

Prevalence of bovine trypanosomosis and assessment of knowledge and practices of livestock owners in the control of Trypanosomosis in Assosa District of Benishangul Gumuz Regional State, Ethiopia

Fantahun Miteku^{1*}, Wagari Tafese¹ and Tsegaw Fentie²

¹*Veterinary Drugs and Animal Feed Administration and Control Authority, Addis Ababa*

²*College of Veterinary Medicine and Animal Science, University of Gondar, Gondar, Ethiopia.*
Corresponding author; Fantahun Miteku email: jarrafantahun@gmail.com

Abstract

A cross-sectional study was conducted from December 2013 to February 2014 to estimate the prevalence of bovine trypanosomosis and identify species of trypanosomes infecting cattle. Besides, attempt was made to assess the knowledge and practice of the livestock owners in Assosa district of Benishangul Gumuz Regional State, Ethiopia. A total of 310 blood samples were collected from randomly selected cattle. Packed cell volume (PCV) was measured and samples were examined for the presence of trypanosomes using the buffy coat technique. In this study bovine trypanosomes were detected in 22.9% of the blood samples. The most common trypanosome species identified were *T. congolense* 13.2% (41/310) followed by *T. brucei* 3.2% (10/310), *T. vivax* 2.9% (9/310), mixed infections of *T. vivax* and *T. congolense* 1.6% (5/310), *T. congolense* and *T. brucei* 1.29% (4/310) and *T. brucei* and *T. vivax* 0.64 (2/310). There were no statistically significant prevalence differences ($p > 0.05$) between sexes, ages category and management systems. However, prevalence difference was noted between poor and good body condition categories ($p < 0.05$). Animals with poor body condition were found 2.11 times more likely of getting trypanosome infection (OR=2.11, 95% CI, $p=0.027$) than animals in good body condition. The mean PCV values recorded were 23.3% in parasitaemic and 25.1% in aparasitaemic animals with a statistically significant difference ($p < 0.05$). A questionnaire survey was conducted for the assessment of knowledge of farmers on control and prevention of bovine trypanosomosis provided important information on farmer's knowledge of bovine trypanosomosis and practices in control and prevention measures. In this study few livestock owners know the vector (tsetse) association with the disease. In conclusion, this study confirmed that trypanosomes are still a threat to cattle in the study area. Therefore, it is

recommended that an integrated prevention and control program have to be designed and implemented to minimize their impacts on livestock production.

Keywords: Assosa; Cattle; Knowledge assessment; Trypanosomosis; Practices, Prevalence

Introduction

Livestock is a significant contributor to economic and social development in Ethiopia at the household and national level. On a national level, livestock contributes a significant amount to export earnings in the formal market (10% of all formal export earnings or \$150m annually) and the informal market (likely \$300m+ annually). Livestock accounts for 15-17% of total GDP and 35-49% of agricultural GDP. Livestock directly contributes to the livelihoods of more than 70% of Ethiopians. Ethiopia has the largest livestock herd in sub-Saharan Africa, with an estimated cattle population of 49 million, sheep population of 25 million and goat population of nearly 22 million (EATA, 2014).

Tsetse transmitted animal trypanosomosis still remains as one of the largest causes of livestock production losses in Ethiopia. About 10 to 15% of the land believed to be suitable for livestock production is affected by one or two species of the tsetse flies. While tsetse-borne trypanosomosis is excluding agriculturally suitable land of the country; 14 million head of cattle are at the risk of contracting trypanosomosis at any one time (Desta *et al*, 2013).

According to Abebe (2005), trypanosomosis is prevalent in two main regions of Ethiopia that is, the Northwest and the Southwest regions. Six species of trypanosomes are recorded in Ethiopia and the most important trypanosomes, in terms of economic loss in domestic livestock are the tsetse transmitted species: *T. congolense*, *T. vivax* and *T. brucei*. For the closely related *T. brucei* subspecies, *T. b. rhodensiense*, which causes human sleeping sickness, cattle can be a reservoir host. The other trypanosome species of economic importance are *T. evansi* of camels and *T. equiperdum* of horses (Abebe, 2005). Recent findings and field observations have indicated that the common trypanosomosis control tools; i.e., trypanocurative and trypanoprophylactic drugs have become ineffective in many areas due to development of drug resistance by the parasite. Moreover, toxicity of the drugs and exhibition of antigenic variation which hampers vaccine production are the limitations facing the modern vet-

erinary medicine (Uilenberg, 1998). Though trypanosomosis is a problem for cattle production in the study area, information is limited to the magnitude of the disease and farmers' perception on the presence, impact and management of trypanosomosis in cattle, and their desire for establishment of intervention programs against the disease. Thus, the objectives of this study were to estimate the prevalence of bovine trypanosomosis and associated risk factors in the district; and to assess the knowledge and practices of livestock owners towards the control of bovine trypanosomosis.

Materials and methods

Description of study area and population

The study was conducted from December 2013 to February 2014 in Assosa Zone of Benishangul Gumuz Regional State (Figure 1). The area stretches over 2313 km² in a major tsetse and tsetse born trypanosomosis belt characterized by lowland plane with altitude range of 580-1544 meter above sea level. Assosa is located between 8°30" and 40°27" N and 34°21" and 39°1" E. According to National Meteorological Service, the average annual rainfall is 1316 mm with uni-modal type of rainfall that occurs between April and October. Its mean annual temperature ranges between 16.75°C and 27.9°C. Assosa zone has 35.6% of the livestock population of the region constituting 81,939 cattle, 73,181 goats, 10,231 sheep, 14,089 donkeys, 40,315 poultry, 29 horses and 59,695 beehives (CSA, 2005). The study was carried out on indigenous zebu cattle of all age groups of both sexes in five selected kebeles in and around Assosa town which are managed mostly under extensive and semi-intensive production systems.



Figure 1: Map of study area, Assosa district in Benishangul Gumuz Regional State

Source: From Wikipedia, the free encyclopedia

Study design

A cross-sectional study was conducted from December 2013 to February 2014 in five peasant associations (amba-1, amba-5, amba-14, Abrahamo, AAGRC), and Assosa town. During sampling sex, age, body condition, breed, management system and origin of animals were recorded. The body condition score was categorized as poor and good taking the middle point as a border in the 9 scale scores of method of body condition scoring for zebu cattle (Nicholson and Butterworth, 1986).

Questionnaire survey

Questionnaire survey was conducted to assess the knowledge and practices of farmers in the control of trypanosomiasis. To address the questionnaire survey, a total of 70 farmers in the 5 districts were interviewed with a structured questionnaire format. The interviewed people were selected randomly from the study areas.

Sample Size Determination and Sampling Method

The desired sampling size was calculated according to the formula given by Thrusfield (2005), with 28.1% expected prevalence (Mulaw *et al.*, 2010), at 95% confidence interval and 5% absolute precision. Accordingly, a total of 310 samples were collected during the study period using systematic random sampling technique. Sample size was proportionally distributed to kebeles.

Parasitological study

Packed Cell Volume (PCV) determination: Blood samples were obtained by puncturing the marginal ear vein with a lancet and collected directly into a pair of heparinized capillary tubes. The tubes were then sealed at one end with crystal seal. The capillary tubes were placed in micro-hematocrit centrifuge and were allowed to centrifuge at 12,000 revolutions per minute (rpm) for 5 minutes. After centrifugation, the capillary tubes were placed in a hematocrit reader. The length of the packed red blood cells column is expressed as a percentage of the total volume of blood. Animals with PCV less than 24% were considered to be anaemic (Murray, 1988).

Buffy Coat Technique: After the centrifugation, trypanosomes were usually found in or just above the buffy coat layer. The 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 onto a glass slide, and covered with cover slip. The slide was examined under x40 objective and x10 eye piece for movement of parasite. Trypanosome species were identified according to their morphological descriptions on Giemsa stained blood film as well as movement in wet film preparations (Marquardt *et al.*, 2000).

Data Management and Analysis

The data collected was entered into Microsoft Excel spread sheet. All analysis was performed using STATA statistical software package (Stata 11.0). P-value < 0.05 was considered to determine level of significance.

Result

Parasitological prevalence

Out of 310 blood samples, the overall prevalence of bovine trypanosomosis was found to be 22.9% (Table 1).

Table 1: Prevalence of bovine trypanosome infections in Assosa district on the basis of kebele/location.

Kebele	No of animals examined	No. positive	Prevalence (%)
AAGRC	20	1	5
Assosa	110	27	24.5
Amba-14	54	8	14.8
Abrahamo	18	7	38.8
Amba-5	54	14	25.9
Amba-1	54	14	25.9
Total	310	71	22.9

The most common trypanosome species identified were *T. congolense* 13.2% (41/310) followed by *T. brucei* 3.2% (10/310), *T. vivax* 2.9% (9/310), mixed infections of *T. vivax* and *T. congolense* 1.6% (5/310), *T. congolense* and *T. brucei* 1.29% (4/310) and *T. brucei* and *T. vivax* 0.64 (2/310) (Table 2).

Table 2: Prevalence of bovine trypanosome in Assosa district on the basis of Trypanosoma by species identified.

Kebele	Positive (%)	Trypanosoma identified					
		T. congolense	T. brucei	T. vivax	Mixed infections		
					T. congolense and T. vivax	T. congolense and T. brucei	T. brucei and T. vivax
AAGRC	1(5%)	1(5%)	0.00	0.00	0.00	0.00	0.00
Assosa	27(24.5%)	20(18.2%)	4(3.6%)	2(1.8%)	2(1.8%)	1(0.9%)	0.00
Amba-14	8(14.8 %)	3(5.5%)	1(1.8%)	1(1.8%)	1(1.8%)	1(1.8%)	1(1.8%)
Abrahamo	7(38.8%)	6(33.3)	1(5.5%)	0.00	0.00	0.00	0.00
Amba-5	14(25.9)	7(12.9%)	2(3.7%)	2(3.7%)	1(1.8%)	2(3.7%)	0.00
Amba-1	14(25.9)	4(7.4%)	2(3.7%)	4(7.4%)	1(1.8%)	0.00	1(1.8%)
Total	71(22.9%)	41(13.2%)	10(3.2%)	9(2.9%)	5(1.6%)	4(1.29%)	2(0.6%)

Among host and management related factors only body condition was found to be risk factor for trypanosome infection. Animals of poor body condition were 2.11 times more likely of getting trypanosome infection than animals in good body condition (Table 3).

Table 3: Host and management-related risk factors associated with the prevalence of trypanosome infections.

Risk Factor		No of examined	Prevalence (%)	Odds ratio	95% CI	<i>p-value</i>
Body condition	Good	261	54(20.7%)	1.00	-	0.027
	Poor	49	17(35.4%)	2.11	1.09-4.09	
Sex	Female	180	38(21.1%)	1.00	-	0.54
	Male	130	33(25.4%)	1.18	0.69-2.01	
Age	< 2 yrs.	40	13(32.5%)	1.00	-	0.131
	2-4 yrs.	144	31(10%)	0.56	0.26-1.19	
	>4 yrs.	126	25(8%)	0.43	0.19-0.94	
Management system	Semi-intensive	20	1(5%)	1.00	-	0.082
	Extensive	290	70(24.1%)	6.05	0.79-45.97	

The mean PCV values and standard deviation (SD) for the whole examined animals was 25.03±5.5. However, the mean PCV value for aparasitaemic (non-diseased) animals was 25.8 ± 5.5 and mean PCV of Parasitaemic (diseased) animals were 22.3 ± 4.4 (Table 4). The difference was found to be statistically significant ($p < 0.001$).

Table 4: Mean Packed Cell Volume in parasitaemic and aparasitaemic animals.

Status	Sample frequency	Mean PCV (%)	SD
Parasitaemic	71	22.3	4.4
Aparasitaemic	239	25.8	5.5
Total	310	25.03	5.5

SD- Standard deviation

Questionnaire Survey

All interviewed livestock owners (100%) know bovine trypanosomosis very well and locally call it “Wozwuz” or Gendi to say disease that causes wasting or emaciation. According to farmers response to the major diseases symptoms in relation to trypanosomosis, the following symptoms were listed according to their frequency of response; emaciation, weakness, rough hair coat, reduced milk production, depression, lacrimation and nasal discharge (Table 5).

According to farmers response the major signs in relation to trypanosomosis were recorded. According to farmer’s frequency of response: rough hair coat, weakness, depression, reduced milk production, emaciation, lacrimation and nasal discharge were the major clinical signs. Concerning knowledge of disease transmission and season of occurrence, only 12.8% of the farmers responded that the tsetse flies are responsible, while 63% associates with cold weather and 24.2% do not know anything about the vector for trypanosomosis. The respondents consider season of occurrence of the disease to be from June to September (34.3%), July to December (25.7%) and September to November (40%) (Table 5).

Table 5: Findings of the questionnaire survey

No	Variables		Frequency of Response	Percentage (%)
1	Diseases symptoms in relation to trypanosomosis	Emaciation	70	100
		Weakness	58	82.8
		Rough hair coat	45	64.3
		Reduced milk production	38	54.3
		Depression	26	37.1
		Lacrimation	24	34.3
		Nasal discharge	17	24.3
	Disease transmission	Tsetse flies	9	12.8
		Cold weather	44	63
		Don't know	17	24.2
2	Season of occurrence	June to September	24	34.3
		September to November	28	40
		July to December	18	25.7
3	Control and prevention	Trypanocidal drugs	70	100%
		Nothing	-	-

Discussion

The study revealed that the trypanosomosis caused by different species of trypanosomes were common in Assosa district in domestic livestock's specially cattle's. The overall disease prevalence in the study area was 22.9% indicating that trypanosomes are still of much concern and represent a major obstacle to livestock production. This study agreed with findings of 28.1% (Mulaw *et al.*, 2010) in Assosa district, 24.7% (Ali and Bitew, 2011) in Mao Komo special district which were higher than the current study. The current result was relatively lower than the previous findings. This could be due to variation in study site, sample size, study season, extensive or seasonal clearing of bushes, expansion of human and agricultural investment in the area affecting the agro-ecology.

This study has also shown that *T. congolense* was the dominant species with a proportion of 13.2% followed by *T. brucei* 3.2%, *T. vivax* 2.9%, mixed infections

(*T. congolense* and *T. vivax* 1.6%, *T. congolense* and *T. brucei* 1.29%, *T. vivax* and *T. brucei* 0.6%). This result concurs with the reported proportion of 63.2% *T. congolense*, 13.6% *T. vivax*, 11.6% *T. brucei* and 11.6% mixed infection in cattle from the neighboring Mao-Komo special district (Ali and Bitew, 2011). This result is also in agreement with the reported proportions of *T. congolense* (77.6%) followed by *T. vivax* (14.9%), *T. brucei* (6.0%) and *T. congolense* and *T. vivax* mixed infection (1.5%) from Metekel and Awi zones (Afework et al., 2000). The high ratio of *T. congolense* in tsetse-infested area may be ascribed to the more efficient transmission of *T. congolense* by major cyclical vectors than *T. vivax* in East Africa (Kuzoe, 1991). The difference in the infection rate may be explained by the variation in study site and duration, season of study and vegetation coverage. The highest and the lowest prevalence were recorded in Abrahamo (38%) and AAGRC (5%) respectively. However, there was no statistically significant difference ($p > 0.05$) in the prevalence of trypanosomosis in the study sites, because they were located in similar agro-ecology of tsetse belt. The associations of the disease with age and sex were assessed. No statistically significant association was observed with respect to age and sex ($p > 0.05$). Infection in poor body condition was significantly higher than good body conditions. This finding is in agreement with a study report by Mehirt and Mamo, (2007). Out of infected animals examined 20.7% from good body condition and 35.4% from poor body condition were found positive of the trypanosomosis and they were statistically significant ($p < 0.05$). This is in agreement with Afework et al., 2000. The mean PCV of parasitaemic animals is lower than mean PCV of aparasitaemic animals and, the difference was highly significant ($p < 0.001$). This finding roughly in agreement with what was reported by Cherinet et al. (2004), Tadesse et al. (2011) and Zeryehun and Abraham (2012).

In order to control and prevent bovine trypanosomosis, knowledge of farmers should be assessed. Rapid method for assessing their knowledge and enhancing the control and prevention with active participation of livestock owners should be in place. Therefore, this survey was conducted with the objective of exploring the knowledge assessment of farmers in control and prevention of bovine trypanosomosis in Assosa district. According to farmers response, the season of occurrence of the disease considered to be June to September 24 (34.3%), July to December 18 (25.7%) and September to November 28 (40%).

Ability of livestock keepers to determine seasonal variations and peak level of trypanosomosis and its vectors as recorded in the present study is in line with

the reports of Chernet *et al.* (2004); Dagnachew *et al.* (2005) and Tesfaye *et al.* (2001) from Ethiopia, Catley *et al.* (2009) from Kenya and Grace *et al.* (2009) from west Africa. Wet and warm months of the year (such as May and June) are favorable periods for vectors and trypanosomes growth and multiplication and are observed as peak months of infection). The way of transmission of trypanosomosis is not well known by most of farmers and they have no idea (24.2%), while some consider as to be following cold season (63%). However, a few knows as by tsetse flies (12.8%). This finding disagreed with recent reports showing significantly higher numbers of respondents in the study districts are aware of the causal association between biting flies and bovine trypanosomosis but not considered as the etiological factor. This coupled with their knowledge on the signs of the disease and treatment suggests that the farmers have comparable understanding of the problem as reported earlier (Maudlin *et al.*, 2004; Catley *et al.*, 2009) in other African countries.

In conclusion, animal trypanosomosis is a major obstacle to livestock production and productivity in Assosa district. In this study only few livestock owners know the vector (tsetse) association with the disease. However, most of them have satisfactory knowledge in suggesting signs of trypanosomosis and its impact on production and they have strong desire to give their part on control and prevention of trypanosomosis. The prevalence of trypanosomosis found in the study area is high. Thus, further studies on the distribution of tsetse flies and trypanosomosis should be conducted throughout all seasons of the year. Awareness creation on vector (tsetse) control by the farmers by providing trainings and materials for trapping is very crucial.

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