

Study on Prevalence of Bovine Trypanosomosis in Dale Wabera District, Kellam Wollega Zone, Western Ethiopia

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Abstract

A cross-sectional study was conducted from November 2009 to April 2010 in Dale Wabera district, western Ethiopia. The objectives of the study were to determine the prevalence of bovine trypanosomosis and to assess the apparent densities of vectors of the trypanosomosis. A parasitological study using conventional Buffy coat technique was employed for the determination of prevalence of trypanosomosis while baited traps were used for the vector survey. A total of 479 tsetse flies were collected and the density of *Glossina* species was 11.98 fly/trap/ day. Three species of tsetse fly including *Glossina morsitans submorsitans*, *G. pallidipes* and *G. tachnoides* were recorded from the area. The result of parasitological study revealed that the overall prevalence of trypanosomosis was found to be 12.28%, 95% CI. The prevalence for trypanosome species was 1.53%, 3.32% and 7.42% for *Trypanosoma brucei*, *T. vivax* and *T. congolense*, respectively. Highest trypanosome prevalence (16.42%) was seen in animals with poor condition than that of those with medium (10.27%) and good (9.91%) body condition for the concerned parasite, but no significant difference was observed among the body conditions of cattle considered and infection with trypanosomes ($P > 0.05$). Higher infection rate without significant difference was occurred in male (13.02%) than female (10.77%) cattle. Infection rate was higher in adult (13.25%) than young cattle (8.11%), although the difference is not significant. The mean PCV values of parasitologically negative (26.80%) animals were higher than that of positive ones (20.00%). With 12.28% the highest prevalence in the present study revealed that trypanosomosis is causes significant loss of economy due to reduced production, cost of treatment and death of the animals is supposed to be significant. Therefore, trypanosomosis and its vector control and prevention strategies should be implemented in the area.

Introduction

Trypanosomosis is one of the diseases that are caused by flagellated protozoan parasites belong to the genus *Trypanosoma*. Trypanosomosis limits the extension of natural herds particularly in Africa where the presence of tsetse fly density access to fertile woody and savannah lands with good grazing potential and livestock rearing [1,2]. It is a serious constraint to agricultural production in extensive areas of the tsetse infested regions [3,4] which accounts over 10 million square kilometers of the tropical Africa. According to [5] the reduced capacity for work animals is also a very important factor where 80% of the traction power in African agriculture is provided by animals. Generally, there is a great threat of trypanosomosis which impedes the economic development of sub-Saharan Africa and reasonable for the incalculable toll of human health.

The most economically important trypanosomes in livestock are the tsetse transmitted species: *Trypanosoma congolense*, *T. vivax* and *T. brucei*. Tsetse flies in Ethiopia are confined to southwestern and northwestern regions between longitude 33° and 38° E and latitude 5° and 12° N covers an area of 220000 km². The low lands and in the river valleys of Blue Nile, Baro, Akobo, Didessa, Ghibe, and Omo are tsetse fly infested part of Ethiopia. The country is infested with five species of tsetse fly including *G. morsitans submorsitans*, *G. pallidipes*, *G. tachnoides*, *G. fuscipes* and *G. longipennis* and the first four are widely distributed and economically important. According to [6], tsetse transmitted animal trypanosomosis remain as one of the largest causes of livestock production losses in Ethiopia.

Trypanosomosis is found to be one of top health problems of livestock in most lowlands of western and southwestern Ethiopia. However, the distribution and the magnitude of the disease and its vectors are not well understood. Therefore, the aim of this research was to estimate the prevalence of trypanosomosis in cattle and relative abundance tsetse fly in Dale Wabera district, Western Ethiopia.

Materials and Methods

Study area

The present study was conducted in four settlement areas in Dale Wabera district of Kellam Wollega zone, Oromia Regional state, west Ethiopia. Dale Wabera is located at 600 km west of Addis Ababa between 08025' to 080 58' N and 034033'to035028'. The climate alternates with long summer rain (June-September) and short rainy season and winter dry season (October- February) with mean annual rainfall of 1200-1800 mm. The mean annual temperature is 25°C and the altitude ranges from 1200-2200 meters above sea level.

The study area includes four settlement areas, namely Gosh amba, Midhaga birbir, Dagaga birbir and Lalisa birbir. The perennial rivers flowing through the district and drain in to the large river, Birbir, areketo, Bosona, kunni and then Birbir continuous in to the Baro which is a tributary of the White Nile. These rivers support the growth of vegetation that could harbor tsetse flies and its reservoir hosts.

Agriculture is the main stay of livelihood of people with a mixed farming system and livestock plays an integral role for agriculture.

Sample size determination and sampling method

The sample size was estimated based on the formula given by Thrustfield [7] considering 50% expected prevalence (P_{exp}) and 0.05 desired absolute precision (d).

$$N = 1.962 \times (P_{exp} \times (1 - P_{exp})) / d^2$$

Accordingly, 384 small ruminants were needed to be sampled although, a total of 391 cattle were randomly sampled from four (4) purposively selected peasant associations of the district to determine the prevalence of bovine trypanosomosis. The sex, age, body condition and origin (villages) of cattle were explanatory variables used to associate with the prevalence. Body condition for each cattle was determined according to [8]. The age of study animals was estimated based on dentition given by [9] for age determination and information from owners.

Study design and protocol

The study employed a cross-section study design, involving determination of the prevalence of trypanosomes and an entomological survey of tsetse flies. For the entomological survey, a total of 20 baited mono-pyramidal traps were deployed along suitable tsetse habitats to assess the apparent densities, distributions and species of tsetse flies. All traps were baited with acetone, Octenol (1-3 - Octane) and cow urine filled in separated bottles and deployed at an interval of 200-250 meters. After 48 hours of trap deployment time, the cages were collected and captured flies were identified to species level and sexed according to morphological characteristics.

For the prevalence study, blood samples were collected randomly from cattle of the four peasant associations during the study periods. Blood samples were collected in to heparanized micro haematocrit tubes (Delta lab S.L, Barcelona, Spain) after piercing the ear vein using lancet. Then one end of the capillary tube was sealed with sealant (Hawksley Ltd, Lancing, UK) and spun at 12,000 rpm for five minutes to separate the blood cells and to concentrate trypanosomes [10].

Data management and analysis

The data collected were entered in to Microsoft Excel Data base system. The entered data were analyzed using STATA version 10 statistical software program. The prevalence of trypanosomosis was calculated by dividing the proportion of cattle infected with one and/or more trypanosome species by the total number of cattle examined multiplied by 100. The association between the prevalence of trypanosome infection and associated risk factors were assessed by logistic regression, whereas the student's t-test was used to assess the difference in mean PCV between trypanosome positive and negative animals. A statistically significant association between variables was said to exist if the calculated $P < 0.05$ at 95% confidence level. Finally, the density of fly population is calculated by dividing the number of flies caught by the number traps deployed and number of days of deployment, and expressed as fly/ trap/ day.

Results

Entomological survey results

A total of 479 tsetse flies were caught by deploying 20 mono pyrimidal traps that were collected after 48 hours of deployment. Therefore, the apparent density of *Glossina* species was 11.98 fly/ trap/day. Out of the total caught tsetse flies, 113, 94 and 33 were *Glossina morsistans* submorsistans, *Glossina pallidipes* and *Glossina tachnoides*, respectively. Higher proportion, 75% (359/479) were females and the rest, 25% (120/479) of them are males tsetse flies.

Parasitological examination and hematological examination results

Out of the 391 local breeds of cattle examined during the study period, 48 animals were found positive for trypanosomosis. Prevalence, hence, is 12.3% and from the total trypanosomosis positive animals 7.42%, *T. congolense*, 3.32% *T. vivax* and 1.53% was *T. brucei*. There was no significant correlation between trypanosome infection rate in the four study sites ($p > 0.05$).

Body condition was evaluated in cattle, which are living under similar environment and management systems to see the impact of trypanosomosis in causing debilitation. Statistically, there is no significant difference ($p > 0.05$) between different body conditioned animals.

From 391 cattle examined in four settlement areas, 261 of them were male, out of which 34 (13.02%) animals were positive of trypanosomosis and 130 of them were females out of which 14 (10.78%) animals were positives of trypanosomosis. Analysis of the data showed that there is no statically significant difference between different sex groups of animals.

The prevalence of these different age groups was 8.11 and 13.25% for cattle less than 3 years and greater than three and / or equal to three, respectively. There is no statically significant difference ($p > 0.05$) in different age groups.

Discussion

During the entomological survey, 479 tsetse fly species were caught and the apparent density was 11.98 fly/ trap/ day. Lelisa et al. [11] and Kassaye [12] reported fly densities of 10.5 and 13.01 fly/trap/ day from western part of Ethiopia. Three species of tsetse fly including

Table 1: Prevalence of trypanosomosis in four study sites of Dale Wabera district.

Sites	No. examined				Number of positive		X ²	p-value
	T.b	T.c	T.v	Total	Total	Prevalence		
					13	12.87%	4.5	0.21
Gosh amba	101	1	9	3	13	12.87%		
Lalisa	96	1	6	3	10	10.42%		
Degaga	98	2	4	2	8	8.16%		
Total	391	6	29	13	48	12.28%		

Table 2: Prevalence of trypanosomosis in different body condition of cattle.

Body condition	No. examined	Infected (N)	Prevalence	X ²	P-value
Good	111	11	9.91%	3.2551	0.196
Medium	146	15	10.27%		
Poor	134	22	16.42%		
Total	391	48	12.28%		

Glossina morsistans submorsistans, *G. pallidipes* and *G. tachnoides* were recorded from the area. Different studies from western Ethiopia showed this three species of *Glossina* are common in the area [13,14]. Sex identification was assessed and greater numbers of female was recorded and similar results reported by other workers [15]. Leak [16] reported that in unbiased sample female would comprise 70-80% of the mean populations. The higher population of female may be attributed to the fact that they live longer lifespan [17].

Even though various conventional diseases induce livestock mortality and result economic losses in Ethiopia, tsetse transmitted trypanosomosis has crucial effect. The result of this study, which was conducted in Dale Wabera district of western Ethiopia, indicated that trypanosomosis is one of the major diseases of cattle retarding livestock development of the area. The finding of the present study showed an overall prevalence of 12.28%, 95% CI. Nearly similar values was also reported by Fentahun et al. [18] and Kediret et al. [19] who reported a prevalence of bovine trypanosomosis 12.40 and 13.14% in a given order from western Ethiopia. Mekuria and Gadisa [20] and Dagnachew and Shibeshi [21] reported a prevalence of 12.41 and 11.33%, respectively, from northwestern Ethiopia.

The present work revealed that *T. congolense*, *T. vivax* and *T. brucei* were species of trypanosomosis causing cattle trypanosomosis in the study area. Similarly, NTTICC [22] also indicated these three species of trypanosomes are the dominant species in Ethiopia (Table 1).

Table 3: Prevalence of trypanosomosis based on the sexes of cattle.

Sex	Number of examined	Number of infected	Prevalence	x ²	P-value
Male	261	34	13.02%	0.00	0.99
Female	130	14	10.77%		
Total	391	48	12.28%		

Table 4: Prevalence of trypanosomosis on age groups of cattle.

Age groups	Number examined	Number infected	prevalence	x ²	P-value
<3 years	74	6	8.11%	1.47	0.22
≥years	317	42	13.25%		
Total	391	48	12.28%		

The prevalence of trypanosomosis in Midhaga birbir (17.71%), Gosh amba (12.87%), Lalistu birbir (10.42%) and Degaga birbir (8.26%) was not significant, although it was highest in Midegabirbir.

The difference in prevalence of trypanosomosis under different body condition groups was not statistically significant ($p > 0.05$). The prevalence in animals of poor, medium and good body conditions were 16.42% 10.27% and 9.91% respectively (Table 2).

The present study revealed that the prevalence of young animals (<3 years) was lower than that of adult (≥ 3) animals but the difference was not significant ($p > 0.05$). When the age of the bovine increased, the infection rate of trypanosomosis also increased and this finding is similar with the result of [23]. This may be due to more exposure of adult animals to vectors of trypanosomes.

Higher prevalence (13.02%) were observed in male than in female animals (10.78%), but the difference was not significant ($p > 0.05$). Similar result reported by different researchers [24,25]. The possible suggestion to the present finding might be associated with the hardworking of male animals (Table 3).

The development of anemia might be the indication of trypanosome infection [26]. Mean PCV values of parasitaemic animals were more significantly lower than that of aparasitaemic animals. Similar results were reported by Leak et al [27] Rowland et al. [28] and Bekele et al. [29]. Considering the PCV value 24%-46% as normal PCV value of bovine, 87.5% of parasitologically positive and 28.9% of negative animals had PCV value of less than 24%. This

suggests that other factors can also be the cause for the reduced PCV value. Hence, when evaluating trypanosomosis in the field based on PCV, it is essential to consider other factors like nutrition and other anemia causing Anemia [30] (Table 4).

Conclusion and Recommendations

The presences of tsetse in many areas of Ethiopia and the diseases, which they transmit, have been responsible for the country being left poor. With 12.28% the highest prevalence in the present study revealed that trypanosomosis is causes significant loss of economy due to reduced production, cost of treatment and death of the animals is supposed to be signification. Therefore, trypanosomosis and its vector control and prevention strategies should be implemented in the area.

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