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# Prevalence of Eimeria infection in calves in and around Sekota town, North Wollo, Ethiopia

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## Abstract

A cross- sectional study was carried out from July to October 2014 in and around Sekota town in order to determine the prevalence, and associated risk factors of Eimeria infection in calves. To achieve these objectives direct fecal smear technique was employed. From a total of 384 calves examined 23(6.0%)of calves were positive for Eimeria infection. The prevalence of bovine coccidiosis in calve based on breed variation were 22(5.9%) and 1(8.3%) in local and cross breed respectively. The prevalence of bovine coccidiosis in calve based on sex variation, male 8(6.25%) and female 15(6.0%) recorded.The prevalence of bovine coccidiosis in calve based on address variation, Urban12 (6.7%) and rural 11(5.3%). The prevalence of bovine coccidiosis in calve based on age variation 0-6 month 9(5.7%) and >6-1year 14 (6.2%). The prevalence of bovine coccidiosis in calve based on body condition variation, good 7(6.0%), medium 14(8.3%) and poor 2(2.0%). The prevalence of bovine coccidiosis in calve based on fecal consistency variation, normal 3(1.8%), soft 8(7.5%) and bloody diarrhea 12 (10.9%).The prevalence of bovine coccidiosis in calve based on management system, intensive 1(8.3%) and extensive 22(5.9%). Prevalence associated with breed, sex, age, body condition, address and management system had no significant difference ($p > 0.05$), but the presence of bloody diarrhea in examined calve of fecal consistency were observed as the most important factors associated with occurrences of Eimeria infection in calves. There was significant association ($p<0.005$) between the intensity of infection of the calves and bloody diarrhea consistency of the faeces.

**Keywords:** Coccidiosis, Epidemiology and risk factors

## Introduction

Ethiopia is endowed with abundant livestock resources of varied and diversified genetic roles with specific adaption to its wide range of agro ecologies. The country is claimed to have the largest livestock population of 47.5 million cattle, 26.1 million sheep 21.7 million goat, 7.8 million equines, 1 million camel, 39.6 million chickens (CSA, 2009). Farm animals are as a whole an integral parts of country agricultural system and raised both in the highland hand and low land area. Various report shows that the livestock subsector contributes 12-16% of the total and 30-35% agricultural GDP, respectively (AAPBMPDA, 1999).

Ethiopia's great livestock potential is not properly exploited due to many prevailing socio economic values and attitudes, traditional management methods, limited genetic potential and rampant disease. Gastrointestinal parasite infections are a world-wide problem for both small- and large-scale farmers; however, their impact is greater in sub-Saharan Africa. The prevalence of gastrointestinal parasites and the severity of infection vary considerably depending on the genera of helminthes parasites involved, animal species, local environmental conditions such as humidity, temperature, and rainfall, vegetation, and management practices (Debela, 2002; Tembely et al., 1997).

Coccidiosis is one of the most common and important disease of cattle worldwide bovine coccidiosis has been observed in almost all areas where cattle are raised and is usually most common and important in calves younger than one year. All calves managed under conventional systems are exposed and become infected early in life. Many studies indicated that under natural conditions, mixed species infections are much more common than mono species infection (Ernst et al. 1987). Coccidiosis in cattle is particularly a problem of confined animals kept under intensive husbandry practices. The disease is more common in housed animals than in those on pastures. In associations with other entero pathogens, coccidia have been indicated as an important cause of diarrhea in calves (Radostits et al. 1994).

The disease spreads from one animal to another by contact with infected feces. It is most severe in young or weak animals and often causes bloody diarrhea.Coccidiosis is one of the most alarming problems for calf rearing industry and is responsible for morbidity and mortality. The most common clinical manifestations include inappetance, weakness, and loss of weight, diarrhea, depression and anemia (Soulsby, 1982).The development of clinical coccidiosis in cattle mainly depends on factors like species of *Eimeria*, age of infected animal, number of oocysts ingested, presence of concurrent infections and type of production system and management practices (Daugschies and Najdrowsk, 2005).

The prevalence, species composition, and importance of bovine coccidiosis has been documented in various countries of the world (Ernst et al.1987) who reported a 82.28% infection rate; (Rodriguez-Vivas et al.1996) who reported 87.8% infection rates of *Eimeria* in a sub humid tropical climate; Abisola, (2004) who reported 62.68% infection rates of coccidiainnigeria; (Pandit, 2009) who reported Prevalence of Coccidiosis in Cattle in Kashmir valley. A little study available on the coccidia of cattle in Ethiopia is the work of (Abebe et al.2008) who reported an overall prevalence of 68.1% in an epidemiological study of bovine Eimeriosis in calves at Addis Ababa and Debre Zeit dairy farms. As a result, there is lack of information on the occurrence and losses associated with bovine coccidiosis and very little attention has been given to the role of coccidiosis as the cause of disease and production losses in cattle in Ethiopia. Moreover, no attempt was made to determine the prevalence, species composition, and associated risk factors of coccidiosis in cattle. Even though the parasite is one of the most important causes of economic losses and there is scarcity of information about the status of the disease in the current study area.Therefore, the objectives of the study were:

- To estimate the prevalence of calf coccidiosis infection in the study area.
- To assess the associated risk factors of coccidiosis.

## Materials and Methods

### Study Area

The study was conducted in Sekota town. Sekota is found in the North part of Ethiopia which is 720 k.m from Addis Ababa, in Amhara regional state, under Wag Himra- zone. The town is located in a range of altitudes between 1300-2000m above sea level with average rainfall of 550 – 650ml during the study period. Its annual temperature ranges from 23 – 25$^{o}$c.

### Study animals

The study animals were calves with the age of 1 month to 1 year old during the period, from July 2014up to September, 2014. .A total of 384 fecal samples were collected and examined for coccidia species of Eimeria from Urban and Rural areas found in Sekota. Examined animals were categorized age into two age groups as groups I= 1-6months and group II= >6-12months age which is recorded by asking owner orally.Examined animals were also categorized body condition into three such as good, medium and poor. This is based on different body visible bone structure and fat deposit (Nicolson and Butterworth, 1986).

### Study design

A cross sectional type of study was conducted to address the objective of the study from Apirl 2014, up to September 2014.It was conducted to determine the prevalence of bovine coccidiosis in Sekota town by using flotation technique on faeces and of samples collected from live calves in the study area.

### Sample size determination and sampling techniques

A systematic random sampling technique was used to select the study animals from the target population. The sample size required for the study was determined according to (Thrusfield, 2005) as follows. By taking a 95% confidence interval, 50% expected prevalence

and 5% desired absolute precision the sample size is calculated as follows:

$$n = \frac{(1.96)^2 x P_{exp} (1-P_{exp})}{d^2}$$

Where, n =sample size
$P_{exp}$ = expected prevalence
d = desired absolute precision

Therefore, 150calves with the age of 1month to 1 year old were required from study population in the study area. But, the sample size wasmaximized in the area. 384calves with the age of 1month to 1 year old were selected systematically from study population in the study area.

### Study Methodology

#### *Fecal sample collection*

About 3gm fresh fecal sample was collected from rectum from each calf using sterile disposable plastic gloves. The samples were placed in a labeled clean plastic container (universal bottle) and were transported to the Animal Health Clinic of Sekota and Diagnostic Center on the same day of collection and were preserved at refrigerator until processing within 48 hours of arrival. At the time of sampling, the name of the farm (owner), date of sampling, consistency of the feces (soft, watery or normal) and the age, sex, breed, address and management system were recorded for each calf on a data recording format.

#### *Parasitological investigation*

A 5g portion of each of the 384 fecal samples collected from total above was weighed out using a balance and put in a 50ml beaker. 42ml of water was added, mixed thoroughly and poured into a 100ml glass beaker through a strainer. The 50ml glass beaker was rinsed with 8ml of water and the total fluid poured into four 15ml conical tip centrifuge tubes. After Centrifugation at 1,500rpm for 5 minutes, the supernatant was decanted and a sugar solution (specific gravity 1.25) added to the sediment, until the tube was about half full. The content of each test tube was thoroughly mixed with a wooden applicator stick. With the aid of a conical flux, more sugar solution was added until a convex meniscus was formed on top of the tube. A glass cover slip was placed on top of each tube and left for 30 minutes. Then, each glass cover slip was briskly lifted up and placed on a clean glass slide, not allowing formation of air bubbles. The entire area under each cover slip was examined under a binocular microscope at x40.

### Data management and Analysis

Data collected from study sites were entered and stored in a Microsoft excel spread sheet program and coded for analysis. Statistical analysis was done on SPSS 15.0 statistical software. The prevalence was calculated for all data as the number of infected individuals divided by the number of sampled individual x 100. Categorical data were analyzed first with the chi square ($X^2$) test for independence as a screening process. A P-value < 0.05 was considered as statically significant.

## Results

### Overall prevalence

A total of 384fecal samples collected from urban and rural areas were examined by flotation technique. Of these animals 12(8.33%) calves were intensively kept and 372(5.91%) calves were extensively kept. Out of 384calves whose fecal samples were examined, 23 (5.99%) were found to be positive.

### The prevalence of bovine coccidiosis based on breed variation

From the total of 384 fecal samples 12 fecal samples were collected from Holstein breed of calves which were intensively kept and 372 fecal samples were collected from local breeds of calves which were extensively kept under one years of age. Based on breed variation there was no significant difference on the prevalence of bovine coccidiosis ($X^2$=0.121, P> 0.05). However, the prevalence is low in local breeds 22(5.9%) than cross breeds 1 (8.3%).

Table 1 also shows us as there is no significance variation on the prevalence of bovine coccidiosis and sex of the animal ($X^2$=0.406, P>0.05). However, the prevalence of bovine coccidiosis isin female calves 15(6.0%) is higher as compared to male calves 8 (6.25%).

Out of the total 384samples were collected from urban and rural area, which are included in urban area178and 206 samples were collected from rural areas. From thus animals 12 of the calves were intensively kept and 372calveswere which are extensively kept.

There is no significance difference between the prevalence of bovine coccidiosis and address of the animal ($X^2$=0.333P>0.05). However, the prevalence of

bovine coccidiosis is highest in urban calves 12 (6.7%) with a minimal difference in rural calves 11 (5.3%).

**Table 1**: The association of different risk factors with the prevalence of coccidiosis in calves

| Variables | | No of calf examined | No of prevalence positive | Prevalence % | $X^2$ | P-value |
|---|---|---|---|---|---|---|
| Breed | Local | 372 | 22 | 5.9 | 0.121 | 0.728 |
| Cross | | 12 | 1 | 8.3 | | |
| Sex | Male | 128 | 8 | 6.25 | 0.406 | 0.524 |
| | | 256 | 15 | 6.0 | | |
| Female | | | | | | |
| Area | Urban | 178 | 12 | 6.7 | 0.333 | 0.564 |
| | Rural | 206 | 11 | 5.3 | | |
| Age | <6month | 157 | 9 | 5.7 | 0.031 | 0.860 |
| >6month | | 227 | 14 | 6.2 | | |
| BCS | Good | 116 | 7 | 6.0 | 4.466 | 0.107 |
| | Medium | 168 | 14 | 8.3 | | |
| | Poor | 100 | 2 | 2.0 | | |
| | Normal | 168 | 3 | 1.8 | 10.457 | 0.005 |
| | Soft | 106 | 8 | 7.5 | | |
| | Diarrheic | 110 | 12 | 10.9 | | |
| Mgt | Intensive | 12 | 1 | 8.3 | 0.121 | 0.728 |
| | Extensive | 372 | 22 | 5.9 | | |

Out of 384 animals, 157animals were under the age of 6months and 227animals were between 6 up to 12months. The highest prevalence were recorded in the age group II (>6-12months) 15(6.61%) then group I - 8(5.0955%).

There is no significant difference between the prevalence of bovine coccidiosis and age groups of calves ($X^2$= 0.031,P>0.05).However, the prevalence of bovine coccidiosis in calves is high in >6_12 month age of calves 14(6.2%) and a minimal difference 0_6month of calves 9(5.7%).

Out of 384 calves, 116 calves were grouped in good body condition, 168 calves in medium body condition and 100 in poor body condition. The prevalence of bovine coccidiosis is high in medium body condition calves 14 (8.3%) and the lowest prevalence has been recorded in poor body condition 2 (2.0%).

Analysis of body condition with body condition of the calf has revealed that there is no significance difference between the prevalence of bovine coccidiosis and body condition difference of calves ($X^2$=, P>0.05). The examined animals were grouped into three based on body condition as good, medium and poor. This is based on different body confirmation, body musculature and posture.

Out of 384 calves, 168 samples were collected from normal fecal consistency, 106 samples from soft fecal consistency and 110 samples from diarrheic fecal consistency. The highest prevalence has been recorded in diarrheic that include watery, blood stained fecal consistency 12 calves (10.9%) and the lowest prevalence is recorded in normal fecal consistency 3calves (1.8%).There is a significant difference between the prevalence of bovine coccidiosis and fecal consistency of the calves ($X^2$=10.457, P<0.05).

Out of 384 calves, 12 samples were collected from intensive management system and 372 samples were collected from extensive management system. There is no significant difference on the prevalence of bovine coccidiosis on basis of animals breed variation for the occurrence of the disease ($x^2$=0.121, P> 0.05). However, the prevalence is high in intensive management system 1(8.3%) and in small difference low prevalence in Extensive management system 22(5.9%).

## Discussion

The present study has revealed that the presence of bovine coccidia species parasitizing the gastro intestinal tract of calves under the age of one years. The overall prevalence of *Eimeria* species was infection rate of 6.0% in the present study. However, the present finding is lower than previous finding by (Abebe et al.2007) 68.1% *Eimeria* infections in calves in Addis Ababa and Debre Zeit; 82.28% *Eimeria* infections in beef calves from the coastal plain area of Georgia (USA); (Rodriguez-Vivas et al.1996) 87.8%coccidiainfections in Calves in a sub humid tropical climate. This variation is most likely attributed to the differences in agro-ecology, management, and husbandry practices of the study animals in different countries (Radostits et al.2006).

Analysis of risk factor in the association of disease occurrence, there were no statistically significant association (P>0.05) difference in between breed and coccidia infection. These indicate that body condition does not have influence on the occurrence of coccidia infection. This is due to either equal chance of accessing the oocysts, poor nutrition, poor hygienic barn, and management system of the animals. This finding agrees with the report of (Abebe et al.2008; Radostits et al.2006). However, the slight high prevalence can be explained by the fact that local breeds which are kept intensively in intensive dairy farm that expose to overcrowdings of the calves, poor hygiene of the barn and due to high sampled size than cross breeds (Radostits et al.2006). The controversy pertaining to the influence of sex on the occurrence and establishment of the disease needs further investigation.

Analysis of potential risk factors in the association of disease occurrence has revealed that; there was no statistically significant association (P>0.05) between sex and coccidia infection. These indicate that sex does not have influence on the occurrence of 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.,* 2007). The slight high prevalence can be explained by the fact that females are kept intensively in intensive dairy farm that expose to overcrowdings of the calves, poor hygiene of the barn and high sampled size (Radostits et al.2006). The controversy pertaining to the influence of sex on the occurrence and establishment of the disease needs further investigation.

There was no a statistical significance association between the address of the animals and coccidian infection (P>0.05). The slight high prevalence was seen in urban area due to most of the sampled calves were kept under intensive management system and overcrowded condition. However, the previous studies indicated there were a statistical significance association between geographic zone and the occurrence of coccidia infection (Abisola, 2004; Abebe et al.2007). In intensive management system the calves were kept in moist and poor hygiene and much more conducive climatic condition for the survival, sporulation, and development of the oocysts (Abisola, 2004).

There was no significant association (P >0.05) in between the age of the calves with the risk of infection in which the prevalence of coccidiosis appeared to follow an age pattern. However this finding is different from other reports it is may be management difference means mostly extensive management system and local breeds in the study are about the factwhere older calves showing higher rates of infection >6 – 12months age old calves than 1-6months age old calves. Higher infection rate was observed in affected in calves >6 – 12months of age than calves 1- 6months of age was due to the colostrums feeding good nursing of the younger calves. During investigation, almost all calves older than 6 months were housed in overcrowded condition, less care were given and easily contact with adult animals. This has given more chance for the animals to lick each other and ingest large number of oocysts.

This is disagreement with previous reports of other studies (Kennedy, 2001; Abebe et al.2007; Rodriguez-Vivas et al. 1996; Radostits et al.2006).Very young animals are relatively resistant to infection with a mixture of pathogenic species of coccidia, but susceptibility increases progressively up to at least 4 weeks of age. Coccidiosis occurs most commonly in young animals, with a seasonal incidence that may be associated with the time of year young calves and lambs are brought together for weaning or moved into feedlots or fed in small areas for the winter months. The prevalence of infection and the incidence of clinical disease are also age related (Radostits et al.2006).

There was no a statistical significance association between body condition of the animals and coccidian infection (P>0.05). These indicate that body condition does not influence on the occurrence of coccidia infection. This is due to either the level of infection,

sampled size or most of the affected animals harbor the disease without showing clinical signs (Fraser, 2006). The slight high prevalence can be explained by the fact that medium body condition calves harbor subclinical coccidiosis without showing clinical signs and the severity of the disease is low. However, Poor body condition could be also due to lack of feed or nutritional management, might lead to lack of resistance to infection, decrease immune status of the animals and contribute for prevalence rate in poorly conditional animals. It is likely that *Eimeria* infection cause weight loss of animal have indicated the effect and economic impact (Abisola, 2004).The controversy pertaining to the influence of body condition on the occurrence and establishment of the disease needs further investigation.

There was statistically significant ($p<0.005$) difference in prevalence rate in between fecal consistency with coccidia infection in this study. This finding disagrees with the report of (Abebe et al.2007). During investigation, most of diarrheic calves (blood stained, watery and fetid diarrhea) show a positive result for *Eimeria* infection. There were no apparent clinical signs in most of the animals sampled for the study. However, among cases of110diarrheic sample12 (10.9%) were found positive for species of *Eimeria*. Few cases of calves passing frank blood instead of fecal material were also seen and *Eimeria zuernii* oocysts obtained. These agree with (Pandit, 2009).

This study was conducted to see the influence of management system on prevalence of coccidiosis and revealed that there were no statistically significant association ($P>0.05$). This finding is disagreeing with the report of (Abisola, 2004; Kennedy, 2001). These might be attributed to the fact that hygienic system of the barn, nutritional status, contamination of the feed or overcrowding of the animal. However, the prevalence was higher in calves which were kept in intensive management system. The slight high prevalence can be explained by the fact that in intensive management the calves were put in overcrowded condition, poor barn hygiene and get access to ingest oocyst from infected animals (Radostits et al.2006; Fraser, 2006).

## Conclusion and Recommendations

The study was conducted on bovine coccidiosis of calves in Sekota town and surrounding areas of Wag Himra zone. The study result revealed that the overall prevalence of coccidiosis in the study area is 5.99%.

The prevalence of coccidiosis has no significance association with address, sex, age, breed, body condition, management system of animals. However, calves with diarrheic condition have seen found more affected than their counter parts of soft and normal feces consistency. This high prevalence of coccidiosis in the study area indicates the disease has a great economic importance and requires a great control and preventive issue.

Therefore, based on these findings, the following recommendations are forwarded:

- Further epidemiological investigation on prevalence of coccidia species should be needed in the study area
- Pathogenic coccidia species which are present in the study area should be identified
- Implementation of improved calf management practices is greatly suggested to prevent overcrowdings of the animals and disease problems in the study area

Special emphasis should be given to the effective preventive and control measure

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