Prevalence of Calves Coccidiosis and its associated Risk Factors in Jimma Town

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Abstract: A cross-sectional study was conducted from November 2014 up to April 2015 to estimate prevalence and assess risk factors associated with calf coccidiosis in Jimma town and its surroundings. Three hundred eighty four fecal samples were examined for the presence of *Eimeria* species oocysts by floatation technique using saturated salt (NaCl) solution. Farms which have at least 10 calves were included in the study and simple random sampling method was employed to select calves for fecal sample and data collection. Out of the 384 fecal samples examined, 165 were positive for Eimeria oocysts resulting in an overall prevalence of 43.0 %. All the risk factors including age, sex, breed, body condition score, and state and husbandry system of the calves were not significantly associated (P>0.05) with the prevalence of coccidiosis. Considering the high occurrence and negative effects of the infection on health and growth performance of calves, attention should be given to appropriate preventive and control measures. Further investigation that includes identification of *Eimeria* species is also recommended.

Keywords: *Calves, Coccidiosis, Eimeria species, Prevalence*

Introduction

Bovine coccidiosis occurs worldwide wherever cattle are raised and it mainly affects calves causing severe damage to the intestinal tract (Davoudi *et al*., 2011). The critical age at which calves are affected by coccidiosis is between one month to one year, but cattle remain susceptible to coccidiosis throughout their lives or till they develop acquired immunity (Nalbantoglu *et al*., 2008). Coccidiosis causes diarrhea of varying degrees of severity, secondary infections and mortality (Daugschies and Najdrowski, 2005). The species that cause clinical disease belong to the suborder Eimeridea and family *Eimeridae*. However, the most pathogenic species of this suborder belong to only two genera: *Eimeria* and *Isospora* (Bowman, 2009).

The lifecycle of coccidian is direct and transmission is faecal-oral from contaminated water and feed. Inactive oocysts enter the environment from faeces of an infected animal and the oocysts sporulate under humidity, warmth and oxygen, and become infective (Coetzer and Justin, 2004). Coccidiosis is commonly a self-limiting disease; and the most common signs of bovine coccidiosis are chronic or subclinical (Nisar-Khan *et al*., 2013). *Eimeria* species inhibit the intestinal epithelial cells, leading to mucosal damage and the appearance of clinical signs, malnutrition, weakness, anemia, diarrhea and bloody stool. Mortality from coccidiosis is usually associated with severe diarrhea, which causes loss of electrolytes and dehydration (Fraser, 2006).

Most anticoccidial drugs are only effective during early stages of a coccidian life cycle. These drugs have also been used for prophylaxis to reduce the prevalence of coccidia (Maas, 1996; Coetzer and Justin, 2004; Maas, 2007; Radostits *et al*., 2007). In an attempt of preventive actions, management is important tool in reducing infection pressure (Trotz-Williams *et al*., 2008). Temperatures below 15°C and a maximum humidity of 80% in the farm reduce cases of clinical coccidiosis (Larsson *et al*., 2006). Moreover, frequent pasture rotation practices assist in the control of the lifecycle (Fitzpatrick, 2006).

This protozoan parasite results in huge economic losses in animals worldwide, particularly in developing countries (Om *et al*., 2010; Farooq *et al*., 2012). However, there is lack of information on the occurrence and losses associated with bovine coccidiosis. As a result, very little attention has been given to coccidiosis as a cause of disease and production losses in cattle in Ethiopia. Therefore, this study was conducted to estimate the prevalence of *Eimeria* infections and associated risk factors in calves under one year of age in Jimma town and its surrounding areas.

Materials and Methods

Study Area

The study was conducted in Jimma town, Oromia Regional State, Ethiopia, at a geographical coordinates lying between 7°13' and 8°56' N latitude, and 35°52' and 37°37'E longitude. The area has an altitude ranging from 1720 to 2110 meters above sea level with an annual rainfall ranging from 1200 to 2000mm. In normal years, the rainy seasons extend from February to October. The annual mean temperature ranges from 12.1 to 28°C (JZARDO, 2009).

Sample Size and Sample Farms

Simple random sampling method was used to take the study calves from the study population. Before selection of calves, an identification number was given to each calve in consultation with the owner/attendant. Then depending on the number of calves per farm, a proportion of 70-90% was included for sampling and data collection. The study population consists of calves less than one year of age which constitutes of different

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ISSN 2616-8804 (Print)

sexes, breed, management and body condition. The total number of calves required for the study was calculated based on the formula given by Thrusfield (2005).

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

Where; n = required sample size

P_{exp}= expected prevalence

d= required precision

Since there is no documented information about the prevalence of coccidiosis in calves in the study area, the sample size was calculated using 50% expected prevalence with 5% desired level of precision and 95% of confidence interval. By using this formula the required sample size was 384. Twenty five dairy farms were purposively selected among the 72 dairy farms registered at Jimma town municipality Urban Land Agriculture Development Department. Eighteen extensive and 7 intensive farms were selected based on the number of calves (a minimum of 10 calves). Based on a preliminary survey, almost equal proportion of target animals (calves) in the study area were managed under extensive and intensive production system with approximately similar female to male calve ratio (0.4:0.6). However, there was great variation in proportion of breeds. Accordingly, indigenous calves accounts for more than 70%.

Sample Collection and Laboratory Analysis

Sample collection: A cross-sectional study was conducted from November 2014 to April 2015 and three hundred and eighty four calves' fecal samples were collected. At the time of sampling, date of sampling, age, sex, breed, address, state of calf (weaned or suckling) and management system were recorded for each of the calf on a data recording format. About five to ten grams of fecal samples were collected in a wide mouth plastic bottle directly from rectum or immediately after defecation and preserved in 10% formalin. The sample was transported to Jimma University College of Agriculture and Veterinary Medicine Parasitology Laboratory.

Coprological examination: To undertake a flotation technique, 3 g of fecal samples was weighed using a balance and put in a 100 ml beaker. Fifty ml of saturated NaCl solution (prepared by adding 150gm of NaCl to 350ml of water) was added, mixed thoroughly with fork and the resultant fecal suspension was added to the test tube until the tube was filled to the top and a convex meniscus was formed; then a glass cover slip was placed on the top of the tube and left for 10 minutes. 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 10x power magnification microscope for the presence of protozoan oocysts (Rehman *et al*., 2011).

Statistical Analysis

Data was entered into Microsoft excel spread sheet 2007 and descriptive statistics was used to determine the prevalence, while Chi-square test was employed to detect the presence of differences in prevalence between age, sex, breed, state of calf, body condition score, and husbandry system involved in the study. All statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software package version 20.0.

Results

The overall prevalence of coccidiosis in calves was 43.0% (95% confidence interval: 38.0-48.0) and the prevalence in male calves was slightly higher numerically than females (Table 1).

The infection with *Eimeria* species was not significantly (P> 0.05) associated with breed and body condition score categories (Table 1).

There was also no significant correlation between infections in calves reared under intensive and extensive system of management, and between suckling and weaned calves (Table 2).

Table1. Prevalence of coccidiosis based on biological risk factors

Factors		No of sample	Test +ve	Prevalence (%)	χ^2	P-value
Sex of calves						
	Male	207	90	43.5	0.084	0.827
	Female	177	75	42.4		
Age (Month)						
	0-<6 month	158	74	46.8	1.638	0.201
	6-12 month	226	91	40.3		
Breed						
	Cross breed	114	51	44.7	0.207	0.649
	Local	270	114	42.2		
Body condition Score						
	Poor	180	76	42.2	0.054	0.816
	Good	204	89	43.6		

Table 2. Prevalence of coccidiosis based on managemental risk factors

Factors		No of sample	Test +ve	Prevalence (%)	χ^2	P-value
Husbandry						
	Intensive	191	80	41.9	0.182	0.669
	Extensive	193	85	44.0		
State of calf						
	Weaned	180	84	46.7	0.077	0.781
	Suckling	204	81	39.7		

Discussion

The present study revealed the presence of bovine coccidia species parasitizing the gastrointestinal tract of calves under the age of one year. The overall prevalence of *Eimeria* species oocyst recorded in the present study is lower than previous results reported in Addis Ababa (76.4%), Debre Zeit (57.2%) (Rahmeto *et al.,* 2008), in the coastal plain area of USA, Georgia (82.28%) (Ernst*,* 1987), and in sub-humid tropical area (87.8%) (Rodriguez-Vivas *et al*., 1996). However, it was higher than the value recorded in Dire Dawa (22.7%) (Ferid *et al*., 2012) and Wollo (31.9%) (Alula *et al*., 2013). These variations are most likely attributed to the differences in agro-ecology and husbandry practices employed in different areas and countries (Radostits *et al.,* 2007). The present study was conducted during the dry season and higher prevalence could have been recorded if the study were carried out in the rainy season.

The absence of significant difference between the sexes might suggest that both sexes of calves at this age have almost equal likelihood of being infected with coccidiosis. Yet, a slightly more prevalence in male calves than female could be due to lower care given to the male calves as compared to the female calves that are deemed to be the future cows (Tauseef *et al.,* 2011). However, previous studies on adult cattle reported higher prevalence of *Eimeria* in female animals than in males (Priti *et al.,* 2008; Lassen *et al.,* 2009; Tauseef *et al.,* 2011; Ferid *et al*., 2012), which could be attributed to the physiological stress on female animals due to pregnancy and birth as compared to males (Radostits *et al*., 2007).

In the present study, there was no significant association (P>0.05) between the age of the calves in infection. However, previous studies in Ethiopia (Rahmeto *et al*., 2008; Ferid *et al*., 2012; Alula *et al*., 2013) showed that younger ages were strongly associated with infection of coccidiosis. However, numerically higher prevalence was observed in calves within the age of 6 to 12 than 1 to 6 months, which could be due to colostrum feeding at young age. Additionally, the older calves are stressed with feed change from milk to other feed (Kennedy, 2001; Radostits *et al.,* 2007; Rahmeto *et al*., 2008).

The absence of association between breed and coccidia infection may indicate either equal chance of accessing the oocysts or no difference on protective immunity for the disease between the breeds. Literature indicated that the immunity of indigenous breeds is superior to that of exotic and cross breeds in tropical climates (Perry *et al*., 2002; Bebe *et al*., 2003). Since indigenous calves comprise larg proportion of the study population, the relatively low prevalence recorded in the present study may indicate the tolerance of indigenous breeds to coccidiosis.

The absence of association between body condition of the animals and coccidian infection (P>0.05) could be due to either the level of infection, sample size or most of the affected animals harbor the disease without showing clinical signs (Fraser, 2006). Coccidiosis mainly affects calves less than six months old and is associated with intensive management systems where hygiene is not well observed (Maas, 2007). According to the results of this study, husbandry methods did not significantly affect the risk level of coccidia infection in cattle, which agrees with the finding of Alula *et al.* (2013). This might be attributed to the fact that hygienic system of the barn, nutritional status, contamination of the feed or overcrowding of the animal was similar in both management systems. The result of the present study is not in agreement with the findings of previous studies (Kennedy and Kralka, 1987; Abisola, 2004; Ferid *et al.,* 2012) that concluded husbandry systems to significantly influence prevalence of disease such as coccidiosis.

Conclusion

The study revealed that calf coccidiosis is prevalent in and around Jimma town. The prevalence of coccidia has no significant association with all risk factors that include sex, age, breed, body condition, state of calf, and husbandry systems. The result indicates that the prevalence of calve infections due to *Eimeria* species is high and it is more important in calves above six months of age.

Acknowledgement

The authors would like to express their deepest gratitude to Jimma University College of Agriculture and Veterinary Medicine and staff members for facilitation during the laboratory work.

Conflict of Interests

The authors declare that they have no competing interests.

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