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Research Article

STUDY ON THE PREVALENCE AND ASSOCIATED RISK FACTORS OF CAMEL TRYPANOSOMOSIS (*SURRA*) IN AND AROUND YABELLO, ETHIOPIA

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ABSTRACT

Camels are affected by many infectious and parasitic diseases. Among parasitic diseases, camel trypanosomosis caused by *Trypanosoma evansi* is the most important single cause of morbidity and mortality in camels. The objective of the current study was to estimate the prevalence of camel trypanosomosis, identifying the species of trypanosome and associated risk factors involved in Yabello district of Ethiopia. The methods employed were thin smear, PCV or MHCT and Buffy coat examination (BCE). The overall prevalence of camel trypanosomiasis was found to be 2.5% (10/394) and the only species identified was *Trypanosoma evansi*. There was no significant difference between sex and age groups ($P<0.05$) but higher prevalence of trypanosomiasis was observed in males and in young growing camels, respectively. Disease has been found to be significantly correlated with BCS and disease was more prevalent in camels with poor body condition. The mean PCV was significantly ($P<0.05$) lower in parasitaemic camels (21%) than in aparasitaemic camels (28.5%). It was concluded that it is a major cause of economic loss in the area which needs continued awareness creation among farmers and interference by authorities to prevent and control disease.

Keywords: Borana, Camel, *Dromedarius*, *Trypanosoma evansi*, Yabello

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Camels (*Camelus dromedarius*) are domestic animal species that are best adapted to harsh environments and fluctuating nutritional conditions of arid and extremely arid zones. Whereas, they (*Camelus bactrianus*) are well adapted to cold wet arctic environment (Demelash *et al.*, 2014). Ethiopia has high livestock resource potential with approximately 2.6 million camels are found in Borena, Somale and Afar regions, which are *dromedarius* or one-humped (CSA, 2010).

Camels are believed to be relatively resistant to diseases as compared to other animals. There are only a few diseases recorded in them, of which Trypanosomiasis is the major one. Camel trypanosomiasis is the disease caused by the species, *Trypanosoma evansi*. They are unicellular flagellar protozoa belonging to phylum Sarcomastigophora, order Kinetoplastidae, family Trypanosomatidae and the genus *Trypanosoma*, under the Salivaria group.

Trypanosomes are insect-borne and their occurrence depends on vector dynamics. *T. evansi* is transmitted mechanically, non-cyclically, by haematophagus flies such as horseflies (*Tabanus*) and stable flies (*Stomoxys*) which are endemic in Africa as well as in Ethiopia (Urquhart *et al.*, 1996). In camels, the disease is manifested by elevation of body temperature, marked depression, dullness, loss of body condition and progressive anemia. Anemia appears to be a major component of the pathology of *surra* and generally the degree of anemia might be considered as an indicator of the disease severity and will finally end up in death of camel due to anoxia (Eyob and Matios, 2013).

Even though, there are large number of camel in Yabello area a research on prevalence and predisposing factors of camel trypanosomiasis is less (Kassa *et al.*, 2011). Therefore, the current study was conducted to identify the parasite *Trypanosoma evansi* from infected camels, to determine the prevalence of trypanosomosis and to identified associated risk factors of disease in and around Yabello.

MATERIALS AND METHODS

Study area: The study was conducted in Borana zone, Yabello district which is located at 565 km south of Addis Ababa, Ethiopia (Fig.1). The climatic condition of the town is arid and semi-arid and the town is located at an altitude of 1000-1650 meters above sea level. The temperature level ranges from 19-24°C and yearly rainfall varies from 300-700 mm.

Study population and Study design: The study animals were indigenous one hump camel (*Camel dromedarius*) which varied in age, sex and were reared under extensive husbandry system. A cross sectional study was conducted on camels in and around Yabello, Borana zone such as A. yabello, Moyale, Taltele, Dire, Bake, Dhareto, Jijidhu, Project and Arerotown. In present study camel of both sex and all age groups (i.e. calves below 1 years of age (14), young up to 4 years of age (95) and adult above 4 years

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(285) were included. The age of camels was determined based on the information obtained from the owners and were grouped as young (< 4 years old) and adult (> 4 years old). For the study, a total of 394 one humped camels (202 females and 192 males) were selected by systematic random sampling technique.

Sampling method and sample size determination: The sample size was determined by using the formula given by Thrusfield (2007). To calculate sample size, 18 % expected prevalence from (Abera *et al.*, 2014) 95% confidence level and 5% desired absolute precision (d=0.05) was used. Therefore, according to (Thrusfield, 2007) the sample size was determined as follows:

$N = (1.96^2) P_{exp} (1-P_{exp})/d^2$

Where, N = required sample size

P_{exp} = expected prevalence

D = desired absolute precision

Z = required confidence level (Z=1.96 for 95% confidence interval)

$N = [1.96^2 * 0.18(1-0.18)]$

0.05^2

N = 217

Therefore, according to the above formula, minimum of 217 animals should be sampled, but to increase the accuracy of the prevalence estimates, a total of 394 animals were sampled.

Study Methodology

Sample Collection: The blood samples were collected from 394 camels by puncturing ear vein and the blood were collected into sealed and heparinized (EDTA) capillary tube. During sampling, data with regard to age, body condition and sex were recorded for each sampled animal. Finally, samples were taken to Yabello Veterinary Regional Laboratory for parasitological examination.

Blood examination and Parasite identification: The tubes containing blood were centrifuged for 5 minutes at 12,000 revolutions per minute. After the centrifugation, tubes were then placed in hematocrit reader and recorded for each sample. Then, the readings were expressed as a percentage of packed red cells to the total volume of whole blood. Animals with Packed Cell Volume (PCV <25%) were considered to be anemic (Morag, 2002). Trypanosomes were usually found in or just above buffy coat layer. So, capillary tube was cut using a diamond tipped pen 1 mm below the buffy coat to include the upper most layers of the red blood cells and 3 mm above to include the plasma. The content of the capillary tube was expressed on to slide, homogenized on to a clean glass slide and covered with cover slip. The slide was examined under 40x objective and 10x eye pieces for examination of the movement of parasite (wet smear) the trypanosomes were identified based on the characteristic movement and its morphology (Paris *et al.*, 1982). And finally thin blood smear was prepared for identification of trypanosome in genus and species as well. For wet film, a drop of blood was placed on a clean glass slide and covered with cover slip, allowing the blood to spread as a thin layer of cells then examined under microscope to observe the motile trypanosomes. Thin blood smear were made air dried and then fixed in absolute methylene alcohol for 2-3 minutes. The slides were immersed in Giemsa stain for 20-25 minutes and washed with tape water to remove excess stain. After air drying, the slides were examined under oil immersion objective lens (100x) for detection and identification of trypanosome species based on their morphological characters. The observed trypanosomes were slender shape, highly mobile and prominent undulating membrane with long free flagella which is so called *Trypanosoma evansi* (Fig. 2). *Trypanosoma evansi* is morphologically identical with and indistinguishable from slender forms of other members of the subgenus Trypanozoon and is described as monomorphic but may be pleomorphic in some strains with length of 15 to 34 µm. Leaf-like slender forms are characterized by a long free flagellum, which may be up to one half of the length of the organism with narrow and drawn out posterior end.

Data management and analysis: The data obtained was analysed using STATA-11 (Stata Corp. 4905 Lake way Drive College Station, Texas 77845, USA) software. Descriptive statistics like percentage and chi-square (χ^2) test was used to determine the prevalence of the disease and any association between the disease and associated risk factors (age, sex, district and body condition score), respectively. The association between *T. cruzi* infection and sex of camels was estimated using odds ratios (OR). In this analysis, confidence level was held at 95% and P<0.05 was set for significance.

RESULTS AND DISCUSSION

Prevalence of trypanosomiasis in camels: Out of 394 camels, 10 (2.5 per cent) camels were positive for *T. evansi* and it was the only species detected as a causative agent of camel trypanosomiasis during this study, which is in harmony with reports from Ethiopia (Kassa *et al.*, 2011; Tadesse *et al.*, 2012) as well as from different parts of the world (Delafosse and Doutoum, 2004; Ahmed, 2008). The prevalence of camel trypanosomiasis noticed in this study was comparable with earlier reports of 4.4% in Fentale district (Kassa *et al.*, 2011), 3.9 % in Jijiga zone (Tadesse *et al.*, 2012), 2% in Afar region (Aregawi *et al.*, 2015) of

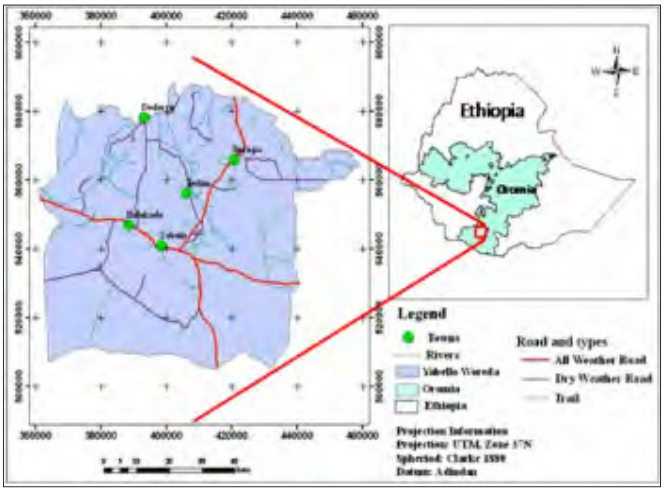

Fig. 1. Map of the study area, Yabello district of Borana rangelands, southern Ethiopia (Nortjé and Nortjé, 2017)

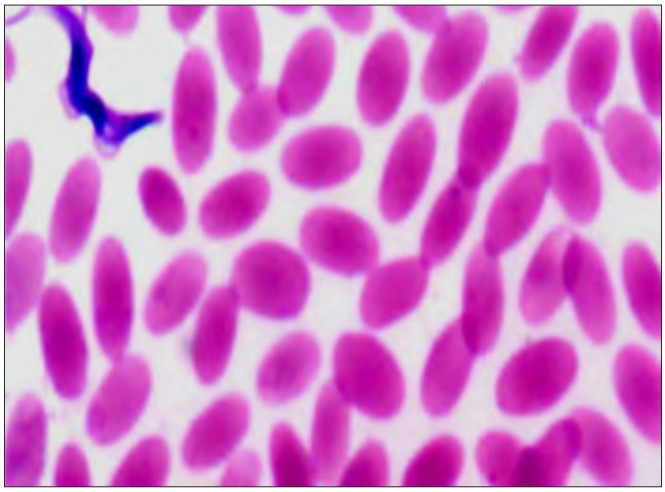

Fig. 2. Blood smear containing *Trypanosoma evansi*

Table 1. Age, sex and body condition score wise prevalence of trypanosomosis in camels

Risk Factors	No. of animals examined	No. of positive samples	%	÷2	P value
		According to age			
>4 Adult	285	7	2.50%	0.0904	0.764
</=4 Young	95	3	3.20%		
<1 Calves	14	0	0.00%		
Total	394	10	2.50%		
		According to sex			
Male	192	6	3.10%	0.3899	0.532 OR=1.59
Female	202	4	2.00%		
Total	394	10	2.50%		
		According to body condition			
Poor	21	10	2.50%	120.14	0
Medium	126	0			
Good	247	0			
Total	394	10	2.50%		

Table 2. Prevalence of *T. evansi* in the different study areas

Region	No. of animals examined	No. of positive samples	% age	χ^2	P value
A. yabello	92	3	3.3	2.5759	0.765
Bake	48	1	2.1		
Dhareto	59	1	1.3		
Arero	67	3	4.5		
Jijidhu	68	2	3		
Project	60	0	0.0		
Total	394	10	2.5		

Ethiopia; and the 2.3, and 5.3 % reports by Ngaira *et al.* (2002) and Delafosse and Doutoum (2004) from Mauritania, Kenya and Chad, respectively. However, the present report is not in consonance with the findings of Ravindran *et al.* (2008) who reported the prevalence of 1.5% (2/131) in India. This might be due to geographical difference and different management systems. On the contrary, higher prevalence 24.0% (97/408), 25% (49/195) was reported by Abdi *et al.* (2017) and Elwathig *et al.* (2016), respectively. The difference in the prevalence rate may be due to poor sensitivity of test, management system, season of study period, lower vector density, fly repellents used, good awareness of the animal owners about the disease, ecological and geographical difference.

Prevalence of trypanosomiasis with regard to sex: In the present study, no statistically significant difference was

observed between different sexes (P >0.05). This might be due to the reason that all camels are equally susceptible to trypanosome infections regardless of breed and sex (Pathak and Khanna, 1995). However, higher infection rate was recorded in males (3.1%) than females (2%) (OR=1.59) (Table 1), which could be due to the fact that female camels were kept in house while males were used for work all the time and were allowed to graze out in the fields. However, the finding of the present study were not in consonance with the findings of Shah *et al.* (2004) who reported that females were more susceptible to the disease than males (15.68%). Similarly, Bhutto *et al.* (2010) reported prevalence of 15.79 % in females as compared to 9.84 % in males in Pakistan. This might be associated with physiological difference between male and female animals. Female animals face higher demands and stress during pregnancy and lactation which decreases resistance and renders them more susceptible to *T. evansi* infection.

Prevalence of trypanosomiasis with regard to age: Out of 192 male and 202 female animals examined for presence of trypanosomiasis, no statistically significant difference in prevalence (p<0.05) among different age groups was observed and prevalence of 2.4%, 3.1% and 0.0% was recorded for adult, young and calves more than one year, respectively (Table 1). However, higher infection rate was reported in young growing animal than calves less than 1 year age. The finding was in line with the reports of (Abera *et al.*, 2014), but disagree with the findings of Atarhouch *et al.* (2003), who reported that infection rate of *T. evansi* increases with age and reaches maximum in the 7-10 years. The higher prevalence in current study might be due to lower immunity status at such a young age.

Prevalence of trypanosomiasis with regard to body condition score: In the present study, statistically significant difference in prevalence (P<0.05) between animals with different body conditions was observed and prevalence of 2.5%, 0.0%, and 0.0% were recorded for poor, medium and good body conditioned animals, respectively (Table 1). This result was in consistence with the findings of Kassa *et al.* (2011) and Tadesse *et al.* (2012), who also reported higher prevalence of trypanosomiasis in poor body conditioned animals. The higher prevalence in current study might be due to decreased immunity and strength in poor body conditioned animals.

Prevalence of trypanosomiasis with regard to study area: In this study, there was no significant difference between the prevalence of camel trypanosome infection among the six districts under study (P>0.05). However, the highest prevalence of the disease was observed in Arero, A. yabello and Jijidhu i.e., 4.5%, 3.3% and 3%, respectively, whereas lower prevalence was recorded in Bake, Dhareto and project i.e., 2.1%, 1.7% and 0%, respectively, during the study period (Table 2). This might be due to the difference vector density, poor veterinary services, ecological difference and lack of awareness of the animal owners about the disease.

CONCLUSIONS

The present study revealed an overall prevalence of 2.5% of camel trypanosomiasis in the study area and is a major constraint that hinders camel production and productivity. Anemia is the major pathology of the diseases and finally ends up in death of the camel duo to anoxia. Therefore, effective treatment, prevention and control measures which include mercuric chloride test for rapid diagnosis and treatment with naganol should be designed against the parasite and their vectors to minimize the disease and more detailed studies should be carried out in both dry and rainy seasons.

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