemayew *et al.*, 2013). Coccidiosis is mostly a disease of young animals kept under intensive management systems when there is stress, overcrowding, housing under conditions of poor hygiene, food changes, nutritional deficiencies, and adverse weather conditions which are favourable for the survival of oocysts and therefore higher infection rates when compared to extensive farming systems (Vorster and Mapham, 2012).Based on this finding, absence of significant difference between intensive and

extensive farming systems might be due to presence of good management system in selected animals which belong to intensive management system in Kombolcha. In this study high prevalence of the disease was observed in intensive management system which is in line with Vorster and Mapham (2012).

And the prevalence was low in extensive management system compared to other management system. This might be due to less chance of getting the oocystin relation to the area they live(large area was available in extensive management system as compared to intensive management system)and decrease in degree of stressful condition (in relation to overcrowding and ventilation)as compared to intensive system. On 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 strong association of the infection with coccidiosis in relation to the hygienic status of calve has been demonstrated in this study. This observation agrees with Mihreteab *et.al,* (2012). Calves with poor hygiene showed significantly higher prevalence than calves which have relatively better hygiene. This could imply that poor sanitation in calve housing areas as well as poor management of housing favours infection with coccidiosis. Obviously, poor ventilation, heavy stocking, cows present with calves, and soiled bedding were regarded as risk factors for coccidiosis (Daugschies and Najdrowski 2005; Radostitis *et al.*, 2007; Vorster and Mapham, 2012).

6. CONCLUSION AND RECOMMENDATIONS

This study has revealed that the prevalence of calves Eimeria infection in Ambo district was 30.7%, which can be taken as high rate of infection. The prevalence of coccidiosis has no significant association with sex and breed of animals examined during the study period. However, the disease has a significant association ($P<0.05$) with origin, age, management system, hygienic status and faecal consistency. This means origin, age, management system, hygienic status and faecal consistency of calves were the major risk factors for the prevalence of coccidiosis in this district. Even if coccidian oocyst was detected on all age groups but the highest prevalence was recorded in those calves found in the range from one to sixth month of age and the lowest prevalence was observed in the age group >12-24 month of age. Calves with poor hygiene are more susceptible than calves which have relatively better hygiene. Calves with diarrheic faecal consistency are more likely to be affected by coccidiosis than calves which have soft and normal faecal consistency. And the lowest prevalence was recorded on calves with normal faecal consistency. In this study high prevalence of the disease was observed in intensive management system. In general, Eimeria infection has a great significance for the livestock producer in Ambo district and need a serious control and prevention programs.

Based on these findings the following recommendations are forwarded:

- Calves should get colostrum in the first 24 hrs of their life to ensure their immune status in general to prevent the occurrence of concurrent infection that predispose to coccidiosis.
- Coccidiostats should be used in ration early for prevention.
- Livestock producers should give emphasis for the improvement of hygienic status of calves.

- Stressful conditions like overcrowding and transportation which triggers the disease occurrences should be avoided.
- There should be isolation and treatment of sick animals to prevent further transmission of the disease.

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ANNEXES

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

i. 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			Breed		Faecal consistency			Hygienic states		Management system			Result
	D/M	FA	U	R	F	M	1	2	3	L	C	N	S	D	G	P	I	SI	E	
1																				
2																				
3																				

Table Abreviation Meaning;

D=day, M=month, Y=year, FR=Farm, USH=Urban Smallholder, RSH=rural smallholder, 1=0-6 months, 2= >6-12 month, 3=>12-24, F=Female, M=Male, L=local, C=Cross, N=Normal, S=Soft, D=Diarrhoea, G=Good, P=Poor, E=Extensive, S=Semi-Intensive, I=Intensive

