

Trypanosomosis and Apparent Densities of *Glossina* Species in Bilo Nopha District, Southwestern Ethiopia

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Abstract: A cross sectional study was conducted in Bilo Nopha district, Oromia region, southwest Ethiopia. The study was carried out from December 2017 to May 2018 on indigenous zebu cattle breed managed under mixed crop-livestock production system, to determine the impact of trypanosomosis on PCV and prevalence of bovine trypanosomosis and the apparent density of tsetse fly using buffy coat technique and deployment of mono pyramidal baited traps. The overall prevalence of bovine trypanosomosis in the present study was 2.63%. The predominant species recovered were *Trypanosoma congolense* (43.75%) and *T. vivax* (56.25%). Trypanosomosis prevalence was significantly higher in poor body conditioned cattle, indicating it results in significant weight loss in cattle. The mean PCV of parasitemic animals was significantly lower (20.6%) than the aparasitemic animals (27.39%) ($p < 0.05$). Although the present study came up with low prevalence of bovine trypanosomosis, the potential impact of this disease on production and productivity of cattle shall not undermined. Therefore, sustainable community based tsetse and trypanosomosis control program should be implemented.

Key words: Bilo Nopha • Ethiopia • PCV • Trypanosomosis

INTRODUCTION

African trypanosomosis is one of the major constraints of animal production in sub-Saharan African countries [1] including western and southwestern parts of Ethiopia. Vector borne trypanosomosis is excluding some 180, 000 -200, 000 km² of agriculturally suitable land in the west and southwestern parts of the country [2].

Trypanosomosis is disease caused by unicellular parasites, trypanosome, found blood and other tissue of vertebrates; including livestock, wild life and people [3, 4]. It is a serious disease in domestic livestock causing a significant negative impact on food production and economic growth in many parts of the world, particularly in sub-Saharan Africa. Its epidemiology and impact on live stock production are largely determined by the prevalence and distribution of the disease and its vectors in the affected area [5].

This disease is transmitted mainly by tsetse flies (Cyclically), biting flies (Mechanically) and by other means of transmission. The most important species that infected cattle include *Trypanosoma congolense*,

T. brucei and *T. vivax*. Mechanically transmission is particularly important in relation to *T. vivax* and *T. evansi* particularly on the fringe of tsetse areas. It can also occur in the presence of biting. Trypanosomosis is prevalent in two main regions of Ethiopia i.e. the North West and the southwest regions. In Ethiopia, trypanosomosis is one the most important disease limiting live stock productivity and agricultural development due to its high prevalence in the most arable and fertile land of south west part of the country following the grater basins of Abay, Omo, Ghibe, Didessa and Baro with a high potential for agriculture [6].

The economic burden of trypanosomosis is not only due to the direct losses resulting from mortality, morbidity and infertility of the infected animals but also it is due to the indirect losses like exclusion of live stock and animal power based crop production from the huge fertile tsetse infested areas. In Ethiopia, about 5.5 million heads of cattle are exposed to the risk of trypanosomosis. Nevertheless, in Bilo Nopha district the magnitude of trypanosome infection and the distribution of its vectors is not well known except complaints from farmers of the area. Therefore, the study is to fill these gaps.

MATERIALS AND METHODS

Area Description: Bilo Nopha district is located in Ilubabor Zone of Oromia regional state. The district is situated at 575 km from Addis Ababa. Bilo Nopha is located at longitude 035°25'-035°38'E and 08°24'-08°29' north of equator. The area of the district is 390.07 km². The agro-climate of the areas alternates with long summer rainfall (June-September) and winter dry season (December- March). The mean annual rainfall in Bilo Nopha ranges from 992-1658mm district. The annual temperature in Bilo Nopha districts ranges from 20.5-28°C. Bilo Nopha district has altitudes ranging from 1000-1760 meters above sea level.

Study Population: The cattle in the district are indigenous African Zebu breeds that are kept under the traditional extensive husbandry systems with communal herding. Agricultural is the main stay of the likely hood of the society with mixed farming system and livestock play an integral role for agriculture. According to Bilo Nopha district Agricultural office there are about 72, 197cattle, 13, 700 sheep, 22, 700 goats, 670 horses, 450 mules, 2830 donkeys and 44, 150 poultry in district.

Sample Size and Sampling Method: The simple random sampling technique was applied to collect from the ear vein. The sample size can be determined based on the study type and sampling method for investigation, 95% confidence interval, 5% desired absolute precision and 50% average prevalence [7].

Study Methods

Determination of Packed Volume: The capillary tubes were placed in micro haematocrit centrifuge with sealed end outer most. The tube was loaded symmetrically to ensuring good balance after screwing the rotators 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 a haematocrit and readings were expressed as a percentage of red blood cells to the total volume of whole blood. Animals with PCV<24% were considered to be anemic.

Buffy Coat Technique: A small blood was collected from an ear vein using heparinized microhaematocrit capillary tube. A haematocrit tube with a whole blood sample and end was sealed with haematocrit clay. The tube was centrifuged at 12000 revolutions per minute for five minutes. After centrifugation trypanosome 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 1 mm above to include the plasma. The content of capillary tube was expressed on to side, homogenized on to clean side and covered with cover slip. The slide was under x40 objective x10eye piece for the movement of the parasites [8].

Data Management and Analysis: The prevalence was calculated as the number of infected individuals divided by the number of total examined and multiplied by 100. Statistical analyses were conducted using STATA version 12.0 software. Descriptive statistics were used to summarize data. The association between the prevalence of trypanosome infection and risk factors were assessed by logistic regression, whereas the two group mean comparison (t-test) was used to assess the difference in mean PCV between trypanosome positive and negative animals. The test result was considered significant when the calculated p-value was less than 0.05. The density of fly population was calculated by dividing the number of flies caught by the number of traps deployed and the number of days of deployment and expressed as fly /trap/day (FTD).

RESULTS

Entomological Survey Result: A total of 70 mono-pyramidal traps were deployed in Bilo Nopha district. As it was shown in Table 1 there was high catch of tsetse flies in Suli and Maru chage localities, while the lowest catches were in Charchari. The highest and lowest fly densities are 5.38 and 3.41 and 0.00 fly/trap/day (FTD), respectively. The mean tsetse fly density of the district is 2.7 fly/trap/day. The relative apparent density of 1.36 for *G. pallidipes* was, 0.54 for *G. m. submorsitans*, 0.38 for *G. f. fuscipes* and 1.12FTD for *G. tachnoids*. During the study period, there were abundant savannah species (The *G. pallidipes* and *G. m. submorsitans*) having the FTD of 1.91 than that of the riverine species (*G. f. fuscipes* and *G. tachnoids*) having 1.51 FTD.

Parasitological Survey Result: During the study period in Bilo Nopha district, the overall prevalence of the district was 2.63%. On the other hand, the Relative prevalence of trypanosomosis species was known that 1.315 for *T. congolense* and 1.315 prevalence results for *T. vivax* in which the proportion value of the both species have equal value.

Table 1: The Mean catch of fly species in Bilo Nopha district

		Glossina species caught									
		G.P		G.m.m		G.f.f		G.t			
		M	F	M	F	M	F	M	F	Total	FTD
Pas	NT										
Suli	26	38	58	22	37	17	22	35	51	280	5.38
Maru chage	29	38	57	10	7	5	10	30	41	198	3.41
Charchari	15	0	0	0	0	0	0	0	0	0	0.00
Total	70	76	115	32	44	22	32	65	92	478	3.41

NT: No. of traps deployed, PAs: Peasant associations, G.p: *Glossina pallidipes*, Gff: *Glossina fuscipes fuscipes*, Gt: *Glossina tachnoides*, G.m.m: *Glossina morsitans sub morsitans*, FTD: Fly per trap per day, F: female, M: male

Table 2: The prevalence of trypanosomosis in selected PAs of Bilo Nopha district

No.	Name of PA	No. animals examined	No. infected	Prevalence (%)
1	Suli	96	6	6.25
2	Kitabir	155	6	3.87
3	Adare	191	1	0.52
4	Maru chage	95	1	1.05
5	Charchari	61	2	3.27
Total		608	16	2.63

Table 3: The mean packed cell volume of examined cattle in Bilo Nopha district

Group	Observations	Mean PCV	SE	SD	95% CI
Negative	592	27.39	0.15	3.68	27.10-27.69
Positive	16	20.63	0.58	2.31	19.39-21.85
Total	608	27.21	0.15	3.81	26.91-27.51

SD=standard Deviation, SE= Standard Error

Poor body conditioned cattle have significantly higher prevalence than medium and good conditioned. The prevalence of trypanosomosis in good, medium and poor body conditioned cattle was 0.99, 2.21 and 6.45%, respectively.

Haematological Results: The mean PCV values of studied animals was significantly ($p < 0.05$) varying between parasitemic ($20.63 \pm 2.31\%$) and aparasitaemic ($27.39 \pm 3.68\%$) $t=0.00$, $DF=606$ (Table 3).

DISCUSSION

In this study, the entomological findings revealed that four species of *Glossina* (*Glossina pallidipes*, *G. morsitans submorsitans*, *G. fuscipes fuscipes* and *G. tachnoides*) out of five reported in Ethiopia. Tekle and Mekonen [9] and Duguma *et al.* [10] also reported these species of tsetse flies from western Ethiopia. The overall apparent density of *Glossina* species was 3.41 flies/ trap/ day. Kedir *et al.* [11] and Mulatu *et al.* [12] reported 4.27 and 3.40 flies/trap/day, respectively from different tsetse infested parts of the country. Higher percentage of female (59.20%) tsetse flies was

caught than males (40.79%) that are in line with various reports from different parts of Ethiopia [13, 14]. This could be adhered to longer lifespan of female tsetse flies than males [15-18].

The result of the present study revealed an overall trypanosomosis of 2.63%, 95% CI. This finding was lower than the previously reported infection rate of 23% in western Ethiopia, 21% in Metekel district, 18.5% in Arba-minch zuria district, 17.5% in upper Didesa valley areas, 11.7% in Abay Basin northwestern Ethiopia [19-21]. The lower prevalence in the current study might due to the low sensitivity of diagnostic method, use of prophylactic and trypanocidal drugs, application of relatively designed method of tsetse fly control and expansion of cultivation land in the area which in directly affects its vectors.

The study revealed the infections were due to *T. congolense* (43.75%) and *T. vivax* (56.25%). The higher proportion of *T. vivax* infection was in agreement with trypanosome species prevalence data from other tsetse-infested regions of Ethiopia [22]. The ratio of *T. congolense*, *T. vivax* and *T. brucei* was 2.6: 1:0.4 indicating high trypanosome infection due to *T. congolense*. The percentage specious distribution in our finding was similar to Abebe and Jobre [23].

The mean PCV values of studied animals was significantly ($p < 0.05$) varying between parasitemic (20.63%) and aparasitaemic (27.39%). This result was in agreement with the previous result by Sinshaw *et al.* [24]. Being intracellular blood parasites, trypanosomes result in lowering PCV of cattle because they lyses and destruct the red blood cells. The appearance of trypanosomosis negative animals with PCV values of less than the threshold values (25%) may be due to the inadequacy of detection method used or delayed recovery of anemic situation after current treatment with trypanocidal drugs. Parasitaemic animals with PCV values greater than 25% might be thought of recent infection. Trypanosome infection and mean values obtained in this study in the parasitaemic animals was found to be highly associated. Different authors in southern, northwestern and southwestern Ethiopia [25, 26] also reported similar results. The mean PCV can be affected by many factors including helminth parasites infections, nutritional deficiencies and blood parasites, other than trypanosomosis, however, these factors are likely to affect both trypanosomosis positive and negative animals [27, 28].

Although, the present study the prevalence of bovine trypanosomosis in the study area was low, potential impact of the infection on production and productivity of cattle shall not be undermined.

CONCLUSION

The prevalence of trypanosomosis in the studied area was 2.63% and its vectors density was 3.41 FTD, implying trypanosomosis is one the challenges of cattle production in the area. Therefore, appropriate trypanosomosis and its vectors interventions strategies should implemented.

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