Prevalence of bovine coccidiosis and ostertagiosis in & around kombolcha district of south wollo, ethiopia

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Abstract: A cross-sectional study was conducted from November 2014 up to April 2015 in and around Kombolcha district with the objective of determining the comparative prevalence of bovine coccidiosis and ostertagiosis infection in calves, and the associated risk factors in different production systems. Fecal samples were randomly collected from a total of 384 calves with the age of 1 month to 1 year old. After collection, the samples were transported to Kombolcha regional veterinary laboratory and examined for the presence of *Eimeria spp.* oocyst and *Strongyle type* eggs by flotation techniques and fecal culture for further identification to the genus level (Ostertagia). In this study, out of 384 calves whose fecal samples were examined, to investigate the two genera, *Ostertagia spp.* occurred in 202 calves (52.6%), and the *Eimeria spp.* occurred in 112 calves (29.2%). In 80 (20.8%) of all animals in the current study co-infection has been identified. In the present study there were statistically significant differences (P< 0.05) in the prevalence of *Eimeria spp.* and *Ostertagia spp.* infection, and co-infection in relation to body condition, age and management systems. However, there was no significant association between sex of calves investigated in relation neither with *Eimeria spp., Ostertagia spp.* infection nor with mixed infections (P>0.05). The present findings demonstrated that *Eimeria spp. and Ostertagia spp.* to be important pathogens in calves in the study area. Hence, further investigations should be conducted in order to render more detail information about bovine ostertagiosis and coccidiosis in the study area, so as to put appropriate control and prevention measures in place
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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 in Africa with 47.5 million cattle, 26.1 million sheep 21.7 million goat, 7.8 million equines, 1 million camel, and 39.6 million chickens (CSA, 2009). Farm animals are as whole are integral parts of country agricultural system and rose in the highland, midland and low land areas. Various report shows that the livestock subsector contributes 12-16% of the total GDP and 30-35% agricultural GDP for Ethiopia, respectively (AAPBMPDA, 1999).

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 diseases. Gastrointestinal parasite infections are a world-wide problem for both small and large scale farmers and 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 (Tembely *et al.*, 1997; Debela, 2002). Economic losses due to gastrointestinal parasites results from a variety of ways including 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 (Hansen and Perry, 1994).

The gastrointestinal tract (GIT) of animals harbor a variety of parasites particularly helminthes, which causes clinical and sub clinical parasitism. These parasites adversely affect the health status of animals and cause enormous economic losses to the livestock industry. Gastrointestinal parasites not only affect the health but also affect the productive and reproductive performance of the cattle and buffalo. Gastrointestinal worms are recognized as the most significant part of diseases in livestock sector (Waller, 1999). Among the predisposing factors to internal parasites infection, climates, nutritional deficiency, grazing habits, immunological status, pasture management, presence of intermediate host and vector and the number of infective larvae and eggs in the environment are the most important one (Radostits *et al*., 1994).

Bovine coccidiosis has been observed in almost all areas where cattle are raised and is usually the most common and important in young calves (1 to 2 month

to 1 year) and usually is sporadic during the wet seasons of the year (Fraser, 2006). All calves managed under conventional systems are exposed to coccidia and become infected early in life. Many studies indicated that under natural conditions, mixed species infections are much more common than mono species infection (Ernst *et al*., 1987). Coccidiosis in cattle is particularly a problem of confined animals kept under intensive husbandry practices. In associations with other enteropathogens, *Eimeria* have been indicated as an important cause of diarrhea in calves. Coccidiosis spreads from one animal to another by contact with infected feces and is one of the most alarming problems for calf rearing industry (Radostits *et al*., 1994).

More than 13 species of *Eimeria* species have been described to infect cattle and causes of coccidiosis. The most common pathogenic species are *E. bovis, and E. zuernii* (Kristijanson *et al*., 2004). The prevalence, species composition, and importance of bovine coccidiosis have been documented in various countries of the world. Ernst *et al*. (1987) reported 82.28% infection rate in the coastal plain area of Georgia (USA); Pandit (2009) reported 73.2% infection rate in Kashmir valley. In Ethiopia, Abebe *et al*. (2008) reported an overall prevalence of 68.1% in cattle in Addis Ababa and Debre Zeit area. Dawid *et al*. (2012) reported 22.7% in Dira Dewa and conclude that younger aged calves and poor hygienic status of the farms were strongly associated with infection of coccidiosis in dairy farms.

Gastrointestinal parasitism has been recognized by practitioners as the most common disease in beef cattle, mainly in weaning calves. Among the different genera, *Ostertagia spp* is the predominant parasite in the temperate climate. Bovine Ostertagiosis is a parasitic condition, primarily of young cattle, and. caused by the abomasal nematode *Ostertagia ostertagi* (Armour and Osboum, 1982).

Outbreaks of Type I ostertagiosis are usually seen after weaning time (autumn-winter) when larvae counts are high and food availability is low. It is mostly seen in first-season grazing animals particularly dairy calves heavily stocked on permanent calf paddocks. In areas with warm climates, Type I ostertagiosis may be seen in almost any season but is particularly important in winter and spring. The resulting small worm burdens produce eggs that give rise to a new generation of infective larvae. These 'autoinfection larvae' are responsible for the disease outbreaks that occur from mid-July to the end of the grazing season. It is less often seen in calf suckler or extensive management systems because of the relatively low number of susceptible animals per unit area of grazing land (Stromberg and Gasbarre, 2006). When hypobiosis occurs, many fourth stage larvae accumulate in the gastric glands. Few if any clinical signs will be apparent and egg counts will be zero or low. This condition is called pre-Type II ostertagiosis and occurs at a definite time each year depending on the region - autumn. Type II disease occurs when waves of hypobiotic larvae emerge from the parasitized glands some 4-5 months later. This is typically when cattle are 12-24 months of age, although Type II disease is sometimes seen in older animals. Few adult worms will be present and egg counts will be correspondingly low (Radiostat *et al.*, 1994).

Bovine ostertagiosis has economic importance for several reasons; firstly in heavy infections deaths may occur, and secondly in lighter infections there is a loss of weight and reduced weight gains which result in the development potential of the farm being limited. Also the treatment and prophylaxis of the disease can prove costly both in terms of drug and labour cost (Armour and Osboum, 1982).

There is lack of information on the occurrence and losses associated with bovine Coccidiosis *and* ostertagiosis 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 and around Kombolcha district of South Wollo. Therefore, taking into account the significance of the parasites 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 comparative prevalence of bovine coccidiosis and ostertagiosis infection in calves in and around Kombolcha, South Wollo Zone.
- To assess the risk factors associated with coccidiosis and ostertagiosis in calves in and around Kombolcha district.

3. Materials And Methods

3.1. Study Area

The study was conducted from November, 2014 to April, 2015 in and around Kombolcha town, which is found to the North East of Ethiopia, at 375km from Addis Ababa and 26 Km from Dessie in Amhara regional state. The town is located at latitude and longitude of $11^0$4 N 39^0 44 E and 11.06^0 N, 39.733^0E and its elevation is 1,500 and 1,840 meters above sea level with average rainfall of 750 to 900 ml. Its annual temperature ranges from 25 to 30°C and the relative humidity varies from 23.9 to 79% (NMSA, 2010).

3.2. Study Animals

The study animals were calves within the age of 1 month to 1 year old. A total of 384 fecal samples were collected and examined for *Eimeria spp* and *Ostertagia* spp from different dairy farms found in and around Kombolcha. Examined animals were categorized into two age groups: group I with age

range of 1 to 6 months and group II those ranging between 6 to 12 months age. Based on breed, study animals were classified into two breed: local and crosses which were determined by asking the owner and by inspection. Based on management system, the farms were classified as extensive, semi-intensive and intensive according to feeding and grazing system. Animals included in the current study were also categorized into three according to their body condition: good, medium and poor. This was based on different body visible bone structure and fat deposit.

A total of 384 calves were randomly selected from Kombolcha town its surroundings and subjected to qualitative coprological examinations to identify the major GIT *Eimeria spp* and *Ostertagia spp* parasites involved and also determined their prevalence rates by using cross sectional study.

3.3. Study Design

A cross sectional type of study was conducted to address the objective of the study from November, 2014 up to April,2015. It was conducted to determine the comparative prevalence of bovine coccidiosis and bovine ostertagiosis in and around Kombolcha district by using flotation technique for fecal samples collected from the study animals. Those fecal samples that were positive for strongyle eggs were further cultured to identify whether they were ostertagia or not.

3.4. Sampling Techniques and Sample Size Determination

Random sampling method was used to select the study animals from the target population. Even though the prevalence of coccidiosis (31.9%) was reported by Alemayehu *et al*. (2013), the expected prevalence was assumed to be 50% to increases the sample size. On the other hand there was no previous study undertaken in the study area about bovine ostertagiosis. Therefore, the sample size required for the current study was determined according to Thrusfield (2005) with the expected prevalence of 50%, 5% absolute precision at 95% confidence level as follows:

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

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

Therefore, 384 calves within the age of 1 month to 1 year old were required from target population in the study area. Information on different potential risk factors was collected by personal observation during the visit and from records in some farms.

3.5. Sample Collection and Examination

About 30 g fresh fecal samples were collected directly from rectum using sterile disposable plastic gloves. The samples were placed in a labeled clean plastic container (universal bottle) and were transported to the parasitological laboratory of Kombolcha Animal Health and Diagnostic Center on the same day of collection and were preserved in a refrigerator until processed within 48 hr of arrival. Information about time of sampling, name of the farm (owner), date of sampling and the age, body conditions, sex, breed, address and management system were recorded for each calf on a data recording format while collecting the fecal samples.

3.6. Parasitological Investigation

3.6.1. Floatation technique

3g of feces was put in a beaker then Fifty milliliters of flotation fluid (sodium chloride) was poured to the beaker containing 3 g 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 into 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 the presence of oocysts and nematode eggs under the microscope Hendrix (1998).

Fecal samples from calf whenever positive for *Strongyies* types of eggs was cultured for harvesting third stage larvae (L_3) and identification of the most important genera (Ostertagia) of non-distinguishable nematode eggs in cattle (calves) according to (Hansen and Perry, 1994). Pooled fecal samples was broken up using stirring device, kept moist and crumbly; the mixtures transferred to Petri dishes and placed at 27^0c for 7 to 10 days. The samples were kept humid, mixed occasionally and aerated every 1-2 days. During this period the larvae hatched from the eggs and developed into L_3. Finally larvae were recovered using the Baermann technique. From each culture, the third-stage larvae (L_3) of Ostertagia spp. was morphologically differentiated and identified according to keys provided by Hansen and Perry (1994).

3.7. Data Management and Analysis

Data collected from study sites was entered and stored in a Microsoft Excel spread sheet program and coded for analysis. Statistical analysis was done on Statistical Package for Social Studies (SPSS) 16.0 statistical software. The prevalence were calculated for all data as the number of infected individuals divided by the number of sampled individual and multiplied by 100. Categorical data was analyzed first with the Chi square (x^2) test for independence as a screening process. A P-value < 0.05 was considered as statistically significant.

4. Result

4.1. Overall prevalence of *Eimeria spp. and Ostertagia* spp.

Table 1: Overall prevalence of *Eimeria spp., Ostertagia* spp., and Co-infection

Species	No. Positive	Prevalence (%)
Eimeria spp.	112	29.2
Ostertagia spp.	202	52.6
Co-infection	80	20.8
Total	234	60.94

Out of 384 calves whose fecal samples were examined, *Ostertagia species* were identified in 202 calves (52.6%), and *Eimeria species* oocyst were identified in 112 calves (29.2%). Co-infection encountered in 80 calves which account 20.8% as illustrated below (Table 1).

4.2. The prevalence of bovine coccidiosis *and* ostertagiosis based on age

Out of 384 animals, 171(44.5%) calves were under the age of 6 months and 213(55.5%) animals were between 6 to 12 months. The highest coccidiosis, ostertagiosis and co-infection were recorded in the age group II (≥6-12 months) with respective figure of 71(33.3%), 132(61.4%) and 63(30.8%). With regard to age group I (<6 months), coccidiosis, ostertagiosis and co-infection were identified in 41(24.0%), 70(41.1%), and 17(10.2%), respectively as illustrated below (Table 2).

Table 2: Comparative prevalence of bovine coccidiosis and ostertagiosis based on age

Disease Type	Age	No. Examined	No. Positive (%)	X^2-Value	P-Value
Coccidiosis	<6months	171	41(24.0)	4.019	0.037
	≥6months	213	71(33.3)		
	Total	384	112(29.2)		
Ostertagiosis	<6months	171	70 (41.1)	4.661	0.041
	≥6months	213	132 (61.4)		
	Total	384	202 (52.6)		
Co-infection	<6months	171	17 (10.2)	4.023	0.045
	≥6months	213	63 (30.8)		
	Total	384	80 (20.8)		

Analysis of bovine coccidiosis, ostertagiosis, and co-infection in relation with age of the calves revealed the existence of a significant difference between the prevalence of bovine coccidiosis, ostertagiosis and co-infections among the difference age groups (P<0.05) (Table 2).

4.3. The prevalence of bovine coccidiosis and ostertagiosis based on breed

From the total of 384 calves, 272(70.8%) fecal samples were collected from cross breeds and 112(29.2%) from local breeds. The highest prevalence of ostertagiosis and co-infection were identified from cross breed 156(57.4%), and 56(20.6%) respectively. However, the highest prevalence of coccidiosis was identified from local breeds 34(30.4%) (Table 3).

Analysis of bovine coccidiosis, ostertagiosis, and co-infection in relation with breeds of the calves revealed the existence of a significance association between prevalence of ostertagiosis with breed of calves investigated (P<0.05). However, there was no significant difference on the prevalence of bovine coccidiosis and co-infection in relation with breeds of calves (P> 0.05) as illustrated below (Table 3).

Table 3: Comparative prevalence of bovine coccidiosis and ostertagiosis, based on breed

Disease Type	Breed	No Examined	No. Positive (%)	X^2- value	P-Value
Coccidiosis	Cross**	272	8(28.7)	0.108	0.742
	Local	112	*34 (30.4)*		
	Total	384	112(29.2)		
Ostertagiosis	Cross	272	156(57.4)	8.435	0.004
	Local	112	*46 (41.1)*		
	Total	384	202 (52.6)		
Co-infection	Cross	272	56 (20.6)	0.034	*0.854*
	Local	112	24 (21.4)		
	Total	384	80 (20.8)		

****Cross:** Cross breeds

4.4. **The prevalence of bovine coccidiosis *and* ostertagiosis based on sex**

Out of 384 calves, 245(63.8%) calves were female, and 139(36.2%) calves were male. The highest coccidiosis, ostertagiosis and co-infection prevalence were recorded in female with figures respective of 68(27.8%), 128(52.2%) and 51(20.8%) compared with male 44(31.7%), 74(53.2%) and 29(20.9%), respectively (Table 4).

Analysis of bovine coccidiosis, ostertagiosis, and co-infection with sex of the calves have revealed that there was no significant difference between the prevalence of bovine coccidiosis, ostertagiosis, and co-infection due to sex (P>0.05) as illustrated below (Table 4).

Table 4: *C*omparative *prevalence* of *bovine* coccidiosis *and* ostertagiosis *based on sex*

Disease Type	Sex	No. Examined	No. Positive	X^2- Value	P-Value
Coccidiosis	female	245	68(27.8)	0.653	0.419
	Male	139	44(31.7)		
	Total	384	112(29.2)		
Ostertagiosis	female	245	128(52.2)	0.035	0.852
	Male	139	74 (53.2)		
	Total	384	202 (52.6)		
Co-infection	female	245	51 (20.8)	0.000	0.991
	Male	139	29 (20.9)		
	Total	384	80 (20.8)		

4.5. The prevalence of bovine coccidiosis and ostertagiosis based on management system

From the total of 384 fecal samples, 220(57.3%) were collected from intensively managed calves, 108(28.1%) from semi-intensively managed calves, and 56(14.6%) from extensively managed calves. The highest prevalence of ostertagiosis coccidiosis and co-infection were recorded from intensively managed calves 147(66.8%), 80(36.4%) and 50(22.7%) respectively. The lowest prevalence of bovine coccidiosis, ostertagiosis, and co-infection were recorded from extensively managed calves 16(28.6%), 15(26.8%), and 5(8.9%) respectively (Table 5).

Analysis of bovine coccidiosis, ostertagiosis, and co-infection with management system of the calves have revealed that there was significant difference between the prevalence of bovine ostertagiosis, coccidiosis and co-infection, and management system difference of calves (P<0.05), as illustrated below (Table 5).

Table 5: Comparative prevalence of bovine coccidiosis and ostertagiosis based on MGT

Disease type	Management system	No. examined	No. positive	X^2-Value	P-Value
Coccidiosis	Intensive	220	80(36.4)	23.299	0.022
	Semi-intensive	108	25(23.2)		
	Extensive	56	7(12.5)		
	Total	384	112(29.2)		
Ostertagiosis	Intensive	220	147(66.8)	43.297	0.000
	Semi-intensive	108	40 (37.0)		
	Extensive	56	15 (26.8)		
	Total	384	202 (52.6)		
Co-infection	Intensive	220	50 (22.7)	5.641	0.006
	Semi-intensive	108	25 (23.1)		
	Extensive	56	5 (8.9)		
	Total	384	80 (20.8)		

4.6. **The prevalence of bovine coccidiosis and ostertagiosis based on body condition**

Out of 384 animals, 143(37.2%) calves were grouped in good body condition, 139(36.2%) calves in medium body condition and 102(26.6%) in poor body condition. The highest prevalence of coccidiosis, ostertagiosis and co-infection were recorded in the poor body condition 55(53.9%), 71(69.6%) and 45(44.1%) respectively. The lowest coccidiosis and co-infection prevalence were recorded in the medium body condition 24(17.3%) and 17(12.2), but for ostertagiosis lowest prevalence were recorded in the good body condition 63(44.1%) (Table 6).

Analysis of bovine coccidiosis, ostertagiosis, and co-infection with body condition of the calves revealed that there was significant difference between the prevalence of bovine coccidiosis, ostertagiosis, and co-infection and body condition (P<0.05) as illustrated below (Table 6).

Table 6: Comparative prevalence of bovine coccidiosis and ostertagiosis based on BSC

Disease type	Body condition	No. examined	No. positive (%)	X^2-Value	P-Value
Coccidiosis	Good	143	33(23.1)	42.35	0.000
	Medium	139	24(17.3)		
	Poor	102	55(53.9)		
	Total	384	112(29.2)		
Ostertagiosis	Good	143	63(44.1)	16.776	0.000
	Medium	139	68 (48.9)		
	Poor	102	71 (69.6)		
	Total	384	202 (52.6)		
Co-infection	Good	143	18 (12.6)	45.663	0.000
	Medium	139	17 (12.2)		
	Poor	102	45(44.1)		
	Total	384	80(20.8)		

5. Discussion

The current study revealed the presence of bovine *Eimeria spp.* and *Ostertagia spp.* parasitizing the gastro-intestinal tract of calves under the age of one year. The overall prevalence of coccidiosis, ostertagiosis and co-infections in the present study is found to be 29.2% 52.6%, and 20.8%, respectively. The current finding for coccidiosis due to *Eimeria spp.* was higher than the previous figure in other parts of the country for instance, Dawid *et al.* (2012) 22.7% in Dire Dawa; Addisu and Berihu (2014) 2.9% in West Arsi zone; and it is nearly similar with the finding of Alemayehu *et al.* (2013) 31.9% in the same area indicating the persistent presence of such infection. On the other hand, Abebe *et al.* (2008) reported higher prevalence of coccidiosis (68.1%) in Addis Ababa..

The present finding for bovine ostertagiosis (52.6%) is higher than previous finding by Refiullah *et al.* (2011) 6.7% in Pakistan; Elele (2013) 5.2% in Nigeria; and Addisu and Berihu (2014) 1.8% in West Arsi zone. However, it is less than reported in Ontario (60.2%) by Slocombe (1970). This variation most likely attributed to the differences in agro-ecology, management system, and husbandry practices of calves in different countries and or production systems. Besides, 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. It has been reported that cold stress and changing weather leave the door wide open for the opportunistic, *Eimeria* spp.; hence, severe outbreaks of coccidiosis are common shortly after very cold weather (Radiostits *et al.,* 2006). In addition, the differences among these study areas may be due to differences in the availability of communal grazing, watering areas, and density of other animal species on the grazing land, availability of veterinary services, deworming habit, and awareness of the owner about importance of these diseases.

There was a significant association (P<0.05) between the age of the calves and the prevalence of coccidiosis and ostertagiosis. This finding is in agreement with the report of Alemayehu *et al*. (2013); Dawid *et al.* (2012); Abebe *et al*. (2008) in which prevalence of coccidiosis reported to be higher in calves with the age range of 6 months to 1 year compared with those less than 6 month. Similarly, Addisu and Berihu (2014) reported a higher prevalence of ostertagiosis in older calves than younger ones. Higher infection rate observed in calves with the age range of 6 months to 1year compared with calves of 1 to 6 months might be due to the fact that these groups are well fed with colostrums that protect them against enteric infections. During the current investigation, almost all calves older than 6 months were observed being housed in an overcrowded condition, offered less care and these groups had easy and frequent contact with adult animals. In addition, they were in a position to have more chance of licking each other and ingest large number of oocysts and infective larva. These finding is in agreement with previous reports (Rodriguez-Vivas *et al*., 1996; Kennedy, 2001; Radostits *et al.,* 2006; Abebe *et al*., 2008).

Coccidiosis mostly show seasonal incidence when young calves are brought together for weaning or moved into feedlots or fed in small areas for the winter months. It also mentioned in Radostits *et al.* (2006) that prevalence of coccidiosis and incidence of clinical disease being age related. It is evident that as the age of calves' increases, the chance of contact with infected or contaminated animal during feeding, watering, and exercising area increases. As the result,

the chance of getting infection with *Eimeria spp*. increases in these groups. Similarly, when the age of calves increase, the chance of exposure to arrested larvae due to hypobiosis also increases with subsequent shedding of eggs of *Ostertagia spp.* in the feces. This is supported by the report of Andrews *et al*. (2004), who claimed, type II ostertagiosis being more prevalent in yearlings following their first grazing season which results from the maturation of larvae ingested.

In the current investigation, there was no statistically significant association between sex and coccidiosis nor with ostertagiosis (P>0.05). This finding is in agreement with the report of Alemayehu *et al*. (2013); Dawid *et al*. (2012); Abebe *et al*. (2008) for coccidiosis; and report of Addisu and Berihu (2014) for ostertagiosis suggesting that both sexes of calves having almost equal likelihood of being infected with bovine *Ostertagia spp.* and *Eimeria spp*. However, the prevalence of bovine coccidiosis in male calves (31.7%) was higher than females (27.8%). Yet, a little 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 nursed better due to their value as future of replacer cows.

Analysis of breed as risk factor revealed that there was no statistically significant association between breed and prevalence of occidiosis (P>0.05). These indicate that breed does not have any influence on the occurrence of *Eimeria*l spp. infection. This might be due to equal chance of access to infectious source and susceptibility all breeds to coccidiosis. This finding is in agreement with the report of Alemayehu *et al*. (2013); Abebe *et al*. (2008).

With regard to ostertagiois, indeginous breeds found to be relatively resistant than cross breeds whereby higher prevalence of osteragiosis reported in cross breeds than local ones with a statistically significant association (P<0.05). This finding is in agreement with Addisu and Berihu (2014) report. These differences in rate of infection might be due to the presence of protective immunity in calves born from indigenous breeds than calves born from cross breed cows.

The influence of management system on prevalence of bovine coccidiosis and ostertagiosis have revealed that there was statistically significant association between them (P<0.05). This finding is disagreed with the report of Alemayehu *et al*. (2013) for coccidiosis but agreed with Addisu and Berihu (2014) for ostertagiosis and coccidiosis. This might be attributed to poor hygiene of the barn, nutritional status, improper housing, and contamination of the feed with fecal material significantly influencing the prevalence of the diseases. For instance, overcrowding of calves might have forced to lick each other facilitating transmission of coccidisis. Similarly, development of ostertagia larva to the infective stage requires moisture which might have been different in husbandry practices. Besides, change the climate expected to influence the epidemiology of helminthes when it causes changes in meteorological factors around the thresholds influencing the rate of development or survival and when no strong immune response is induced in the final host (Sutherst, 2001; Hudson e*t al.*, 2006).

The current finding indicated that prevalence of coccidiosis, ostertagiosis and mixed infection being significantly related with body condition of calves (P<0.05). The highest prevalence in calves with poor body condition for coccidiosis, ostertagiois and mixed infection have been agreed with the report of Addisu and Berihu (2014) for coccidiosis and ostertagiosis. On the contrary, the current finding is disagreed with the report of Alemayehu *et al*. (2013) for coccidiosis. This might be due to difference in protective immunity, whereby calves with poor body condition have low protective immunity for coccidiosis and ostertagiosis than those with either medium or good body condition. The poor body condition might have followed the emaciating effect of these diseases due to diarrhea for coccidios and blood sucking nature of *Ostertagia spp*.

The overall prevalence of *Eimeria* spp, *Ostertagia* spp and co-infection in the present study were 29.2%, 52.6%, and 20.8% respectively (Table 1). This high prevalence of *Eimeria spp*. and *Ostertagia spp*. in infected calves and the greater proportions of subclinical infections could negatively influence animals' productivity and cause economic losses from poor feed efficiency, slow weight gain, weight loss, failure to grow to their full potential, and increased susceptibility to other diseases (Fraser, 2006; Stromberg and Gasbarre, 2006). Moreover, continuous oocysts shed from subclinical infected calves contaminate the environment or the hair coats and cause severe coccidiosis in highly susceptible new calves that are kept in these areas (Abebe *et al.,* 2008; Radostits *et al.,* 2006).

6. Conclusion And Recommendations

The study was conducted on the comparative prevalence bovine coccidiosis*, Osertagiosis*, and co-infection of calves' coproscopically in and around Kombolcha districts of South Wollo. In this study, out of 384 calves whose fecal samples were examined, two genera were identified and the most prevalent were *Ostertagia* species, which occurred in 202 calves (52.6%), the second prevalent were *Eimeria species.,* which occurred in 112 calves (29.2%), but co-infection were occurred in 80(20.8%) calves. The high prevalence of ostertagiosis was considered as one of

the important infection in farm in the study area. There were statistically significant differences (P< 0.05) in the prevalence of *Eimeria species, Ostertagia species*, and co-infection to different body condition, management system, and age of examined calves. There were strongly association between the occurrence of *Eimeria species, ostertagia species, and co-infections* with body condition of examined calves (P<0.05). However, there was no significant difference (P>0.05) between sex of calves for the occurrence of bovine Coccidiosis, Ostertagiosis, and *co-infections*. So to minimize the wide spread prevalence of this parasitic problem in the study area the following actions should be taken:

- Further investigations should be conducted in order to render more detail information about bovine coccidiosis and ostertagiosis in the study area, so as to put appropriate control and prevention measures in place.
- The use of communal grazing and watering points should have to be reduced as they are the principal means of transmission of parasites from one herd to the other.
- Implementation of improved calf management practices is greatly suggested to prevent overcrowdings of the animals and disease problems in the study area. All measures that minimize fecal contamination of hair coats, feed and water should be practiced.
- Immune status of the calves could be improved by providing adequate nutrition and good hygiene as well as reducing and monitoring stress levels caused by weaning, a change in feed and overcrowding.

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