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Prevalence and Risk Factor Identification of Calf Coccidiosis in and Around Bahir Dar Town in Amhara Regional State, North West Ethiopia

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ABSTRACT

A cross sectional study was conducted from November 2014 to April 2015 in and around Bahir Dar town to determine the prevalence of Coccidia infection in calves and to identify associated risk factors. Fecal samples were collected from a total of 384 randomly selected calves with the age of under 2 years. Collected fecal samples were examined for the presence of *Eimeria* oocyst by flotation technique. Out of 384 calves, 73 (19.01%) were found to be positive for *Eimeria* oocyst. Analysis of potential risk factors has revealed that; there was statistically significant difference (P< 0.05) in the prevalence of coccidia infection to different age groups of animals, fecal consistency, origin, body condition, hygienic status and management system. However, the difference was not statistically significant (P>0.05) between coccidia infection with sex and breed of calves. In conclusion, the present finding has demonstrated that calf coccidia are one of the most important pathogens in calves in the study area. Therefore, further epidemiological investigations are required to determine the *Eimeria* species composition and different agro ecological risk factor on the occurrence of the disease.

Keywords: Bahir Dar, calves, coccidiosis, eimeria, prevalence

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 in Africa. Farm animals are as a whole an integral parts of country agricultural system and raised both in the highland and low land areas. Various report shows that the livestock subsector contributes 47 % agricultural Gross Domestic Product (GDP) for Ethiopia (ICPALD, 2013). 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.

Even if gastrointestinal parasite infections are world-wide problem for both small and large scale farmers; their impact is greater in Sub-Saharan African countries like Ethiopia. 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). Gastro intestinal parasites can cause loses associated with lowered fertility, reduced work capacity, involuntary culling, a reduction in food intake and lower weight gains, lower milk production, treatment costs, and mortality in heavily parasitized animals. Endo parasites are responsible for the death of one third of calves, lambs and kids and considerable losses of parts of carcasses condemned during meat inspection (Jubb *et al.*, 1993).

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. Of the 13 species recorded, two of the principal pathogens are *E. zurnii* and *E. bovis* (Bowman, 2009). Coccidia parasites are generally host-specific parasites, and very specific to a particular region in the intestines (Leite, 2009).

In Ethiopia few studies were conducted in calf coccidiosis by Abebe *et al.* (2008) in Addis Ababa and Debre Zeit (68.1 %), Alemayehu *et al.* (2013) in Kombolcha (31.9 %) and Dawid *et al.* (2012) in Dire Dawa (22.7 %) and other which show the presence of coccidiosis in the country. However, there is lack of information on the occurrence and factors associated with calf coccidiosis and very little attention has been given to the impact of coccidiosis as a disease and cause of production losses in calves in and around Bahir Dar town. Therefore, this study was conducted with objectives of determining the prevalence and identifying possible risk factors associated with the occurrence coccidiosis in calves in and around Bahir Dar town.

MATERIALS AND METHODS

Study Area

The study was conducted in and around Bahir Dar town, from November 2014 to April 2015 which is found in Amhara National Regional State (ANRS). It is located in the North Western part of Ethiopia at a distance of 565 kilometers from Addis Ababa, the capital city of Ethiopia. The study area is located at 11°29' – 11°41' N latitude and 37°16' – 37°27' E longitude. The landscape is flat with some small hills to the East and West. The average elevation in the area is about 1795 meters above sea level (m.a.s.l). The study area experiences average annual rainfall that ranges from 1200-1600 mm and it has mean annual temperature of 26°C (NMSA, 2010).

Study Design and Sampling Technique

Cross sectional type of study was conducted. Random sampling method was employed to select the study population both from farms and smallholders. Accordingly, calves under 2 years of age were included as study animals. During sample collection all necessary risk factors like age, breed, sex, fecal consistency, origin, body condition, management systems and hygienic status of the barn were properly recorded.

Sample Size Determination

The sample size was determined according to Thursfield (2007) by considering 50% expected prevalence whenever there was no information about the prevalence of the disease, 95% confidence level and 5 % precision. The sample size was calculated as follows:

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

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

Therefore, 384 animals were sampled to establish the prevalence of calf coccidosis.

Study Animals

The study was conducted on calves less than 24 months of 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. Examined animals were also grouped based on body condition into three such as good, medium and poor as described by Nicolson and Butterworth (1986).

Study Methodology

Fecal samples were collected directly from the rectum of each sampled animal with strict sanitation, and placed in sample vial containing 10% formaline solution. While collecting fecal samples, necessary parameters (date of sampling, sex, age, origin, body condition, fecal consistency management system, hygienic status of the barn) were properly recorded and samples were brought to Bahir Dar Regional Veterinary Laboratory in ice pack box. In the laboratory, the samples were examined using the standard flotation technique as described by Hendrix (1998).

Data Analysis

The raw data were entered and managed in Microsoft excel worksheet and analyzed using SPSS-version 20 software. Descriptive statistics and chi square test were employed to determine the prevalence of calf coccidiosis and association of risk factors with the disease respectively. Level of significance was considered at $P<0.05$.

RESULTS

From a total of 384 fecal samples, 73 (19.01%) were found to be positive for coccidiosis. Analysis of potential risk factors has revealed that; there was statistically significant difference ($P< 0.05$) in the prevalence of coccidia infection to different age groups of animals, fecal consistency, origin, body condition, hygienic status and management system. However, the difference was not statistically significant ($P>0.05$) between coccidia infection with sex and breed of calves (Table 1).

DISCUSSION

The overall prevalence of coccidiosis based on coprological examination in this study (19.01%) was lower than previous findings reported in Addis Ababa and Debre Zeit by Abebe *et al.* (2008) (68.1%) and in Kombolcha by Alemayehu *et al.* (2013). However, the result of the present study virtually agrees with the reports form Debre Zeit by Kebadu (1998) (20%) and in Dire Dawa by Dawid *et al.* (2012) (22.7 %). The lower prevalence of coccidiosis recorded in this study as compared to the aforementioned areas could be due to the differences in agro-ecology,

Table 1: Overall prevalence of calf coccidosis with respective risk factors

Variables	No. of animals	No. of positive	Prevalence (%)	x^2	p-value
Age					
≤ 6 month	174	58	33.3		
> 6 - ≤ 12 month	106	10	9.4	41.595	0.000
> 12 - < 24 month	99	5	5		
Breed					
Local	77	19	24.7	2.007	0.157
Cross	307	54	17.6		
Sex					
Female	222	42	18.9	0.003	0.957
Male	162	31	19.1		
Fecal consistency					
Normal	259	24	9.3		
Soft	77	16	33.8	52.911	0.000
Diarrheic	48	23	47.9		
Origin					
Urban	182	45	24.7		
Rural	202	28	13.9	7.339	0.007
Body condition					
Good	154	22	14.3		
Medium	128	23	18	7.043	0.03
Poor	102	28	25.5		
Hygenic status					
Good	288	40	13.9	19.626	0.000
Poor	96	33	34.4		
Management system					
Extensive	216	36	16.7		
Semi-intensive	76	11	14.5	6.900	0.032
Intensive	92	26	28.3		
Total	384	73 (19.01 %)			

management system and husbandry practices of the study animals in different areas. Moreover, this could also be due to the fact that the study has been conducted mainly in dry season; hence, higher prevalence may be recorded if the study was carried out in the rainy season.

In this study a prevalence of 24.67% and 17.58% was recorded in local and cross breed calves respectively. This finding agrees with the report of Abebe *et al.* (2008) and Alemayehu *et al.* (2013). Yet, higher prevalence in local calves in this study could be due to the less care given to the local calves due to less weight gain in fattening program and reduced milk yield in dairy program as compared to the cross calves that are highly productive and special care is given for them.

The prevalence in female calves was almost similar to that of males in this study. This finding agrees with the report of Abebe *et al.* (2008); Alemayehu *et al.* (2013). But, a bit 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 (Dawid *et al*., 2012). Despite this, previous studies done on adult cattle reported higher prevalence of *Eimeria* in female animals than in males (Tauseef *et al*., 2011). 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).

There was a 3-fold increase in *Eimeria* infection in 0-6 months of age (33.33 %) as compared to 6 months to 1 year old animals (9.43 %) and 6-fold increase as compared to 1 - 2 years of age (5.05 %) which is consistent with the finding of other researchers reporting a strong relation between age groups and infection (Chibunda *et al*., 1997; Yu *et al*., 2011; Dawid *et al*., 2012). All these results are against to the study of Abebe *et al*. (2008) who reported that risk of infection by *Eimeria* species appeared to increase with the age of the examined calves. Since coccidiosis is a self-limiting disease and spontaneous recovery without specific treatment is common, previous exposure might have contributed to the development of a certain level of immunity in older calves as compared to the younger ones that did not experience previous exposure. On the other hand the presence of an immature immune system in younger calves may also contribute to higher susceptibility to coccidiosis.

Higher prevalence of coccidiosis was observed in calves from urban areas as compared to those from rural areas. This might be because differences in 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 areas while they have small number of animal. This was due to lack of space in urban areas and most of rural areas management systems were extensive type. This condition in urban areas increase the chance of calves to 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 (Abebe *et al*., 2008; Rodriguez-Vivas *et al*., 1996). This finding disagrees with the finding of Alemayehu *et al.* (2013).

Calves with poor body condition were found to be affected more than that of calves with medium and good body condition. This finding disagrees with the report of Abebe *et al.* (2007) and Alemayehu *et al.* (2013). Higher prevalence of calf coccidiosis in poor body condition calves might be even if all calves assess the oocyst, calves having good body condition can withstand the infection due to high level of immunity compared to calves having poor body condition.

With regard to fecal consistency, calves with diarrheic feces were found to be affected more than that of calves with soft and normal feces. This finding agrees with the finding of Dawid *et al.* (2012). However, it disagrees with the report of Abebe *et al.* (2008). Calves kept under intensive management system were found to be affected more than those kept under semi-intensive and extensive system. This finding is in agreement with Kennedy and Kralka (1987), but disagrees with the work of Alemayehu *et al.* (2013) in Kombolcha. 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 favorable for the survival of oocysts and therefore higher infection rates when compared to extensive farming systems (Vorster and Mapham, 2012). But the reason for higher prevalence of *Eimeria* in extensive management system compared to semi intensive in this study may be more contamination of water in ponds and overcrowding around a limited water source, which concentrates the hosts and parasites within a restricted area in case of a place where extensive management system found.

Calves that are kept under poor hygienic condition showed significantly higher prevalence of coccidiosis than those kept under relatively better hygiene. This could imply that poor sanitation in the calving and calves housing areas as well as poor management of housing favors infection with coccidiosis. Obviously, poor ventilation, draughts, poor calve nutrition, group pens, heavy stocking, cows present with calves, soiled bedding were regarded as risk factors for coccidiosis (Ahmed and Soad, 2008; Mundt *et al*., 2005; Rodastits *et al*., 2007).

CONCLUSION AND RECOMMENDATIONS

The study revealed that calf coccidiosis is highly prevalent disease in Bahir Dar and *Eimeria* infection has a great significance for the livestock producer and need a serious control and preventive issue. Therefore, improvement of hygienic status of calves, avoiding overcrowding, isolation and treatment of sick animals and further epidemiological investigation on coccidia species in the study area are recommended.

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