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 ex, amined, 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.

2. Literatur Rereview

2.1. Bovine Coccidiosis

2.1.1. Etiology

The genus *Eimeria* belongs to the phylum Apicomplexa and contains numerous species that are parasitic to both vertebrates and highly organized invertebrates. Organisms in this order are obligate intracellular and affect epithelial cells of the gastrointestinal system including associated glands as well as other visceral organs like liver and the kidney. The species of this genus that cause clinical disease belong to the order Coccidia, suborder Eimeridea and family Eimeriidae. These require a single host to complete their lifecycles. More than 13 species of *Eimeria* have been described to infect cattle and cause coccidiosis: *E.alabamensis*, *E.auburnensis, E.bovis, E.bukidnonensis*, *E.canadensis*, *E.ellipsoidalis*, *E.illinoisensis*, *E. cylindrical E.pellita*, *E.subspherica*, *E.wyomingensis,* and *E.zurnii* (Radostits *et al*., 2000).

2.1.2. Epidemiology

The two main species that cause clinical disease in bovine are *E. zuernii* and *E. bovis*. There are various factors that influence the occurrence of coccidiosis. These include, age of individual host, climate and farm management practices (Rodríguez, 1996). The management practices include overstocking in pasture, overcrowding in indoor stalls, poor sanitation and hygiene. Most outbreaks occur following weaning. Though most outbreaks are recorded in cold and wet seasons, coccidiosis can be severe in dry years suggesting that immunosuppressive effect of weaning and dietary stress is a major precipitating factor (Radostits *et al*., 2000). *Eimeria spp.* infects all breeds of cattle and although the disease is seen more commonly in calves four to twelve months of age, it may occur in yearlings and adults (Kennedy, 2000). The morbidity is relatively high although clinical disease is as low as 10 to 15%. However, in case of an outbreak, the infection rate can go up to 80%. Generally low mortality rates are experienced with exception of cases of winter coccidiosis accompanied by nervous signs (Radostits *et al*., 2000).

The prevalence, species composition, and importance of bovine coccidiosis have been documented in various countries of the world. Oda and Nishida (1990) reported 59% in Japan; Chibunda *et al*. (1997) 56% in Morogoro, Tanzania; Waruiru *et al*. (2000) 30.9% in Kenya and Bangoura *et al*. (2011) 95.4 % in the dairy farms in South Africa in Pienaars River. Similarly, in Toba-Tek Singh County in Pakistan, the prevalence of coccidiosis in bovines was estimated 47.09% (Rehman *et al*., 2011); Dong *et al*. (2012) 47.1% in Chaina; Mitchell *et al*. (2012) identified age, water hygiene and keeping of other animal species with cattle as factors significantly influencing the prevalence of coccidiosis in farms in Wales, England.

In Ethiopia, Abebe (2008) reported 68.1% *Eimeria* infections in calves in Addis Abeba and Dawid *et al*. (2012) reported 22.7% in Dira Dewa in that younger calves and farms with poor hygienic status showed higher infection. However, in another study, by Alemayehu *et al*. (2013) who reported 31.9% prevalence, age was claimed as a significant factor but not ether breed, body condition, sex, or management system of the farms investigated.

2.1.3. Life Cycle

The lifecycle is direct and transmission is fecal-oral, from contaminated water and feed. Inactive oocysts enter the environment from the feces of infected animals. In the environment with humidity, warmth and oxygen, the oocysts sporulate and become infective. During this sporulation, the cytoplasm decreases and sporozoites develop in the oocysts transforming into sporocysts. The *Eimeria spp.* has 4 sporocysts each containing two sporozoites (Coetzer and Justin, 2004).

Oocyst are passed in the faces, under optimal condition undergo sporulation which consists of the formation of sporoblast, sporocyst and sporozoites. Sporulation occurs in 24 days and sporulated oocyst is the infective stage (Coetzer and Justin, 2004). Following ingestion of the sporulated oocyst, sporozoites are released in the small intestine and penetrate its epithelial cells changing to trophozoites and divide by multiple fission to form a schizont containing nucleated organisms called merozoites. Schizogony may be repeated and finally merozoites give rise to male and female gametocytes. The macro gametocytes are female and micro gametocytes are males and are flagellated. Fusion of the macro gametes & micro gametes nuclei occurs and result in zygote formation known as oocyst. The oocyst is unsporulated and passes in the feces. The prepatent period is 3-4 weeks in ruminants in general (Urquhart *et al.,* 1995).

2.1.4. Pathogenesis

Coccidia are obligate intracellular parasites whose development within the cytoplasm of epithelial cells results in the death of each cell which is parasitized. The effect on the host depends on the magnitude of the initial infective dose and the number of cells invaded at the onset by the sporozoites (Taylor *et al.,* 2007). When the sporulated oocyst is ingested by a susceptible animal, the sporozoites escape from the oocyst, invade the intestinal mucosa or epithelial cells in other locations (Fraser, 2006).

The most pathogenic species of *Eimeria* are those that infect and destroy the crypts of cells of the large intestine mucosa. This is because the ruminant small intestine is very long, providing a large number of host cells and the potential for enormous parasites replication with minimal damage. If the absorption of nutrients is impaired, the large intestine, to some extent, is capable of compensating nutrient loss. Those species that invade the large intestine are more likely to cause pathologic changes particularly if large numbers of oocysts are ingested over a short period of time (Taylor *et al.,* 2007).

2.1.5. Clinical signs

The severity of the disease depends on several factors including the number of oocysts ingested, the species of *Eimeria* present and the age of the host. Severely infected animals present with thin bloody diarrhea, which may persist for about one week, or merely thin feces with shreds of intestinal epithelium and mucus and eventually anemia may develop. Dehydration, weight loss, depression, anorexia, straining after defecation and occasionally death may occur. Mortality is however acute as a result of the infection or later due to secondary complications. In

less severe infections in which the animal survives and develops resistance, but the infection affect the growth and health status and thus the animal remains stunted (Kennedy, 2000; Maas, 2007).

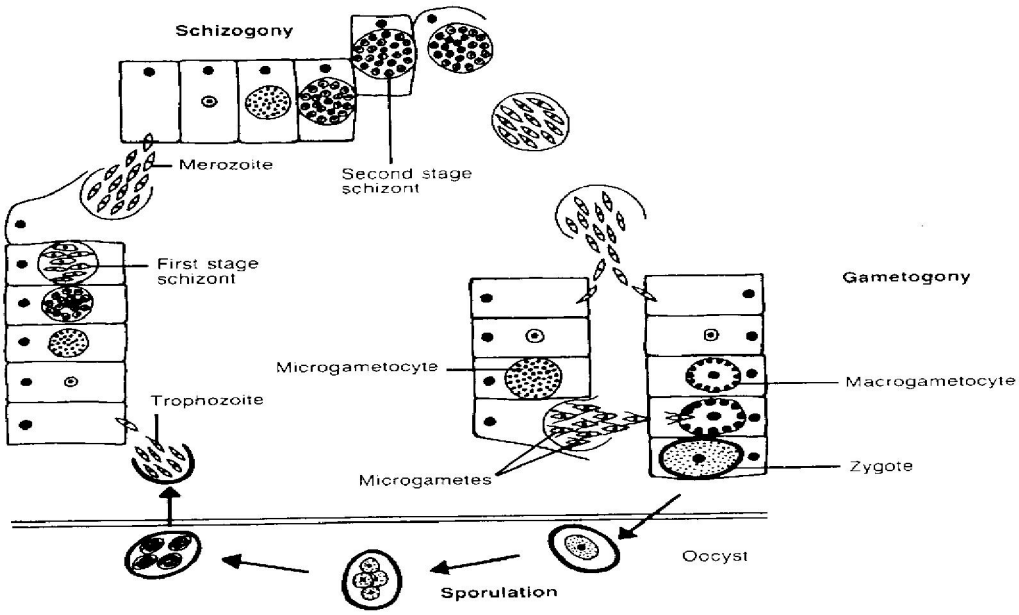

Figure 1: Life cycle of *Eimeria spp*.
Source: Urquhart *et al. (*1995)

Eimeria normally have self-limiting infections and spontaneous recovery without specific treatment is common when the multiplication stage has passed. Cattle that recover from coccidiosis usually acquire a carrier status and continue to shed oocysts in the environments resulting in spread of the disease (Kennedy, 2000, and Fitzpatrick, 2006). However there is no cross immunity and thus another species can still cause disease in these animals. Nervous coccidiosis develops in some calves with acute intestinal coccidiosis. This condition is highly fatal (80-90%) within 24 hours of presentation of the first signs which include: muscle tremors, hyperesthesia, and clonic-tonic convulsions with ventral flexion of the head and neck and nystagmus (Radostits *et al*., 2000).

2.1.6. Necropsy findings

In postmortem finding, there may be little to see beyond thickening and bleeding of the bowel and mucosal scrapings will reveal masses of gamonts and oocysts. Giant meronts may be seen in the mucosa of small intestine as pin points white spots, but unless they are present in vast numbers they cause little harm (Taylor *et al.,* 2007).

In animals dead due to coccidiosis, inflammation and hemorrhage in the affected part of intestine are evident. Thickening of mucosa takes place due to infiltration of cells and the intestine contains fluid, sometimes mixed with blood (Upadhayay, 2005). In cattle, congestion, hemorrhage, and thickening of the mucosa of the cecum, colon, rectum, and ileum are the characteristic gross changes at necropsy. The thickening may be severe enough to produce ridges in the mucosa. Small, white cyst-like bodies, formed by large *schizonts*, may be visible on the tips of the villi of the ileum. Ulceration or sloughing of the mucosa may occur in severe cases (Radostits *et al.,* 2006).

2.1.7. Diagnosis

Diagnosis of coccidiosis in cattle is based on clinical signs especially hemorrhagic diarrhea in acute cases and demonstration of large number of oocysts in the feces (Upadhayay, 2005). It should also be based on history, post mortem findings, supported by oocyst counts and speciation to identify pathogenic species (Taylor *et al.,* 2007).

Oocysts can be identified in feces by salt or sugar flotation methods. Finding appreciable numbers of oocysts of pathogenic species in the feces is diagnostic, but because diarrhea may proceed the heavy output of oocysts by 1-2 days and may continue after the oocyst discharge has returned to low levels, it is not always possible to find oocysts in a single fecal sample. Therefore, multiple examinations may be required. The number of oocysts present in feces is influenced by the genetically determined reproductive potential of the species, the number of infective oocysts ingested, stage of the infection, age and immune status of the animal, prior exposure,

consistency of the fecal sample, and method of examination (Fraser, 2006).

2.1.8. Treatment, prevention and control

In survivors, the disease is self-limiting and clinical signs subside once multiplication stage has passed. Drugs used are however most effective during this phase as they act on the early schizonts. For treatment, various coccidiostats are effective including Sulphadimidine, Nitrofurazone, Monensis, Decoquinate and Amplorium. These drugs have also been used for prophylaxis to reduce the prevalence of *Eimeria spp.* (Radostits *et al*., 2000; Coetzer and Justin, 2004; Maas, 2007).

Though coccidiostats can be given for prophylaxis at the suspected first exposure, hygiene, optimum stocking rate and avoidance of fecal contamination to feed or water cannot be substituted. Moreover frequent pasture rotation, if practiced, assists to interrupt the lifecycle (Fitzpatrick, 2006). Induced immunity can also be achieved by regulated exposure of the calves to contaminated feed without clinical disease. However, young susceptible animals should be kept in clean dry stalls and fed in clean troughs with uncontaminated feed and water and stress associated factors should be minimized. In areas with heavy infestations, soil and bedding fumigation with formaldehyde or disinfection with 1.25% sodium hypochlorite or 0.5% cresol are inexpensive effective methods of destroying oocysts (Coetzer and Justin, 2004).

In feed lots feeding troughs and water container should be the high enough to prevent fecal contamination. The feed lot should also be kept dry and well drained and be cleaned out regularly when dairy calves reared in yards. Water holes and ditches should be fenced off and young calves should be denied accessing them. Bedding and soil may be sterilized by 1.25% sodium hydrochlorite, 0.5% cresol or phenol or by fumigated formaldehyde (Upadhayay, 2005).

The control of coccidiosis assumes greatest importance in calves, and has been difficult to achieve with reliability. Successful and economical control depends on avoiding overcrowding of animals while they develop immunity to the *Eimerial spp.* in the environment. All measures that minimize the amount of fecal contamination of hair coats and fleece should be practiced regularly. Feeding cattle on the ground should be avoided if possible, particularly when overcrowding is a problem (Radostits*et al.,* 2006).

2.1.9. Economic importance

Coccidiosis in bovine species despite not having direct negative effects may manifest losses such as the reduction in the animal's health status; weight loss hence reduced productivity (Mass, 2007; Lassen, 2009). Mortality from coccidiosis is usually associated with severe diarrhea, which causes loss of electrolytes and dehydration as well as secondary infections. Although the economic impact of coccidiosis has not been accurately quantified, coccidiosis can be considered sufficiently important economically in calves. Derickson, (2000) estimated the losses at more than $400 million annually in lost profits due to reduced feed efficiency, slower weight gain, and increased susceptibility to other diseases. In a more recent study, the economic loss from coccidiosis is estimated at about $100 million each year (Maas, 2007). According to Derickson, (2000) 95% of all losses are due to subclinical coccidiosis.

2.2. Bovine Ostertagiosis

2.2.1. *Etiology*

Ostertagia ostertagi is considered being the most important parasite of cattle in temperate climates. The parasite was first described in 1890 by Ostertag and named *Strongylus convolutes* and was later renamed by Stiles in 1892 as *Strongylus ostertagi,* the present name was assigned by Ransom in 1907(Stromberg and Gasbarre, 2006). The genus *Ostertagia* belongs to the kingdom Animalia, phylum Nemathelminthes, class Nematoda, order strongylida, suborder Strongylina, super family Trichostrongloidae, family Trichostrongyidea, subfamily Ostertaginae (Urquhart *et al.,* 1995).

The most prevalent *Ostertagia* species is *O. ostertagi*, which is the most pathogenic abomasal parasite in cattle in temperate area of the world (Armour, 1970). *O. lyrata, O. trifurcate, and O. circumcincta* are common parasite of sheep, and their presence in cattle suggests some contact with sheep grazing areas. *O. trifurcate* has been found in a western Canadian steer that had died in Onterio, but which had no contact with sheep or sheep grazing areas (Armour and Osboum, 1982).

2.2.2. Epidemiology

Ostertagia ostertagi is widely distributed and is the most pathogenic of the parasitic nematodes affecting cattle. Clinical ostertagiasis is seen mainly in calves and yearlings but outbreaks tend to be sporadic so the subclinical disease is of greater importance. *Ostetagia spp.* is especially important in temperate climates and in subtropical regions with winter rainfall (Urquhart *et al.,* 1995). Type I disease is mostly seen in first-season grazing animals particularly dairy calves heavily stocked on permanent calf paddocks (Radostits *et al.,* 2000). In areas with warm climates, Type I ostertagiosis may be seen in almost any season but is particularly important in winter and spring (Armour and Osboum, 1982.

Type I ostertagiosis also occurs in beef cattle if placed on heavily infected pastures immediately after weaning. It is less often seen in sucker calf or extensive management systems because of the

relatively low number of susceptible animals per unit area of grazing land. 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 (Andrews *et al*., 2004). Type II disease occurs when waves of hypobiotic larvae emerge from the parasitized glands some 4 to 5 months later. This is typically when cattle are 12 to 24 months of age, although it is sometimes seen in older animals. Few adult worms will be present and egg counts will be correspondingly low (Radostits *et al.,* 2000).

The prevalence and importance of postmortem finding of bovine ostertagiosis has been documented in various countries of the world; in New Brunswick (100%) by Smith (1971) from ostertagiosis signed died calves; in Ontario (60.2%) postmortem and 49.5% corpological finding were reported by Slocombe (1974); in France (28.4%) by Raynaud *et al*. (1976). Also, carpological study have been reported in Pakistan (6.7%) by Refiullah *et al*. (2011); in Belgium by Bennema *et al.* (2009 and 2011) 62% and 59.1% respectively; in Nigeria 5.2% in exotic breed from extensive management system by Elele *et al*. (2013), and in Ethiopia, 1.8% by Addisu and Berihu (2014) in West Arsi zone, Ormia Regional State.

2.2.3. Life Cycle

O.ostertagi has a direct life cycle, in which eggs that are typical of the Trichostrongloidea, are passed in the feces and under optimal condition develop within the fecal pat to the infective third stage within two weeks. When moist conditions prevail, the L_3 migrate from the feces to the herbage. After ingestion, the L_3 exsheaths in the rumen and further development takes place in the lumen of an abomasal gland. Two parasitic moults occur before the L_5 emerges from the gland around 18 days after infection to become sexually mature on the mucosal surface. The entire parasitic life cycle usually takes three weeks, but under certain circumstances, many of the ingested L_3 become arrested in development at the early fourth larval stage for periods of up to six months (Soulsby, 1982; Urquhart, 1995).

2.2.4. Pathogenesis

The presence of *Ostertagia spp.* in the abomasum in sufficient numbers gives rise to extensive pathological and biochemical changes and severe clinical signs. These changes are maximal when the parasites are emerging from the gastric glands (Radostits *et al.,* 2000). 'This is usually about18 days after infection, but it may be delayed for several months when arrested larval development occurs (Andrews *et al*., 2004).

Type I Ostertagiosis: *Ostertagia ostertagi* is ingested by calves in their first life at grass. The parasites colonize the gastric glands of the fundus and pylorus and then 17-21 days after ingestion, the parasites reach maturity and emerge from the gastric glands. Emergence in sufficient numbers causes extensive pathological changes, chronic gastritis. A thickened, hyperplastic, non-functional gastric mucosa is formed, meaning impaired function in the gut resulting in diarrhoea and hypoalbuminaemia (Urquhart, 1995). Type II Ostertagiosis: *Ostertagia ostertagi* may become hypobiotic in the autumn and if these infestations are heavy, lots of hypobiotic larvae reactivate in the spring. This causes severe acute gastritis (fibrinous or haemorrhagic), and even sudden death (Raynaud, 1976; Soulsby, 1982).

2.2.5. Necropsy finding

The main lesions and the associated biochemical changes occur in the period following the emergence of L_5 from gastric glands. As the larva grows the gastric gland dilates and forms a nodule, 1 to 4mm in diameter, on the surface of the mucosa. When a L_5 emerges from the gastric glands the lesion produced is a raised circular nodule 2-3mm in diameter with a visible central orifice which represents the opening of the parasitized gland. It is the secondary nodule and in heavy infections where coalescence of these nodules occurs, there is a thickened hyperplastic mucosa with a characteristic “morocco leather” appearance (Soulsby, 1982). The lesion which follows emergence from the gland is necrotizing and if there is confluence of lesions the so-called « thumbprint » or superficial mucosal erosion is observed. Several epithelial cytolysis results in a gross diphteritic appearance of the abomasal mucosa. Edema of the abomasal folds may occur as can severe congestion (Brunsdon, 1973).

2.2.6. Clinical signs

Calves are most vulnerable in their first grazing season, although yearlings and, less often, adults are sometimes affected (Radiostat *et al.*, 2000). Bovine ostertagiosis is known to occur in three clinical forms and these are as follows: Type I ostertagiosis is characterized by inappetence, profuse watery diarrhoea, dehydration and marked weight loss, anorexia and thirst are usually present. The morbidity is usually high, often exceeding 75%, but mortality is rare provided treatment is instituted within 2-3 days (Urquhart *et al.,* 1995). Pre-type II ostertagiosis: There are usually no obvious clinical signs but under some conditions, emerging larvae and adults results in mild diarrhoea and reduced growth rate (Armour and Osboum, 1982).

The Type II disease occurs in yearlings. Usually in late winter or spring following their first grazing season and results from the maturation of larvae ingested during the previous autumn and subsequently arrested in their development at the early fourth larval stage (Andrews *et al*., 2004). Its syndrome results

from the subsequent maturation and emergence of large numbers of previously inhibited larvae which had been ingested up to 6 months earlier. The typical disease is characterized by a rapid onset, a severe weight loss and profuse diarrhea, dull and the hind quarters heavily soiled with faces. The morbidity is low but the mortality is high (Urquhart *et al.,* 1995).

2.2.7. Diagnosis

Diagnosis of GIT nematodes in general basis on history of the area, history of anti helmenthices treatment, grazing history, age of animal and clinical signs manifested by the disease, but as GIT nematodosis share common clinical manifestations with other diseases. Therefore, laboratory diagnosis is important (Troncy, 1989).

Although diagnosis of fulminating type I ostertagiosis is very straight forward, the complexity of the life cycle, epidemiology, geographic and climatic variation, and gradations or severity of O. ostertagi infection can make accurate diagnosis of type II disease difficult (Ciordia *et al*., 1964; Urquhart, 1995).

2.2.8. Treatment, prevention and control

In general, anthelmintic groups including Thiabendazoe, Mebendazole, Albendazole, Levamisole, Ivermectin, Triclabendazole are greatly effective against the immature and mature stages of virtually all of the important gastrointestinal nematodes as well as many extra intestinal helminth species. Antibiotics are also given to prevent secondary bacterial infection (Upadhayay, 2005; DACA, 2006).

Type I disease responds well to treatment at the standard dosage rates with any of the modern benzimidazoles (Albendazole or Oxfendazole), the Pro-benzimidazoles (Febantelnetohimin and Thioohanale), Levamisole or Ivermectins (Andrews *et al*., 2004). All of these drugs are effective against developing larvae and adult stages. For the successful treatment of Type II disease it is necessary to use drugs which are effective against arrested larvae as well as developing larvae and adult stages. Only the modern Benzimidazoles listed above or the Ivermectins are effective in the treatment of Type II disease when used at standard dosage levels (Fox, and Jacobs, 2007).

Control measures vary according to local climatic conditions, livestock management system, and epidemiology throughout the world. Broad recommendations regarding timing of preventive treatment can only be made on a regional or climatic basis. Ostertagiosis is a herd disease. So that effective, control through preventive treatment should include all cattle sharing the same pastures. Proper timing of treatment is crucial to successful implementation of preventive treatment programs (Myers, 1988). Today, it is accepted that the prevention of ostertagiosis by limiting exposure to infection is a more efficient method of control. A better policy is to permit young cattle sufficient exposure to larval infection to stimulate immunity but not sufficient to cause a loss in production (Stromberg and Gasbarre, 2006).

Grazing management measures applied in the control of GI nematodes in cattle can be divided in three categories, as proposed by Michel (1985): preventive, evasive and diluting strategies. Preventive strategies aim at minimizing the pasture contamination by putting worm - free animals on clean pasture or by suppressing the egg output by treatment (Armour and Osboum, 1982). The aim of evasive strategies is not to restrict pasture contamination with eggs, but to move the animals just before the larval population resulting from these eggs is expected to reach am significant level. Diluting strategies consist of the mixed grazing of susceptible stock and non - susceptible stock, for example calves and adult cows or cattle and sheep. The use of after - math or reducing the length of the grazing season could be called preventive strategies that can be applied within all three categories (Barger, 1997).

2.2.9. Economic importance

Gastrointestinal nematodes are a world-wide problem for cattle. The most economically important effect of ostertagiosis is the loss of appetite and reduction in the animals health status; weight loss hence reduced productivity (reduced growth rate in the affected host). Mortality from ostertagiosis is usually associated with severe diarrhea, which causes loss of electrolytes and dehydration as well as secondary infections (Stromberg and Gasbarre, 2006).

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.

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).

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

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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