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RESEARCH PAPER

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Study on Major Parasitic Causes of Diarrhoea in Calves and Lambs in and around Asella

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ABSTRACT

A cross sectional study was conducted on calves and lambs in and around Asella from November, 2008 to April, 2009 to determine the prevalence of Eimeria, Cryptosporidium and Toxocara vitulorum infection . A total of 385 faecal samples were collected and examined by faecal flotation using concentrated sugar solution to detect the oocysts of Eimeria and Cryptosporidium spp and the eggs of T. vitulorum. Out of total faecal samples collected and examined 143 (37.1%) calves, 80(20.7%) lambs were found to be infected with Eimeria spp, and 16(4.2%) calves and 41(10.6%) lambs were infected with cryptosporidium. Only 38(9.9%) calves were infected with T. vitulorum. When faecal samples collected and examined, Ascaris egg was not identified from lambs. From the faecal sample collected 4(1%) lambs and one (0.3%) calf were infected with both Cryptosporidium spp and Eimeria. Only 2(0.5%) calves were infected with both T. vitulorum and Eimeria Species. At Asella and its surroundings, 37.1%, 14.8% and 9.9% prevalence of Eimeria, cryptosporidium and T. vitulorum infections were registered, respectively. While 1.3% and 0.5% prevalence of both mixed Eimeria and Cryptosporidium spp and Eimeria and T. vitulorum infections were recorded in the study area, respectively. Statistically, no significant variation ($P>0.05$) in the prevalence rate of Eimeria and cryptosporidium infection among the various sex of the study animals. There was also no significant variation observed in the prevalence of T. vitulorum infection between animal hosts, animal sex and among the months of the study period.

Key words: Calf, Cryptosporidium, Eimeria, Lamb, Prevalence, Toxocara vitulorum.

INTRODUCTION

Diarrhea is one of the most serious and common health problems of calves and lambs which is responsible for greater economic losses in livestock production system. In this context, diarrhea is the most important problem in view of its economic repercussions, not only due to the high mortality it sometimes causes but also because of delayed growth of the animals, medication costs and the expenses derived from veterinary care and working hours. The etiology of diarrhea is complex and can be caused by virus, bacteria, parasites, environmental stress, metabolic or nutritional factors and management factors (Andrews, 1983).

There are a number of parasites known to cause calf and lamb diarrhea but all are not equally important. This study was focus only on those parasites that are most pathogenic and economically important. These include coccidiosis, cryptosporidiosis and toxocariasis which are known to be associated with calf and lamb diarrhea. Coccidiosis due to various *Eimeria* species, cryptosporidiosis due to *Cryptosporidium spp* and toxocarosis due to *T.vitulorum* the most important parasite diseases responsible for diarrhea in young ruminants. (Urquhart *et al.*, 1996).

Clinical coccidiosis in domestic animals becomes an economically important problem with the introduction of intensive rearing systems. Diseases out breaks were associated with high stocking density, very poor weather conditions and use of restricted areas to supplement the herd and the flock with extra feed (Dream and Throp, 1939). Calves and lambs in intensive grazing areas and feedlots are at great risks of coccidiosis as the result of shipping, ration changes crowding stress, severe weather and contamination of the environment with oocysts from adult or other young ruminants (Urquhart *et al.*, 1996).

Cryptosporidiosis caused by the genus *Cryptosporidium*, is another important protozoal disease of young animals and humans with a cosmopolitan distribution. The disease is not host specific and affects several species of animals (Urquhart *et al.*, 1996). In addition, the parasite lacks organ and host specificity and is resistant to various antimicrobial agents cryptosporidium has the ability for autoinfection and occupies a very unique location within the host cell membrane (Tizi pori and Ward, 2001).

T. vitulorum is around worm that mainly affects young animals. Infection is transmitted from the dam to the young by way of colostrum and young start to shed eggs in their faeces after birth. *T. vitulorum* is among the most destructive parasites of young ruminants. The larvae of *T.vitulorum* undergo migration that inflicts great damage to many organs, especially the liver and the intestine. It is responsible for 11 to 50% mortality in young ruminants (Makundi *et al.*, 1996). It can infect many species, but the main hosts are cattle buffalo and sheep and goats in tropical and subtropical countries (Barriga and Omar, 1992). In the calves less than seven months old are the most susceptible because the colostrums do not give good protection against this parasite (Neves *et al.*, 2003).

In Ethiopia though some works have been conducted to determine the prevalence and economic significance of coccidiosis in poultry and other animals in few area of the country, there is no documented report of *Eimeria*, cryptosporidiosis and Toxocariasis in calf and lamb in Asella and its surroundings. Therefore, this study was initiated with the following objectives: To determine the prevalence of major parasitic causes of diarrhea, to identify those parasites incriminated in diarrhea and to recommend relevant control schemes pertinent to local situation.

MATERIAL AND METHODS

Study area

This study was conducted in Asella town and it is situated at 6°59'N latitude and 38°41' to 40°44'E longitude 175km south east of Addis Ababa. Topographically Asella is a high land area with altitude ranging from 1300 to 1350 meter above sea level and has annual rain fall of 2300 to 2400(TDAO, 2006)

Vegetation: - vegetation of the area changes with altitude and rainfall ranging from scattered trees and bushes to dense shrubs and bushes. From the total land 43% is used for grazing, 35% for cultivation, 8.6% forest land, 10.7% productive but unfertilized land grazing which support on average 27livestock/hectares.

Livestock population: - livestock are the major agricultural resources in Asella and surrounding area and has livestock population of 86,122 cattle, 51,292 sheep, 16,292 goats, 35,489 poultry, and 2400 equines (TDAO, 2006)

Study animals

Calves and lambs coming to Asella veterinary clinic were involved in the study.

Sample size determination

The sample size for this study was determined by the formula given by (Thrusfield et al., 1995) and is calculated as below

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

n = required sample size

P_{exp}= expected prevalence which is 50%

d = desired absolute precision = 5%, 95% confidence interval

Accordingly, sample size was calculated to be 384.

Study design

A cross-sectional study was carried out from November 2008 to April 2009 to determine the prevalence of major parasitic causes of diarrhea in non dewormed calves and lambs.

Study methodology

A fresh fecal sample of approximately 30gm was collected directly from the rectum of study animal using disposable plastic gloves. The sample was placed in a separate disposable plastic container and transported to Asella regional veterinary laboratory. Samples which were not processed immediately were preserved in refrigerator at + 4°C. Faecal flotation using concentrated sugar solution was used to examine the parasites.

Data analysis

The collected data was analyzed using SPSS (22 version) software. The prevalence of infection was computed as the number of animals infected by parasite divided by the number of animals examined and multiplied by 100. The prevalence rate was computed at different levels such as animals host, and sex. The person's chi-square (χ^2) was used to see the association between the variables i.e the animal species and sex of the animal and infection with *Eimeria*, *Cryptosporidium* and *T. vitulorum* parasites. A statistically significant association between the variables and infections was considered to exist if the calculated p-value is less than 0.05 at 95% confidence interval.

RESULTS

Overall prevalence of *Eimeria*, *Cryptosporidium parvum* and *Toxocara vitulorum*

Faecal samples from a total of 385 calves and lambs were collected and examined during the study period. Out of these 143(37.1%), 57(14.8%) and 38(9.9%) calves and lambs were positive for *Eimeria*, *Cryptosporidium spp* and *Toxocara vitulorum* respectively. 5(3.1%) were infected with both *C.parvum* and *Eimeria* only 2(0.5) were positive for both *T.vitulorum* and *Eimeria*. Of 143(37.1%) calves and lambs, 63(16.4%) and 80(20.7%) were infected with *Eimeria* species respectively. From 57(14.8%) infected with *Cryptosporidium spp*, 41(10.6%) lambs and 16(4.2%) calves and 38(9.9%) calves infected with *T.vitulorum*. There was no *Ascaris* identified from lambs. From the faecal sample collected 4(1%) lambs and one (0.3%) calf were infected with both *Cryptosporidium spp* and *Eimeria*. Only 2 (0.5%) calves were infected with both *T.vitulorum* and *Eimeria* species. Generally there was no significant difference ($P>0.05$) in prevalence rate of infection of parasites between calves and lambs with almost the same infection rate (60.9%) in calves and (65.8%) in lambs (Table 1).

Table 1. Overall prevalence of parasite infection in calf and lamb in and around Asella.

Animal host	No examined	No of positive (%)
Calves	192	117 (60)
Lambs	193	127 (65.8)
Total	385	244 (63.4)
$\chi^2 = 0.932$		$P=0.322 (P>0.05)$

Table 2. The prevalence of *Eimeria*, *Cryptosporidium spp* and *T. vitulorum*.

Animal host	<i>Eimeria</i>	<i>Cryptosporidium spp</i>	<i>T. vitulorum</i>	Mixed infection of <i>Cryptosporidium spp</i> and <i>Eimeria</i>	Mixed infection of <i>T.vitulorum</i> and <i>Eimeria</i>
Calf	63(14.4%)	16(4.2%)	38(9.9%)	1(0.3%)	2(0.5%)
Lamb	80(20.7%)	41(10.6%)	0	4(1%)	0
Total	143(37.1 %)	57(14.8%)	38(9.9%)	5(1.3%)	2(0.5%)

Host different in the prevalence rates of *Eimeria*, *Cryptosporidium* and *Toxocara vitulorum* infections

There was no statistically a significant difference ($P>0.05$) in prevalence rate of *Eimeria* infection between bovine and ovine, with infection rate (20.7%) in ovine and relatively less in bovine (16.4%) and there was no significant difference ($P>0.05$) in the prevalence rate of *Cryptosporidium spp* which were 41(10.6%) in ovine and 16(4.2%) in bovine with less infection .There was significance difference in prevalence rate of *Toxocara vitulorum* between bovine (9.9%) and ovine.

Sex prevalence interaction

Statistical analysis revealed that there was no significant difference ($p>0.05$) in the prevalence rate of all *Eimeria*, *Cryptosporidium spp* and *Toxocara vitulorum* between the two

sexes. Both sex equally exposed to the parasite, with the prevalence rate of (65.3%) in males and (61.5%) in females. Table 6. The prevalence of Eimeria, Cryptosporidium and Toxocar Vitulorum on sex results.

Table 3. The prevalence of Eimeria, Cryptosporidium spp and T. Vitulorum on sex basis.

Sex	No examined	No positive	Prevalence (%)
Male	193	126	65.3%
Female	192	118	61.5%
Total	385	244	63.4%

$\chi^2 = 0.0607$, $P = 0.436$ (P>0.05)

Results of parasite identification

Sixty three (16.4%), eighty (20.7%) different Eimeria parasite were identified respectively in calves and lambs based on the morphology of Oocysts. Through the majority of the animals 143(37.1%) were infected with Eimeria, mixed infection with more than one Eimeria spp. in both animals were also observed.

Cryptosporidium spp was identified from calves (4.2%) under intensive farm system and lambs (10.6%) rose under extensive grazing system of Asella and its surrounding. *T. vitulorum* was identified only from 38 (9.9%) calves raised in intensive system of study area. Mixed infection with *Cryptosporidium spp* & Eimeria (0.3%) in calves & 1% in lambs and 0.5% mixed infection of *T. vitulorum* & Eimeria were observed.

DISCUSSION

Eimeria species

In this study, out of the 192 calves and 193 lambs examined, 63(16.4%) calves and 80 (20.7%) lambs were found to be infected with Eimeria species. This finding is the first report regarding the prevalence of Eimeria infection in young ruminants in the study area.

Various prevalence rates of Eimeria infection in cattle and sheep have been reported in various parts of the world Pilarczyk *et al.*, (2000) reported 49.6% prevalence in cattle in Poland; Kusiluka *et al.*, (1996) recorded 91% prevalence rates in sheep in Tanzania, Cornelissen *et al.*, (1995) reported 46% in calves in Netherlands; Kasim and Al-shawa, (1985) reported 34.1% in calves in Saudi Arabia; Arslan *et al.*, (1999) obtained a prevalence rate of 93.9% in sheep of Turkey; Galip (2004) recorded 100% prevalence in sheep Turkey; Hasbullah *et al.*, (1990); reported prevalence rate of 19.3% -59% in calves in Japan; Matjila and Pezhorn (2002) obtained prevalence rate of 29-52% in cattle in South Africa; comparable findings were also reported in our country: Kassa *et al.*, (1985) reported prevalence rate of 24.9% in calves, Rahmeto (2005) reported prevalence rate of 68.1% in calves; Dinka (2006) reported prevalence rate of 49% in sheep and Keadu (1998) recorded prevalence rate of 20% in calves; Munyua and Ngotho (1990) reported 67.4% in calves in a neighboring country Kenya; Kaarma and Maji (2002) reported 50% in sheep in Estonia; Sisodia *et al.*, (1997) reported 12.7% prevalence in sheep in India; Vercrvisse (1982) reported 94% prevalence of Eimeria infection in sheep in Senegal.

There was no significant difference (P>0.05) in the prevalence of Eimeria infection between the two species of the study animals; the prevalence rate is almost similar in both animals, in lambs (20.7%) and in calves (16.4%). A prevalence rate of 16.4% was recorded in animals

aged less than or equal to 12 months in calves while animals aged less than or equal to 3 months in lambs had 20.7% prevalence rate. This is perhaps associated with the immunity of the animals where young animals have less immunity.

Cryptosporidium spp

Out of 385 faecal samples collected during this study, 16(4.2%) calves and 41 (10.6%) lambs were found to be infected with *Cryptosporidium spp*. Several reports are available on the prevalence of this infection overseas; most of which are from Europe and few reports from Africa. Freda et al., (2005) reported 2.97% prevalence rate of cryptosporidium spp in 1-60 day-old lambs in Turkey; Majewska et al., (1998) recorded 8.8% prevalence in sheep in Poland; Bogumila and Alexandra (2002) reported 24.32% of cryptosporidium oocysts in lambs of Poland; Causape et al., (2003) again reported 59% and 7.8% prevalence rates in lambs and ewes respectively from Spain; Nassif et al., (2002) recorded 13.3% prevalence rate in sheep from Egypt; Mahdi and Ali (2002) obtained prevalence rate of cryptosporidium infection of 13.4% in sheep Basrah; Rahmeto (2005) reported 17.6% in calves in selected dairy farms of central Ethiopia; Wudu (2004) reported 6.7% point prevalence in dairy calves of Debrezeit. The study was presumed to be *Cryptosporidium spp* based on the epidemiology of parasite.

The present finding in the prevalence rate of cryptosporidium infection (4.2% in calves, 10.6% in lambs) is low compared to the results of different authors described above except that reported by Freda et al., (2005) (2.97%) from Turkey and Majewska et al., (1998) (8.8%) from Poland for lambs which is comparatively less than to the present result. The available report with regard to the presence of cryptosporidium is that of Wudu (2004) who reported 6.7% point prevalence in dairy calves of Debre Ziet, comparatively lower than the present finding; Dinka (2006) who reported (0.35%) point prevalence in sheep at Elfora export abattoir and in & around Debre zeit which lower than the present result and Rahmeto (2005) who recorded 17.6% point prevalence in dairy calves of central Ethiopia, comparatively larger than the present finding.

The lower prevalence of cryptosporidium infection observed in this study as well as in many other similar studies is partly attributed to the type of design employed in studying the problem. The cross-sectional study design in general provides a momentary picture of the infection status of an individual herd (Thrusfield, 1995) and may underestimate the prevalence because oocyst excretion in cryptosporidium infection can be intermittent, and the oocysts may be shed for only a few days (Casemore et al., 1997; McCluskey et al., 1995), consequently there was a possibility of missing calves and lambs that were infected at sampling.

The infection rate was the least among calves 0-6 month of age and 0-2 months of age of lambs when compared to other age group of calves and lambs; however, the present finding indicates that *Cryptosporidium spp* is important in all age groups of calves and lambs. In the present study, *Cryptosporidium spp* was detected in calves aged as early as 4 weeks of age and in lambs aged as early as 3 weeks and this was found to be much lower than the first age reported by other studies 9 weeks (Kvac *et al.*, 2006) and 7 weeks (Wade *et al.*, 2000). Therefore this necessitate that any study on cryptosporidium in cattle and sheep should involve a diagnostic test that can precisely discriminate the cryptosporidium. Statistically, there was no significant difference ($P>0.05$) observed in the prevalence rate of cryptosporidium between animal species (Calf and lamb) and animal sexes.

Toxocara vitulorum

Out of 385 faecal samples collected during this study, only 38 (9.9%) calves were infected with *T.vitulorum*, but there were no lamb infected with *Ascaris* in the study area. Generally there were some reports on the prevalence of *T.vitulorum* infections. The prevalence of *T. vitulorum* in most countries reaches 5 to 50% (Devi et al., 2001). There are no other reports available on the prevalence of *T.vitulorum* infection.

CONCLUSION AND RECOMMENDATIONS

The study has clearly demonstrated that cryptosporidium, *Eimeria* spp, and *T. vitulorum* are prevalent in Asella and surrounding area. In spite of the fact that most of the calves and lambs sampled were found to be infected with *Eimeria* spp. Clinical coccidiosis was observed in a smaller portion of the infected calves and lambs. Therefore, it is concluded that most *Eimeria* infections in calves and lambs in Asella and surrounding area make situation clinical in nature this infections can negatively influence animal productivity and cause economical losses due to poorer feed efficiency, slow weight gain, weight loss, failure of calves and lambs to growth to their full potential and increased susceptibility to other diseases.

In the present study, *Cryptosporidium* spp infection which is the most pathogenic was detected in diarrheic and non diarrheic calves and lambs. This species is one of the most important causes of calf and lamb diarrhea in most part of the world second to rotavirus and the most frequently reported species in prevalent studies focused on cryptosporidium. A lower prevalence rate of *T. vitulorum* infection was registered in this study from faecal samples collected from calves in Asella and its surroundings.

Therefore, based on these finding the following recommendations are for warded that might help in preventing losses associated with the occurrence of the parasites in the study area and thereby improving the productivity of the animals. Detailed study should be carried out to estimate the economic importance of parasites in calves and lambs. Integrated control strategies should be adapted to reduce the losses brought about by *Eimeria*, *Cryptosporidium* and *T. vitulorum* in the study area. The role of veterinarians in giving professional advice regarding preventive and control measures against *Eimeria*, *Cryptosporidium* and *T. vitulorum* should be enhanced. Husbandry practices and management should be kept optimum to reduce the infection. The calves and lambs should be watched regularly and those diarrheic calves and lambs must be isolated from the healthy ones and receive appropriate treatment. Proper feeding of calves and lambs by keeping separately from adult animals to improve the immunity of calves and lambs.

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