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Calf Coccidiosis in Selected Dairy Farms of Dire Dawa, Eastern Ethiopia

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Abstract: Cross-sectional study was conducted from November 2010 up to March 2011 to determine the prevalence and to assess the risk factors of calf coccidiosis in selected Dire Dawa dairy farms. Three hundred eighty four fecal samples were randomly collected from calves belonging to twenty six purposively selected dairy farms and were examined for the oocysts of Eimeria by floatation technique using concentrated sucrose solution. Moreover, the hygienic status of the farms was assessed. Out result revealed that the overall prevalence was 22.7%. And out of the dairy farms surveyed for coccidiosis, virtually all (99%) had one or more calves shedding Eimeria oocysts. There was a statistically significant difference ($P<0.05$) in the prevalence of coccidiosis among the various age categories. However, the sex of the animals was not significantly associated ($P > 0.05$) with the infection by coccidiosis. Calves belonging to the farms with poor hygiene showed significantly higher ($P<0.05$) prevalence than calves belonging to the farms with relatively better hygiene. In conclusion, the study revealed that calf coccidiosis is prevalent in Dire Dawa Dairy farms and consequently affects the productivity of the sector. Hence, appropriate disease prevention and control measures are require to be undertaken to reduce its effect.

Key words: Calves · Eimeria · Hygiene · Prevalence

INTRODUCTION

Bovine coccidiosis is an important protozoan disease of genus Eimeria affecting calves all over the world resulting in considerable economic losses each year to the beef and dairy industries [1]. The disease can be produced by several Eimeria species of which *E. bovis* and *E. zuernii* are the most pathogenic and the chief culprits for the disease in cattle [2,3]. In severe cases, these organisms damage the intestine by destroying epithelial cells and tissues, which interferes with the animal's ability to absorb nutrients [4]. The result is a marked reduction in feed efficiency and weight gain. As the disease progresses, feed and water intake steadily declines, resulting in dehydration. If weight loss and dehydrations are severe enough, cattle may die from coccidiosis [5]. Moreover, it results in failure of young stock to gain weight and to grow to their full potential [3-6]. In many instances, coccidiosis is a silent thief, robbing of performance but never visibly showing most of its symptoms, though the most common of which is bloody diarrhea [2,3].

Although coccidiosis is an important cause of calf morbidity and mortality in Ethiopia, very little attention has been given to this disease. Dire Dawa is one of the big cities of Ethiopia where urban and periurban dairy farms dwell to provide milk for the population of the city. While few studies have been undertaken in various parts of the country [7-9], no previous studies has been undertaken to assess the magnitude of this disease in this particular area. Therefore, the objectives of this study were to determine the prevalence and to assess the risk factors of coccidiosis in calves in some selected Dire Dawa dairy farms.

MATERIALS AND METHODS

Study Area: Dire Dawa Administration Council (DDAC) is situated in the eastern part of Ethiopia at about 515 km of Addis Ababa. The area is located between 9° 27' N and 9°49' E latitudes and 41°38' and 42° 19'E longitude. The rain fall pattern of the area is characterized by small rainy season from February to May and big rainy season from July to September. The dry season extends from October

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to January. The mean annual rain fall in the study area varies from 550 mm in the lowland northern part to above 850 mm in the southern mountain. The monthly mean maximum and minimum temperature ranges from 34.6°C to 14.5°C respectively. The entire territory of DDAC rests on an elevation ranging between 950 m.a.s.l. in the north east to 2260 m.a.s.l. in south west. Using the 1500 m contour as a line of separation, two agro-ecological zones, the kola (below 1500 m) and Woina Dega (above 1500 m) have been recognized [10].

Study Population: The study population consisted of male and female calves of local breeds with less than two year of age belonging to twenty six dairy farms which were purposively selected based on their number of calves.

Study Design: Cross-sectional study was conducted from November 2010- March 2011 to determine the prevalence and to assess the risk factors of coccidiosis in calves in selected Dire Dawa dairy farms.

Sampling Methods and Determination of Sample Size: The sample size required for this study was calculated based on sample size determination method for simple random sampling of infinite population after Thrusfield [11] as follows:

Where, n=required sample size: $$\frac{n = 1.96^2 \, P_{exp}\left(1 - P_{exp}\right)}{d^2}$$

P_{exp}= expected prevalence
d= desires absolute precision

Since no previous study was undertaken in the study area, the expected prevalence was considered to be 50%. Accordingly, with 5% absolute precision at 95% confidence level, the number of calves required to determine the prevalence was found to be 384. Then, simple random sampling method was used to select the calves from dairy farms.

Determination of Age of Calves: The age of calves was determined according to Pace and Wakeman [12] as well as by collecting information from the dairy farm owners and were then conveniently categorized in to three groups: Birth up to 6 months, 6-12 months and 12-24 months.

Assessment of Hygienic Status of Calves: The hygienic status of calf pens and the calves themselves were assessed based on housing system (ventilation, draughts, group pens, heavy stocking), sanitation of bedding (soiled bedding) and body parts of the calves [13] and was conveniently categorized as poor and good.

Sample Collection: A fresh fecal sample of about 20gm was collected from the rectum of each calf using sterile disposable plastic gloves. The sample was placed in a labeled clean glass bottle container and transported to the parasitology laboratory on the same day and was kept at 4°C in a refrigerator until processing within 48 hours of arrival.

Laboratory Investigation: Qualitative fecal examination was conducted using flotation technique for the detection of the oocysts of Eimeria using concentrated sucrose solution (Sheather's sucrose solution) with specific gravity of 1.27 according to Hendrix [14].

Data Analysis: The recorded raw data were entered in to Microsoft excel data base system to be analyzed using statistical program for social science version 16. Descriptive statistics was computed. Prevalence of coccidiosis was calculated as the number calves found infected with coccidia, expressed as the percentage of the total number of calves examined [11]. Pearson's chi-square (χ^2) was used to evaluate the association between the prevalence of coccidiosis and different factors. P-value less than 0.05 (at 5% level of significance) were considered significant in all analysis.

RESULTS

Overall Prevalence: Out of 384 fecal samples examined, 87 were positive for Eimeria oocysts and hence the overall prevalence was found to be 22.7%. And out of the 26 dairy farms surveyed for coccidiosis, virtually all (99%) had one or more calves shedding Eimeria oocysts.

Prevalence of Coccidiosis According to Sex: The prevalence was a bit higher in male calves than in female ones. However, the sex of the animals was not significantly associated ($P > 0.05$) with the infection by coccidiosis (Table 1).

Table 1: Prevalence of coccidiosis according to sex

Sex of calves	No Calves examined	No Positives	Prevalence (%)	95% CI (Confidence interval)	df	χ^2	P-value
Female	299	62	20.7	16.1-25.3	1	2.84[a]	0.092
Male	85	25	29.4	19.7-39.1			
Total	384	87	22.7	18.5-26.9			

Table 2: Prevalence of coccidiosis according to age

Age Categories	No Calves examined	No Positives	Prevalence (%)	95% CI	df	χ^2	P-value
0-6	232	77	33.2	27.1-39.3	2	37.256[a]	0.000
6-12	105	6	5.7	1.3-10.2			
12-18	47	4	8.5	0.53-16.5			
Total	384	87	22.7	18.5-26.9			

Table 3: Prevalence of coccidiosis according to hygienic status of the farms

Farm hygiene category	No Calves examined	No Positives	Prevalence (%)	95% CI	df	χ^2	P-value
Good	291	22	7.6	4.5-10.6	1	1.563E[a]	0.000
Poor	93	65	69.9	60.6-79.2			
Total	384	87	22.7	18.5-26.9			

Prevalence of Coccidiosis According to the Age Category: The highest prevalence was recorded in those calves with youngest age categories. There was a statistically significant difference ($P<0.05$) in the prevalence of coccidiosis among the various age categories (Table 2).

Prevalence of Coccidiosis According to the Hygienic Status of the Farms: There was a statistically significant association ($P<0.05$) between the infection with coccidiosis and the hygienic status of the farms. Accordingly, calves belonging to the farms with poor hygiene showed significantly higher prevalence than calves belonging to the farms with relatively better hygiene (Table 3).

DISCUSSION

The overall prevalence of Eimeria in calves recorded in this study (22.7%) was lower than previous reports in the central high land of Ethiopia by Rhameto *et al.* [7], 68 %; in a neighboring Kenya by Munyua and Ngotho, [15], 67.4%; in Turkey by Arslan and Tuzer, [16], 68%; in Canada by Kennedy and Kralka [17], 64.2%; in USA by Ernst *et al.* [18], 86.3%; and in Mexico by Rodriguez-Vivas *et al.* [19], 87.8%. However, the result of the present study virtually agrees with Kassa *et al*. [8], in Bahirdar which was 24.9%; Kebadu [9], in Debre Zeit (20%) and Nagwa *et al.* [20], in Egypt (24.2). The lower prevalence of coccidiosis recorded in this study as compared to the aforementioned areas with the higher prevalence areas could be due to the differences in agro-ecology, management types and husbandry practices of the study animals in different countries. Moreover this could also be due to the fact that the study has been undertaken mainly in dry season; hence, higher prevalence would have been recorded if the study was carried out in the rainy season. Besides, Dire Dawa is a lowland area where very cold weather is rarely observed. It has been reported that cold stress and changing weather leave the door wide open for the opportunistic, pound-robbing coccidia protozoa; hence, severe outbreaks of coccidiosis are common shortly after very cold weather [3, 6].

Absence of statistically significant difference between the sexes of the study animals might suggest that both sexes of the animals at this age have almost equal likelihood of being infected with coccidiosis. Yet, a bit higher prevalence in male calves could be due to the less care given to the male calves as compared to the female calves that are deemed to be future cows. Despite this, previous studies done on adult cattle reported higher prevalence of Eimeria in female animals than in males [21-23]. Nevertheless, this could be attributed to the physiological stress loaded on female animals in relation to pregnancies and giving birth as compared to males [3].

Nevertheless, age of the calves was significantly associated ($P<0.05$) with the risk of infection by coccidiosis. Accordingly, the highest prevalence was recorded in those calves with youngest age categories (<6months). This is in contrast to Rhameto *et al.* [7]

who reported that risk of infection by Eimeria species appeared to increase with the age of the examined calves. On one hand, it has been stated that coccidiosis is commonly a disease of young cattle (1-2months to 1year) [3,6,24]. Thus, stress factors like weaning, change of diet, harsh environment, poor nutrition and sanitation and overcrowding can increase level of infection and incidence of the disease due to stress-induced immunosuppression [3,6,24-26]. On the other hand, coccidiosis is a self-limiting disease and spontaneous recovery without specific treatment is common when the multiplication stage of the coccidia has passed [3,24]. This could suggest that previous exposure might have a contribution to the development of certain level immunity of older calves as compared to younger that did not experienced previous exposure. Chibuanda *et al.* [27] and Faber *et al.* [28] also indicated the presence of immature immune system in younger calves resulting in more susceptibility to coccidiosis than older calves with immunity from previous exposure, hence more resistant to subsequent reinfections.

The stronger association of the infection with coccidiosis in relation to the hygienic status of the farms has been demonstrated in this study. Consequently, calves belonging to the farms with poor hygiene showed significantly higher prevalence than calves belonging to the farms with relatively better hygiene. This could imply that poor sanitation in the calving and calf housing areas as well as poor management of housing favors infection with coccidiosis. Obviously, poor ventilation, draughts, poor calf nutrition, group pens, heavy stocking, cows present with calves, soiled bedding were regarded as risk factors for coccidiosis [3,29-30].

Conclusions and Recommendations: The study revealed that calf coccidiosis is prevalent in Dire Dawa Dairy farms. Younger age group of calves and poor hygienic status of the farms were strongly associated with the infection of coccidiosis.

Based on these findings the following recommendations are forwarded:

- All measures that minimize the amount of fecal contamination of hair coats should be practiced regularly.
- Feed and water troughs should be high enough to avoid heavy fecal contamination
- 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.
- The general health status of the calves could be maintained by allowing the calves to obtain sufficient amount of colostrums within the first 24 hours after birth.
- As early as 15 days of life, the use of prophylactic doses of coccidiostats in ration is advisable to prevent calves from Eimeria infections.
- Isolation and treatment of sick animals to prevent further disease and premise contamination.

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REFERENCES

1. Daugschies, A. and M. Najdrowski, 2005. Eimeriosis in cattle: current understanding. J. Vet. Med. B Infect. Dis. Vet. Public Health, 52: 417-427.
2. Urquhart, G.M., J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings, 1996. Veterinary Parasitology. 2nd ed. Oxford, UK: Blackwell Science Ltd, pp: 224-234.
3. Radostits, O.M., C.C. Gay, K.W. Hinchcliff and P.D. Constable, 2007. Veterinary Medicine: A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats, 10th ed. Elsevier Health Sciences, Philadelphia, PA, USA, pp: 1498-1506.
4. Taylor, M.A. and J. Catchpole, 1994. Coccidiosis of domestic ruminants. Appl. Parasitol., 35: 73-86.
5. Pilarczyk, B. and A. Balicka-Ramisz, 2004. Occurrrence of protozoa Eimeria and Cryptosporidium in calves from west pomerania. Acta Sci. Pol. Zootechnica, 3: 49-56.
6. Johannes Kaufmann, 1996. Parasitic Infections of Domestic Animals. A Diagnostic Manual., pp: 24-27.
7. Rahmeto, A., W. Abebe and K. Bersissa, 2008. Epidemiology of Eimeria Infections in Calves in Addis Ababa and Debre Zeit Dairy farms, Ethiopia. Intern. J. Appl. Res. Vet. Med., 6: 24-30.

8. Kassa, B., A. Delgado and T. Asegedech, 1987. An outbreak of coccidiosis in cattle. Ethiop. Vet. Bull., 3: 20-27.
9. Kebadu, S., 1998. A study on calf diarrhea in small-scale dairy farms at Debre Zeit. DVM thesis, Faculty of Veterinary Medicine, Addis Abeba University, Derbe Zeit, Ethiopia.
10. Dire Dawa Administrative Council Agricultural Bureau, 1998.
11. Thrusfield, M., 2007. Veterinary Epidemiology 3nd ed, Veterinary Clinical Studies, Royal (Dick) School of Veterinary Studies, University of Edinburgh, Blackwell Science Ltd, a Blackwell Publishing Company, pp: 232-246.
12. Pace, J.E. and D.L. Wakeman, 2003. Department of Animal Science, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.
13. Curt A. Gooch, 2005. Senior Extension Associate, Department of Agricultural and Biological Engineering, PRO-DAIRY Program, Cornell University. Dairy Calves and Heifers: Integrating Biology and Management Conference, January 25-27, 2005. Syracuse, NY. NRAES-175.
14. Hendrix, C.M., 1998. Diagnostic Veterinary Parasitology. 2nd ed. Mosby, Inc. USA, pp: 239-264.
15. Munyua, W.K. and J.W. Ngotho, 1990. Prevalence of Eimeria species in cattle in Kenya. Vet. Parasitol., 35: 163-168.
16. Arslan, M. and E. Tuzer, 1998. Prevalence of bovine Eimeridosis in Thracia, Turkey. Tr. J. Vet. And Anim. Sci., 22: 161-164.
17. Kennedy, M.J. and R.A. Kralka, 1987. A survey of Eimeria species in cattle in central Alberta. Can. Vet. J., 28: 124-125.
18. Ernst, J.V., T.B. Stewart and D.R. Whitlock, 1987. Quantitative determination of coccidian oocysts in beef calves from the coastal plain area of Georgia (USA). Vet. Parasitol., 23: 1-10.
19. Rodriguez-Vivas, R.I., J.L. Dominguez-Alpizar and J.F. Torres-Acosta, 1996. Epidemiological factors associated to bovine coccidiosis in calves (Bos indicus) in a sub humid tropical climate. Rev. Biomed. 7: 211-218.
20. Nagwa, I., Toaleb, FaragalLa M. El-Moghazy and Soad E. Hassan, 2011. Diagnosis of Eimeriosis in Cattle by ELISA Using Partially Purified Antigen. World App. Sci. J., 12: 33-38.
21. Priti, M., S.R.P. Sinha, S. Sucheta, S.B. Verma, S.K. Sharma and K.G. Mandal, 2008. Prevalence of bovine coccidiosis at Patna. J. Vet. Parasitol., 22: 5-12.
22. Lassen, B., A. Viltrop, K. Raaperi and T. Jarvis, 2009. Eimeria and Cryptosporidium in Estonian dairy farms in regard to age, species and diarrhea. Vet. Parasitol., 166: 212-219.
23. Tauseef, Ur R., M.N. Khan, M. Sajid, R.Z. Abbas, M. Arshad, Z. Iqbal and A. Iqbal, 2011. Epidemiology of Eimeria and associated risk factorsin cattle of district Toba Tek Singh, Pakistan. Parasitol Res., 108: 1171-1177.
24. Ahmed, W.M. and Soad E. Hassan, 2007. Applied Studies on Coccidiosis in Growing Buffalo-Calves with Special Reference to Oxidant/Antioxidant Status. World J. Zoolo., 2: 40-48.
25. Lucas, A.S., S.S. William, D.S. Lindsay, G. Scaglia, F.C. Elvinger and A.M. Zajac, 2007. The effect of weaning method on coccidial infections in beef calves. Vet. Parasitol., 145: 228-233.
26. Bashir, A.L., M.Z. Chisti and F. Ahmad, 2011. Prevalence of coccidian and gastrointestinal nematode infection in goats of Barramula District of Kashmir Valley. Global Veterinaria, 7: 27-30.
27. Chibuanda, R.T., A.P. Muhairw, D.M. Kambarage, M.M.A. Mtambo, L.J.M. Kusiluka and R.R. Kazwala, 1997. Eimeriosis in dairy cattle farms in Morogoro municipality of Tanzania. Prev. Vet. Med., 31: 191-197.
28. Faber, J., D. Kollmann, A. Heise, C. Bauer, K. Failing, H.J. Burger and H. Zahner, 2002. Eimeria infections in cows in the periparturient phase and their calves. Oocyst excretion and level of specific serum and colostrum antibodies. Vet. Parasitol., 104(1): 1-17.
29. Mundt, H.C., B. Bangoura, H. Mengel, J. Keidel and A. Daugschies, 2005. Control of clinical coccidiosis of calves due to *Eimeria bovis* and *Eimeria zuernii* with toltrazuril under field conditions. Parasitol. Res., 97: S134-S142.
30. Ahmed, W.M. and Soad E. Hassan, 2008. A Field Investigation on the Correlation Between Reproductive Disorders and Eimeriosis in Female Buffaloes with Emphasis on Use of Partially Purified Oocyst Antigen for Diagnosis, Global Veterinaria, 2: 372-378.