**Research Article**

# Study on Prevalence of Calves Coccidiosisi in and Around Jimma Town, Ethiopia

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## Abstract

Cross-sectional study was conducted from November 2015 to May 2016 to determine the prevalence and to assess the risk factors of calf coccidiosis in and around Jimma town. Fecal samples were collected from a total of 384 calves by random selection from in and around Jimma town. Out of 384 calves, 131 (34.1%) were found to be positive for *Eimeria* species. In this study, age, breed, management and body condition was considered as risk factors and analysed accordingly. The result showed that there was significant difference (P< 0.05) in the prevalence of coccidiosis among the management systems of calves with the highest prevalence in extensive system (40.9%). There was significant variation (P< 0.05) between calf breeds and infection by *Eimeria*s. The highest prevalence of coccidial infection was recorded in calves with age of 12-24 months (62.5%) and the lowest in age of 6-12 months (29.9%) (P<0.05, $\chi^2$=12.69). In conclusion, the present finding has demonstrated that bovine coccidia are one of the important pathogens in calves in the study area. Further epidemiological investigations are required to determine the significance of *Eimeria* in calves and different risk factors on the occurrence of the disease.

## INTRODUCTION

Bovine coccidiosis is one of the most common parasitic diseases of cattle that prevail widely in different parts of the world. More than twelve different species of *Eimeria* in cattle and buffalo have been documented until now. Most commonly prevalent species are *E. bovis, E. zuernii*, and *E. auburnensis* [1] *E. bovis* and *E. zuernii* are highly pathogenic causing mortality and morbidity by disturbing absorption mechanisms. *Eimeria* is very host specific which limits the infection transmission to come from other cattle and occasional passive transfer of oocysts. The oocysts require sporulation time outside of the animal ranging from a few days to weeks depending on the species, humidity, temperature, and other environmental factors [2]. The oocysts are very resistant and can under favorable conditions survive minus degrees of temperatures for long periods that can span the winter season [3].

Coccidiosis in cattle commonly occurs as subclinical disease causing great economical losses. Signs of clinical coccidiosis include reduced appetite, reduced body weight, unthriftness, diarrhea, dysentery, and anemia [4]. Coccidiosis in cattle is observed in all age groups but it is most common and important in young animals. In associations with other entero pathogens, coccidia have been indicated as an important cause of diarrhea in calves. Negative correlation exists between age of cattle and

risk of infection [4]. Higher oocyst counts have been observed in immatures as compared to adults.

Cattle infected with *Eimeria* acquire some immunity to infection. However, the host reaction seems to be largely dependent on age, species of *Eimeria*, infection dose, and intervals [2]. Young calves are especially susceptible due to their undeveloped immune system, and in the farm environment this development may be delayed due to immune-suppressing stress factors, widening the time window for coccidiosis. Calves at the age between 3-6 months seem to be particularly at risk to disease due to reduced immunity rather than a delay in the age acquired resistance. *Eimeria* can be considered disease of the first year of the animal's life. The animal gets infected with several species during its lifetime. Naturally acquired infections are usually of mixed species, and of varying doses and intervals. The location in the intestine, antigen structures, and life cycle intervals vary between different *Eimeria* species. As a consequence, the species can potentially infect both simultaneously and consecutively [5].

The prevalence, species composition, and importance of bovine coccidiosis have been documented in various countries of the world; however, it is excluded from reports on animal morbidity and mortality in Ethiopia. To the authors' knowledge, a single study available on the coccidia of cattle in Ethiopia is the work of Kassa et al. [6] who reported outbreak of coccidiosis

due to *E zuernii* and an overall prevalence of 24.9% in a 5-year retrospective laboratory examination in cattle in a study conducted in the Abay-Tana settlement dairy farm in Bahr Dar.

As a result, there is scarcity 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, especially in Jimma. Moreover, no attempt was made to determine the prevalence, species composition, and associated risk factors of *Eimeria* infections in cattle. Therefore, taking into account the significance of the parasite as one of the most important causes of economic losses and the scarcity of information in the country, the present study was designed to determine the prevalence and associated risk factors with *Eimeria* infections of calves in and around Jimma town.

## MATERIALS AND METHODS

### Description of the study area

The study was conducted in Jimma town, in Oromia Regional State which is located at 352km south west of Addis Ababa at latitude of 7013' and 8056' N and at longitude of 35052' and 37037' E & an elevation of 1915masl. The minimum and maximum annual temperature of the area ranges from 7°C and 30°C respectively. The mean annual rainfall is 1530mm. The livestock population of the area were about 2016823 cattle, 942908 sheep, 288411 goats, 74574 horses, 49489 donkey, 28371 mules, 1139735, poultry and 418831 bee hives [7].

### Study population

The study population was consisting of male and female calves of less than two years of age. A total of 384 fecal samples were collected and examined for coccidia from different dairy farms and small holders found in and around Jimma town

### Study design and Sample size determination

The study was done from November to May (2015/2016) and the type of study was cross –sectional type which is design for the research with the assumption that it can help to get an understanding of the current status of problem by describing it in relation to the prevalence of calve coccidiosis in and around Jimma town and Sample size required for the study was determined using the formula given by Thrusfield [8]. To calculate the sample size, 50% prevalence, 95% Confidence level, 50% expected prevalence and 5 % of desired absolute precision (d=0.05) was used.

$$n = \frac{(1.96)^2 \, pexp \, (1-pexp)}{d^2} = \frac{(1.96)^2 \, 0.5(1-0.5)}{(0.05)^2}$$

*n* = 384

Where, n = required sample size, pexp = expected prevalence, $d^2$ = desired absolute precision at 95% Confidence level. According to the above formula 384 calves was sampled.

## SAMPLING METHOD

### Sampling method

Simple random sampling was followed in selecting the animals to study the prevalence of coccidiosis among calves. Three hundred and eighty four fecal samples were collected during survey. Fecal samples were collected using universal bottle directly from rectum or immediately after defecation and preserved in 2% potassium dichromate or 10% formalin then transported to Jimma University, for laboratory examination. At the time of sampling, the name of the owner, date of sampling and the sex, breed, body condition and management system was recorded for each calf. Floataation method using saturated Sodium Chloride solution was adopted for coprological examination as described by [9].

### Statistical analysis

Data collected from study sites were entered into Microsoft excel data base system to be analyzed using SPSS. The prevalence was calculated for all data as the number of infected individuals divided by the number of sampled individual × 100. Pearson's chi square ($\chi^2$) was used to evaluate the association between the prevalence of coccidiosis and different risk factors. A value of p< 0.05 was considered significant.

## RESULTS

### Overall prevalence

Out of 384 fecal samples examined, 131 were positive for *Eimeria* oocysts and hence the overall prevalence was found to be 34.1% and out of the in and around Jimma town surveyed for coccidiosis, virtually all had one or more calves shedding *Eimeria* oocysts.

### Prevalence in both sexes

The prevalence was a bit higher in female calves than in male ones. However, the sex of the calves was not significantly associated (P > 0.05, $\chi^2$=3.69) with infection by coccidiosis (Table 1).

### Prevalence in relation to Breed

The present study showed that there was significant variation (P < 0.05, $\chi^2$=18.93) in the prevalence of exotic, cross and local breed calves examined during the study (Table 2).

### Prevalence according to age

The overall prevalence according to age was determined and it was 32.2% in 0-6 months, 29.9% in 6-12 months and 62.5% in 12-24 months of calves. There was statistically significant difference (P<0.05, $\chi^2$=12.69) among management systems (Table 3).

### Prevalence according to management

The overall prevalence according to management system was determined and it was 40.9% in extensive and 29.6% in intensively managed calves. There was statistically significant difference (P<0.05, $\chi^2$=5.28) among management systems (Table 4).

### Prevalence in association to body condition

There was a statistically significant association (P<0.05, $\chi^2$=4.73) between infection with coccidiosis and body condition.

**Table 1:** Prevalence of Coccidiosis in both sexes.

| Sex | No examined | No positive | prevalence | df | χ2 (p-value) |
|---|---|---|---|---|---|
| Female | 182 | 71 | 39% | | |
| Male | 202 | 60 | 29.7% | 1 | 3.69(0.055) |
| Total | 384 | 131 | 34.1% | | |

**Table 2:** Prevalence of Coccidiosis in relation to breed.

| Breed | No examined | No positive | prevalence | df | χ2 (p-value) |
|---|---|---|---|---|---|
| Local | 198 | 86 | 43.4% | | |
| Cross | 114 | 22 | 19.3% | 2 | 18.93(0.00) |
| Exotic | 72 | 23 | 31.9% | | |
| Total | 384 | 131 | 34.1% | | |

**Table 3:** prevalence according to Age.

| Age in month | No examined | No positive | prevalence | df | χ2(p-value) |
|---|---|---|---|---|---|
| 0-6 | 245 | 79 | 32.2% | | |
| 6-12 | 107 | 32 | 29.9% | 2 | 12.69(0.002) |
| 12-24 | 32 | 20 | 62.5% | | |
| Total | 384 | 131 | 34.1% | | |

**Table 4:** Prevalence of Coccidiosis according to management.

| Management | No examined | No positive | prevalence | Df | χ2(p-value) |
|---|---|---|---|---|---|
| Extensive | 154 | 63 | 40.9% | | |
| Intensive | 230 | 68 | 29.6% | 1 | 5.28(0.022) |
| Total | 384 | 131 | 34.1% | | |

**Table 5:** Prevalence of Coccidiosis in association to body condition.

| Body condition | No examined | No positive | prevalence | Df | χ2(p-value) |
|---|---|---|---|---|---|
| Good | 182 | 52 | 28.6% | | |
| Poor | 202 | 79 | 39.1% | 1 | 4.73(0.03) |
| Total | 384 | 131 | 34.1% | | |

Accordingly, calves belonging to poor body condition showed significantly higher prevalence than calves belonging to good body condition in the study area (Table 5).

## DISCUSSION

The present study was conducted with the aim of investigating the prevalence and associated risk factors of calf coccidiosis in and around Jimma town. The result had revealed that the presence of bovine coccidiosis parasitizing the gastro intestinal tract of calves under the age of 24 months in the study area. The overall prevalence of *Eimeria* species was found 34.1%, which is lower than previous findings reported in Addis Ababa and Debre Zeit by Abebe et al. [4], (68.1%) and in sub-humid tropical climate by Rodriguez-Vivas et al. [10], (87.8%), but the result were higher than the work of Mehreteab et al. [11], (22.7%) in Dire dawa and Alemayehu et al. [12], (31.9%) in Kombolcha. This variation is most likely attributed to the differences in agro-ecology and husbandry practices of the study animals in different agro ecologies [13].

Analysis of risk factor in the association of disease occurrence

has revealed that there was no statistically significant association (P> 0.05) between sex (Male 29.7%, Female 39%) and coccidial infection. This finding agrees with the report of Alemayehu et al. [12], 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.

During analysis, breed (Local 43.4%, Cross 19.3% and exotic 31.9%) of calves was showed statistically significant difference (P< 0.05) to coccidiosis. However, the present finding disagrees with previous studies indicating that there was no statistical significant association between breed and coccidial infection [12]. This is due to either unequal likelihood of being infected with coccidiosis or no difference on protective immunity for the disease.

The influence of management system on prevalence of coccidia (Extensive 40.9%, and Intensive 29.6%) has revealed that there was statistical significant association between them (P< 0.05). This result also disagrees with the previous report by Alemayehu et al. [12], indicating that there was no statistical

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significant association between the occurrence of coccidial infection and management system. This might be attributed to the fact that hygienic system of the barn, nutritional status and contamination of the feed or overcrowding of the animal was different in all management systems.

Moreover, management factors may also be related to greater susceptibility of cattle to this disease. Calves that are reared under extensive conditions are exposed to greater number of risk factors for eimeriosis, such as: early weaning, failure to ingest colostrum and difficulty in adapting to artificial high-density diets. Pasture with high concentrations of animals also present greater quantities of feces deposited, and consequently, greater contamination of the ground with parasite eggs and oocysts, which constitutes a risk for susceptible calves [14]. It is important to emphasize that, even in the subclinical form the lesions caused by different species of this parasite may be related to lower nutrient absorption, with an effect on the performance, health and production of the animals [1].

The stronger association (P< 0.05) of *eimeria*l infection in relation to the body condition (Good 28.6% and Poor 39.1%) of calves has been demonstrated in this study. Consequently, calves belonging to poor body condition showed significantly higher prevalence than calves belonging to good body condition. This result agrees with the report of Mehreteab et al. [11], This poor body condition is due to poor sanitation of calves and calf housing areas as well as poor management of housing favors infection with coccidiosis. Obviously, poor ventilation, droughts, poor calf nutrition, group pens, heavy stocking, cows present with calves, soiled bedding were regarded as risk factors for coccidiosis [15].

There was statistically significant variation (P< 0.05) in prevalence of coccidiosis between the different age categories. This agrees with previous reports [4,16]. The prevalence of coccidiosis was increased with the age of the examined calves. Accordingly, the highest prevalence of coccidiosis was observed in calves between 12-24 months of age. This is due to the fact that almost all of the study calves older than 12 months were housed in a large numbers in overcrowded condition. These older calves may also be in physical contact with adult animals that favored higher infection rate from a greater chance of licking each other and ingestion of large number of oocysts. The low prevalence of coccidiosis in calves less than 12 months age might be due to passive immunity from colostrums during the first few weeks of life.

## ACKNOWLEDGMENTS

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