American-Eurasian Journal of Scientific Research 7 (3): 112-117, 2012
ISSN 1818-6785

DOI: 10.5829/idosi.aejsr.2012.7.3.64230

Prevalence of Bovine Trypanosomosis in Addisamba and Amarit District of West Gojjam Zone, Amhara Regional State

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Abstract: Cross sectional study was conducted in Addisamba and Amarit district of West Gojjam administrative zone from November 2011 to May 2012 to determine the current prevalence rate of bovine trypanosomosis. In the parasitological survey, blood samples of 392 cattle were examined using a buffy coat technique. The PCV value of each animal was also measured using hematocrit reader. The overall prevalence of trypanosomosis was found to be 1.02% and it consists of 0.9 and 1.2 in Addisamba and Amarit, district peasant associations, respectively. The positive cases were due to *Trypanosoma vivax*. The mean PCV value (%) of parasitaemic and aparasitaemic animals during the study period were 25±2.16 SD and 26±4.19 SD with a no significance difference ($p > 0.05$). The study also demonstrated no variations in prevalence among different age groups and between both sexes which were statistically insignificant ($p > 0.05$). Infection rate in poor body condition animals were not higher than good body condition animals and statistically were insignificant ($p > 0.05$). The present prevalent study generated valuable information on the epidemiology of bovine trypanosomosis in the study area. Although the present study revealed low prevalence, implementing control of trypanosomosis with an integrated approaches have paramount importance in the study sites.

Key words: Cattle · Ethiopia · *Trypanosoma vivax*

INTRODUCTION

Ethiopia with its great variation in climate and topology possesses one of the largest livestock populations in Africa. The estimated livestock population in Ethiopia is 44.3 million cattle, 23.6 million sheep, 23.3 million goats, 2.3 million camels, 6 million equines and 23.6 million poultry.

Among the livestock, cattle directly provide food such as meat and milk,. A non- food such as hide and indirectly they also contribute to over 30% agricultural production by supplying essential inputs such as manure for replenishing soil fertility and restoring nutrients animal traction and power for Plowing and threshing, increasing the productivity of small holdings [1]. Nevertheless, many factors affect the maximum benefit to be obtained from cattle. Livestock disease is among the major factors that affect the production and productivity and trypanosomosis is one of the most important diseases that influence livestock productivity in our country [2].

Trypanosomosis is a serious disease in domestic livestock that causes a significant negative impact in food production and economic growth in many part of the world, particularly in Sub-Saharan Africa [3-5]. African animal trypanosomosis and its vectors occur in vast areas of Sub-Saharan Africa with devastating impact on livestock productivity [6]. Its epidemiology and impact on livestock especially cattle production are determined largely by the prevalence and distribution of the disease and its vectors in the affected area [7]. Tsetse flies (*Glossina*) inhabit wide range of habitats covering over 10 million km^2, representing 37% of the African continent and affecting 37 countries [8] including Ethiopia. Approximately 30% of the total cattle population in the African continent and about 50 million people are exposed to animal trypanosomosis and human sleeping sickness, respectively [9].

Trypanosomosis is one of the most important diseases limiting livestock productivity agricultural development due to its high prevalence in the most arable

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and fertile land of South-west and North-west part of the country following the greater river basins of Abay, Omo, Ghibe and Baro with a high potential for agricultural development. Currently, about 220,000 km^2 area is infested by tsetse flies namely *Glossina pallidipes, Glossina morsitans, Glossina fuscipes, Glossina tachinoides* and *Glossina longipennis* [10]. The most important trypanosome species affecting livestock in Ethiopia are *Trypanosoma congolense, Trypanosoma vivax* and *Trypanosoma brucei,* in cattle sheep and goat, *Trypanosoma evansi* in camel and *Trypanosoma equiperdum* in horse [11]. In the Amhara region of north-west Ethiopia, trypanosomosis is considered an important disease of cattle [12-14] but systemic studies have not yet been carried out on the epidemiology, prevalence and economic significance of bovine trypanosomosis in the study sites. Therefore the objectives of the study were to assess the prevalence of bovine trypanosomosis in the study sites, identify and determine the dominant trypanosome species in the study sites and to assess the type and density of different fly species that were responsible for transmitting the disease.

MATERIALS AND METHODS

Study Area: The study was conducted in Addisamba and Amarit, district of west Gojjam administrative zone of Amhara regional state. The district was situated at a distance of about 8 kms east of Bahir Dar and about 557 kms North West of Addis Ababa. Bahirdar is a town in north western Ethiopia and capital of the Amhara region of Ethiopia located in the west Gojjam zone. The geographical location of the area was densely populated. Based on 2007 census conducted by the Central Statistical agency of Ethiopia (CSA) this city has a total population of 22,991 an increase of 130.90% over the population recorded in the 1994 census, of whom 108,456 were men and 113,535 women, with an area of 213.43 square kilometer and most of the land was intensively cultivated and in the rainy season, particularly among the domestic animals, cattle were the dominant species raised and the Fogera cattle breed /type was concentrated in the study districts having an altitude and longitude of 11° 36' N 37 ° 23' E an elevation of 1840 meters above sea level. The maximum temperature was 32°C and the minimum temperature of the area was about 14°C. The annual rain fall of the area ranges from 1500 millimeter to 2000 millimeters. The area receives long heavy rainy season from June to September [15].

Animal Population: The study animal were cattle breeds in selected areas of Addisamba and Amarit district, a total of 392 cattle designed for treatment were diagnosed with their specific identification numbers. Examination of blood sample were collected from the ear vein of cattle and sucked in to heparanized capillary tubes and put in to screw capped bottle and transported to laboratory for examination of blood for trypanosomiasis.

Entomological Study: The apparent density of tsetse fly and other biting flies in relation to altitude and vegetation types were studied from 2009 to 2011 at selected sites. The apparent density was determined based on the mean catches of flies in traps deployed and expressed as the number of fly catch/trap/day [16]. The flies were caught with monoconical traps baited with acetone and cow urine. In this area around 10-11 traps were deployed just before sunrise in the morning and in position for 72 h. The biting flies were identified based on morphological characteristics such as size, color, wing venation and proboscis at the genus level. Sexing was done for tsetse fly just by observing the posterior end of the ventral aspect of abdomen by hand lens as a result male flies easily identified by enlarged hypophgeum [17, 18].

Study Design and Sampling: Cross sectional survey was conducted to determine the prevalence of bovine trypanosomosis from November 2011- May 2012 in Addisamba and Amarit. Animals were grouped in to sex, age and place of origin and species were sampled using systematic random sampling method.

Sample Size and Sampling Method: Simple random sampling technique was followed, to select the study animal and the desired sample size was calculated according to the formula given by Thrusfield [19].

$$\frac{n= 1.96^2 \text{ (Pexp (1- Pexp))}}{d^2}$$

$$\frac{n= (1.96)2 \text{ (0.5) (1-0.5)}}{0.0025}$$

n = 384 cattle. The minimum sample size was about 384 but to increase the precision 392 cattle were used for the study.

Where,

n - The sample size
d - The desired absolute precision
p - The expected prevalence

Study Method and Procedure

Buffy Coat Technique: Blood was collected from an ear vein using heparinized micro-haematocrit capillary tube and the tube was sealed. A heparinized capillary tube containing blood was centrifuged for 5 minutes at 12,000 revolutions per minute. 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 on to slide, homogenized on to a clean glass slide and covered with cover slip. The slide was examined under ×40 objective and ×10 eye pieces for the movement of parasite [20].

Thin Blood Smear: A small drop of blood from a microhaematocrit capillary tube to the slide was applied to a clean slide at an angle of 45°, air dried and fixed for 2 minutes in methyl alcohol, then immersed in *Giemasa* stain (1:10 solution) for 50 minutes. Drained and washed of excess stain using distilled water, allowed to dry by standing up right on the rock and examined under the microscope with oil immersion objective lens.

Measuring of Packed Cell Volume (PCV): Blood samples were obtained by puncturing the marginal ear vein with a lancet and collected directly into a capillary tube. The capillary tubes were placed in micro haematocrit centrifuge with sealed end outer most. The tube was loaded symmetrically to ensure good balance. After screwing the rotary cover and closing the centrifuge lid, the specimens were allowed to centrifuge at 12,000 revolutions per minute for 5 minutes. Tubes were then placed in haematocrit and the readings were expressed as a percentage of packed red cells to the total volume of whole blood. Animals with PCV < 24% were considered to be anemic.

Data Analysis: Row data on individual animals and parasitological examination results were inserted into MS excel spread sheets to create a database and transferred to SPSS version 16.0 software program for data analysis. Chi-square was used to compare the prevalence of trypanosome infection in different variables, districts, peasant associations, age and sex, while student-t test was utilized to compare the mean PCV of the infected animals with that of non infected animals.

RESULTS

Prevalence: Out of the total 392 cattle examined, 4 (1.02%) were found positive to trypanosomosis. The prevalence between different study areas was 0.9 % in Addisamba to 1.2% in Amarit district (Table 1). However, the difference is statistically insignificant (p>0.05). The prevalent trypanosome species in the study area was *T. vivax*.

Table 1: Prevalence of cattle *Trypanosoma* species in the study area

Area	Total examined	T-vivax (%)	Prevalence (%)
Addisamba	227	2(100)	0.90
Amarit	165	2(100)	1.20
Total	392	4(100)	1.02

Table 2: Mean packed cell volume and standard deviation of infected and non-infected cattle in Addisamba and Amarit

Condition	Number	Mean PCV (%) ± STD deviation	t-test	p-value
Infected	4	25±2.16	0.942	
Non-infected	388	26±4.19		0.347
Total	392	26.96±4.181		

Table 3: Prevalence of trypanosomes with body condition score, age and sex

Variables	Number	Infected (prevalence)	X^2	p-value
Body condition				
Good	23	0(0)	0.858	0.651
Medium	161	1(0.6)		
Poor	208	3(1.4)		
Age				
1-2 year	11	0(0)		
3-5 year	117	0(0)	1.959	0.375
>5 year	264	4(1.5)		
Sex				
Male	175	3(1.7%)	1.507	0.220
Female	217	1(0.46)		

Table 4: The distribution and apparent densities of vectors of trypanosomosis in study sites

Year	Genus of fly	Fly trap per day (average)
2009	*Stomoxys*	0.1
2010	*Tabanus*	0.02
2011	*Hematopota*	0.003
	Hipobusca	
	Cryesops	

Source: Bahirdar Regional Laboratory Report, 2012 [21]

NB. All the above mentioned flies were collected at each year of the study period

Hematological Findings: Out of the observed animals, 4 of them had mean PCV value of 25% and the overall mean PCV value of the study also resulted in 26.96%. Statistically insignificant (p>0.05) in mean PCV was observed between infected and non infected animals (Table 2).

Prevalence of trypanosomes based on body condition score, age and sex: According to this finding, cattle infected with trypanosome have no difference in body condition score than the non infected animal (Table 3) and difference is statistically insignificant (p > 0.05). A high infection rate was observed in adult animals and animals above five years of age in the study area but the variation was not statistically significant (p > 0.05). The prevalence of trypanosome infection was higher in male than female animals; however there was no statistically significant differences observed between two sexes (p > 0.05) (Table 3).

Entomological Findings: Study conducted by Bahir Dar Regional Veterinary laboratory during 2009-2011 showed that *Stomoxys, Tabanu, Hematopota, Hipobusca* and *Cryesops* were the prevalent flies in the study area and no *Glosina* species were identified. Tsetse transmitted trypanosomosis was not a potential threat for the local farmers and the report also indicated that the average value of fly trap per day was decreasing from year to year (Table 4).

DISCUSSION

The study revealed that the prevalence of bovine trypanosomosis in the area was 1.02% (4/392) which was in agreement with the previous findings by Shimelis *et al*. [22] but lower than the previous work reported by Solomon [23]. The discrepancy between reports might be due to the presence of large study time gap, application of relatively well designed methods of tsetse control and treatment, expansion of cultivation in the area which indirectly affects flies distribution, expansion of veterinary clinic and awareness of people towards the control and treatment of the disease were improved. *T. vivax* was the only species found in the study site: Addisamba and Amarit peasant association. Similar findings were reported previously by various researchers. This is due to the location of the study site which was located on the edge of a fly belt. Jordan and ILRAD [24, 25] have reported that as the distance from recognized edge of tsetse belt areas increase, the species of trypanosome most encountered and diagnosed is *T. vivax,* because *T. vivax* has the ability to adopt and establish itself in the absence of tsetse flies and is transmitted by other biting flies. The idea can be more strengthened by the result obtained from the Regional laboratory i.e. *Glosina* species were not identified in the study area on the survey conducted from 2009 -2011. Tsetse transmitted trypanosomosis was not a potential threat for the local farmers and the report also indicated that the average value of fly trap per day was decreasing from year to year this might be due to deforestation as a result of expansion of cultivation in the districts. The mean PCV value of studied animals was not significantly (P > 0.05), varying between parasitaemic (25.00%) and aparasitaemic (26.96%) animals. This result was not in agreement with the previous result reported by (Molalgne *et al*.) [26] but in agreement with Sinshaw [27]. The mean PCV of trypanosome-positive cattle was 25% and statistically insignificant differences (p > 0.05) between affected and non affected animals were observed. Anemia is one of the indicators of trypanosomosis in cattle [28]. The level of anemia or PCV gives an indication of the disease states and reduces performance of infected animals [29]. The finding was not in accordance with Stephen [28] since smaller PCV values were observed in aparasitemic animals which can affect mathematical expression of the data. The lower PCV in apparasitemic animals could be due to the occurrence of other diseases that causes anemia in general and shistosomiasis in particular [24]. Infection rate in poor body condition animals were not significantly (p > 0.05) higher than good body condition animals and was in agreement with Mussa [30]. Although higher infection rate was observed in adult animals and animals above five years of age, in the present study no statistically significant difference was observed in both age and sex (p > 0.05). This result is in agreement with the previous research result reported by Sinshaw [27]. This could be due to the fact that adult animals travel long distance for grazing and draft as well as harvesting of crops to tsetse challenged areas (Rowlands *et al.*) [31], however that suckling calves do not go out with their dams but graze at homesteads until they are weaned off. Young animals are also naturally protected to some extent by maternal antibodies [32]. This could result in low prevalence of trypanosome that was observed in calves.

CONCLUSION AND RECOMMENDATION

The present study indicated that trypanosomosis is an important disease limiting livestock rearing and agricultural activity in both Addisamba and Amarit due to

the presence of biting flies that can transmit the disease and animal movements. Epidemiological studies should be conducted in order to determine the impact on productivity as well as its economic impact at large. Further studies should be conducted in order to exploit the tolerance to trypanosome infection. A progressive integrated control campaign in the Addisamba and Amarit is quite necessary to minimize the effect of trypanosomosis and to make sustainable the observed reduction both in trypanosomosis prevalence and biting and tsetse fly densities which is encouraging to scale up the control program to other areas bordering both districts.

ACKNOWLEDGEMENTS

The author would like to thank Wollega University School of Veterinary Medicine for financial support to execute this research work. Managers and technical staff of the Bahir Dar Regional Veterinary Diagnostic and Investigation Center are acknowledged for their indispensable support and collaboration during the study period.

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