

Cross Sectional Study of Camel Trypanosomosis in Babile District, Eastern Hararghe Zone, Oromia Regional State, Eastern Ethiopia

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Abstract: A cross-sectional study was conducted to determine the prevalence of camel trypanosomosis and assess associated potential risk factors in four localities of Babile district, eastern Hararghe zone, Oromia Regional State, eastern Ethiopia from November 2014 to April 2015. Randomly selected camels were blood-sampled and examined for *T. evansi* infection by Wet film, Giemsa-stained thick/thin smears and Buffy coat technique. Out of 384 examined camels, 31 (8.1%) were positive for *Trypanosoma evansi*. There was statistically significant difference between the prevalence of camel trypanosome and study site (peasant association), sex and age of the animals ($P < 0.05$). The highest prevalence of the disease was observed in Erer-ibada (12.3%) whereas the lowest prevalence value was recorded in Rahmata site (3.3%) during the study period. The prevalence was higher in female (8.9%) than male (5.5%) camels. Adult camels (10.5%) were infected more than young camels (4.9%). The mean PCV was lower (23.1%) in parasitemic animal as compared to aparasitemic animals (28.1%). There was no statistically significant difference observed between infection and PCV. The result of the current study revealed that camel trypanosomosis was highly prevalent in the study area. Thus, there is need of designing control and prevention strategies as well as identifying risk factors.

Key words: Babile District • Camel • Prevalence • *Trypanosoma evansi*

INTRODUCTION

The camel (*Camelus dromedaries*) is an important livestock species uniquely adapted to hot arid environments. World camel population is estimated to be around 25.89 million across 47 countries. About 85% of the camel population inhabits mainly eastern and northern Africa and the rest inhabits the Indian subcontinent and Middle East countries [1]. In Ethiopia, camels represent a subset of major livestock resources with a population estimated as greater than 2.4 million [2].

In Ethiopia, the importance of camel is increasing from time to time both at local and global markets. As a result, the country is earning hard currency by exporting live camels to Middle East Countries. Moreover, camel husbandry is the main source of living for millions of pastoralists in the arid and semi-arid zones of Ethiopia [3]. These areas include the major parts of the Somali and Afar National Regional States and some parts of the Oromia National Regional State [4]. The most common uses of camels by the pastoralists are for milk and

meat production and for transporting grain, water, salt and other goods [5]. The animal is a more reliable milk provider than other classes of livestock in arid areas, during both dry seasons and drought years. There is also an increasing demand for camel milk and meat in local market [3].

Even though the livestock sub sector contributes much to the national economy, its development is hampered by different constraints. The most important constraints to camel production are widespread diseases, poor veterinary service and lack of attention from government [6]. Camels are believed to be comparatively less susceptible to many diseases that affect other livestock species. However, they are still affected by many endemic diseases [6].

Among the diseases constraints, camel trypanosomosis caused by *T. evansi* continues to be the major problem in sub-Saharan African countries including Ethiopia [8]. The disease is an important single cause of economic losses, causing morbidity of up to 30% and mortality of around 3% camels in Ethiopia [9].

Despite all its ecological, economic importance and significant role in the life of pastoral community, until recently camels were neglected by researchers and development planners in Ethiopia. Only few documented information about camel trypanosmosis and associated risk factors are found in country. The current study was designed to fulfill this gap in the country and in particular in the study area.

Thus, the objective of this study was:

- To determine the prevalence of camel trypanosmosis
- To assess the associated risk factors in the study area.

MATERIALS AND METHODS

Study Area and Population: Babile district is found in eastern Hararghe zone of Oromia Regional State, Ethiopia. It is located 31km away from the town called Harar and about 557 km east from Addis Ababa, the capital city of Ethiopia. It lies between 8°, 9°9', 23'N latitude and 42°, 15'-42°, 53' E longitude and is characterized by semi-arid and arid climate with average annual rainfall of 410-800 mm and the annual temperature ranges from 24-28°C. It shares its border with Gursum from the north, Fedis from the west, Harari National Regional State from the north-west and Somalia National Regional State in the east, South and South West. The total land covers an area of 200,000 hectors with a human population of 100,003. The livestock population of the district comprises about 76,161 cattle, 11,470 sheep, 20,644 goats, 7,393 donkies, 15,430 camel and 21,114 poultry (Babile animal agency, 2013).

Study Design: Across-sectional study was conducted from November 2014 to April 2015 in the study areas to determine the prevalence of camel trypanosmosis and assess the associated potential risk factors. The four study sites were purposely selected based on their camel population, proximity to main road and other socioeconomic characteristics.

Sample Size and Sampling Methods: The desired sample size was determined based on the expected prevalence of 50% with 95% confidence level and 5% absolute precision and calculated by the formula recommended by Thrusfield [12].

$$N = \frac{1.96^2 * P_{exp} (1 - P_{exp})}{d^2} = \frac{1.96^2 * 0.5(1-0.5)}{(0.05)^2} = 384$$

where,

n = required sample size

P_{exp} = expected prevalence

d = required precision

The study animals include camels of all age groups and both sex. Villages of each peasant association and animals were selected by simple random sampling method. The age groups of camels were two, young (<4 years old) and adult (= 4 years old).

Sample Collection and Preparation: The whole blood samples were collected from 384 camels by puncturing jugular vein into 5ml ethylene tetra-acetic acid (EDTA) coated vacutuner tubes, then kept in cooler box and transported to Dire Dawa Veterinary Regional laboratory for lab processing.

Examination Procedures: 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. Thick and thin blood smear was made as described by Murray *et al.* [13]. The air dried smears were fixed in absolute methylene alcohol for 2 minutes. The slides were immersed in Geimsa stain for 20-25 minute and washed with tap water to remove excess stain. After air drying, the slides were examined under oil immersion objective lens (100x) for the detection and identification of trypanosome species based on their morphological characteristics [13].

For the PCV determination, blood samples were drawn into heparinized microhaematocrit capillary tubes up to ¾ of their length. Then, one end of the tubes was sealed and symmetrically loaded in the haematocrit centrifuge, with the sealed end outwards. After that the tubes were centrifuged for 5 minutes at 12,000 revolutions per minute. Then, tubes were placed in hematocrit reader and the result was recorded for each sample. Then, the readings were expressed as a percentage of packed red cells to the total volume of whole blood. If the PCV is less than 25%, it was considered as anemic [14]. 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 slide, homogenized on a clean glass slide and covered with a cover slip. The slide was

examined under 40x objective and 10x eye pieces for the presence of parasite and Giemsa stain of thin blood films were made for positive samples to further characterize the species of the parasite [15]

Data Analysis: Data of individual animals and parasitological examination results were inserted into Microsoft excel spread sheet program to create a database. The data analysis was done using SPSS version 20 software program. The prevalence of *T. evansi* infection was determined on the basis of the combined results from the different parasitological methods (wet film, thin and thick smears and PCV) and was stratified by site, sex and age. Factors, identified as significant in this analysis, were subsequently subjected to logistic regression analysis to investigate the associations between *T. evansi* infections and potential risk factors (study area, sex and age). The test result was considered to be significant when $p < 0.05$ at 95% confidence interval.

RESULTS

Out of 384 examined Camels, 31(8.1%) were positive for *T. evansi*. In this finding, no other trypanosome species were detected. The highest prevalence of the disease was recorded in Erer-ibada (12.3%), followed by

8.6%, 5.15% and 3.3% in Ibada-gamachu, Gamachu and Rahmata respectively. Females had a relatively higher (8.9%) rate of infection than the male (5.5%) population. Adult camels (=4 years old) were found to be more affected (10.5%) than young camels (<4 years old) (4.9%) relatively (Table 1, Table 2 and Table 3).

DISCUSSION

The overall prevalence of camel trypanosomosis observed was 8.1% (31/384) and this could indicate the importance of the disease in the area. The prevalence of *T. evansi* obtained agrees with the findings of Eshetu *et al.* [16] (6.25%) in Jijiga Zone of Somalia regional states of Ethiopia, Tekle and Abebe, [11] (10.9%) in Borena, Southern Ethiopia, Shah *et al.* [17] (10%) in Pakistan and Pathak *et al.* [10] (7.5%) in India.

However, the result of the current study was lower than the findings by previous workers: Zeleke and Bekele [19] 21% in eastern Ethiopia, Mohamed [20] 20% in Dire Dawa, southeastern Ethiopia, Dereje *et al.* [21] 17.9% in Bale, Southern Ethiopia, Njiru *et al.* [9] 28% in Kenya and Pacholek *et al.* [10] 29% in Niger. This type of difference might be attributed to variations in the ecology of the study areas and seasons of the year at which the study was conducted which have a direct effect on the

Table 1: Prevalence of Camel trypanosomosis in the study area by peasant association.

| Peasant Association | No. Examined | No. Infected | Prevalence | χ^2 -value | P-value |
|---------------------|--------------|--------------|------------|-----------------|---------|
| Erer-ibada | 122 | 15 | 12.3% | 188.9 | 0.00 |
| Ibadagamachu | 105 | 9 | 8.6% | | |
| Gamachu | 97 | 5 | 5.15% | | |
| Rahmata | 60 | 2 | 3.3% | | |
| Total | 384 | 31 | 8.1% | | |

Table 2: Association between prevalence and risk factors

| Risk factors | No. Examined | No. Infected | Prevalence (%) | χ^2 -value | P-value |
|--------------|--------------|--------------|----------------|-----------------|---------|
| Sex Female | 293 | 26 | 8.9 | 17.59 | 0.00 |
| Male | 91 | 5 | 5.5 | | |
| Age Young | 164 | 8 | 4.9 | 20.3 | 0.00 |
| Adult | 220 | 23 | 10.5 | | |
| Total | 384 | 31 | 8.1 | | |

Table 3: Association between trypanosome infection status and mean PCV in camels

| Infection status | Number of Observation | Mean PCV | Prevalence | χ^2 -value | P-value |
|------------------|-----------------------|----------|------------|-----------------|---------|
| Parasitaemic | 39 | 23.1 | 10.15 | 22.4 | 0.05 |
| Aparasitaemic | 345 | 28.1 | 89.8 | | |
| Total | 384 | 25.6 | 99.95 | | |

distribution of biting flies responsible for the mechanical transmission of *Trypanosoma evansi*. The presence of rainfall, moisture-retaining clay soil and surface water pools are also suitable for the survival and propagation of the vector.

As reported by different researchers from different parts of the world Swai *et al.*, [22] and Enwezor and Sackey [23] and Delafosse and Doutoum [24] and Atarhouch *et al.* [25] and Demeke [26] *T. evansi* is the main cause of camel trypanosomosis. The current study also indicates similar result.

There was strong statistically significant difference between the prevalence of camel trypanosome and Study site (peasant association), age and sex of the animals ($P < 0.05$). The disease was higher in female (8.9%) than male (5.5%). This might be due to stress during pregnancy and lactation which could decrease resistance in female and render them more susceptible to *T. evansi* infection. This result agrees with Shah *et al.* [17] who reported sex related differences in prevalence of the disease where females (15.68%) were more susceptible than males (11.76%).

The adult camels were more likely to contract *T. evansi* infections than young camels. This result is in line with Atarhouch *et al.* [25], Gutierrez *et al.* [27] and Dial *et al.* [28] who reported that a tendency for infection rate to increase with age. The higher prevalence in adult age camel might be due to heavy stress through their use for transportation of goods from one place to another and long-term exposure under poor management which increase the risk of infection than younger camel as well as the reduced exposure of the young which are often browsed within the vicinity of human dwellings as opposed to older camels which are browsed and watered in the open where they will have a greater chance of contact with the vectors. Young animals are also bitten less frequently than older ones due to the greater defensive behavior they exhibit making it hard for biting flies to feed readily on the former.

Even though, there was no statistically significant difference observed between infection and PCV ($P > 0.05$), several factors are responsible for causing anaemia; the production of haemolysin by trypanosomes resulting in haemolysis of RBCs, extravascular destruction of RBCs, the erythrophagocytosis, immune mediated, depression of erythropoiesis and non-specific factors, which increase red cell fragility, may be responsible for anaemia [29]. So, anemia is a major component of the pathology of surra [23].

CONCLUSION AND RECOMMENDATION

In Ethiopia, the importance of the camel is increasing from time to time both at local and global markets. As a result, the country is earning hard currency by exporting live camels to Middle East Countries. Moreover, camel husbandry is the main source of living for millions of pastoralists in the arid and semi-arid zones of Ethiopia. The most important constraints to camel production are widespread diseases, poor veterinary service and lack of attention from the government. Among the diseases constraints, camel trypanosomosis caused by *T. evansi* continues to be the major problem in sub-Saharan African countries including Ethiopia. The disease is an important single cause of economic losses in Ethiopia. The result of the current study revealed that camel trypanosomosis was highly prevalent in the study area. It was found to be the major constraint that hamper camel production and productivity. This means, that Trypanosomosis is a disease of major economic importance in the study areas.

Thus, We Strongly Recommend:

- Further studies that focus on the trypanosomosis and potential associated risk factors like seasons, age, sex, movement and management of camels should be conducted.
- Attempt should be made to expand government veterinary services to serve the community in the study areas.
- Effective prevention and control measures should be designed against the parasite and their vectors to minimize the disease.

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