

Bovine Trypanosomosis and Its Vector Type and Density at Debre Elias District, North-western, Ethiopia

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Abstract

A cross sectional study was conducted from September to November, 2011 to determine the status of trypanosomosis in bovine, vector type and density in Debre Elias district, north-western Ethiopia. Totally, 581 blood samples were collected and analyzed using wet and thin smears, and buffy coat technique. Four traps at randomly selected areas were deployed, and type and number of flies trapped were recorded. The overall prevalence of trypanosomosis was 10.67%. The prevalence were significantly ($p < 0.05$) higher in lowland (17.55%) than midland (7.38%) agro-climatic zones and it was also significantly higher in middle (14.35%) than either young (10.74%) or old (6.96%) animals. However, there was no significant ($p > 0.05$) variation between sex groups. *Trypanosoma vivax* and *T. congolense* were the two species identified in the area accounting 56.45% and 43.55% of the positive cases, respectively. A total of 912 flies were caught. Of these, 192 (21.05%) were belonging to Glossina species, whereas the remaining were Stomoxys and Tabanus. The apparent density of Glossina, Tabanus and Stomoxys were 1.60, 4.3 and 1.7 fly/trap/day, respectively. From this particular study, it was confirmed that bovine trypanosomosis is a disease of concern in the district. Therefore, appropriate strategies have to be designed to reduce its effect on livestock production.

Keywords: Debre Elias; prevalence; Trypanosomosis; vectors

Introduction

Trypanosomosis is a parasitic disease caused by species of flagellate protozoa belonging to the genus *Trypanosoma* which inhabit the blood plasma and various body tissues and fluids. The disease is one of the main constraints to animal production particularly in Africa. The parasite infects domestic and wildlife animals in approximately 10 million km² involving 37 countries in the continent. The parasite is transmitted by tsetse fly (*Glossina* species), cyclically and biting flies, mechanically. The tsetse belt extends from Sahara in the North to South Africa in the South (Marquardt *et al.*, 2000; Parryet *et al.*, 2004). An estimate of 160 million cattle and 260 million sheep and goat as well as many domestic and wild animals are at risk (Leak, 1996). In infected areas, the livestock productivity severely reduced in terms of meat and

milk production. Animal traction power is also significantly reduced by trypanosomosis (Abebe, 2005).

In Ethiopia, trypanosomosis is known for creating serious economic losses. The tsetse transmitted trypanosomosis is widespread in country occupying about 220,000 km² area whereas the non-tsetse transmitted disease is even wider than this. The most important pathogenic trypanosomes found in the country are *T. congolense* and *T. vivax* even though *T. brucei* and *T. evansi* are also found (FITCA, 2004; Miruk *et al.*, 2008; Tadesse and Tsegaye, 2010). Currently, the presence of vectors, existence of reservoir hosts, various agro-climatic zones and poor veterinary service exacerbate the existence and distribution of the trypanosomosis. Debre Elias district laid bordering Abay (Nile) river belt in its south direction where livestock in the district are challenged by tsetse and other biting flies. Despite this, the information on the status of trypanosomosis and its vectors were scares. This study was designed mainly to determine the current

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prevalence of trypanosomosis and its vector type and density in the district.

Parasitological Survey

Materials and methods

Study Area

The study was carried out at Debre Elias district in East Gojjam Administrative Zone, Amhara region, Northwestern Ethiopia. According to the Agricultural and Rural Development Office annual report (ARDO, 2010), the district has 88,167 cattle where local zebu (*Bos Indicus*) is the dominant breed. The husbandry system is mainly extensive type in which animals are allowed to graze freely and housed in poorly constructed barn at night. The altitude of the district ranges from 800-2200 meter above sea level (m.a.s.l.) and receives mean annual rainfall of 1150 mm Hg which occurs mainly in the June, July, August and September. Other months of the year are almost dry with erratic rainfall. The average daily temperature ranges from 18 - 27OC.

Study Population and Sampling Techniques

The study population consists of all age and sex groups of local zebu cattle. A total of 581 animals were randomly selected in the district. None of these animals were treated against trypanosomosis for the last 6 months by any trypanocidal drugs. In this survey, a total of 15 peasant association were randomly selected and eight of them were in low-land (800-1500 m.a.s.l.) and the rest seven were in midland (>1500m.a.s.l.) agro-climatic zones. The sample size was determined using a 95% confidence interval, at 5% desire absolute precision at estimated prevalence rate of 12.4% (FITCA, 2004) and calculated based on the formula given by Thrusfield (2005).

Sample Collection and Examination

Blood sample collection and recording of the animal's sex and age were performed simultaneously.

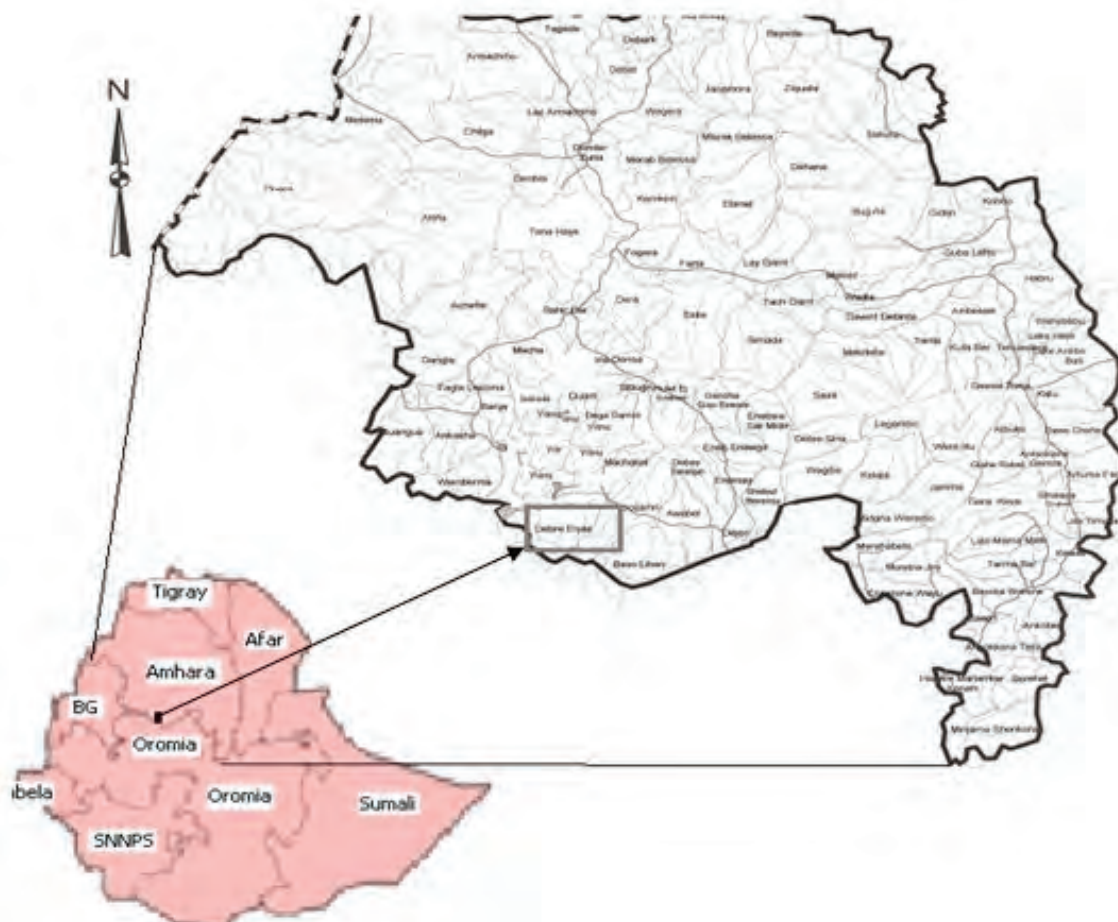


Fig. 1. The map showing the location of the study area (Debre Elias), in Amhara Region, North-western Ethiopia, Adopted from EPLAUA, 2004

Animals with two years and less were considered as young, those over two years but less than four were middle age whereas over four years of age were adults. The age of animals was determined based on the owner's information and dental eruption (De Lahunta and Habel, 1989). The animals were bled aseptically at their ear vein. Thin and wet smears were prepared from the sample and examined under the microscope. The thin smear was stained with Giemsa staining prior to examination. In addition to this, the Buffy coat was also examined after centrifugation of the capillary tube 1200rpm for 5 minutes (Paris *et al.*, 1982).

Entomological Survey

For the entomological survey, four traps having monoconical shape were deployed randomly in different parts of the district by baiting with acetone and cow's urine. Each trap was inspected every three days for one month (October). The trapped flies were collected and transported to the laboratory for identification and counting. For identification of the genus morphological characteristics such as size, colour, proboscis and wing venation were used (Marquardt *et al.*, 2000).

Data Analysis

The prevalence was calculated as the number of infected individuals divided by the total number of animals examined and multiplied by 100. For the analyzing of the association of the disease with different risk factors, chi-square was used. SPSS version 17.0 statistical software was used for data analysis; probability (P) value less than 0.05 was considered as statistically significant. The total fly in each genus was divided by the number of days

and traps to get the daily density of fly per trap per day (f/t/d).

Results

Prevalence of the Disease

Out of 581 animals examined, 62 (10.67%) were positive for trypanosome. The two species of trypanosome encountered in the area were *T. congolense* and *T. vivax* contributing 43.55 and 56.45% of the infection, respectively. No mixed infection was observed. The prevalence of the disease was significantly (P<0.05) varies among age groups. The highest prevalence was observed in middle age groups 32 (14.35%). However, statistically (P>0.05) significant difference was not observed between sexes. The prevalence was significantly (P<0.05) higher in lowland agro-climatic zone (17.55%) than midland areas (7.38%) (Table 1).

Entomological Findings

A total of 912 flies were caught. Of these, 192 (21.05%) belonged to Glossina species, 516 (56.58%) were Tabanus and 204 (22.37%) were Stomoxys. The overall apparent fly density was 7.60 f/t/d. The apparent density of Glossina, Tabanus and Stomoxys were 1.60, 4.3 and 1.7 f/t/d, respectively. Considerable number of house flies were also caught but discarded due to their little role in the transmission of the disease.

Discussion

The present study indicated that trypanosomosis is

Table 1: The prevalence of trypanosomosis in different risk factor

Risk Factors	No. Examined	Species		Total Positives	Total prevalence	χ^2_{cal}	p-value
		<i>T. vivax</i>	<i>T. congolense</i>				
Age							
Young	121	6	7	13	10.74	6.59	0.03
Middle	230	21	11	32	14.35		
Adult	230	8	9	17	6.96		
Sex							
Male	289	17	15	32	10.38	0.05	0.82
Female	292	18	12	30	10.96		
Agro-climate							
Lowland	188	14	19	33	17.55	7.31	0.007
Midland	393	21	8	29	7.38		

χ^2_{cal} = Chi square calculated

still of much concern and represents a major obstacle to cattle production in Debre Elias district of Amhara region, northwestern Ethiopia. The parasitological examination revealed that the prevalence rate of trypanosomosis was 10.67% which agrees with the finding of Sisay (2009) at districts of upper anger valley of East Wollega. It was also almost equivalent to the reports of Mekuria and Gadissa (2011) (12.42%) in Metekel and Awi zones, Ethiopia. But it was lower than the finding of Dagnachew (2004) (19%) in Denbecha and Jabitnan districts of the country. The difference in the prevalence of trypanosomosis in these reports may be related to the distribution of vectors and degree of fly-animal contact. In addition, there were parasite and vector control program in different areas of the country that may have also contributed to the difference.

A number of studies have shown the effect of age on the prevalence of trypanosome infections in cattle. The highest prevalence was observed in middle age group (2<x<4 years). The lower prevalence in younger group may be related to the husbandry system in which young animals were usually kept around their house with lower fly challenge. The lower prevalence in old group may be attributed to the development of immunity due to their long term contact with the parasite (Rowlands *et al.*, 2001).

The prevalence rate was not also affected by sex which agrees with the reports of Sisay (2009), Dagnachew *et al.* (2011) and Mekuria and Gadissa (2011). This may be due to equal chance of exposure for the disease in both sexes.

The prevalence of trypanosomosis was affected by agro-climatic zone. As the districts have two agro-climatic zones, the prevalence rate of the disease was higher at lowland than midland altitudes. Similar results were also reported by Dagnachew (2004). Higher prevalence in lowland areas related to the fact that animals in lowland areas are more challenged by vectors than higher altitudes. Hence prevalence of trypanosomosis in lowland area was relatively higher than midland areas. This finding agrees also with many other studies (Abebe, 2005; Mamoudou *et al.*, 2006; Mekuria and Gadissa, 2011). This is related to the temperature difference between these areas as temperature is one of the most important biotic factors that limit the distribution of vectors (Mekuria and Gadissa, 2011). This study had also showed that *T. vivax* was the

predominant species encountered (56.25%). The high ratio of *T. vivax* may be suggested that *T. vivax* has also ability to adopt and established itself in the absence of tsetse flies and is transmitted by other biting flies. The lower prevalence of *T. congolense* was attributed to the fact that this species established itself in cyclic transmission in tsetse infested area. Since the transmission of *T. congolense* is cyclical, it requires the presence tsetse flies, whereas *T. vivax* is more readily transmitted mechanically by biting flies than tsetse flies. The finding of this study also agrees with this idea were only *T. vivax* was recovered in apparently in tsetse free area (Cherenet *et al.*, 2006). According to Abebe (2005), *T. congolense* and *T. vivax* are most prevalent trypanosomes that infect cattle in tsetse infested and tsetse free areas of Ethiopia, respectively. Our entomological finding also supports this as there was a higher percentage of biting flies like *Tabanus* than *Glossina* which indicated that non-tsetse transmitted trypanosomes (non-cyclic transmission) was more potential threat for cattle than cyclic transmission (tsetse transmission) in the area.

In conclusion, trypanosomosis is prevalent and a threat for the livestock production in the district by inflecting remarkable direct and indirect losses. Therefore, different strategies have to be designed to control the disease so as to reduce its effect in livestock production in the area.

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