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Prevalence of calve coccidiosis and associated risk factors in Banadir region, Somalia.

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Abstract
A cross sectional study was conducted from July 2018 to February 2019in Banadir region, Somalia to assess the prevalence of calve coccidiosis and its risk factors. A total of 400 fecal samples were examined by using fecal floatation technique for the presences of coccidian oocytes.Data was analyzed SPSS by using Descriptive statistics and Chi-square test The overall prevalence of coccidiosis was found to be 8.7%, and there was a statistically significant variation ($p<0.05$) between age groups with the highest prevalence (12%) found in calves between 6 months to 1 year of age compared to calves <6 months of age (6.3%).A significant associationwas also found between infection rate and body condition score of the animals where animals with poor body condition had the highest prevalence (78%) followed by animals with medium body condition (13%) and the least prevalence was seen on the animals with good body condition (2%). Infection rate and hygienic level was also compared and a significant association was found ($p<0.05$).According to sex, no significant difference was foundalthough females were found to have a slightly higher prevalence (9%) compared to males (8.4%).

Keywords:*Age, Body weight, Coccidiosis, Banadir, Oocyte, Prevalence, Risk factors.*

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I. Introduction

Coccidiosis is a disease caused by a protozoan parasite called coccidia which effectsthe intestinal tract of animals and is one of the most important disease of cattle worldwide. Bovine coccidiosis has been observed in almost all areas where cattle are raised and is usually one of the most common and important in calves younger than 1 year (Alemayehu *et al.*,2013)

This disease is more severe inearly-weaned animals, but may occur frequently in calves between six to twelve months of age(Kennedy, 2006). Several other species including sheep, goats, cats, dogs, poultry and rabbits are also susceptible to this infection (Nalbantoglu*et al*., 2008). Around nine species of Eimera are identified in cattle namely, *Eimeria subspherica, E. zuernii, E. alabamensis, E. elipsoidalis, E. cylindrica, E. bovis, E. condenses, E. bukidonensis and E. auburnensis*.

Stress conditions like poor hygiene, poor nutrition and overcrowding reduce animal resistance, which may enhance coccidial infections (Oluwadare*et al*., 2010). Coccidiosis is more likely to occur in animals kept under overcrowdedand confined areas (Abebe *et al*., 2008). Fecal contaminated feed and water are also the main causes of *Eimeria* transmission (Taylor *et al*., 2007). Diarrhoea and dehydration is the usual outcome of coccidiosis if weight loss and dehydration aresevere enough, cattle may die from coccidiosis. Moreover, it results in failure of young stock to gain weight and grow to their full potential (Radostits*et al*., 2007).

In Somalia there is no data oncalve coccidiosis recoded or available, so this study was undertaken to investigate the presence of calve coccidiosis in the study area to have a baseline information about the level of the disease based on it is prevalence and also what factors are facilitating its existence and propagation.

II. Material and methods

Study Area

The study was conducted in Banadir region of Somalia, the area is around 30 ft. above sea level, it experiences a hot and semi-arid type of climate with average annual rainfall of 300 mm. (Metz., et al.,1993)

Study design and study population

A cross-sectional study was conducted from July 2018 to February 2019 to determine the prevalence and to assess the risk factors of coccidiosis in calves from different farms and production systems in districts of Banadir region, Somalia.

The study populations were selected in calves aged 12 month and lower in Banadir region. A total of 400 fecal sample were collected and examined for coccidia species from different dairy farms and households. Examined animals were categorized into two age groups as group one; 6 month of age and lower and group two; 6 to 12-month age.

Sampling Methods and Determination of Sample Size:

Sample size required for the study was determined using the Thrusfieldformula (Thrusfield, M. 2005) To calculate the sample size, 95% Confidence level, 50% expected prevalence and 5 % of desired absolute precision (d=0.05) was used.

$$\mathrm{N} = \frac{1.96^2 \mathrm{Pexp}(1 - \mathrm{Pexp})}{d^2}$$

Where, N=required sample size, Pexp= expected prevalence, d^2= 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 calculated to be 384, however, a total of 400 calves was examined in this study to increase the precision. Then, simple random sampling method was used to select the calves from dairy farms and household pens.

Sample Collection procedure

A fresh fecal sample of about 30g was collected from the rectum of each calve using gloves, the samples were then placed in a labeled clean plastic container. Prior to fecal samples collection, necessary parameters (date of sampling, sex, age, breed, body condition, management system, hygienic status of the barn) were properly recorded and were then transported to the veterinary laboratory at Somali National on the same day and immediately processed or kept at 4^oC in the refrigerator until processing within 48 hours of arrival.

Laboratory examination of fecal samples

The fecal samples were first examined by both direct smear method and then the samples were further processed using qualitative fecal examination particularly flotation technique for the detection of the oocysts of Eimeria using concentrated salt solution (sodium chloride).

Approximately 3 grams of feces were put into a beaker, 50 ml of floatation fluid were poured into the same beaker mixed thoroughly, the resultant mixture was then poured into a separate container through a tea strainer or double layer of cheese cloth, the fecal suspension was then poured into a test tube. The test tubes were put into a test tube rack and were toped up leaving a convex meniscus at the top of the tube, then a cover slip is placed at the top of the meniscus, it is then allowed to stand for 20 minutes. After that the cover slip is lifted up of the tube together with the drop adhering to and placed on a clean dry glass slide and examined under the microscope for oocyte presence. (Hendrix, 1998).

Data management and analysis

Data obtained was coded and entered into Microsoft Excel spread sheet and analyzed using SPSS version 20. Descriptive statistics was employed to summarize the data and expressed in terms of frequency and percentage. Chi square analysis was used to determine the association of the disease with risk factors. In analysis, a $P<0.05$ was used as cut-off point for significance difference.

Quality control

Researchers did a thorough research and testing on the diagnostic techniques they used prior to the actual study started, to ascertain that the instruments and diagnostic tests used were reliable, on the other hand a number of experts in area of parasitology were consulted to approve that the survey of experiment is applicable to start this research.

III. Results

Overall prevalence

In the current study a total of 400 of calves aged under one year of age managed under both extensive and intensive production systems were examined for coccidiosis. Out of which 35 were found to be positive for presence of Eimeria oocytes and an overall prevalence of 8.7 % was found in the current study (Table 1).

Table 1 Overall prevalence of coccidiosis in calves in Banadir region

Total number	Number positive	%	Number negative	%
400	35	8.7	365	91.3

Prevalence according to age

Out of 236 animals examined aged less than 6 months of age, 15 (6.3%) of them were found positive, where 164 animal examined aged above 6 months of age, 20 (12%) of them were found positive for coccidia oocyte and there were a significant variation between two age groups X^2 (1, N=400) = 4.13, P-value = 0.033 (Table2).

Table 2 Prevalence of coccidiosis in relation to age

Age	No examined	No of positive	Prevalence %	X^2	P-value
<6 moths	236	15	6.3	4.13	0.033
6-12 months	164	20	12		

Prevalence according to Management system

The prevalence of coccidiosis in calves managed under intensive and extensive production system was found to be 25% and 7.3% respectively. Significance difference in prevalence of coccidiosis infection was observed between calves managed under intensive and extensive production system of the study X^2 (1, N=400) = 12.24, P= 0.03. (Table 3). Intensive production system was found to have higher prevalence of coccidiosis compared to those managed under extensive production system**. (**Table3)

Table 3 Prevalence of calve coccidiosis by production system.

Management	No. examined	No. positive	Prevalence %	Chi^2 stat	P-value
Intensive	32	8	25	**12.24**	**0.03**
Extensive	368	27	7.3		

Prevalence in relation to Body condition score

The body condition score was categorized as good, fair, and poor and its prevalence was 2%, 13.4%, and 78.2% respectively. Statistically was highly significant difference in the prevalence of calve coccidiosis was recorded X^2 (2, N=400) = 158, *P*= 0.0000, higher in poor body condition calves than fair and good body condition animals. (Table 4)

Table 4 Prevalence of coccidiosis according to body condition score

Body condition	No. examined	No. positive	Prevalence %	X^2	P-value
Good	295	6	2	**158**	**0.000**
Fair	82	11	13.4		
Poor	23	18	78.2		

Prevalence in relation to Sex

Coccidiosis prevalence in male and female calves was 8.4% and 9% respectively, a significant difference was not observed between the prevalence of male and female calves diagnosed, X^2 (1, N=400) = 2.1, P=0.551. Female calves were found to have a slightly higher prevalence compared to male calves. (Table 5)

Table 5 Prevalence of coccidiosis in relation to sex

Sex	No. examined	No. positive	Prevalence %	X^2	p-value
Male	190	16	8.4	2.1	0.551
Female	210	19	9		

Prevalence in relation to Hygiene

The prevalence of coccidiosis in calves reared in poorly, moderately and highly hygienic condition was 20%, 22% and 1% respectively. Statistically highly significant variation in the prevalence of coccidiosis was recorded among calves reared in poorly, moderately and highly hygienic state X^2 (2, N=400) = 44.49, P=0.000. Highest prevalence of coccidiosis was observed in herds managed under moderate and poor hygienic state than good (Table 6).

Table 6 Prevalence of coccidiosis in relation to hygienic status

Hygiene status	No examined	No positive	Prevalence %	X^2	P-value
Good	253	4	1	44.49	0.000
Fair	63	14	22		
Poor	84	17	20		

IV. Discussion

The present study has revealed the presence of pathogenic calve*Eimeria* species parasitizing the gastrointestinal tract of calves under the age of one year in Banaadir region, southern Somalia.

An overall prevalence of 8.7% was found by the study which is in line with the study carried out in Iran by Heidari*et al.* (2014) who reported a prevalence of 8.25%. On the other hand, the study is not in agreement with previous study carried out in dire dawa, eastern Ethiopia with by Dawid, F. *et al., (2012)* which reported an overall prevalence of 22.7%. The study is not also in line with the study carried out by Temesgen, GK (2016) in souhwollo zone in Amhara region of Ethiopia which is reported by 24.3 prevalence. The mismatch in the prevalence between this study and those other studies carried in those respective areas could be explained due to the difference in agro-ecology, managementand husbandry practices of the study animal in current study area and those areas (Radostits et al.,2006). Another possible explanation could be the fact that the study was carried out in autumn season of 2018 which the study area experienced lower levels of autumn rains.

A significant association ($p<0.05$) was observed between age of the calves with risk of infection in which the prevalence of coccidiosis appeared to follow age pattern, the rate of infection was higher in calves greater than 6 month of age than calves of less than 6 month of age, this could be due to the fact that there is proper feeding of colostrum for younger calves per response of the owners, this finding is in agreement with (Gebeyehu, B. *et al., 2018).*

On the other hand, during observation all calves older than 6 month of age were found to be housed in close contact with the adult animal and were kept under overcrowded condition and the less care given to them which might have increased the chance for the animals to lick each other and ingest large number of oocysts which is in agreement with previous reports (Radostits *et al.,* 2007; Alula *et al.,* 2013;Dejene et al., 2016) who reported that coccidiosis to occur most commonly in young animals with a seasonal incidence when young calves are brought together for weaning or moved into feedlots or fed in small areas for the winter months. The prevalence of infection and the incidence of clinical disease are also age related however, this finding is in disagreement with the report of Dawid, F.*et al (*2012) which reported a higher prevalence in calves less than 6 months of age.

The study also revealed a stronger association ($P < 0.05$) of coccidia infection in relation to the hygienic status with a prevalence of 1%, 22% and 20% for good, fair and poor hygienic condition respectively. This result agrees with the report of (Mehreteab et al., 2012; Ibrahim et al., 2016; Getahun et al., 2016). This could imply that poor sanitation in the calving and calve housing areas as well as poor management of housing favors infection with coccidiosis. Obviously, poor ventilation, droughts, poor calve nutrition, group pens, heavy stocking, cows present with calves, soiled bedding were regarded as risk factors for coccidiosis (Radostits., et al. 2006). However, the current study is not in agreement with the findings reported that hygiene and coccidian infection have no association (Yamral T., *et al.* 2016).

According to this study coccidia infection found to have strong association ($p>0.05$) with a body condition score, calves with a poor body condition were observed to have highest prevalence compared to good

and fair body condition score, this result agrees with the report of (Mehreteab et al.2012). while the study disagrees with the report of Abebe *et al.* (2007) and Alemayehu *et al.* (2013) who reported no association with body condition of the calves and the prevalence of coccidiosis.

Higher prevalence of calve coccidiosis in poor body condition calves might be due to their decrease immunity while the calves with good body condition can withstand the infection due to high level of immunity compared to calves having poor body condition. This result is not in agreement with the study carried out by (Gebeyehu, B. et al., 2018) who did not report any significance difference.

Management system and prevalence of calve coccidiosis have strong association, higher prevalence of calve coccidiosis was found in those kept under intensive management compared to those kept under extensive management which is in agreement with Vorster and Mapham, (2012) who reported that coccidiosis to be mostly a disease of young animals kept under intensive management systems when there is stress, overcrowding, housing under conditions of poor hygiene, food changes, nutritional deficiencies, and adverse weather conditions which are favorable for the survival of oocysts and therefore higher infection rates when compared to extensive farming systems.However, this result disagrees with the previous reports by (Alemayehu., *et al.* 2013; Getahun 2016; Yamral T., et al 2016) indicating that there was no statistically significant association between the occurrence of coccidial infection and management system. (Vorster and Mapham, 2012).

There was no statistically significant association ($P > 0.05$) between sex and coccidia infection. This finding agrees with reports of (Abebe., *et al.* 2008; Alemayehu., *et al.* 2013; Alula., *et al.* 2013; Ibrahim., *et al.* 2016; Mohammed., *et al.* 2016) this lack of statistically significant difference between the two sexes could prove that sex may not have significant influence on the occurrence of coccidian infection. This is could be to the fact that they have equal chance of exposure to the oocytes since they are housed in the same area or no difference on protective immunity for the disease.

Despite this, previous studies done on adult cattle reported higherprevalence of Eimeria in female animals than in males(Priti, M., et al., 2008), which could be attributed to thephysiological stress loaded on female animals in relationto pregnancies and giving birth as compared to males(Radostits*et al*., 2007).

V. Conclusion and recommendation

The current study proved the existence of coccidian infection of calves in Banadir region, with an overall prevalence of 8.7%. This prevalence is low compared to several studies carried out in the region.

The study confirmed the presence of significant association between the prevalence of calve coccidiosis and several risk factors like age, management system, body condition score and hygienic status, where calves greater than 6 months of age, animal with poor body condition, those under poor hygienic level and intensive production system all showed higher prevalence.No significant association was found between prevalence and sex of animals examined during the study period.In light of the above conclusion it is important to control and tackle this disease in the study area, to do so the following recommendations are forwarded:

- An elaborate epidemiological investigation on coccidia species is needed and to observe the effect of other risk factors such as breed, season and fecal consistency which did not become possible for the authors of this study.
- Livestock producers should give emphasis for the improvement of hygienic status of calves.
- The use of prophylactic doses of coccidiostats in ration even at an early age is advisable to prevent calves from Eimeria infections.
- Calves should be housed in a separate house and should not be mixed with the adult cows which could increase the risk of getting infected.

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