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Prevalence, Public Health and Associated Risk Factors of Coccidiosis in Small Ruminants at Deyniile Sub-District in Mogadishu, Somalia

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Abstract

Prevalence study of coccidiosis was conducted in Raadeerka, Gubta and Bangalo in deyniile Sub-district, using a cross sectional approach. A total of 120 faecal samples were examined, the overall positive for the parasite was 100% of which, 37.5%, in sheep and 62.5% in goats. Sex and species did not significantly influence ($p > 0.05$) the trend of infection. Prevalence of Small ruminants within different body conditions were Good 16(33.3%), Medium 20(41.7%) and Poor 12(25%) This indicates small ruminants with medium body condition are most likely to be effected with coccidiosis. There was significant ($p < 0.05$) difference observed in Prevalence of Coccidia species based on the study site of small ruminants, and All ages of small ruminants (Sheep and Goat) were risk factors of infection when compared to the other small herds. In Raadeerka 14(29.5%), Gubta 18(37.5%) and Bangalo 16(33.3%) The prevalence of coccidosis in Gubta was higher as compared to other two Sub-districts. The overall prevalence of pathogenic Eimeria species was 100 %, while the prevalence of that in sheep and goats were 78.68% and 48.13% respectively. Species, sex and age of animals in this case significantly influenced ($p < 0.05$) the prevalence of pathogenic Eimeria species. The females (58.3%) significantly ($p < 0.05$) had higher infection rates than males (41.7%). Animals of age greater than one years old (62.5%) had significantly ($p < 0.05$) higher prevalence rates than one years (20.8%) and less than one years old (16.7%). Conclusively, prevention, public health awareness and effective control programs should be targeted towards the most predisposed females and younger animals. The results of the study revealed that the sheep and goat Coccidiosis is widespread in the study areas. Therefore, there is a need for executing control measures and increasing public awareness in the prevention methods of the disease transmission.

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Introduction

Coccidial infection is universal in sheep and goats, and coccidiosis can be a significant problem in the young of both species. The coccidian are members of the protistan phylum Apicomplexa, subclass Coccidiasina, intracellular parasites, characterized at some stage of the life cycle by a typical apical complex of organelles at one end of the organism. Members of the genus *Eimeria* and *Isospora* are homoxenous with sexual and asexual development taking place in a single host. The etiology of coccidiosis in sheep and goats is complicated by the morphologic similarity of the coccidia infecting these species (A. & hashemnia)

Coccidiosis is not caused by a bacteria, virus or roundworm but by single cell protozoa. There are multiple coccidia species that are found in the environment. Some of these are non-infective, some moderately infective and others are highly infective. Strains of coccidia are animal species specific with some very limited crossover between sheep and goats.

Intestinal coccidian parasites such as Cryptosporidium, Isospora, Cyclospora and Sarcocystis have gained importance as emerging pathogens in the era of AIDS. Several protozoan infections that had previously been considered rare are now much more commonly recognized in the immune compromised group and, more importantly many new species of parasitic protozoa have been recognized as human parasites. All coccidian parasites have a complex life-cycle involving asexual, sexual and sporogenous cycles, and details are discussed here.

Coccidiosis (Eimeriosis sensu stricto) of small ruminants is a protozoan infection caused by several species of the genus *Eimeria* which develop in the small and the large intestine, affect young animals in particular and are specific for each host. *Eimeria ovinoidalis* in sheep and *Eimeria ninakohlyakimovae* in goats are the most pathogenic species. Coccidiosis is of great economic importance because of the losses due to clinical disease (diarrhoea) but also because of subclinical infections (poor weight gain in particular). Oocyst excretion is at the maximum around the weaning period and shows a steady decline afterwards due to a strong immunity. Risk factors for high excretion include breeding intensification, high stocking rates in premises, poor hygiene and all causes of stress (physiological, nutritional, etc.). Reliable diagnosis include combined clinical, epidemiological, necropsy and coproscopical approaches. Control is mainly based on hygienic measures between lambing/kidding and weaning periods and on anticoccidial compounds use.

In intensive breeding conditions, coccidiosis can become an infection of great economic importance. Sub clinical Coccidiosis is probably not of major importance in comparison with other infections. In two studies conducted in East Africa Coccidiosis appear to be secondary cause of mortality amongst small ruminants in combination with other parasite or infectious disease Pneumonia, Helminthic disease.

There are many effects that coccidiosis may bring including low production, diarrhea, low income, emaciation, loss of appetite and anemia lastly it causes death. Therefore, this study investigates the prevalence of sheep and goats coccidiosis in Deynile district

In general, gastrointestinal parasite infections are a worldwide problem for both small- and large-scale farmers, however, 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 helminthic parasites involved, animal species, local environmental conditions such as humidity, temperature, rainfall, vegetation, and management practices. The variation dynamics of parasite population has been described in a number of studies in many African countries Include Somalia.

In Somalia, there is no more related data on sheep and goat coccidiosis recoded or available, so this study was undertaken to investigate the presence of sheep and goats' 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.

Materials and methods

Study Area

Mogadishu or Benadir region consists of 18 districts. It borders with middle Shebelle in the north and the east, lower Shebelle in the west and Indian Ocean in the south. The study was carried out in one district of Benadir region of Somalia namely, Dayniile district. The region lies between latitude 2°2'59"N and longitude 45°15'44"E. Although by far the smallest administrative region in Somalia, it has the largest population estimated to be about 2.3 million and covers an area approximately 96,878 km. There is no information on Benadir Animal population in particular. Therefore, these sub area of dayniile district were selected purposively due to their Animal population. Samples were collected randomly from the semi intensive and intensive herds.

Study design

A cross-sectional study design was conducted from November, 2021, until May, 2021, to determine the seroprevalence of coccsidiosis infections in small ruminates in selected pastoral animals' keepers and residences of the deynile Districts, especially Gubta, Radeerka and Bangalo Sub-Vilages of Deynile to identify Public Health Awareness and potential risk factors associated with seropositivity. The three sub Villages of the district districts and about 50% were selected purposively, based on easier availability and Small ruminant populations. Target population was taken sample 172 of Somali sheep and goats in deyniile district Benadir region Somalia for faeces collection particularly some villages such as Raadeerka, Gubta and Bangalo herds but we selected and collected 120 samples.

Sample size

The methodology of this study were explanation research with using lab technician for studied current prevalence cases of coccidian infection of sheep and goat in deynile district in Benadir somalia. Target population was take sample 172 of Somali sheep goats but selected and collected sample of 120 sheep and goats instead of 172. Researchers used sample Calculation of Confidence Level 95% and Confidence Interval 5%. The researcher will use Slovene's formula to select the respondents of the study from the population; using the following formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the required sample size, N is the target population size and e is the standard error or level of significance, which is popularly known to be =0.05 or 5%. For this study, N = 172 and so the sample size was calculated as follows;

Sampling procedure

The study Samples were collected faces of sheep and goats, Researchers were used plastic gloves to collect the faecal sample directly in the rectum of small ruminants and also were put in container box. For that box we wrote date, place, and sex of animal for identification method and transported the faecal containing box to the laboratory Room in University campus. after the day researchers were placed in refrigerator in 18 h before examination (means we made examination the next day morning).Wearing gloves insert the fingertips of the collection hand into the lubricant were used to procedure the s faecal samples then wipe some into the sheep's or goat's were Putin directly to anus. Therefore, the use of the finger were inserted more easily (this was optional that can make the process easier). However, the Insert of the pointer finger or middle finger into the anus, were carefully made by extending it into the rectum as far as it was about to go and keeping the finger along/parallel to the wall of the rectum to avoid pushing dung further back or tearing the rectum. If a fold or constriction in the wall of the rectum was felt by the animals, the researchers were taken care not to tear or puncture the animals itself. However these methods were used to collect the samples, after collection of the samples the selected 120 samples were then transported to cool box and then easily and been proceed at the Benadir university Veterinary laboratory. The faecal sample were placed in a beaker (plastic), then been added sodium chloride then mixing and filter (tea filter) after that take small drops and put in the glass slide and covered with cover slide. Light microscope were recycled for identification of parasite eggs and oocytes, with 10x or 40x objective magnification. After that researcher took one picture for each unique Parasites using cell phone camera (Samsung Jace 1) then collected and cut into frame.

Data Analysis

This part addresses, processing and analysis. The data was collected through quantitative methods. Therefore, collected data from the study area, were edited, organised and tabulated. Data collected through using quantitative methods by showing the percentage, and classified with base on region and sex, presented variation in both types of small animals, Researchers were used P value at confidence level was 95%, P value ≤ 0.005. Both MS Excel Windows® 2010 were also use the base of data and SPSS for statistical computer software to store and analyse the data.

Results

This contains detailed presentation, data analysis and results of the study. Therefore, the findings were presented under the following tables:

Table 1: The Overall Prevalence of Coccidiosis in Small Ruminants.

Species	Number of animal	Number of Positive	Number of (%) Positive	P-valve
Sheep	58	30	62.5	0.053
Goats	62	18	37.2	
Total:	**120**	**48**	**100.0**	

Table 1 The percentage prevalence of coccidiosis in both species goat and sheep were 62.5%, 37.5% respectively which indicates that goat having a higher number of positive results when compared to sheep however there is no statistically significant association ($p < 0.05$) between the two species.

The Overall Prevalence of Coccidiosis in Small Ruminants:

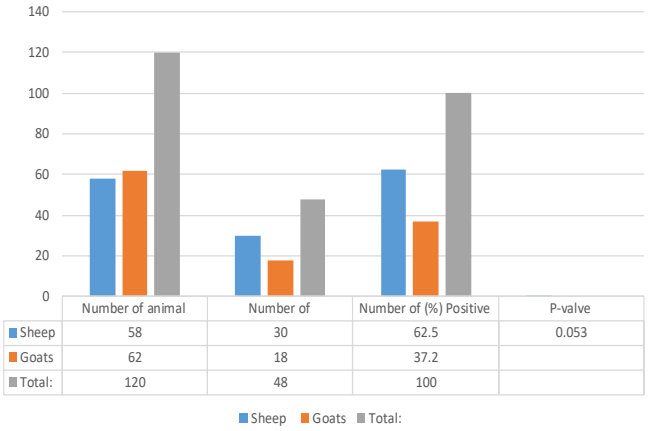


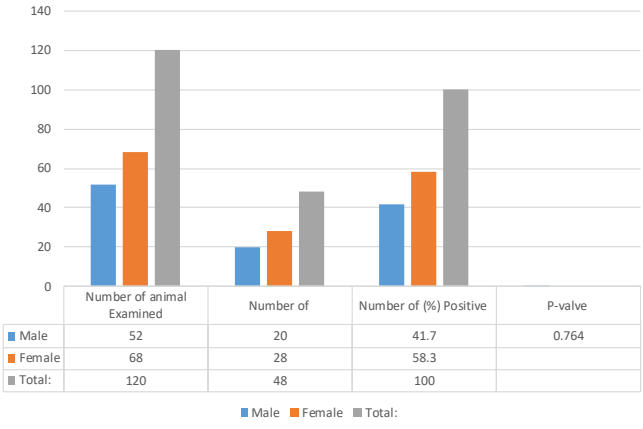
Chart 1: The Overall Prevalence of Coccidiosis in Small Ruminants showed by charts with their results.

Table 2: Prevalence of Small Ruminant's Coccidiosis Based on Sex.

Sex	Number of animal Examined	Number of Positive	Number of (%) Positive	P-valve
Male	52	20	41.7	0.764
Female	68	28	58.3	
Total:	**120**	**48**	**100.0**	

Table 2 Positive results in both female and male were 58.3% and 41.7% respectively this reveals the prevalence of coccidiosis is higher in female than male though prevalence of coccidiosis in this study area indicates that sex had no significant relations ($P < 0.05$) with presence of coccidian oocytes.

Prevalence of Small Ruminant's Coccidiosis Based on Sex



The above chart shows that the percentage of male and female concerning to the study area.

Table 3: Prevalence Of Small Ruminant's Coccidiosis Based on Age.

Age Category	Number of Examined	Number of Positive	Number of (%) Positive	(P-valve)
>One year Old	70	30	62.5	0.304
One year Old	36	10	20.8	
<One year old	14	8	16.7	
Total:	**120**	**48**	**100.0**	

Table 3: Presents the Age distribution of small ruminants having coccidiosis are (>1yr, one year and <1yrs old) however the percentage prevalence of these age categories are 62.5%, 20.8 %, 16,7% correspondingly, though the highest number of positive results were seen in >One year olds. In this study, there is no a significant difference observed in the prevalence of coccidiosis between the 3 age categories.

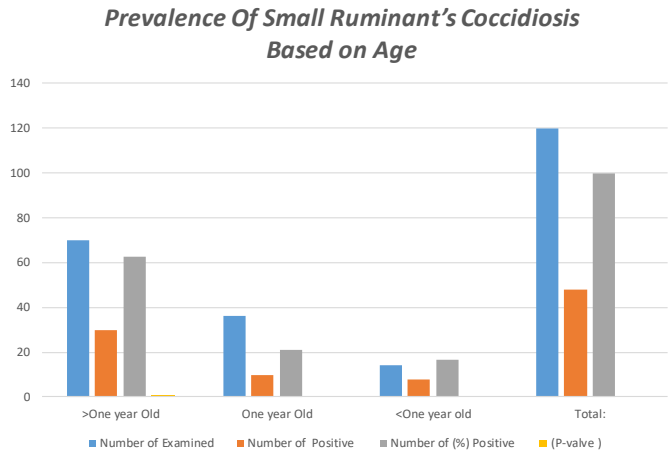
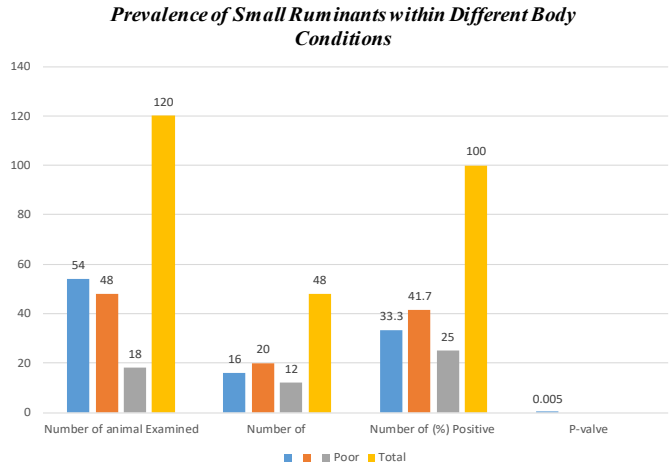


Table 4: Prevalence of Small Ruminants within Different Body Conditions.

Body condition Score	Number of animal Examined	Number of Positive	Number of (%) Positive	P-valve
Good	54	16	33.3	0.005
Medium	48	20	41.7	
Poor	18	12	25	
Total	**120**	**48**	**100.0**	

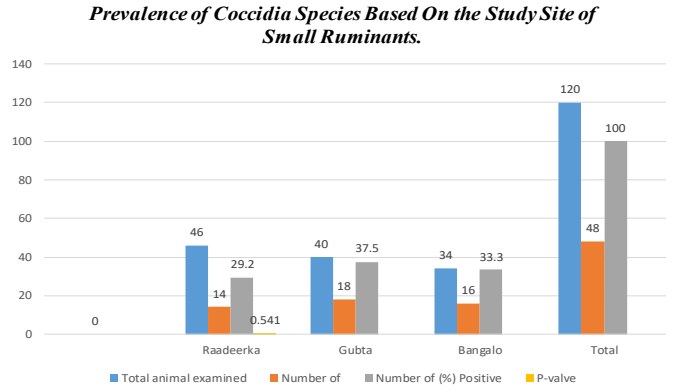
As shown in the table above different body conditions according to the number of positive are (33.3%) good, (41.7%) medium, (25%) poor, our result indicates small ruminants with medium body condition are most likely to be effected with coccidiosis. These results show that body condition had a significant association (P= 0.005) with coccidian infections.



In this table display positive results of different villages in Deynile district affected with coccidiosis as follows (37.5%) Gubta, (33.3%) Bangalo and (29.2%) Raadeerka, the percentage prevalence of coccidiosis in Gubta village was higher as compared to other two villages in Deynile district. In this study, there is no a significant difference observed in the prevalence of coccidiosis between the 3 villages in Deynile district.

Table 5: Prevalence of Coccidia Species Based On the Study Site of Small Ruminants.

Some Daynile district Villages	Total animal examined	Number of Positive	Number of (%) Positive	P-valve
Raadeerka	46	14	29.2	0.541
Gubta	40	18	37.5	
Bangalo	34	16	33.3	
Total	**120**	**48**	**100.0**	



Discussion

This study was conducted in Deyniile district in Benadir region, Smallholder farmers. The incidence of coccidian infection was 62.5% in goats and 37.5% in sheep respectively, which indicates that goat having a higher number of positive results when compared to sheep however there is no statistically significant association ($p < 0.05$) between the two species. This result is unlike the research by Mohamed Ibrahim (2018) the authors found in incidence of 26.74% and 44.19% respectively.

There are other researches that showed dissimilar Prevalence that was conducted in Mekelle, Regional state of Tigray, Northern Ethiopia, reported prevalence 87.31%, in sheep and 85.03% in goat respectively, which shows that sheep having higher number of positive results. Also another similar research that was conducted in Heilongjiang Province, northeastern China between January 2007 and June 2009. by prevalence of 92.9% in sheep and 87.9% for goats respectively. Which indicates that sheep having higher number of positive. In the present study, the total number of sheep examined was 142 (66 less than 1 year and 76 adult) and for goats the total number was 135 (60 less than 1 year and 75 adult). The prevalence of Eimeria sp. infection in Geneffe village was found in 81 goats (60%) and 82 sheep (57.7%). Prevalence of small ruminant's coccidiosis based on sex A further look on the table 2 reveals the compares of positive result in both female=58.3%, Male=41.7% indicating that coccodosis is commonly found in female than male. The parasite prevalence in our study was similar to the one reported by Zvinorovaa,b, et.al,(2016) In these studies The females (74.87%) significantly ($p < 0.05$) had higher infection rates than males (53.3%). This might be associated with level of immunity and management variation showing why more female animals were exposed to Eimeria infections. Prevalence of small ruminants coccidiosis based on age As Table 3 Presents the Age distribution of small ruminants with coccodiosis from >1 yr. -<1yrs old of which >one year old =62.5%, one year old=20.8 %,< one year old =16,7% in conclusion the highest number of positive results were seen in >One year olds. in disagreement with the research stated by A.Jalilaa. Dornyb. Sania N.B. Salima J. Vercruysseb (2018) Coccidian infections were studied in goats in

the state of Selangor (peninsular Malaysia) during a 12-month period. The study included 10 smallholder farms on which kids were monitored for faecal oocyst counts from birth until 1-year old. Eimeria oocysts were found in 725 (89%) of 815 faecal samples examined. Oocyst counts were significantly higher in animals of less than 4-months old (P<0.05). High oocyst counts were mainly caused by non-pathogenic species. Is an agreement with the research reported by College of Veterinary Medicine, Mekelle University, Mekelle, Ethiopia) Animals of age 3 months (91.13%) had significantly ($p < 0.05$) higher prevalence rates than 4-6 months (59.86%) and 7-12 months (38.94%).

Prevalence of Small ruminants within different body conditions As shown in the table 4 above the comparism of different body conditions according to the number of positive results are Good=33.3%, medium=41.7%, poor=25%.This indicates small ruminants with medium body scores are most likely to be effected with coccidiosis. This unlike with the studies of Khan et al. (2011) reported a higher infection rate in sheep with poor body scores than in sheep with good body scores. This might be due to the weak immune status of poorly scored animals as a result of malnutrition and other parasitic infections, which results in immunocompromised. Prevalence of Coccidia species based on the study site of small ruminants In table 5 different villages were compared according to the number of small ruminants effected with coccidian as follows Raadeerka=29.2%,Gubta=37.5%,Bangalo=33.3% The prevalence of coccidosis in gubta was higher as compared to other two districts.

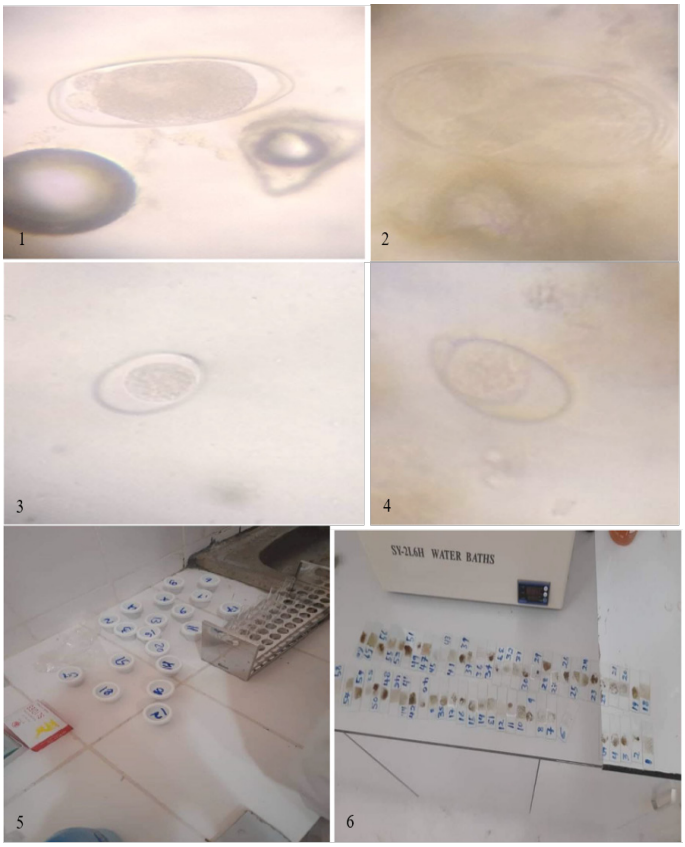


Figure 1-6

Conclusion

In general, coccidial infection is prevalent and considered as great significant diseases to control for the sheep and goats producers in and around deyniile district.

This study revealed that high prevalence of coccidiosis in sheep and goats in gubta, raadeerka and bangalo affects young lambs and kids. Positive results of different villages in Deynile district affected with coccidiosis as follows (37.5%) Gubta, (33.3%) Bangalo and (29.2%) Raadeerka, the percentage prevalence of coccidiosis in Gubta village was higher as compared to other two villages in Deynile district. In this study, there is no a significant difference observed in the prevalence of coccidiosis between the 3 villages in Deynile district. The risk factors, sex and species were significantly associated with pathogenic Eimeria infection.

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