

Full Length Research Paper

Prevalence of bovine trypanosomiasis in Gamogoffa Zone, Ouba Debrestahay District, Southern Ethiopia

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This cross-sectional study was conducted in Ouba Debre-Tsehay District, Gamogoffa Zone, Southern Ethiopia from October 2013 to July 2014 with the objectives of estimating the prevalence of bovine trypanosomiasis and to assess the possible risk factors. Blood samples were collected from 384 randomly selected cattle from purposefully selected peasant associations with consideration of different age groups and both sexes. Buffy coat method was employed for parasitological survey and packed cell volume (PCV) determination was done. From the examined animals, 58 (15.1%; 95% CI: 11.7-19.6) were positive for trypanosome infection. In the area, *Trypanosome congolense* and *Trypanosome vivax* were the two identified *Trypanosoma* species with proportion of 60.3 and 27.6% , respectively and 12.1% mixed infection. Trypanosomiasis was observed as 13.8% in males and 15.9% in females out of these, 4.9 (95% CI: 1.0-13.7), 11 (95% CI: 5.8-18.4) and 20.1% (95% CI: 14.9-26.1) were found in animals <1year, between 1 and 3 years and above 3 years of age, respectively. Significant difference was observed between <1 year and >3 years of age ($p<0.05$). Based on body condition category, 8 (95% CI: 4.7-13.8), 16 (95%CI: 10.2-23.5) and 26.1% (95%CI: 17.3-36.6) were good, medium and poor conditioned animals, respectively and there was a significant association between good and poor condition animals ($p<0.05$). The recorded overall mean PCV in parasitaemic and aparasitaemic animals was 20.4 and 25.6%, respectively; it significantly varied ($t=12.28$, $p = 0.00$). Out of the parasitaemic and aparasitaemic animals, 77.6 and 16.6% were anemic, respectively (with PCV < 24%).

Key words: Cattle, Ouba Debre-Tsehay, prevalence, *Trypanosoma*, trypanosomiasis.

INTRODUCTION

Cattle population of Ethiopia is estimated at about 49.3 million heads (CSA, 2009). Despite its huge population size, cattle productivity remains marginal due to various diseases, malnutrition and management constraints. Parasitism represents a major obstacle to the development of sub-sector of which trypanosomiasis plays a great role (FAO, 2005). Animal trypanosomiasis is

a protozoan parasitic disease of domestic animals resulting from infection with different *Trypanosoma* species transmitted by tsetse fly and other haematophagous flies, mechanically (Sharma et al., 2013). It is a chronic, debilitating disease, which occur in some 240,000 km² area of Ethiopia. About 10-14 million heads of cattle and a significant number of

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small ruminants and equines are under serious risk of contracting the disease of which 20,000 heads die every year (Solomon, 2006). Animals affected with trypanosomiasis become anaemic and weak; lose weight and have reduced productivity, and often, mortality rates are high due to pathology induced by trypanosomes (Urquhart et al., 1996; Bal et al., 2012).

In Ethiopia, there are five economically important animal *Trypanosoma* species; however, *T. congolense* is responsible for the most important form of animal trypanosomosis in domestic animals and also the most prevalent trypanosome species in tsetse-infested areas of the country (Leak, 1999).

Trypanosomosis in Africa is mainly restricted to areas in which the vector, tsetse fly species like *G. m. submorsitans*, *Glossina pallidipes*, *Glossina fuscipes fuscipes* and *Glossina tachinoides* can survive. These species of tsetse flies are distributed along the lowlands of western, southern and southwestern part of Ethiopia. The disease is also found outside the tsetse belt areas transmitted mechanically by biting flies of the genus *Tabanus*, *Haematopota*, *Chrysops* and *Stomoxys*. This type of transmission has caused the spread of *Trypanosoma evansi* and *Trypanosoma vivax*, outside tsetse infested areas (Abebe, 2005). In very acute infections with highly susceptible exotic animals, infection with *T. vivax* can also pass through the placenta and into the fetus in pregnant animals. As a result, some cows abort and some calves are born before birth time (Abebe and Jobre, 1996).

Trypanosoma congolense and *T. vivax* exert their effect mainly by causing severe anemia and mild to moderate organ damage. The onset and severity of the anemia is directly related to the appearance of the parasite in the blood and to the level of the parasitaemia. The rapid decline in the hemoglobin concentration, red blood cell number and PCV and the clear clinical sign of pallor of the mucus membrane reveals that the animal is infected with trypanosome (OIE, 2008).

Animal Trypanosomosis in and around Arbaminch has socio-economic impact due to debilitation and death of untreated animals and reduces production and productivity of affected animals (Waldeyes and Aboset, 1997); but the disease had not yet been assessed and there is no documented baseline data in Ouba Debre-Tsehay district. Therefore, this study was done with the objectives of estimating the prevalence of bovine trypanosomiasis, to identify the predominant species of trypanosomes and to estimate the risk factors for the occurrence of the disease in the study area.

MATERIALS AND METHODS

Study area

Ouba Debre-Tsehay district is found in southern Ethiopia at 549 km from Addis Ababa, and 285 km from Arbaminch. The altitude of the selected PAS varies from 1001 to 1600 m.a.s.l. The rainfall pattern

is bimodal; a short rainy season runs from March to May and long rainy season runs from June to September and the average annual rain fall ranges from 600 to 1800 mm. The mean temperature varies from 27- 40°C. The land is covered by different vegetation types mainly savanna grassland forest, and bush lands predominated by acacia tree. The district has a livestock population of 218732 cattle, 90670 sheep and goat, 3947 equines and 250600 poultry (MARDO, 2011).

Study population

The study population was local breed zebu cattle which are kept in traditional management system. The animals in the area mainly depend on communal grazing fields and crop residues as feed source and watering points are the tributaries of Lomat and Bezo Rivers which is infested with tsetse flies predominantly by *G. pallidipes* and *Tabanus* (Amenu et al., 2008).

Sampling method and sample size determination

A cross-sectional study using simple random sampling technique was employed to determine the prevalence of bovine trypanosomiasis in the study area. The 8 PAs (Shele-bune, Yela-shabo, Galada, Zeka –zelto, Hoshele- shambara, Shala-Tito-Tife, Beto and Bala) were selected purposively based on the availability of transportation and logistics as well as their agroecological representativeness for the district was considered. From each selected PA, the farmers as well as the study animals were selected randomly in each household. During sampling, PAs, age, sex and body condition score (BCS) of the animal were recorded. The body condition score was grouped into good, medium and poor conditioned animals based on the appearance of ribs and dorsal spines applied for zebu cattle (Nicholson and Butterworth, 1986). Age of the animal was estimated by dentition (De-lahunta and Habel, 1986) and owner's information. The desired sampling size was calculated according to the formula given by Thrusfield (2005) with the expected prevalence of 50%, 95% confidence level and 5% absolute desired precision; as a result, the maximum sample size (384) was taken.

Trypanosome survey

Parasitological and hematological techniques were employed to detect the trypanosome and determine blood PCV, respectively. Accordingly, blood samples were obtained by bleeding marginal ear veins of cattle using a sterile lancet and drawing the blood into the heparinized capillary tube up to 3/4th of the length. The collected blood was sealed with crystal sealant and centrifuged for about 5 min with 12,000 rpm. After centrifugation, the packed cell volume (PCV) level was measured using hematocrit capillary reader and the length of the packed red cells column was expressed as a percentage of the total volume of blood. Animals with PCV below 24% was designated to be anemic (OIE, 2008).

Blood smears were made via cutting the centrifuged blood containing capillary tube 1 mm above and below the buffy coat layer using a diamond tipped pencil so as to include plasma and red blood cell (RBC) in the blood smear. The blood then expanded onto the clean glass slide, mixed well and covered with a clean cover glass. Examination was done under 40x objective lenses and 10x eye piece magnification, and the parasites were identified based on their morphology and movement in wet film preparation (Radostits et al., 2007). When the presence of the parasite was determined, a small drop of blood from a micro-haematocrit

Table 1. Prevalence of bovine Trypanosomosis in Ouba Debre-Tsehay district and proportion of the disease in the eight PAs.

PAs	Number of animals examined	Trypanosoma species			Total positives (%)	(95% CI)	χ^2 (P-value)
		<i>T. congolense</i> (%)	<i>T. vivax</i> (%)	Mixed (%)			
Shele-bune	56	6(60)	3(30)	1(10)	10 (17.9)	8.9-30.4	4.1 (1.00)
Yela-shabo	49	4(50)	3(37.5)	1(12.5)	8 (16.3)	7.3-29.7	
Galada	48	4(57.1)	2(28.6)	1(14.3)	7 (14.6)	6.1-27.8	
Zeka –zelto	46	5(71.4)	1(14.3)	1(14.3)	7 (15.2)	6.3-28.9	
Hoshele- shambara	48	5(71.4)	2(28.6)	-	7 (14.6)	6.3-27.8	
Shala-Tito-Tife	51	5(62.5)	2(25)	1(12.5)	8 (15.7)	7.0-28.6	
Beto	42	2(40)	2(40)	1(20)	5 (11.9)	4.0-25.6	
Bala	44	4(66.7)	1(16.7)	1(16.7)	6 (13.6)	5.2-27.4	
Total	384	35(60.3%)	16(27.6%)	7(12.1%)	58(15.1%)	11.7-19.1	

capillary tube was applied to a clean slide and spread by using another clean slide at an angle of 45°. The smear was dried by moving it in the air and fixed for 2 min in methyl alcohol. The thin smear was flooded with Giemsa stain (1:10 solution) for 30 min. Excess stain was drained and washed by using distilled water. Then, it was allowed to dry and examined under the microscope (100x) oil immersion objective lens (OIE, 2008).

Data management and analysis

The collected raw data and the results of parasitological and hematological examination were entered into a Microsoft excel spread sheet. Then, the raw data was summarized using SPSS version 20.

The prevalence of trypanosome infection was calculated as the number of positive animals as examined by Giemsa stain of thin blood film and buffy coat method divided by the total number of animals examined at the particular time. Pearson's Chi-square (χ^2) was used to evaluate the association of different variables with the prevalence of trypanosome infection and independent t-test was used to compare the mean PCV value between parasitaemic and non parasitaemic animals. P-value less than 0.05 was considered as significant.

RESULTS AND DISCUSSION

This study show that the overall prevalence

was 15.1% (95% CI: 11.7-19.1) which is in agreement with the reports of Feyissa et al. (2011) in Humbo District, Southern Ethiopia, but higher than the reports of Ayana et al. (2012) and Achenef and Admas (2012) in Amhara region. The higher prevalence might be due to the presence of frequent tsetse fly challenge as a result of high density in the study area (Amenu et al., 2008).

T. congolense and *T. vivax* were the two trypanosome species identified. However, higher proportion of *T. congolense* (60.3%) was observed than *T. vivax* (27.6%) and also 12.1% mixed infection (Table 1) which is in agreement with the reports of Feyissa et al. (2011). This might be due to the absence of significant variation in vector density and agro-climatic difference (Dagnachew, 2004).

In the present study, higher prevalence was observed in females (15.9%) than males (13.8%) which is in agreement with the reports of Feyissa et al. (2011) who reported 15 and 13.7% in female and males, respectively but there was no significant difference ($P > 0.05$) (Table 2). This was inconsistent with the report of Abrham and Tesfaheywot (2012). The possible explanation for

relative increment of prevalence in female animals might be due to physiological differences (Torr et al., 2006).

Based on age category, 4.9, 11 and 20.1% prevalence was observed in animals less than one year, between one and three years and above three years of age, respectively which revealed significant variation ($P < 0.05$) (Table 2). This might be due to young animals slightly protected by maternal antibodies (Fimmen et al., 1999).

The overall prevalence of trypanosome infection was significantly associated with the body condition of the study animals ($P < 0.05$) (Table 2). The prevalence was higher in poor body condition score animals (26.1% [95%CI: 17.3-36.6]) than the medium (16% [95% CI: 10.2-23.5]) and good (8.5% [95%CI: 4.7-13.8]) score animals. This is comparable with the finding of Feyissa et al. (2011). This is because Trypanosomosis is a chronic wasting disease characterized by slow progressive loss of condition (Uilenberg, 1998).

In this study, out of the total animals examined, 25.8% were anemic having PCV $< 24\%$ and 74.2% were not anemic (PCV ≥ 24). On the other hand, out of the total 58 parasitaemic animals, 77.6%

Table 2. Prevalence of Trypanosomosis based on sex, age and body condition score of examined animals.

Variables	Number of examined	Number of positive (%)	(95% CI)	χ^2 (p-value)
Sex				
Male	145	20 (13.8%)	8.6-20.5	0.31 (0.6)
Female	239	38 (15.9%)	11.5-21.2	
Age				
≤1 year	61	3 (4.9%)	1-13.7	10.5 (0.005)
1-3 years	109	12 (11%)	5.8-18.4	
>3 years	214	43 (20.1%)	14.9-26.1	
BCS				
Good	165	14(8.5%)	4.7-13.8	14.1 (0.001)
Medium	131	21 (16%)	10.2-23.5	
Poor	88	23 (26.1%)	17.3-36.6	
Total	384	58 (15.1%)	11.7-19.1	

Table 3. Comparison of mean PCV between parasitaemic and aparasitaemic cattle.

Condition	Total examined	Number of PCV <24%	Number of PCV ≥24%	Mean PCV	[95% CI]	t-test (p-value)
Parasitaemic	58	45(77.6%)	13 (22.4%)	20.4	19.6-21.3	12.28 (0.001)
Aparasitaemic	326	54 (16.6%)	272(83.4%)	25.6	25.28-25.9	
Total	384	99(25.8%)	285 (74.2%)	24.8	24.5-25.2	

were anemic (PCV<24) and only 22.4% were not; whereas, from 326 aparasitaemic animals, only 16.6% were anemic (PCV<24) but 83.4% were not anemic. There was significant difference between the mean PCV values of parasitaemic and aparasitaemic animals ($t=12.28$, $p<0.05$) (Table 3). This lower PCV was reported in previous studies in different parts of the country (Nigatu, 2004; Abraham and Tesfaheywet, 2012).

CONCLUSION AND RECOMMENDATIONS

Trypanosomosis is an important disease and a potential threat to health and productivity of cattle in Ouba Debre-Tsehay district. The result revealed that *T. congolense* is the most prevalent species in the study area and the infections significantly affect the PCV values and body condition. Therefore, economical and environment friendly community based tsetse fly and typanosomosis control program should be designed and implemented in the area.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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