Acta Parasitologica Globalis 7 (1): 07-11, 2016
ISSN 2079-2018

DOI: 10.5829/idosi.apg.2016.7.1.10333

Study on Prevalance of Small Ruminant Coccidiosis in and Around Harmaya, Eastern Haraghe Ethiopia

Girma Kiltu, Migbaru Keffale and Yimer Muktar

Haramaya University, College of Veterinary Medicine, P.O. Box 138, Dire Dawa, Ethiopia

Abstract: Cross-sectional study was conducted from November 2014 to April in and around Haramaya, Eastern Hararghe zone of Oromia region, Ethiopia, with the aim to determine the prevalence of coccidiosis of small ruminants and to identify the possible risk factors. A total of 384 fecal samples were collected and Standard parasitological methods of floatation technique using saturated Sodium Chloride solution were employed to detect the oocysts of Eimeria. Out of the 384 fecal samples examined, 64.1% of overall coccidian prevalence was recorded in both species of which, 62.7% in *ovine* and 66.9% in *caprine* were recorded in this study. Statistically significant associations ($P < 0.05$) were observed between sex, body condition and age groups of examined animals. However, there was no significant association ($P > 0.05$) between species and management system employed. Strategic deworming and an improved feeding of shoats should be attempted and further study should be needed with identification of the coccidian species.

Key words: Coccidiosis · Prevalence · Small Ruminant

INTRODUCTION

Ethiopia possesses an estimate of 26.1 million sheep and 21.7 million goats [1] which are well adapted to local climatic and nutritional conditions and contribute greatly to the national economy. The exploitation of small ruminants represents an important commercial activity worldwide and most especially in countries with arid and/or semiarid climates. Africa especially sub-Saharan country which Ethiopia is one of these regions is also part of this impact. Ethiopia, with its great variation in climate and topography, possesses one of the largest livestock populations in the world [2].

In spite of this huge number small ruminant population in Ethiopia under developed infrastructure coupled with poor management practices, low nutritional status, poor genetic makeup and diseases considerably affect the productivity of this sector. The share of parasitic diseases in this regard has been of paramount importance [3, 4]. Goats and sheep have numerous gastrointestinal parasites, many of which are shared by both species. One of the most important and insidious parasitic diseases is coccidiosis. Coccidiosis of small ruminants is an obligate intracellular protozoan infection caused by coccidian parasites of the genus *Eimeria* which develop in the small and the large intestine. Several species of *Eimeria* are involved in different ruminant hosts (Bovine, ovine, caprine) but there is no cross infection due to the strict host specificity [5].

The main symptom of coccidiosis is diarrhoea which can be haemorrhagic in sheep but less frequently than in cattle [6]. In contrast, the diarrhoea is never haemorrhagic in kids. The faeces are watery with clumps of mucus and colour changes from brown to yellow or dark tarry [7]. There is weight loss and dehydration. The general condition of the animal is worsened because of decreased appetite. In certain conditions, coccidiosis can be characterized by sudden mortality without preceding digestive signs, in particular amongst young animals between 2 and 4 months old [8].

Treatment of the coccidiosis must be done as early as possible before animals showing no obvious signs that may contaminate the environment. Anticoccidial products such as Sulfonamides, amprolium, ionophores (Monensin, lasalocide) decoquinate and more recently toltrazuril and diclazuril are molecules which are used in the treatment of the coccidiosis [9]. Prevention and control of coccidiosis is achieved through control of hygienic conditions, the reduction of stressors, an adequate nutrition and the use of anticoccidial drugs [6].

Corresponding Author: Yimer Muktar, Haramaya University, College of Veterinary Medicine, P.O. Box 138, Dire Dawa, Ethiopia.

Since Subclinical coccidiosis is the most common form of the disease and, it cannot be readily identified, have a significant impact on the flock's health and production efficiency. Information with respect to the prevalence of these infections in small ruminants in Ethiopia is few. Therefore, taking the economics of disease and scarcity of literature into account, the present study was planned with objectives of estimating the prevalence and identifying the major risk factors of coccidiosis in sheep and goats in and around Haramaya district

MATERIALS AND METHODS

Study Area Description: The study was conducted from November 2014 to April 2015 in Haramaya University, eastern Hararghe zone of Oromia Regional State of Ethiopia. Haramaya is located approximately 511 km east of Addis Ababa; 14km west of Harar town. The elevation of the area is about 2000m above sea level and geographically it located 041°59'58'' latitude and 09°24'10''longitudes. The district has about 63,723 cattle 13,612 sheep 20,350 goats 15,975 donkeys 530 camels and 42,035 chickens. The district receives an average annual rain fall approximately 900mm and climatically two ecological zones of which 66.5% is midland and 33.5% is lowland [10].

Study Animals: The study animals including randomly selected samples from Haramaya University sheep farm, goat farm and surrounding areas which were bought from the surrounding towns and woredas of local breeds. Sex, age, body condition score and management system of animals were recorded during sample collection.

Study Design: A cross-sectional study was conducted from November 2014 to April 2015 on 384 sheep and goats in selected area to estimate the prevalence of coccidiosis in Haramaya and surrounding area and compare degree of their prevalence with age of animals, sex, sample collection sites (Husbandry), body condition score and between animal species.

Sample Size Determination: By using simple random sampling methods and 95% confidence interval with required 5% precision, the sample size was determined by using the formula of Thrusfield [11].

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

Where; n= required sample size
Pexp= expected prevalence
d= required precision

The expected prevalence of small ruminant coccidiosis is 50% with the required precision (d) of 5% (0.05). By substituting the value in the above formula, we get the sample size was 384.

Study Methodology

Coprological Examination

Sample Collection: Fecal sample was collected for each from Hramaya and surrounding area into a clean, sterile and dry universal bottle and with hand for freshly voided faeces by using sterile gloves. The faecal sample was put into sample bottles, identified appropriately and transported to Haramaya University Veterinary Parasitology Laboratory and was processed.

Sample Processing and Examination: 3 grams of faecal sample was placed in a universal bottle and then samples were kept in refrigerator at 4℃ if there was lack of time and the collected samples were so many. Fecal samples was then observed, processed by floatation method using saturated sodium chloride solution and finally examined under a microscope for the presence of protozoan oocysts as described by Rehman *et al*. [12].

Data Management and Analysis: Data was entered into Microsoft Excel sheet 2007 and descriptive statistics was used to determine the prevalence, while Chi-square analysis was employed to test the presence of variation between species, age, sex, husbandry systems and body condition score involved in the study. Confidence level was held at 95% and $P < 0.05$ was set for significance. All statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software package version 20.0.

RESULTS

Out of the total 384 fecal samples collected and examined during the study period, an overall prevalence rate of 64.1% small ruminant coccidiosis was obtained.

Table 1: The overall prevalence of coccidiosis in small ruminants

Species of animal	Number of animal examined	Number (%) positive	χ2 (P-value)
Ovine	264	166(62.9%)	0.51(0.47)
Caprine	120	80(66.7%)	
Total	384	246(64.1%)	

Table 2: Prevalence of small ruminant coccidiosis based on age

Age category	Number examined	Number (%) positive	95% CI	χ2(P-value)
< one year old	135	80(59.3%)	50.5-67.6	7.27 (0.02)
One year old	78	44(56.4%)	44.7-67.6	
> one year old	171	122(71.3%)	63.9-78	
Total	384	246(64.1%)	59.03-68.9	

Table 3: Prevalence of small ruminant coccidiosis within different body conditions

Body condition score	Number of animal examined	Positive results (%)	95% CI	χ2(P-value)
Good	80	24(30%)	11.0-49.0	70.60(0.00)
Medium	132	78(59.1%)	50.2-67.6	
Poor	172	144(83.7%)	77.3-88.9	
Total	384	246(64.1%)		

There was a statistically no significant difference (P >0.05) in the prevalence rate of coccidiosis between ovine and caprine; with more infection rate (66.7%) in caprine and relatively less in ovine (62.9%), as shown in Table 1.

There was the interaction between the age of study animals and prevalence rates of coccidiosis. In this study, there was a significant difference observed in the prevalence of coccidiosis between the 3 age categories i.e. old animals with the age of greater than one year were found to be more infected with coccidiosis (71.3%) than one year old (56.4%) and those under one year old (59.3%), as shown in Table 2.

Out of 384 animals examined 80 animals were in good body condition, out of which 24 (30%) animals were positive for coccidian oocysts, 132 animals were in medium body condition and out of these 78 (59.1%) animals were positive for the oocysts and the rest 172 animals were in poor body condition state and out of these 144 (83.7%) animals were positive for coccidiosis. These results showed that body condition had a significant association (*P*= 0.00) with coccidian infections (Table 3).

The prevalence ofcoccidiosis within different management system in and around Haramaya showed no significant difference (*P*=0.74) among the management system with the highest in extensive system (64.7%) than semi intensive system (63%), as shown in Table 4.

Table 4: Prevalence of small ruminant coccidiosis within different husbandry

Husbandry system	Number of animal examined	Positive results (%)	χ2(P= value)
Semi intensive	135	85(63%)	0.109 (0.74)
Extensive	249	161(64.7%)	
Total	384	246(64.1%)	

Table 5: Prevalence of small ruminant coccidiosis based on sex

Sex	Number of animal examined	Positive results (%)	95% CI	χ2 (P-value)
Male	135	77(57.0%)	57 (48.2-65.5)	4.46(0.03)
Female	249	169(67.9%)	67.9 (61.8-73.6)	
Total	384	246(64.1%)	64.1 (59-68.9)	

Out of 384 animals examined 135 animals were male out of which 77(57.0%) positives and the rest 249 animals were female from which 169(67.9%) animals were positive for coccidian oocysts. Prevalence of coccidiosis in this study area indicated that sex had significant relations (*P*= 0.03) with presence of coccidian oocysts (Table 5).

DISCUSSION

In this study, out of the 264 sheep and 120 goats examined, 166 (62.9%) sheep and 80 (66.9%) goats were found to be infected with coccidiosis. Various prevalence rates of *Eimeria* infection (Coccidiosis) in sheep and goats have been reported in various parts of the world. The present finding in the prevalence of *Eimeria* infection in sheep (62.9%) was lower as compared to that reported by Kambarage *et al*. [13] (97.5%), Kusiluka *et al.* [14] (93%), Arslan *et al.* [15] (93.9%), Kaya [16] (100%) in Tanzania and Turkey, however greater than that reported by Sisodia *et al*. [17] (12.74%) in India. As far as goats were concerned, the present finding, 69.7%, was lower as compared to that reported by Kambarage *et al.* [13] (97.3%), Kusiluka *et al.* [14] (91%), Değer *et al.* [18] (73.6%), Balicka-Ramisz [19] (1999) (90.5%), Hassum and Menezes [20] (81.95%), Woji *et al.* [21] (87%) and Harper and Penzhorn [22] (88.7%) in Tanzania, Turkey, Nigeria and South Africa, however greater than that reported by Divanovic *et al.* [23] (16.62%) in Croatia.

There was no significant difference (P = 0.47) in the prevalence of coccidiosis between the two species of the study animals; the prevalence rate was being higher in goats (66.7%) than sheep (62.9%). Higher prevalence of coccidiosis in goat than sheep could be attributed to the fact that goats acquired a lower level of immunity tococcidiosis compared to sheep, which developed a strong natural immunity around 12 months of age [24].

Prevalence of the infection varied between the adult (>1years) and the young sheep and goats (<1year) and was significantly associated ($P < 0.05$). More adults were infected than the young. The prevalence of coccidian oocysts in adult (71.3%) was higher than that in young (59.3%) and the differences were statistically significant ($P<0.05$). However, the prevalence in young was significantly higher ($P < 0.05$) than in adults; consistent with previous observations [15, 25, 26].Trend to shed more oocysts in lambs in comparison to adults may be due to acquisition of immunity by adults over periods of time which therefore suppressed *Eimeria* infection [25].

In this study, a significant difference was observed in prevalence of coccidiosis in relation to body condition score where a higher prevalence of coccidiosis were recorded in the poor and medium body conditioned animals compared to the animals in good body condition. That was, animals in poor body condition score (83.7%) were infected dominantly followed by medium (59.1%) and good body (30%) conditioned animals, respectively.

The type of husbandry practice adopted was the other factor that could influence survival of the parasites. However, There was no significant difference ($P>0.05$) in the prevalence of coccidiosis in this study; the prevalence rate was being the highest in extensive system (64.7%) than semi intensive system (63.0%). This was associated with housing condition in which higher prevalence rate was observed in non-cemented floor than in cemented floor. The same pattern of incidence was reported by Rehman *et al.* [12] who observed more prevalence in non-cemented floor (48.5%) as compared to cemented floor. The disparity could emanate from the fact that in the non-cemented floor type urine accumulates in the floor and increases the temperature; thereby providing warm and wet environment favorable for the sporulation of the oocysts, moreover higher prevalence of coccidiosis in non-cemented (Mud/ mud brick) type of floor may be associated with more chances of coccidian oocysts to survive in cracks and crevices of mud/ mud brick type of floor which may be difficult for effective cleanliness of houses [27].

The level of intensification in breeding and the related high stocking rates in premises were also predisposing factors for coccidiosis [22,28] as opposed to present study in which prevalence was more in extensive (64.7%) than semi intensive system (63.0). Over Crowding of animals concentrated the hosts and parasites within a restricted area. McKellar [29] stated that coccidiosis was most commonly prevalent under conditions of poor sanitation and overcrowding. Balicka-Ramisz [19] described that high stock rates increased the environmental contamination with oocysts and therefore the risk of an infection and shedding of coccidian oocyst increased. Coccidiosis was seen universally, most commonly in animals housed or confined in small areas contaminated with oocysts as described by McKellar [29].

Out of 384 animals examined 135 animals were male out of which 77(57.0%) positives and the rest 249 animals were female from which 169(67.9%) animals were positive for coccidian oocysts. Prevalence of coccidiosis in this study area indicated sex had significant relations with presence of coccidian oocysts ($P= 0.03$). This study was in agreement with Yakhchali and Golami [26] report, in which sex significantly influenced the prevalence of coccidiosis in sheep and goats.

CONCLUSION

In general, this study showed high prevalence of coccidiosis in goats and sheep in and around Haramaya area affecting wellbeing of the animals. Among the assumed risk factors tested sex, age and body condition were showed significant association with the occurrence of coccidiosis in small ruminants. Further detailed epidemiological study should be needed and identification of the coccidian species should also be recommended..

ACKNOWLEDGEMENTS

We would like to forward our appreciation for staff members of Haramaya University, College of Veterinary Medicine, for their cooperation and allowance of the laboratory and all animal owners to allow sampling of their animal's for the study to accomplish this work.

REFERENCES

1. CSA, 2009. (Central Statistical Authority) Federal Democratic Republic of Ethiopia Agricultural Sample Enumeration Abstract.
2. ELSMA, 1999. Ethiopian Livestock Marketing Authority.
3. Silvestre, A., C. Chartier, C. Sauve and J. Cabaret, 2000. Relationship between helminthes species diversity, intensity of infection and breeding management in dairy goats, Vet. Parasitol, 94: 91-105.
4. Rahman, M.H., 1988. Problems of parasitic diseases among domesticated ruminants in Bangladesh, The Veterinarian, 12(8): 1-4.

5. Maratea, K.A. and M.A. Miller, 2007. Abomasal coccidiosis associated with proliferative abomasitis in sheep, J. Vet. Diagn. Invest., 19: 118-121.
6. Foreyt, W.J., 1990. Coccidiosis and cryptosporidiosis in sheep and goats. Vet. Clin. N. Am., 6: 655-670.
7. Koudela, B. and A. Bokova, 1998. Coccidiosis in goats in the Czech Republic, Vet. Parasitol., 76: 261-267.
8. Chartier, C. and C. Paraud, 2012. Coccidiosis due to Eimeria in sheep and goats: a review, Small Ruminant Research.,103: 84-92.
9. Taylor, M.A., 2009. Changing patterns of parasitism in sheep, In Practice., 31: 474-483.
10. Shimelis, A., 2010. Prevalence of Abomasal Nematode in small ruminants slaughtered at Haramaya Municipal Abattoir, Eastern Hararghe, Ethiopia.
11. Thrusfield, M., 2007. Veterinary Epidemiology 3Nd Ed. University of Edinburgh, Blackwell Science, pp: 180-188.
12. Rehman, T.U., M.N. Khan, I.A. Khan and M. Ahmad, 2011. Epidemiology and economic benefits of treating Ruminants coccidiosis, Pak Vet J., 31: 227-230.
13. Kambarage, D.M., S.I. Kimera, L.J.M. Kusiluka and M.M.A. Matambo, 1996. Prevalence of Eimeria and Cryptosporidium oocysts in cattle, sheep and goats in Morogoro region, Tanzania. J. Appl. Anim. Res., 9: 73-78.
14. Kusiluka, L.J.M., D.M. Kambarage, R.W. Matthewman, L.J.S. Harrison and C.J. Daborn, 1996. Coccidiosis of small ruminants in Tanzania; Small Ruminant Res., 21: 127-131.
15. Arslan, M.O., S. Umur and M. Kara, 1999. The prevalence of coccidian species in sheep in Kars Province of Turkey. Tropical Animal Health and Production, 31: 161-165.
16. Kaya, G., 2004. Prevalence of Eimeria species in lambs in Antakya province, Turkey. Turk, J. Vet. Anim. Sci., 28: 687-692.
17. Sisodia, S.L., K.M.L. Pathak, M. Kapoor and P.P.S. Chauhan, 1997. Prevalence and seasonal variation in Eimeria infection in sheep in Western Rajasthan, India. J. Vet. Parasitol, 11: 95-98.
18. Değer, S., A. Gül, E. Ayaz and K. Biçek, 2003. The prevalence of Eimeria species in goats in Van, Turkey. Turk. J. Vet. Anim. Sci., 27: 439-442.
19. Balicka-Ramisz, A., 1999. Studies on coccidiosis in goats in Poland. Vet. Parasitol, 81: 347-349.
20. Hassum, I.C. and R. de Menezes, 1999. Species of the genus Eimeria (Apicomplexa: Eimeridae) in dairy goats from the Fluminense do Grande Rio region, Brazil. Rev. Brasil. Med. Vet., 21: 15-16.
21. Woji, A.Y., D.A. Little and O.A. Ikwuegbu, 1994. Prevalence of coccidial infections in the West African Dwarf goats in the subhumid zone of Nigeria. Trop. Anim. Health. Prod, 26: 1-6.
22. Harper, C.K. and B.L. Penzhorn, 1999. Occurrence and diversity of coccidia in indigenous, Saanen and crossbred goats in South Africa. Vet. Parasitol, 82: 1-9.
23. Divanovic., K.A., Z. Almedina and J. Omeragic, 1999. Coccidiosis in goats in Sarajevo region, Croatia. Prav. Vet. (Zagreb), 47: 173-176.
24. Vlasoff, A., D.M. Leathwick and A.C.G. Heath, 2001. The epidemiology of nematode infections of sheep. New Zealand Veterinary Journal, 49: 213-221.
25. Maingi, N. and W.K. Munyua, 1994. The prevalence and intensity of infection with Eimeria species in sheep in Nyandarua district of Kenya. Veterinar Research Communications, 18: 19-25.
26. Yakhchali, M. and E. Golami, 2008. Eimeria infection (Coccidia: Eimeriidae) in sheep of different age groups in Sanandaj city, Iran. Veterinarsski Archive, 78: 57-64.
27. Lawrence, S., 2011. The prevalence of coccidiosis of chicken in Kalisizo Town Council, Rakai District, Uganda.
28. Cai., K.Z. and J.L. Bai, 2009. Infection intensity of gastrointestinal nematodosis and coccidiosis of sheep raised under three types of feeding and management regimes in Ningxia Hui Autonomous Region, China. Small Rumin, Res, 85: 111-115.
29. McKellar, A.Q., 2008. Gastro-intestinal Parasites of Ruminants. In: C.M. Kahn, S. Line and S.E. Aiello, (Eds.), the Merck Veterinary Manual. Whitehouse Station, NJ, USA.