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Occurrence of Coccidiosis in Diarrheic Calves in and Around Asella Town Dairy Farms

Eyuel Tsegaye

College of Veterinary Medicine and Agriculture,
Addis Ababa University, Ethiopia

ABSTRACT

Diarrhea induces massive problems in the rearing of calves in farms. Eimeria is the most common cause of protozoan diarrhea that leads to significant morbidity and mortality in animals worldwide. The aim of the study was to obtain current data about the occurrence of Eimeria, which is the cause of coccidiosis, in diarrheic calves in and around Asella dairy farms. Fecal samples were collected from a total of 108 diarrheic calves less than four months of age from large and small scale dairy farms and examined for the oocysts of Eimeria by centrifugal fecal flotation technique using Sheather's flotation solution. Eimeria oocysts were detected in 38.9% of examined calves. There was statistically significant difference (P=.000) in the occurrence of Eimeria infection to different age of calves. Hygiene was statistically significant (P=.029) with infection of Eimeria. However, the difference was not statistically significant (P>0.05) between this protozoan infection and sex of the calves. The results indicated that in and around Asella dairy farms, Eimeria seem to play a major role in dairy calves less than four months of age as a cause of diarrhea. Further epidemiological investigations are required to determine the Eimeria species composition and different agro ecological risk factors on the occurrence of this protozoan as a cause of diarrhea in calves.
Key words: Age, Asella, Calf, Dairy Farms, Diarrhea, Hygiene and Eimeria.

INTRODUCTION

Ethiopia possesses the largest livestock population in Africa. Livestock is a significant contributor to economic and social development in Ethiopia at the household and national level. Livestock accounts for 15-17% of total GDP and 35-49% of agricultural GDP. Livestock directly contributes to the livelihoods of more than 70% of Ethiopians (CSA, 2010/11).

The country faces a range of opportunities and constraints in improving the productivity of its livestock population. The main constraints to increasing livestock productivity and output are the lack of adequate supplies of good quality livestock feed, high incidences of diseases and mortality rates and water shortage. Livestock diseases are the major constraints of productivity causing economic losses to the peasant farmer and pastoralists in Ethiopia amounting to hundreds of millions of birr annually (Sintayehu *et al*., 2008).

Neonatal calf diarrhea (Calf scours) is considered as one of the most important problem of neonatal calves that causes huge economic losses in the cattle industry (Millemann, 2009). Calf scours (diarrhea) is the most common symptom of illness in young calves and can be caused by several infectious agents or non-infectious agents (dietary changes, overfeeding, and changing of milk replacer brands) (Razzaque *et al*., 2010).

Infectious diarrhea (scours) of neonatal animals is a common disease. The infectious agent that causes scours can be a virus (Bovine Viral Diarrhea virus, Rotavirus, Coronavirus), bacteria (*E. coli,* salmonella, Enterotoxemia) or protozoa (Eimeria, Cryptosporidium, Giardia) (Abdullah *et al*., 2013; Gillhuber *et al*., 2014). The role of protozoan parasites in the etiology of diarrhea in calves is highlighted with emphasis on correct diagnosis (Geurden *et al*., 2005). Giardia, Cryptosporidium*,* and Eimeria are the most important protozoan parasites causing gastrointestinal problems including diarrhea in calves (Gillhuber *et al*., 2014). Bovine coccidiosis is an important protozoan disease of genus Eimeria affecting calves all over the world resulting in considerable economic losses each year to the cattle industries (Daugschies and Najdrowski, 2005). Bovine coccidiosis has been observed in almost all areas where cattle are raised and is usually most common and important in calves younger than 1 year especially in calves less than 3months old (Yosef *et al*., 2011). All calves managed under conventional systems are exposed and become infected early in life. *Eimeria spp*. are strictly host specific (Daugschies and Najdrowski, 2005). The occurrence of diarrhea depends upon the interaction of many factors, including the species of Eimeria, the density of Eimeria oocysts in the environment, the related rate of exposure of naive calves to oocysts, environmental temperature, humidity and sunlight, which affect the development and survival of oocysts and Stressors (Daugschies and Najdrowski, 2005).

Calves are primarily infected via the fecal-oral route and it takes less oocysts to infect a healthy calf (Fayer *et al*., 2000). Infection can rapidly spread from calf to calf when animals are communally housed and overcrowded or from cow to calf via the udders when they are contaminated with infected calf feces in the lying area of the dams (Nasir *et al*., 2009).

In Ethiopia, though diarrhea is an important cause of calf morbidity and mortality, studies done to quantify the magnitude of the problem and to determine the underlying causes are scant and scarce. Eimeria is among the most common diarrhea causing protozoan enteropathogen in calves in Ethiopia. Although some works have been conducted to determine the prevalence and economic significance of Eimeria in few areas of the country, there is no information on the status of this protozoan parasite as a cause of diarrhea in calves in Asella and its surrounding.

Therefore, the objectives of this study were:

> ➢ To determine the occurrence of Eimeria as protozoan enteropathogen incriminated in diarrheic calves in the study area.
> ➢ To identify the associated risk factors for the occurrence of this protozoan enteropathogen in diarrheic calves.

MATERIALS AND METHODS

Study Area

Asella town, the capital of Arsi zone, is located at about 175 km Southeast of Addis Ababa at 6° 59' to 8° 49' N latitudes and 38° 41' to 40° 44' E longitudes with an altitude of the area ranges from 2500 to 3000metre above sea level. Asella town is characterized by mild sub-tropical weather with the maximum and minimum temperature ranging from 18°C and 5°C, respectively around the year. Agricultural production system of the study area is of mixed crop and livestock production. Dairy farming using improved breeds is a common practice in urban and peri-urban areas (KARC, 2008).

Study Population

The study population consisted of diarrheic male and female calves, which are less than four months of age belonging to in and around Asella town large scale farms and small dairy holders. Examined calves were categorized into four age groups as group I = 1 to30 days age, group II = 31 to 60 days age, group III=61to 90 days, and group IV=91to120 days (Paz e Silva *et al.*, 2012) which was determined by asking the owner of the animal orally and by observing calf age records.

Study Design

Cross sectional study was conducted from November 2013 to April 2014 to determine the occurrence of the Emeria and associated risk factors in diarrheic calves in and around Asella town dairy farms.

Study Methodology

Sample collection

Purposive type of sampling was employed for the collection of samples, i.e., calves showing diarrhea in the study area during the study period was used as source of sampling. Fresh fecal samples were collected per-rectum using sterile plastic gloves from the diarrheic calves from November 2013 to April 2014. The samples were placed in suitable sterile universal bottle tightly closed, labeled, and transported to Asella regional veterinary laboratory for examination. The sample was transported in ice box to the laboratory on the same day of collection, and preserved at refrigeration temperature until processing within 48 hours of arrival.

Laboratory investigation

A centrifugal fecal flotation technique using Sheather's sugar solution was applied to detect the oocysts of Eimeria (Hendrix, 1998).

Questionnaire Survey

Structured questionnaire was prepared and used to collect information from calves' owners. The actual questions were presented to the respondent after the clarity of the questions had been checked and respondents were briefed to the objective of the study. Accordingly, information about the age of calves, sex, feeding, and usual problems observed in calves and the associated signs were collected for risk assessment. The hygienic status of calf pens and the calves themselves were assessed based on housing system (ventilation, group pens, heavy stocking), sanitation of bedding (soiled bedding), types of floor and body parts of the

calves (Curt and Gooch, 2005) and was categorized as poor, fair and good (Abebe *et al.*, 2008b).

Data management and Analysis

Data collected from the study area were entered and stored in a Microsoft excel spread sheet program and coded for analysis. Statistical analysis was done on Statistical Package for Social sciences (SPSS) 20 version statistical software. The occurrence rate was calculated for all data as the number of infected individuals divided by the number of sampled individual and multiplied by hundred (Thrusfield, 2007). Pearson's chi-square (x^2) was used to evaluate the association between the prevalence of coccidiosis and different risk factors. P-value less than 0.05 (at 5% level of significance) was considered as significant in all analysis.

RESULTS

Occurrence of Eimeria

 A total of 108 fecal samples were collected from diarrheic calves from large scale dairy farms and small dairy holders and examined for Coccidiosis of which 42 (38.9%) were positive for Eimeria oocysts.

Questionnaire Survey

The age of calves was considered as the potential risk factor for the occurrence of Eimeria, with a significant association of P=0.000. There were also a significant association (P=.029) for the occurrence of Eimeria with the hygiene of the house of the calves. However, there is no significant association observed (P>0.05) between sex of the calves and Eimeria.

Table 1. Potential risk factors and frequency for the occurrence of Eimeria.

Risk factors	No. of calves examined	No. of positive calves	Prevalence (%)	X^2	p-value
Age (in days)					
1-30	51	7	13.7		
31-60	23	14	60.9	25.786	.000
61-90	19	12	63.2		
91-120	15	9	60.0		
Sex					
Male	61	26	42.6	.822	.364
Female	47	16	34.0		
Hygiene					
Good	37	8	21.6		
Fair	31	15	48.4	7.067	.029
Poor	40	19	47.5		
Total	108	42	38.9		

There was a statistically significant difference (P= .000) in the prevalence of coccidiosis among the age of calves. The highest prevalence was recorded in those calves with 61to90 days age category followed by 31 to 60 days, 91 to 120 days and 1 to 30 days age groups. Even though, the occurrence Eimeria is a bit higher in male calves than in female ones, the sex of the animals was not significantly associated (P = .364) with the infection. There was a statistically significant association (p=.029) between the infection with coccidiosis and the

hygienic status of the farms. Accordingly, calves belonging to the farms with poor hygiene showed significantly higher prevalence than calves belonging to the farms with relatively better hygiene (Table 1).

DISCUSSION

The present study has revealed that the presence of coccidiosis in diarrheic calves under the age of four months in and around Asella dairy farms. The prevalence of Eimeria in the present study is lower than previous findings reported in Addis Ababa and Debre Zeit by Abebe *et al.* (2008a) (68.1%), in South Africa by Matjila and Penzhorn(2002) (70%), and in China by Hui *et al*. (2012) (47.1%). The results of the present study, however, is higher than previous reports by Alemayehu *et al.* (2013) (31.9%) in Kombolcha, by Bekele *et al*. (2012) (22.7%) in Dire Dawa, by Nagwa *et al*. (2011) (24.2%) in Egypt, and by Gillhuber *et al.* (2014) (13.3%) in Southern Germany. This variation is most likely attributed to the differences in agro ecology, number and target group of the study animals and husbandry practices of the study animals in different countries (Radostits *et al.,* 2007).

The strong significant association between the ages of the calves with the risk of infection in Eimera observed in this study is in agreement with the reports of Abebe *et al*. (2008a), Alemayehu *et al.* (2013) and Bekele *et al.* (2012) in Ethiopia. In this study, the age dependent frequency was highest in calves between 61and 90 days of age. This was similar to the results of Gillhuber *et al.* (2014), a study on diarrheic calves in Southern Germany. The study suggests that the calves at this age stage have been provided additional nutrition other than milk and could get infection by licking contaminated container and ingestion of contaminated feed.

There was no statistically significant association between sex and Eimeria infection. This finding agreed with the report of Abebe *et al.* (2008a), Alemayehu *et al.* (2013) and Bekele *et al.* (2012). This suggests that both sexes of the animals at this age have almost equal likelihood of being infected with Eimeria. Yet, a higher prevalence in male calves could be due to the less care given to the male calves as compared to the female calves that are deemed to be future cows (Abebe *et al*., 2008a). Despite this, previous studies done on adult cattle reported higher prevalence of Eimeria in female animals than in males (Priti *et al*, 2008, Tauseef *et al*, 2011). Nevertheless, this could be attributed to the physiological stress loaded on female animals in relation to pregnancies and giving birth as compared to males (Radostits *et al.*, 2007).

The present study revealed that there was a statistically significant association between the infection with Eimera and the hygienic status of the farms. Accordingly, calves belonging to the farms with poor hygiene showed significantly higher prevalence than calves belonging to the farms with relatively better hygiene. This finding was also in agreement with the finding of Bekele *et al*. (2012). Obviously, calves with poor ventilation, draughts, poor calf nutrition, group pens, heavy stocking, cows present with calves soiled bedding were regarded as risk factors for coccidiosis (Mundt *et al*., 2005)

CONCLUSION AND RECOMMENDATIONS

The present study has showed that Eimeria, seems to play a contributing role of great importance in diarrhea in calves less than four months of age in the study area and cause severe loss of production in dairy industry. Age can be considered as a risk factor for the occurrence of Eimeria in calves. The hygiene of the house of calves had also increase the risk of infection with Eimeria. However, sex of calves has not showed any difference with the

occurrence of this protozoan parasite infection. In general, different risk factors were considered to affect the rate of infection of calves with this protozoan parasite.

Based on these findings the following recommendations are forwarded.

- Immune status of the calves should be improved by providing sufficient amount of colostrum within the first 24 hours after birth
- Adequate nutrition and good hygiene as well as reducing and monitoring stress levels caused by weaning, a change in feed and overcrowding.
- Further epidemiological investigations are required to determine the protozoan parasite species composition and different agro ecological risk factor on the occurrence of these parasites as a cause of diarrhea in calves.

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Corresponding author: Dr. Eyuel Tsegaye, College of Veterinary Medicine and Agriculture, Addis Ababa University, Ethiopia
Email: eyuelb19@gmail.com