A STUDY ON THE PREVALANCE OF CALVE COCCIDISIS IN AND AROUND SEKELA DISTRICT IN AMHARA REGIONAL STATE, NORTH WEST ETHIOPIA

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(Received on Date: 15th February 2017 Date of Acceptance: 16th March 2017)

ABSTRACT

A cross sectional study was conducted from November 2015 to April 2016 in and around Sekela district, North West Ethiopia to determine the prevalence of coccidia infection in calves. Fecal samples were collected from a total of 384 calves with the age of under 2 years old which were included in the study area randomly. Out of 384 calves, 71 (18.5 %) were found to be positive for *Eimeria* oocyst by flotation techniques. 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 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 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.

Key words: *Calf, Coccidiosis, Eimeria, Prevalence, Sekela*

No: of Tables : 9 **No: of References**: 25

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, 2012). 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). Economic losses are caused by gastrointestinal parasites in a variety of ways, they cause losses through 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). Many studies indicated that under natural conditions, mixed species infections are much more common than mono species infection. Coccidiosis occurs most commonly in animals housed or confined in small areas contaminated with oocysts. Clinical cases can vary from some loss of appetite and decrease in weight gain, short lived diarrhea to severe cases involving great amounts of dark, bloody and foul smelling diarrhea, fluid feces containing mucous and blood, persistent straining in attempt to pass feces, loss of weight, rough hair coat, dehydration, and in some cases death (Radostitis*et al.,* 2007).Clinical disease is most prevalent where animals are subjected to overcrowding, unhygienic environments, or when animals are stressed. Economic loss in clinical disease is mostly attributed to mortality, poor performance, and the costs of treatment and prevention and although sub clinically

infected animals may appear normal; they may have reduced feed consumption, feed conversion and growth performance (Vorster and Mapham, 2012). Climatic factors, age of the host, as well as management determine the pattern of presentation of coccidiosis in different regions (Rodriguez-Vivas*et al*., 1996).

In Ethiopia a few studies were conducted in calves 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 %). However, there is lack of information on the occurrence and losses associated with calf coccidiosis and very little attention has been given to the impact of coccidiosis as the cause of disease and production losses in calves in and around Sekela district. Therefore, the objectives of this study were to determine the prevalence and risk factors of coccidiosis infection in and around Sekela district.

MATERIALS AND METHODS

Study area

The study was conducted in and around Sekela district, Northwest Ethiopia, from November, 2015 to April, 2016. Sekela is located between 10^{0}59.25'N latitude and 36^{0}55.30'E longitude, in the northwest Ethiopia, at 460 km from Addis Ababa. Topographically, it has an elevation of 1500–3200 meter above sea level (m.a.s.l.). The area mean annual rainfall is 1700mm and the mean annual temperature is 18^{0}C.Thefarming system in the area is characterized as mixed crop-livestock production systems. Most of the livestock in the study area were managed under extensive production system. According to CSA (2012) census result, the study area has 73,170 cattle, 12,264 equines, 152,545 small ruminants, and 26,725 chickens. Smallholder mixed crop-livestock farming dominates the farming system (80 %) and livestock in the area is an integral part of the farming system in which it supplies milk, meat, manure, draft power, skin and hides to the local communities (Dawit *et al.*, 2012).

Study design and sampling technique

Cross sectional type of study was conducted from November 2015 to April 2016 in and around Sekela to determine the prevalence of calf coccidosis. Random sampling method was employed to select the study population. Accordingly, calves less than 2 years of age were included as study animals. During sample collection; all necessary risk factors related to calf coccidosis were properly taken such as age, breed, sex, fecal consistency, origin, body condition, management systems, and hygienic status of the barn.

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.

$$n = \frac{1.96^2 \times Pexp(1-Pexp)}{d^2}$$

Where: n = required sample size

Pexp = expected prevalence

d = desired absolute precision

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

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 (Dawid *et al*., 2012). Examined animals were also grouped based on body condition into three such as good, medium and poor as described by Nicolson and Butterworth (1986)(Table 11).

Study methodology

Sample collection: 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 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).

*Flotation technique***:** Three grams of feces was put in a beaker then 50 milliliters of flotation fluid was poured to the beaker containing 3 gm of feces. Next, the flotation fluid (sodium chloride) was mixed with feces thoroughly with stick rod and the resulting fecal suspension was poured through a tea strainer in to another beaker. Next fecal suspension was poured into a test tube from the second container, then placed in a test tube rack, leaving a convex meniscus at the top of the tube and a cover slip was carefully placed on top of test tube. The tube was left to stand for 20 minutes and finally the cover slip was lifted off from the tube vertically together with the drop of fluid adhering to it and immediately placed on microscope slide and examined under the microscope 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

Overall Prevalence

From a total of 384 fecal samples collected during the study period, 71 (18.5%) calves were found to be positive for coccidiosis (Table 1).

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

Variables		No. of calves examined	No. of positive calves
Age	≤6 month	173	55 (31.8%)
	>6-≤12 month	115	12 (10.43 %)
	>12-<24 month	96	4 (4.2 %)
Breed	Local	306	58 (19.0 %)

	Cross	78	13 (16.7 %)
Sex	Female	217	38 (17.5 %)
	Male	167	33 (19.8%)
Fecal consistency	Normal	295	29 (9.8 %)
	Diarrheic	89	42 (47.2 %)
Origin	Urban	149	40 (26.8 %)
	Rural	235	31 (13.2 %)
Body condition	Good	148	18 (12.2 %)
	Medium	125	21 (16.8 %)
	Poor	111	32 (28.8 %)
Hygenic status	Good	290	35 (12.1 %)
	Poor	94	36 (38.3 %)
Management system	Extensive	278	44 (15.8 %)
	Intensive	106	27 (25.5 %)
Total		**384**	**71(18.5 %)**

Prevalence of coccidiosis in relation to the age category

The highest prevalence were recorded in those calves found below sixth (31.8%) months of age and the lowest prevalence were observed in the age group >12-<24 (4.2%) months of age. There was statistically significant difference (P< 0.05) in the prevalence of coccidia infection to different age of animals (Table 2).

Table 2: Prevalence of coccidiosis in calves in relation to age

Age	No. of calves examined	No. of positive calves	x^2 value	p-value
≤ 6 Month	173	55 (31.8%)		
>6- ≤12 Month	115	12 (10.43%)	38.331	0.000
>12-≤24 Month	96	4 (4.2%)		
Total	**384**	**71(18.5 %)**		

Prevalence of coccidiosis in relation to breed

The prevalence of coccidiosis in calves was higher in local breed (19.0 %) calves than in cross breed (16.7 %) calves. Analysis of breed for the occurrence of coccidiosis has showed that there was no statistically significant association (P> 0.05) between breed and coccidiosis (Table 3).

Table 3: Prevalence of coccidiosis in calves in relation to breed

Breed	No. of calves examined	No. of positive calves	x^2 value	P- value
Local	306	58 (19.0%)	0.216	0.642

Cross	78	13 (16.7%)
Total	**384**	**71(18.5 %)**

Prevalence of coccidiosis in relation to sex

The prevalence in female calves (17.5 %) was similar to that of males (19.8 %) and analysis of sex for the occurrence of coccidiosis has showed that there was also no statistically significant association (P> 0.05) between sex and coccidiosis (Table 4).

Table 4: Prevalence of coccidiosis in calves in relation to sex

Sex	No. of calves examined	No. of positive calves	x^2 value	P-value
Female	217	38 (17.5%)	0.317	0.574
Male	167	33(19.8%)		
Total	**384**	**71(18.5 %)**		

Prevalence of coccidiosis in relation to fecal consistency

The higher prevalence were observed on calves with diarrheic fecal consistency (47.2%) than normal fecal consistency (9.8%).Significant association was observed between prevalence of the disease condition and fecal consistency of the calves($p<0.05$)(Table 5).

Table 5: Prevalence of coccidiosis in calves in relation to faecal consistency

Fecal consistency	No. of calves examined	No. of positive calves	x^2 value	P-value
Normal	295	29 (9.8%)	63.324	0.000
Diarrheic	89	42(47.2%)		
Total	**384**	**71(18.5 %)**		

Prevalence of coccidiosis in relation to origin

In this study, sample was taken from calves that are belongs to different origin and the highest prevalence was recorded in those calves taken from urban (26.8 %) and the lowest prevalence was observed on calve belongs to rural (13.2 %) (Table 6).

Table 6: Prevalence of coccidiosis in calves in relation to origin

Origin	No. of calves examined	No. of positive calves	*x*2 value	P-value
Urban	149	40 (26.8 %)	11.280	0.001

Rural	235	31(13.2 %)
Total	**384**	**71(18.5 %)**

The prevalence of coccidiosis in relation to body condition difference

The prevalence of calf coccidiosis was high in poor body condition calves (28.8 %) and the lowest prevalence has been recorded in good body condition (12.2 %).Analysis of calf coccidiosis with body condition of the calves has revealed that there was significance difference between the prevalence of calf coccidiosis and body condition difference of calves (P=0.002) (Table 7).

Table 7: Prevalence of coccidiosis in calves in relation to body condition difference

Body condition	No. of calves examined	No. of positive calves	x^2 value	P-value
Good	148	18(12.2%)		
Medium	125	21(16.8%)	12.042	0.002
Poor	111	32(28.8%)		
Total	**384**	**71(18.5 %)**		

Prevalence of coccidiosis in relation to hygienic status

Calves with poor hygienic condition (38.3%) showed significantly higher prevalence than calves which has relatively better hygienic condition (12.1%). There was statistically significant association between prevalence of coccidiosis and hygienic status of the calves (P=0.000) (Table 8).

Table 8: Prevalence of coccidiosis in calves in relation to hygienic status

Hygienic status	No. of calves examined	No. of positive calves	x^2 value	P-value
Good	290	3512.1%	32.405	0.000
Poor	94	3638.3%		
Total	**384**	**71(18.5 %)**		

Prevalence of coccidiosis in relation to management

There was statistically significant difference (P= 0.000) in the prevalence of coccidia infection to different management with higher prevalence on intensive system (25.5%) than extensive system (Table 9).

Table 1: Prevalence of coccidiosis in calves in relation to management

Management system	No. of calves examined	No. of positive calves (percentage)	x^2 value	P-value
Extensive	278	44(15.8%)	4.736	0.030
Intensive	106	27(25.5%)		
Total	**384**	**71(18.5 %)**		

DISCUSSION

The overall prevalence of coccidiosis based on coprological examination in this study (18.5%) was lower than previous findings reported in Addis Ababa and Debre Zeit by Abebe *et al*. (2008) (68.1%), in Kombolcha by Alemayehu *et al*. (2013), in Pakistan by Muhammad *et al.* (2010) (47.09%) and in sub-humid tropical climate by Rodriguez-Vivas *et al*. (1996) (87.8%). However, the result of the present study virtually agrees with Debre Zeit by Kebadu (1998) (20%), in Dire Dawa by Dawid *et al*. (2012) (22.7 %) and Egypt by Nagwa *et al*. (2011) (24.2 %). The lower prevalence of coccidiosis recorded in this study as compared to the aforementioned areas with the higher prevalence areas could be due to the differences in agro-ecology, management system and husbandry practices of the study animals in different countries. Moreover, this could also be due to the fact that the study has been undertaken mainly in dry season; hence, higher prevalence would have been recorded if the study was carried out in the rainy season. In this study, the infection rate was 19.0 % in local breed calves and 16.7 % in cross breed calves. There was no statistically significant association (P>0.05) between breed and 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*. (2008) and Alemayehu *et al*. (2013). Yet, higher prevalence in local calves in this study either 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.

There was also no statistically significant association (P>0.05) between sex and coccidia infection. The prevalence in female calves was similar to that of males in this study. This finding agrees with the report of Abebe *et al.* (2008) and Alemayehu *et al.* (2013) who reported that the absence of statistically significant

difference between the sexes of the study animals might suggest that both sexes of the animals at this age have almost equal likelihood of being infected with coccidiosis. 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). 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).

Age is one of the major risk factors in the spread of coccidiosis in calves morbidity and risk of infection .In the present study, there was an increase in *Eimeria* species infection in 0 up to 6 months of age (31.8 %) compared to 6 months up to 1 year old animals (10.43 %) and 1 up to 2 year of age (4.2 %) which is consistent with the finding of other researchers reporting a strong relation ($P< 0.05$) between age groups and infection (Chibunda *et al*., 1997;Dawid*et al*., 2012 and Yu *et al*., 2011). The findings of the present study results run 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. Coccidiosis is a self-limiting disease and spontaneous recovery without specific treatment is common when the multiplication stage of the coccidia has passed. This could suggest that 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 (Dawid *et al*., 2012). Chibunda *et al*. (1997) and Faber *et al*. (2002) also pointed to the presence of an immature immune system in younger calves resulting in their higher susceptibility to coccidiosis. In contrast, older calves can develop immunity in response to previous exposure, and hence be more resistant to subsequent re-infections.

The study has revealed that the prevalence of *Eimeria* has significant association with origin of calves. Higher prevalence of the disease condition was observed in calves belong to urban areas and lower in calves belong to rural. This might be in relation to 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 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). This was due to lack of space in urban areas and most of rural areas management systems were extensive type.

Analysis of risk factor in the association of disease occurrence has revealed that, there was statistically significant association ($P<0.05$) in between body

condition and coccidia infection. These indicate that body condition have influence on the occurrence of coccidia infection. This finding disagrees with the report of Abebe *et al.* (2007).This 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.

There was statistically significant (P<0.05) difference in prevalence of coccidia infection and fecal consistency which agrees with the finding of Dawid *et al.* (2012). However, this finding disagrees with the report of Abebe *et al.* (2008). The influence of management system from the present study also shows the presence of significant association (P<0.05) between prevalence of coccidia infection and different management system which 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 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.

The stronger association (P< 0.05) of the infection with coccidiosis in relation to the hygienic status has been demonstrated in this study. Consequently, calves belong to poor hygiene showed significantly higher prevalence than calves belong to 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 *et al.*, 2008; Mundt *et al*., 2005 and Rodastits *et al*., 2007). In addition, Different study designs and methods, hygiene conditions and management, poor nutrition and sanitation, change of diet, breeding of animals, stress factors such as weaning, high animal density, climate and different geographical regions, may all contribute to the variation in results (Dawid *et al*., 2012; Yu *et al*., 2011).

CONCLUSION AND RECOMMENDATIONS

The study revealed that calf coccidiosis is prevalent in Sekela district, North West Ethiopia. The prevalence of coccidiosis has no significant association (P> 0.05) with sex and breed during the study period. However, the disease has a significant association (P< 0.05) with age, origin, body condition, management system, hygienic status and fecal consistency. Accordingly, younger age group of calves, urban origin,

poor body condition and poor hygienic status were strongly associated with the infection of coccidiosis. Calves with diarrheic fecal consistency are more likely to be affected by coccidiosis than calves which have normal fecal consistency. In this study high prevalence of the disease was observed in intensive management system. In general, results from this study indicate the *Eimeria* infection has a great significance for the livestock producer and need a serious control and preventive issue.

Therefore, based on the finding the following suggestions were forwarded:

- ❖ Calves should get colostrum in the first 24 hrs of their life to ensure their immune status.
- ❖ Feeding and watering troughs should be high enough in height to avoid heavy faecal contamination.
- ❖ Livestock producers should give emphasis for the improvement of hygienic status of calves.
- ❖ Stressful conditions like overcrowding and transportation which triggers the disease occurrences should be avoided.
- ❖ Epidemiological investigation on coccidia species should be conducted in the study area.

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